

Infrastructure and Servicing Report

2 Woongarra Road,
Woongarra

Client

LANDCORP NSW PTY LTD.

Issued

30/03/2023



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BW
Beveridge Williams

Client: LANDCORP NSW PTY LTD.
Issued: 30/03/2023
Version: A
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Checked by: Sonya Harrison
Project Manager: Kelly Hassab
Project Number: 1801942 (10)

Surveying
Asset Recording
Civil Engineering
Infrastructure Engineering
Traffic & Transport Engineering
Environmental Consulting
Water Resource Engineering
Strata Certification (NSW)
Town Planning
Urban Design
Landscape Architecture
Project Management

Revision Table

REV	DESCRIPTION	DATE	AUTHORIZED
A	ISSUED FOR REVIEW	30/3/2023	Sonya Harrison

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1 OVERVIEW

Beveridge Williams has been engaged to prepare a high-level infrastructure and servicing report to address Roads, Stormwater Drainage, Wastewater, Potable Water, Electricity, and NBN in support of a proposed rezoning Planning Proposal at Lot 1, DP 1275060, Hakone Road, Woongarra – The Subject Site. The proposal seeks to rezone the current B2 Local Centre Zone and B4 Mixed Use Zone per the Warnervale Town Centre DCP, to R1 residential zone. The Warnervale Town Centre DCP states the subject site in its current zoning is to have 136 apartments. The proposed rezoning to R1 residential is for 55 lots. ABS data indicates the population density for apartments is 1.8 people and for detached dwellings, this figure is 2.5 people.

136 apartments x 1.8 people per apartment = 245 total population density

55 Lots x 2.5 people per dwelling = 138 total population density

As seen in the calculations above, the population density of the proposed rezoning reduces by 107 persons and reduces the net load of servicing required.

The Subject Site (Refer to red outline in **Figure 1**) is referred to by Beveridge Williams as Stage 10 of our Warnervale Town Centre Development, lies within the Central Coast Council LGA and is bounded by Hakone Road to the north, Stage 9 to the South, ADW Johnson Development to the East and Rural land to the west which is part of the Town Centre Civic Centre per the Warnervale Town Centre DCP. The site is divided by a ridge approximately through the midway of the site running north/south which forces the eastern side of the development to fall to the east and the western side of the development to the west.



Figure 1: Site Image – The extent of the Site is bounded in Red.

Hakone Road, adjacent to the site has a sealed pavement with no kerb and gutter on either side of the road fronting the subject site. The Road has an existing crest approximately outside of proposed lot 1040 (see figure 2 below) and drops off quite steeply to the west from this point. Hakone Road grades out very gradually to the east of proposed lot 1040.

The western half of the development will drain to the far western frontage of Hakone Road whereby the stormwater is proposed to discharge to the existing road table drain and the wastewater will be connected to a new sewer

pump station as per the Council's sewer servicing strategy. Preliminary discussions with the Council's water and sewer team regarding the pump station being located in the north-western corner of the subject site and being constructed as part of this development. The subject site's eastern half will drain east with stormwater and wastewater connecting into the adjoining development stubs. Provisions have/will be made in the adjoining developments for connections to potable water, electricity & NBN.

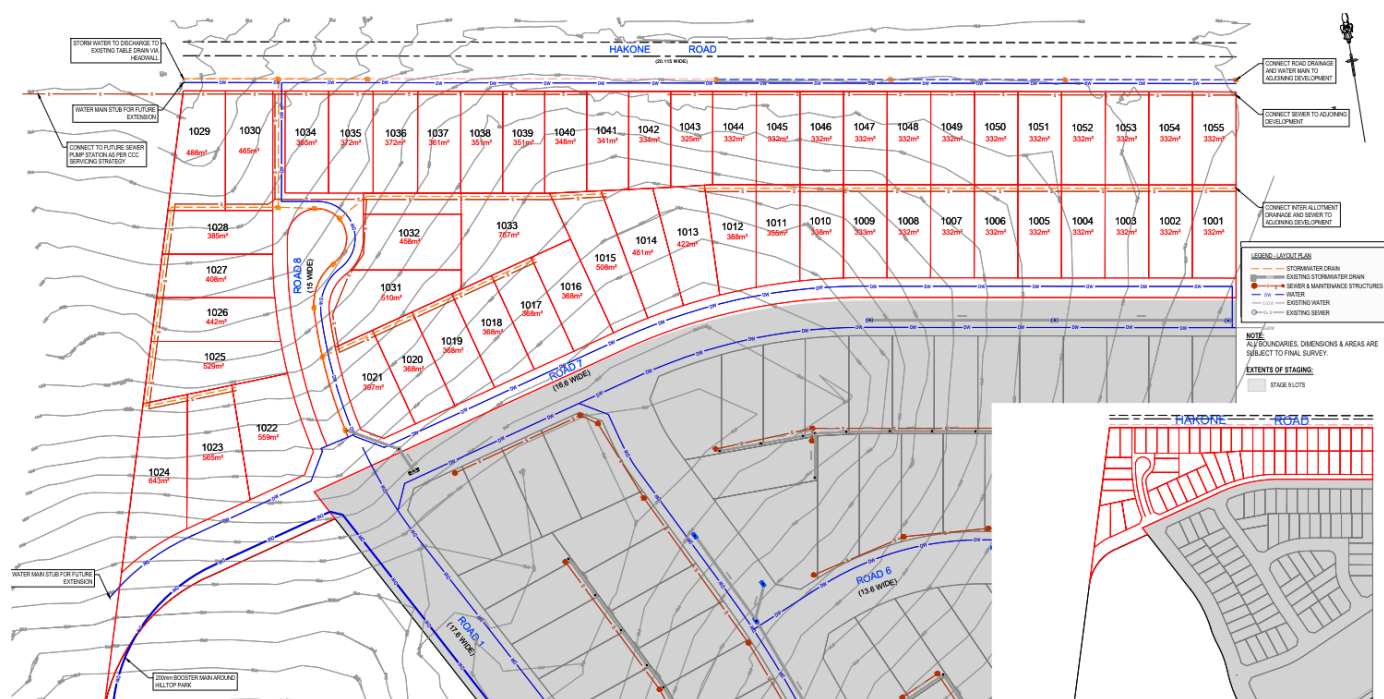


Figure 2: Indicative Subdivision Layout

The proposal has been reviewed by Central Coast Council as part of a recent Pre-Lodgement review carried out by the Council's specialist staff. Council issued a list of matters to be considered/investigated to support the proposal. Items relevant to servicing strategy referred to in the Council Letter are: -

2 SERVICES

2.1. Investigation

To prepare this Infrastructure and servicing Report the following information was used/sought:

- Indicative Road and Lot Layout by Beveridge Williams
- Water and Sewer concept design by Beveridge Williams
- Northrop Consulting Civil Engineering Report
- DBYD Plans

2.2. Roads and Transport

The proposed lot layout and road layout of the subject site proposes some key differences from the Warnervale Town Centre DCP. Road 7 (**figure 2**) is proposed to be changed from a 21m wide 'type 3' road per the DCP to a 16.6m wide 'type 11' road with the proposed rezoning from B2 and B4 to R1.

Road 8 (**figure 2**) is shown in the DCP as a connection point to Hakone Road and a 21m wide 'type 3' road. This planning proposal seeks to reduce the road width to 15m wide with a cul-de-sac rather than a link to Hakone Road. Preliminary investigations indicate anticipated SISD issues at the approximate connection point with Hakone Road, if road 8 continued through to Hakone Road, given the proximity of the crest and road grades on Hakone Road.

The 4-way intersection at road 8 and road 7 (**figure 2**), is proposed to be treated as a raised intersection per Council's standard drawing SD0902.

2.3. Stormwater

As mentioned previously, the proposal seeks to rezone the current B2 Local Centre Zone and B4 Mixed Use Zone per the Warnervale Town Centre DCP, to R1 residential zone. According to Central Coast Council Design Guidelines table 10.2, this reduces the impervious area of the subject sites from 90% to 80%, therefore minimising calculated runoff from the subject site.

The catchment areas of the subject site are divided in two by a crest running through lots 1013 and 1042 (figure 2 above).

The eastern half of the development is proposed to follow the lay of the land and connect into stormwater infrastructure at the back of lots fronting road 7 and in Hakone Road to service lots fronting Hakone Road. The regional basin, represented in blue in the north-eastern corner of **figure 3** below, has been sized to cater for the eastern catchment of the subject site. Refer to **Appendix B** for Northrop Consulting Report previously presented to Council for the overall stormwater management strategy.



Figure 3: Excerpt from Warnervale Town Centre DCP identifying basin locations

The western half of the subject site will also follow the lay of the land and flow to the north-western corner of the subject site. The stormwater is proposed to discharge into the roadside table drain on Hakone Road. A stormwater management facility within the subject site at the north-western corner is required to improve water quality and reduce peak flows to pre-development levels prior to discharging to the roadside table drain. The stormwater management facility type, size, and exact location are to be identified at the DA stage. Refer to **Appendix B** for Northrop Consulting Report previously presented to Council for conceptual basin sizing. Please note, the Northrop preliminary sizing is based on the subject site composite impervious areas of 90% consistent with the current zoning. These calculations will be refined to 80% composite impervious area on approval of the planning proposal.

2.4. Sewer

The catchment areas of the subject site are divided in two by a crest running through lots 1013 and 1042 (figure 2 above).

The eastern half of the development is proposed to follow the lay of the land and connect into sewer infrastructure at the back of lots fronting road 7 and in Hakone Road to service lots fronting Hakone Road.

The western half of the subject site will also follow the lay of the land and flow to the north-western corner of the subject site. Council's Water and Sewer Servicing strategy identifies that a Sewer Pump Station must be installed on Hakone Road further to the west of the subject site. Preliminary discussions have occurred with Council's Water and Sewer team regarding constructing the pump station at the boundary of the subject site under the Housing Acceleration Funding (HAF). This is required as there have been no development plans received by the Council for the adjoining land to the west of the subject which would have included construction of the Sewer Pump Station identified in the Warnervale Town Centre Water and Sewer servicing strategy.

The Western half of the subject site is proposed to be serviced by the Sewer Pump Station constructed in the vicinity of Lot 1029 (**figure 2**), with the connecting sewer rising main following Hakone Road to the west and Nikko Road to the south to the connect into the existing sewer infrastructure on Nikko Road (below) per preliminary discussions with Council.

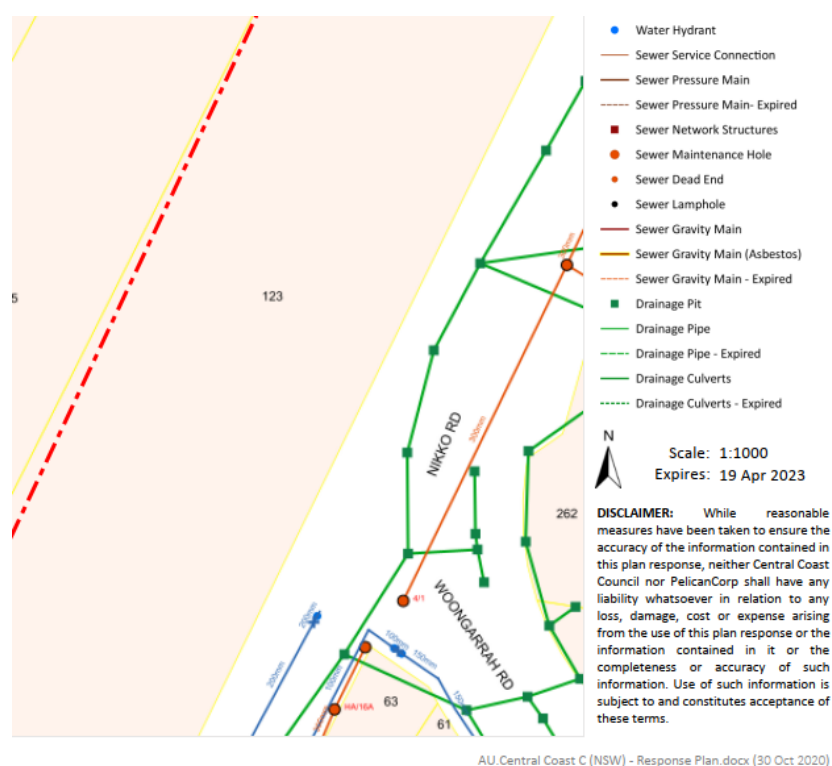


Figure 4: Sewer connection point on Nikko Road for proposed Sewer Rising Main

2.5. Water

A proposed stub for connection has been provided in road 8 (**figure 2**) in the Stage 9 DA plans currently with Council for assessment. A new water main is proposed to be constructed for the extent of the frontage of Hakone Road in accordance with the servicing strategy. The proposed water main in road 8 will connect the water main from stage 9 to the proposed water main in Hakone Road. A water main is also proposed on the northern alignment of road 7 (**figure 2**). It is anticipated the stage 9 works (which includes half road construction and water main on the southern alignment of road 7) will be completed prior to the stage 10 works commencing, the main on the northern alignment of this road will eliminate excavating the newly built road for long services to services lots fronting road 7.

Provisional connection stubs are proposed to be provided at all western boundary locations for future connections.

2.6. Electricity

Provisions for connections and capacity for electricity have been considered in the electrical designs for Stages 6, 7, and 9 for Stage 10. Detailed electrical design and investigation will occur during the DA and SWCC phases of the project.

2.7. Communications

Provisions for connections and capacity for communications utilities have been considered in the comms designs for Stages 6, 7, and 9 for Stage 10. Detailed communications design and investigation will occur during the DA and SWCC phases of the project.

2.8. Gas

Provisions for connections and capacity for gas services have been considered in the comms designs for Stages 6, 7, and 9 for Stage 10. Detailed gas design and investigation will occur during the DA and SWCC phases of the project.

3 CONCLUSION

The impact of the rezoning reduces the capacity requirements of all services compared to the zoning. The development is constrained by the sewer pump station to service the western half of the subject site. The site is also reliant on the development of the adjoining land, most of which is either with Council for assessment or under construction at present and this has been catered for in these designs.

The following is a summary of constraints and works that need to occur:

- Road 7 (**Figure 2**), road width to be reduced from 21m to 16.6m.
- Road 8 (**Figure 2**), road width to be reduced from 22m to 15m
- A sewer pump station located within the subject development. The pump station will be constructed under the HAF scheme with the rising main connecting to the existing gravity system at the Nikko Road / Woongarra Road intersection.
- Gravity sewer servicing the eastern half of the subject site is reliant on the adjoining development providing connection points.
- Water main connection from proposed stub on the proposed stage 9 works to service all lots within the subject site in accordance with the Preliminary Servicing plan prepared by Beveridge Williams+
- New water main along the extent of Hakone Road Frontage – consistent with Warnervale Town Centre Water and Sewer Servicing strategy.
- Gas, Communications, and Electrical servicing shall be consistent and connected to previous/adjoining developments, with designs of the previous/adjoining stages considering and providing connections for future development.
- Stormwater for the western half of the site is proposed to discharge to the existing roadside table drain in Hakone Road. A stormwater management facility within the subject site is required to improve water quality and reduce peak flows to pre-development levels.
- The eastern half of the subject site is reliant on the adjoining development providing connection points and utilizing the adjoining developers' stormwater management facility, which has been catered for in the design by the adjoining developer.

Sonya Harrison
NSW Engineering Manager
Harrisons@bevwill.com.au

APPENDIX A: DBYD

Caller Details

Contact:	Chris Sheppard	Caller Id:	3191821	Phone:	0409 981 596
Company:	Beveridge Williams				
Address:	5 Colony Close Tuggerah NSW 2259	Email:	sheppardc@bevwill.com.au		

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference:	WTC Stage 10		
Working on Behalf of:	Private		
Enquiry Date:	Start Date:	End Date:	
22/03/2023	22/03/2023	29/03/2023	

Address:
236-260 Hakone Road
Woongarra NSW 2259

Job Purpose:

Design

Onsite Activities:

Planning & Design

Location of Workplace:

Both

Location in Road:

Road, Footpath, Nature Strip

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:

Not supplied

Your Responsibilities and Duty of Care

- The lodgement of an enquiry does not authorise the project to commence. You must obtain all necessary information from any and all likely impacted asset owners prior to excavation.
- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at www.byda.com.au
- For more information on safe excavation practices, visit www.byda.com.au

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.

** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.

Asset owners highlighted with a hash # require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
222598769	Ausgrid	(02) 4951 0899	NOTIFIED
222598770	Central Coast Council	(02) 4350 3111	NOTIFIED
222598771	Jemena Gas North	1300 880 906	NOTIFIED
222598768	NBN Co NswAct	1800 687 626	NOTIFIED
222598772	Telstra NSW Central	1800 653 935	NOTIFIED

END OF UTILITIES LIST



Legend

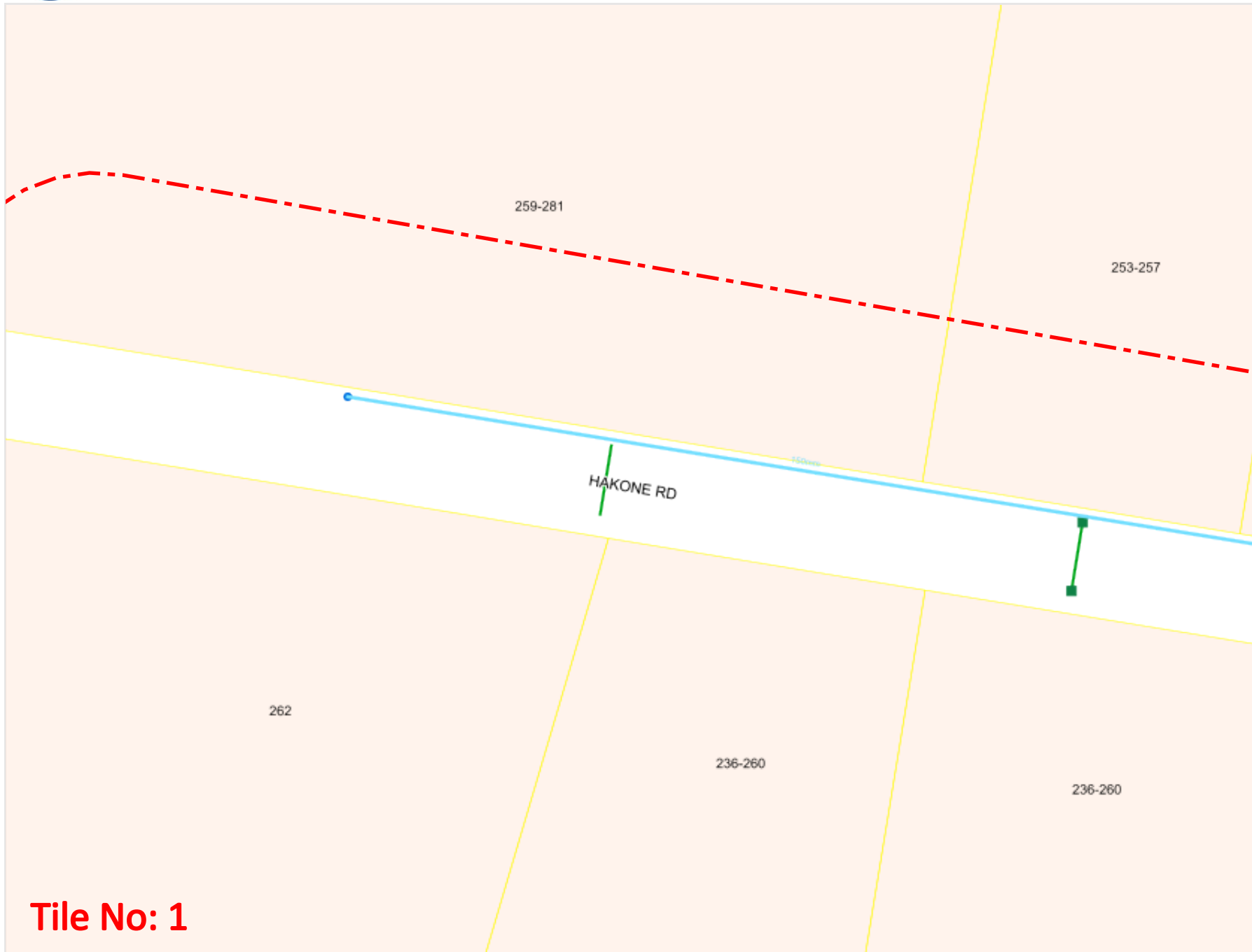
- Watermain
- - - Watermain (Asbestos)
- ... Watermain - Expired
- ... Watermain - Expired (Asbestos)
- + Water Valve
- Watermain - Recycled
- Water Hydrant
- Sewer Service Connection
- - - Sewer Pressure Main
- ... Sewer Pressure Main - Expired
- Sewer Network Structures
- Sewer Maintenance Hole
- Sewer Dead End
- Sewer Lamphole
- Sewer Gravity Main
- - - Sewer Gravity Main (Asbestos)
- ... Sewer Gravity Main - Expired
- Drainage Pit
- Drainage Pipe
- ... Drainage Pipe - Expired
- Drainage Culverts
- ... Drainage Culverts - Expired



Scale: 1:3075
Expires: 19 Apr 2023

DISCLAIMER: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither Central Coast Council nor PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

Overview



Legend

- Watermain
- Watermain (Asbestos)
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- + Water Valve
- Watermain - Recycled
- Water Hydrant
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- - - Sewer Gravity Main - Expired
- Drainage Pit
- Drainage Pipe
- - - Drainage Pipe - Expired
- Drainage Culverts
- - - Drainage Culverts - Expired



Scale: 1:1000
Expires: 19 Apr 2023

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Tile No: 1



Legend

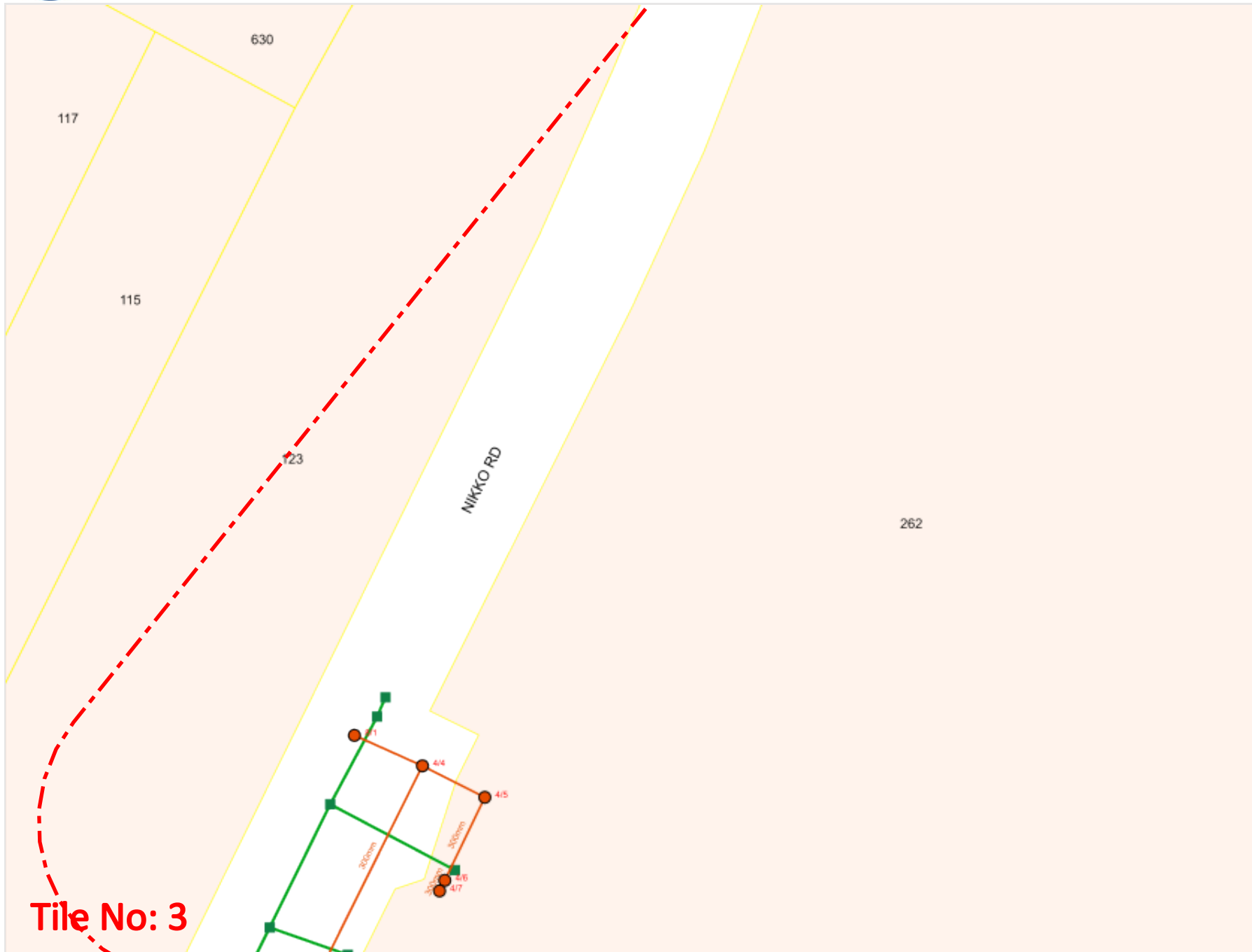
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Tile No: 2



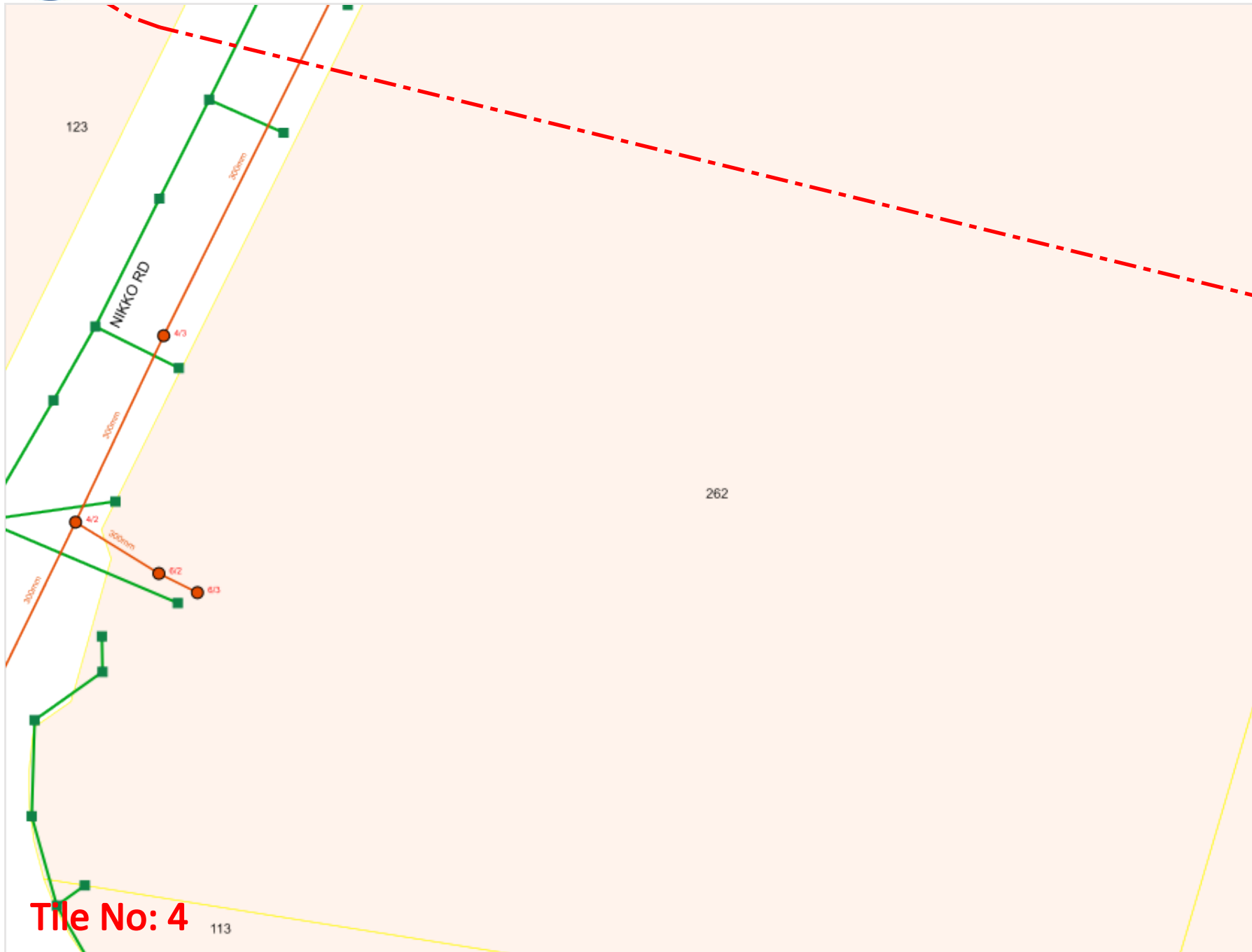
Legend

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Tile No: 4



Legend

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Tile No: 5

To: Chris Sheppeard
Phone: Not Supplied
Fax: Not Supplied
Email: sheppeardc@bevwill.com.au

Dial before you dig Job #:	33860303	 DIAL BEFORE YOU DIG www.1100.com.au
Sequence #	222598768	
Issue Date:	21/03/2023	
Location:	236-260 Hakone Road , Woongarra , NSW , 2259	

Indicative Plans

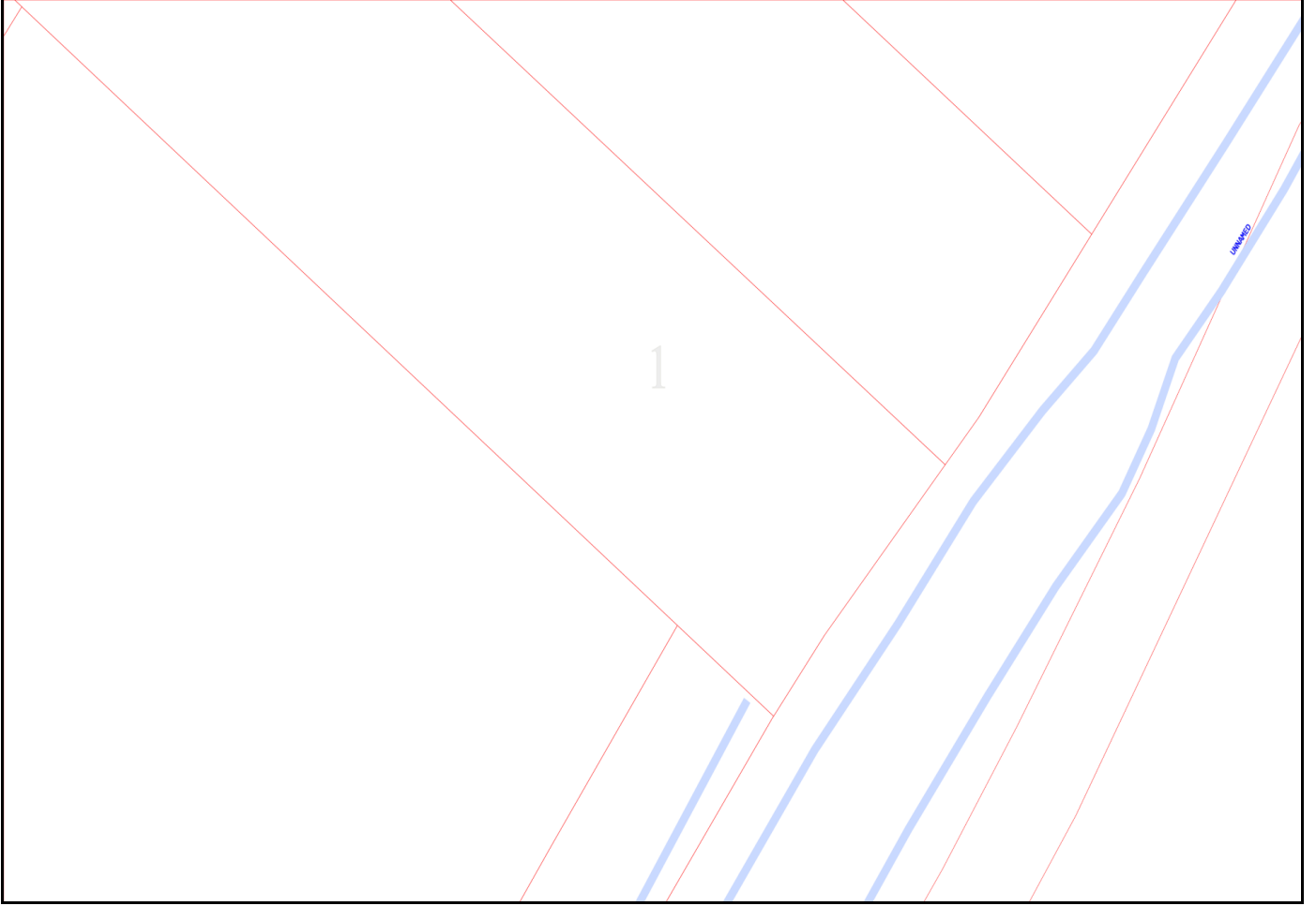
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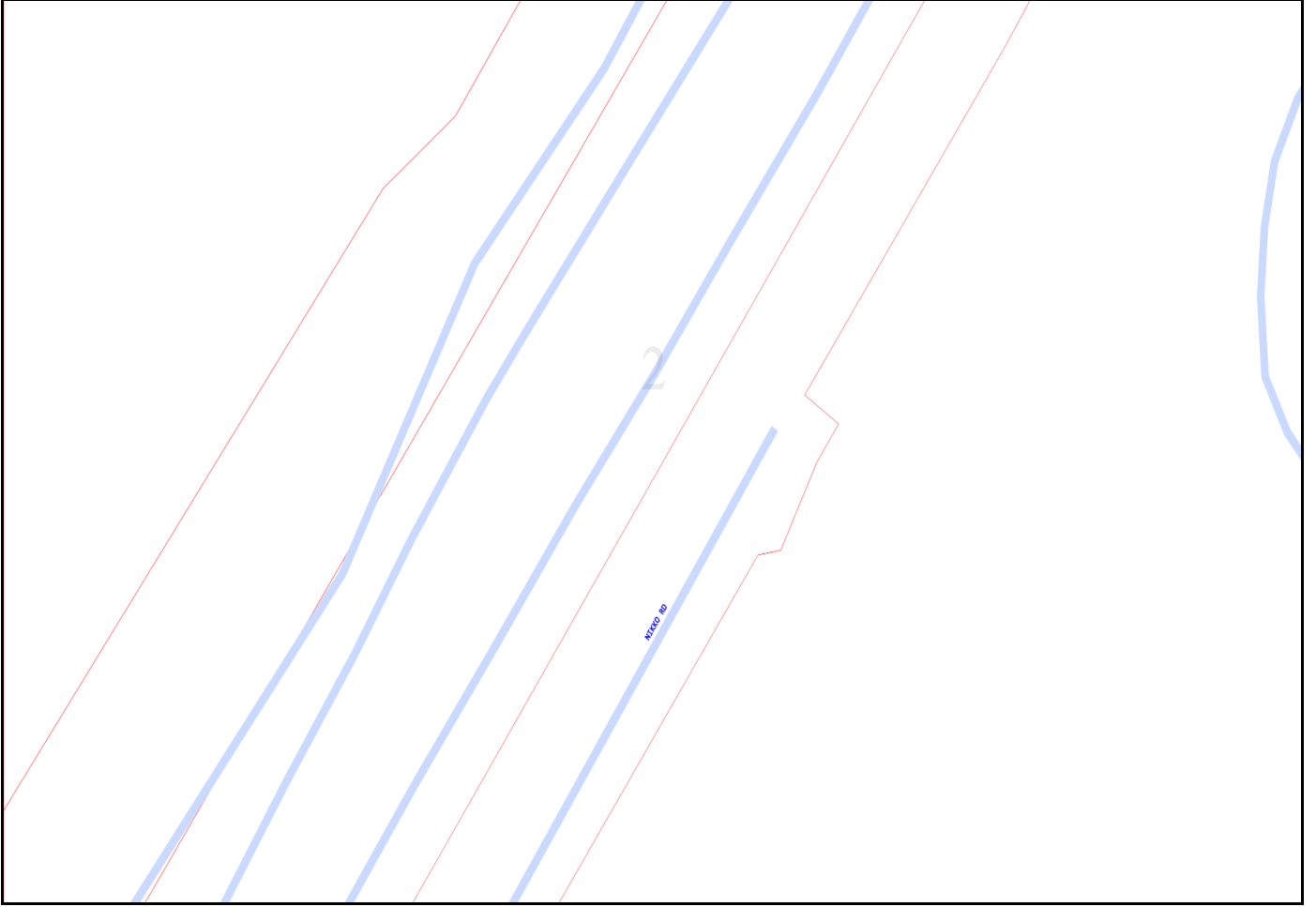


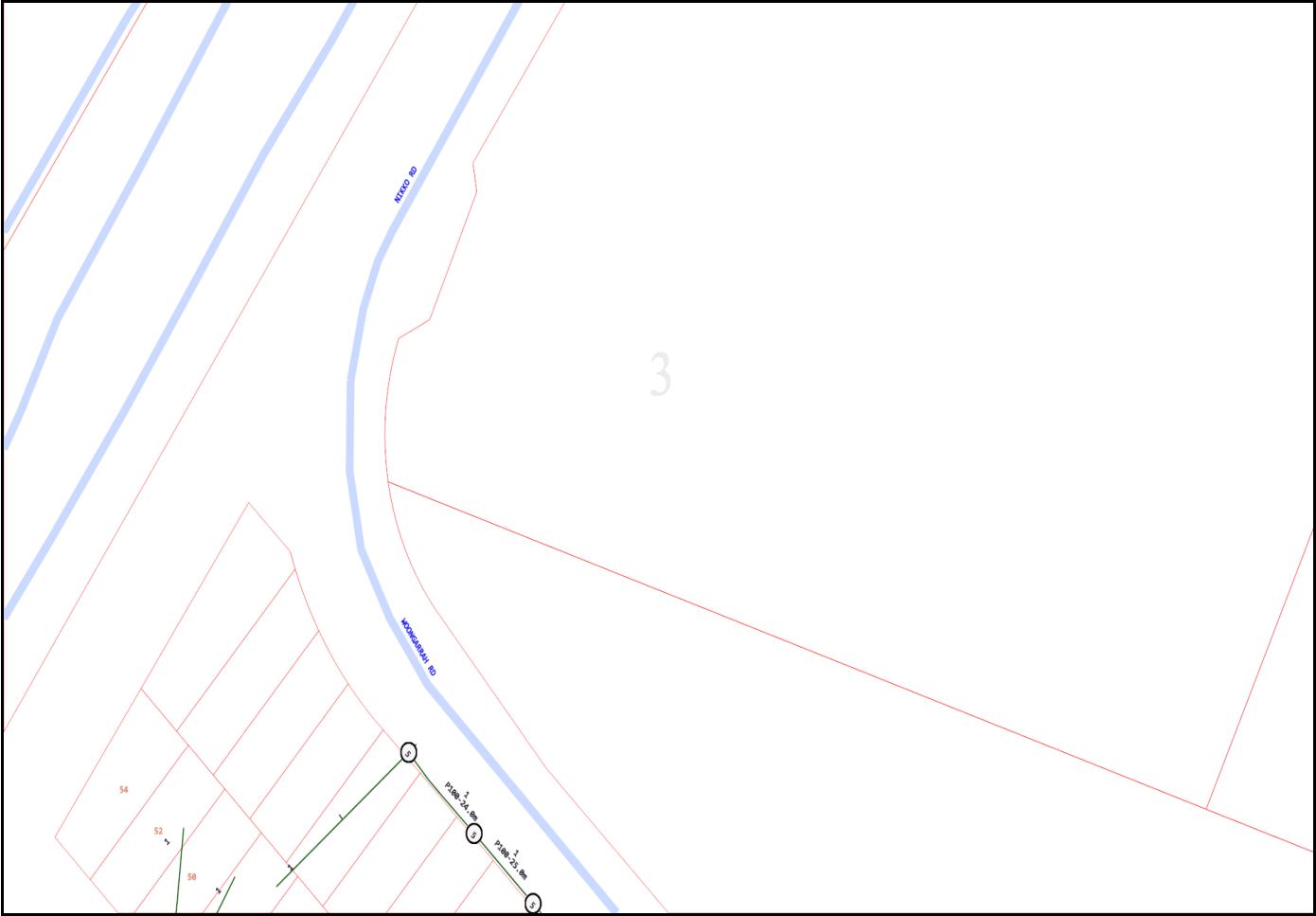
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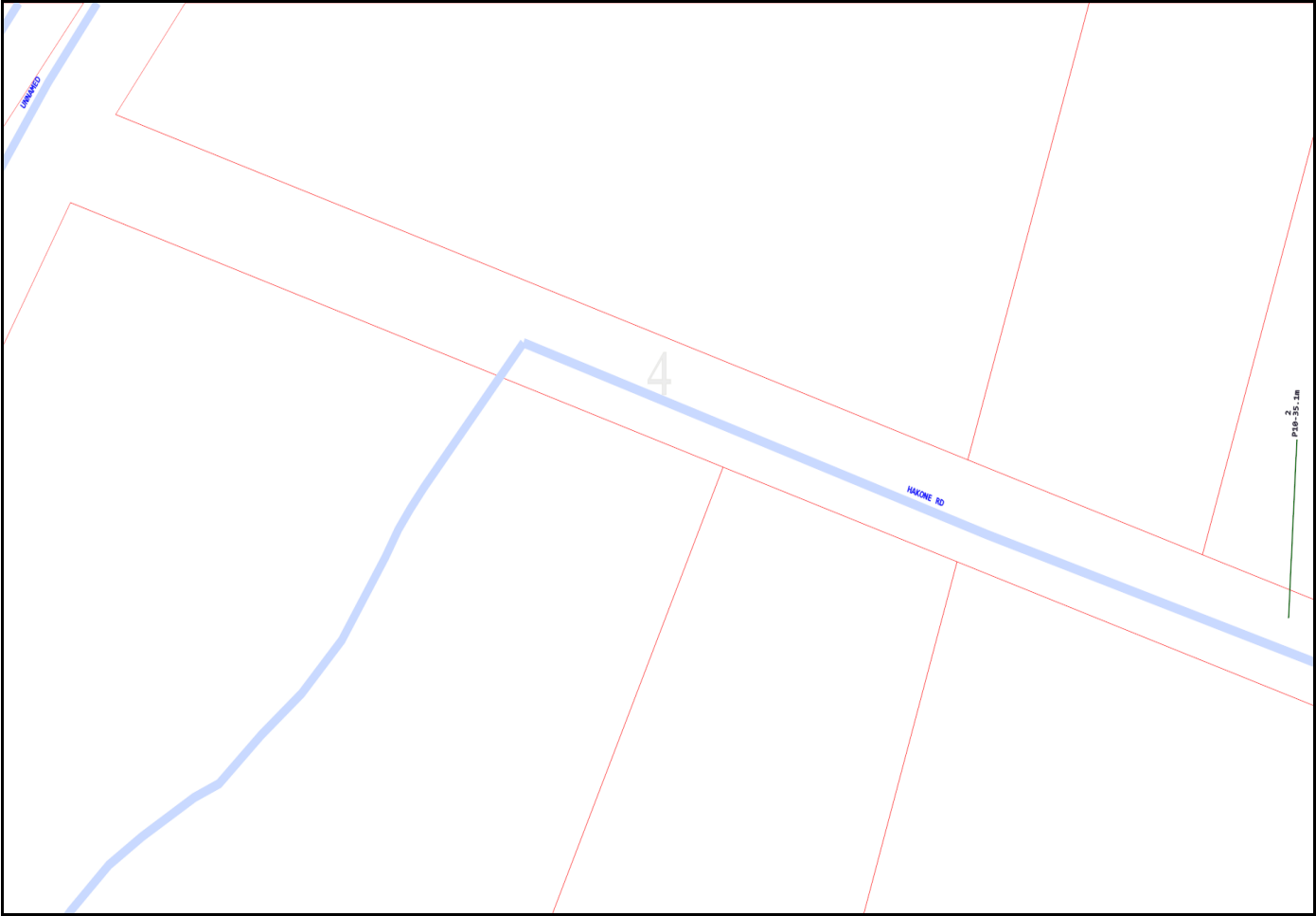


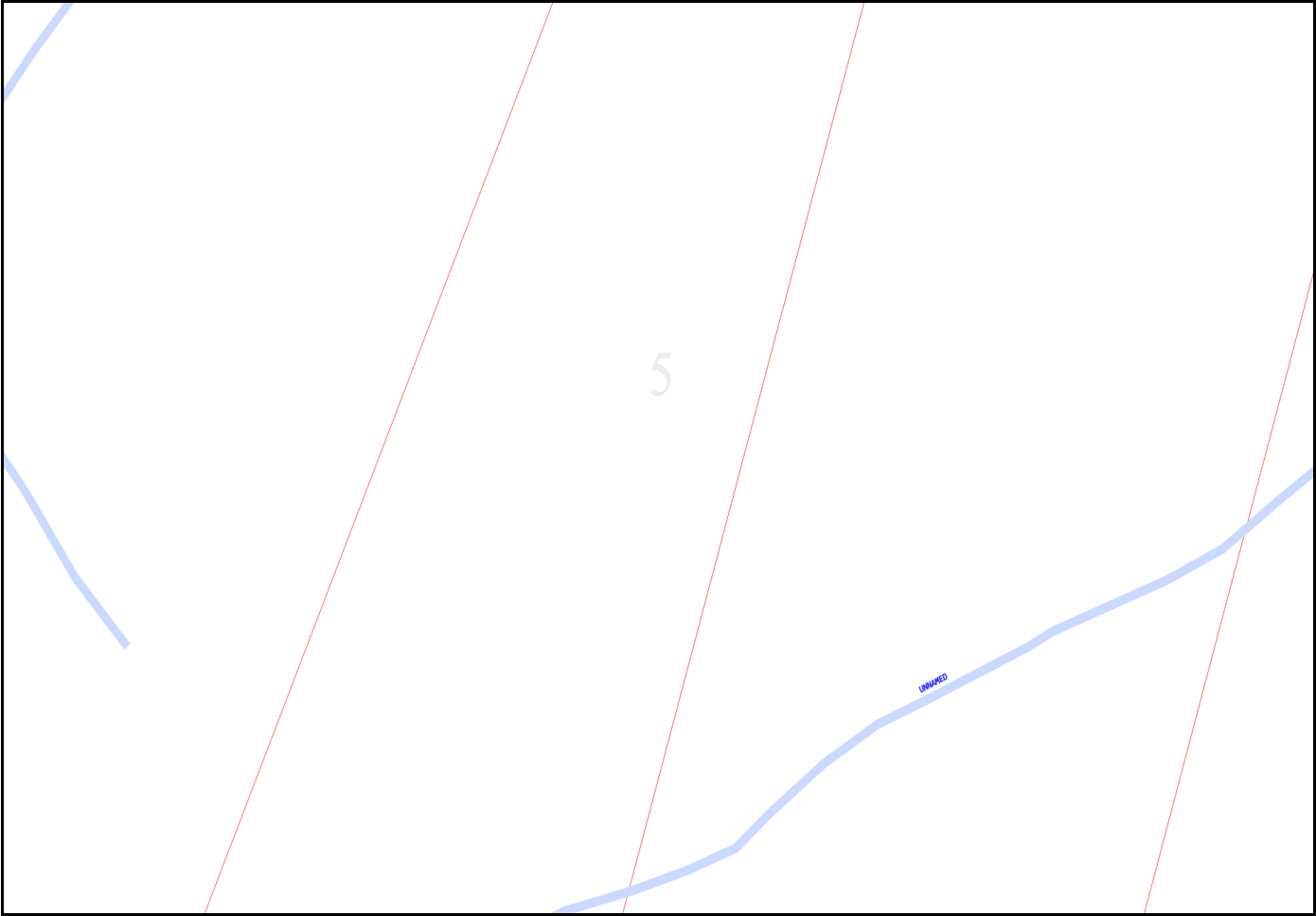
	Parcel and the location
	Pit with size "5"
	Power Pit with size "2E". Valid PIT Size: e.g. 2E, 5E, 6E, 8E, 9E, E, null.
	Manhole
	Pillar
	Cable count of trench is 2. One "Other size" PVC conduit (PO) owned by Telstra (-T-), between pits of sizes, "5" and "9" are 25.0m apart. One 40mm PVC conduit (P40) owned by NBN, between pits of sizes, "5" and "9" are 20.0m apart.
	2 Direct buried cables between pits of sizes, "5" and "9" are 10.0m apart.
	Trench containing any INSERVICE/CONSTRUCTED (Copper/RF/Fibre) cables.
	Trench containing only DESIGNED/PLANNED (Copper/RF/Fibre/Power) cables.
	Trench containing any INSERVICE/CONSTRUCTED (Power) cables.
	Road and the street name "Broadway ST"
Scale	0 20 40 60 Meters 1:2000 1 cm equals 20 m

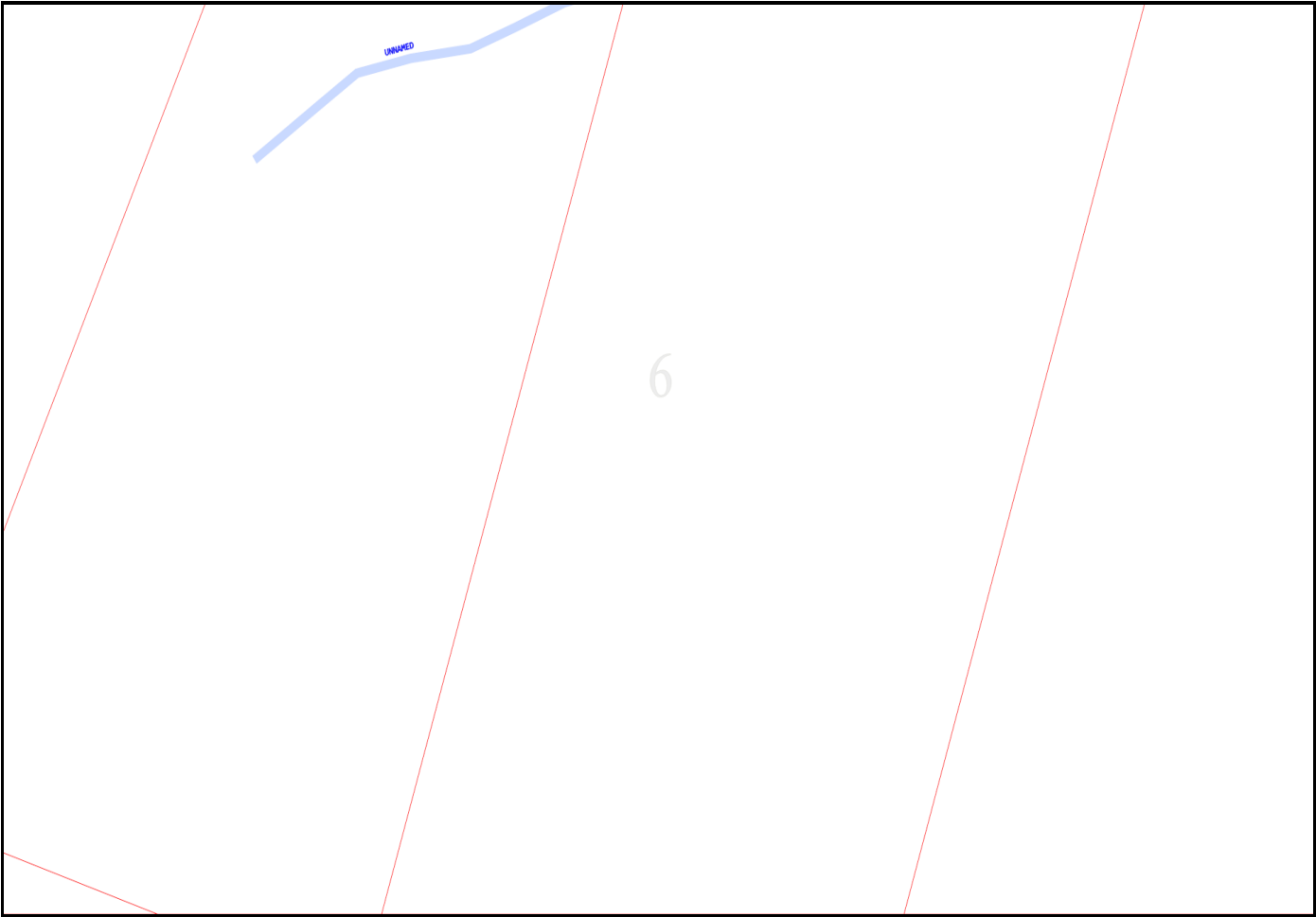


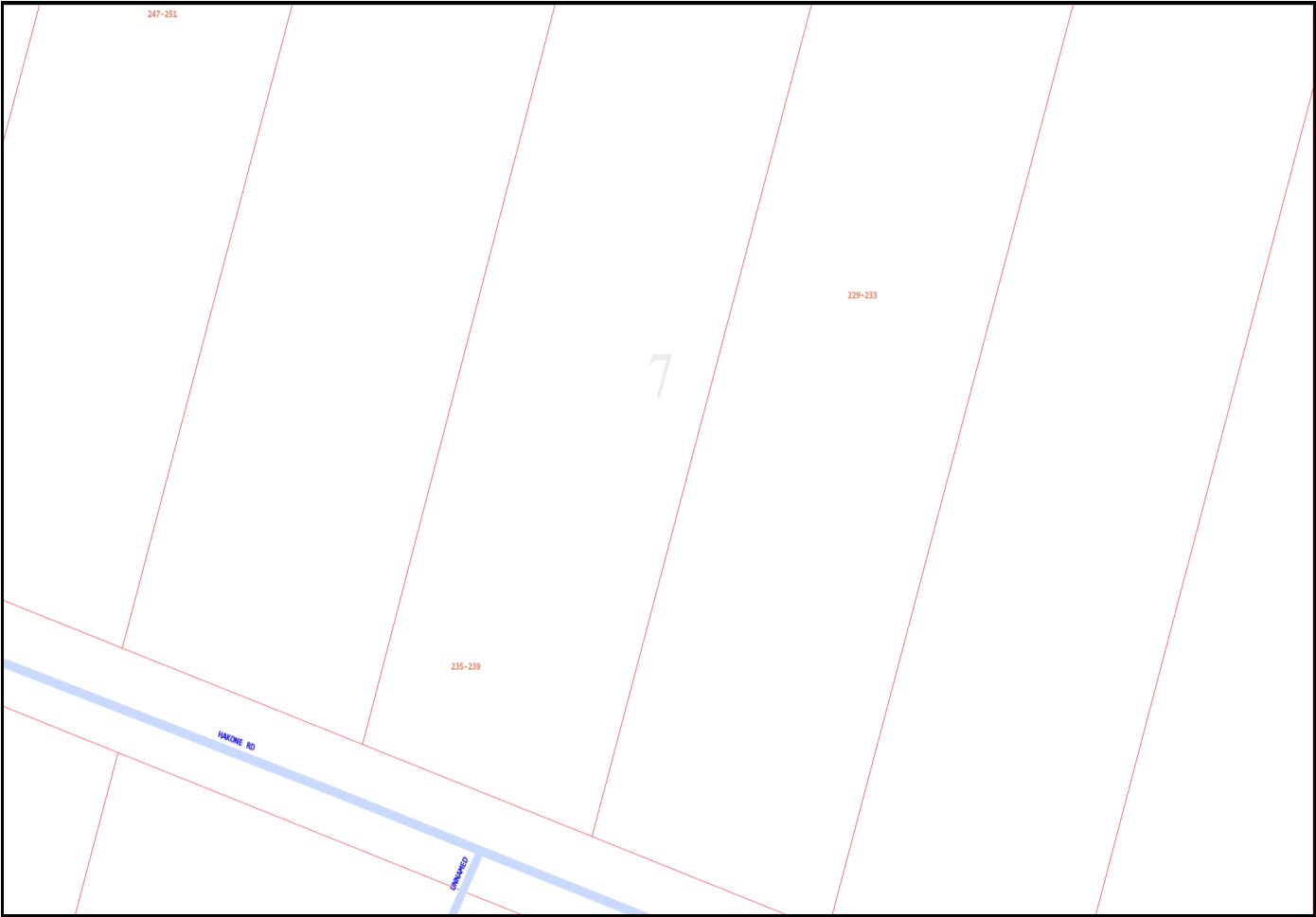


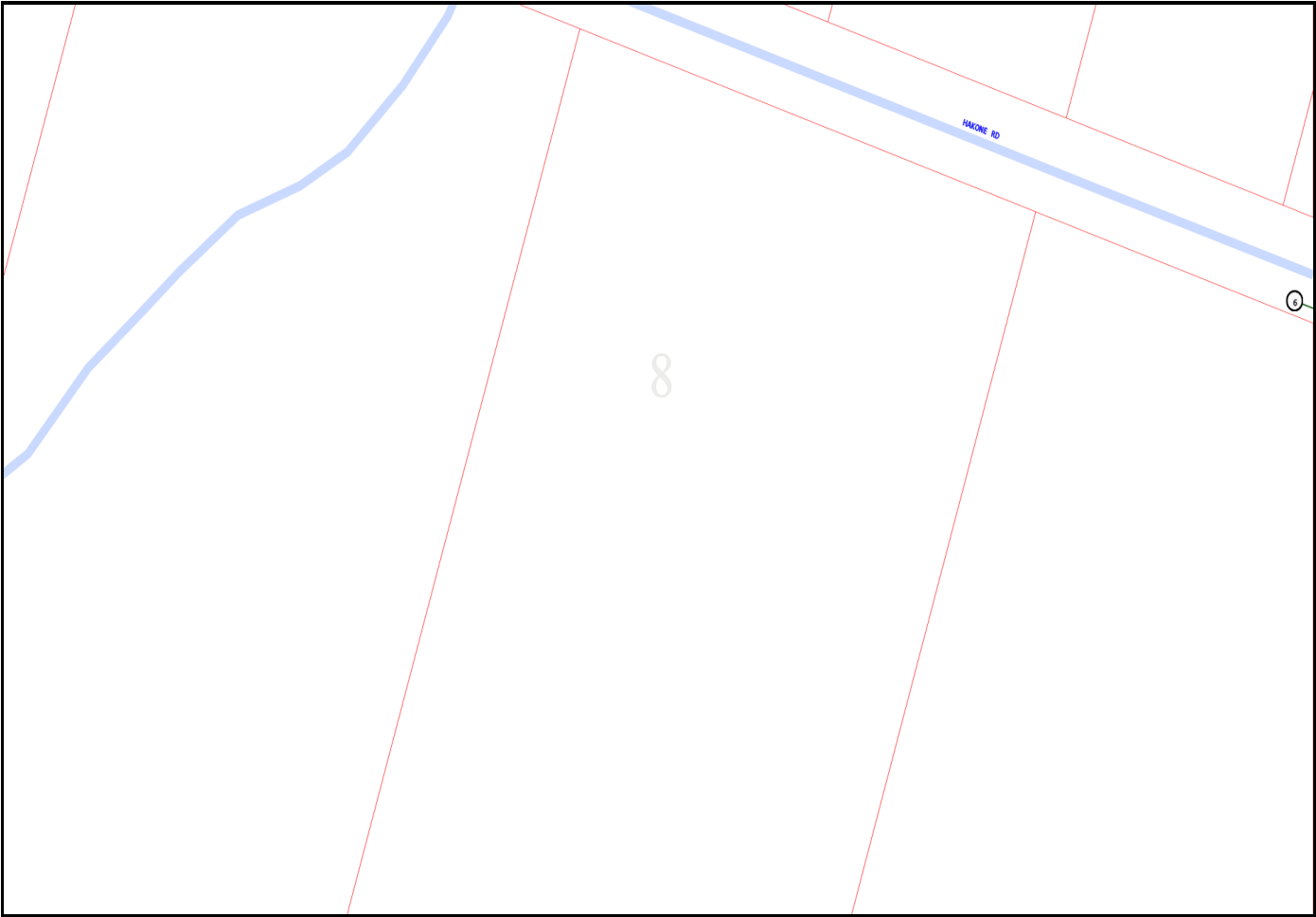


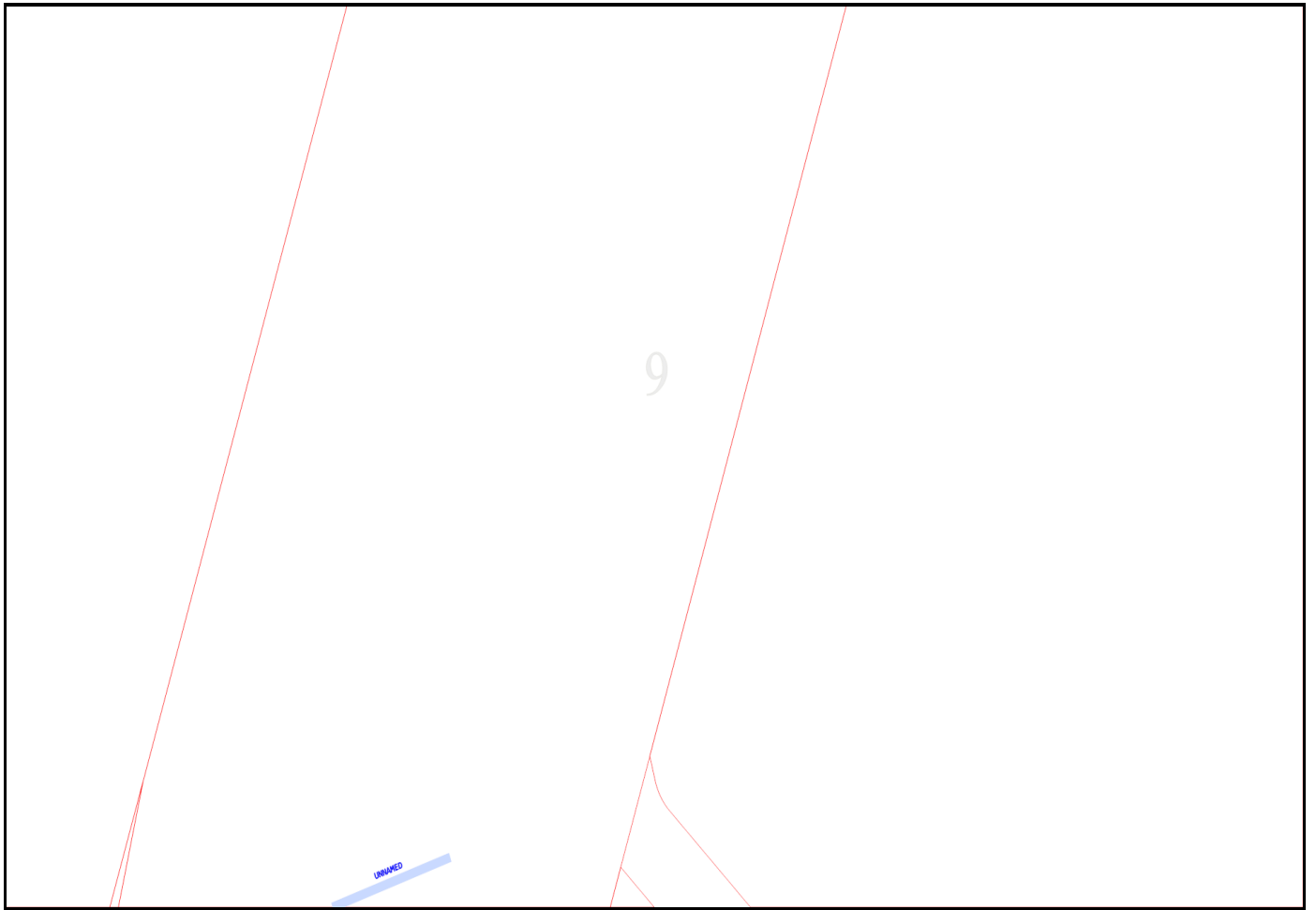






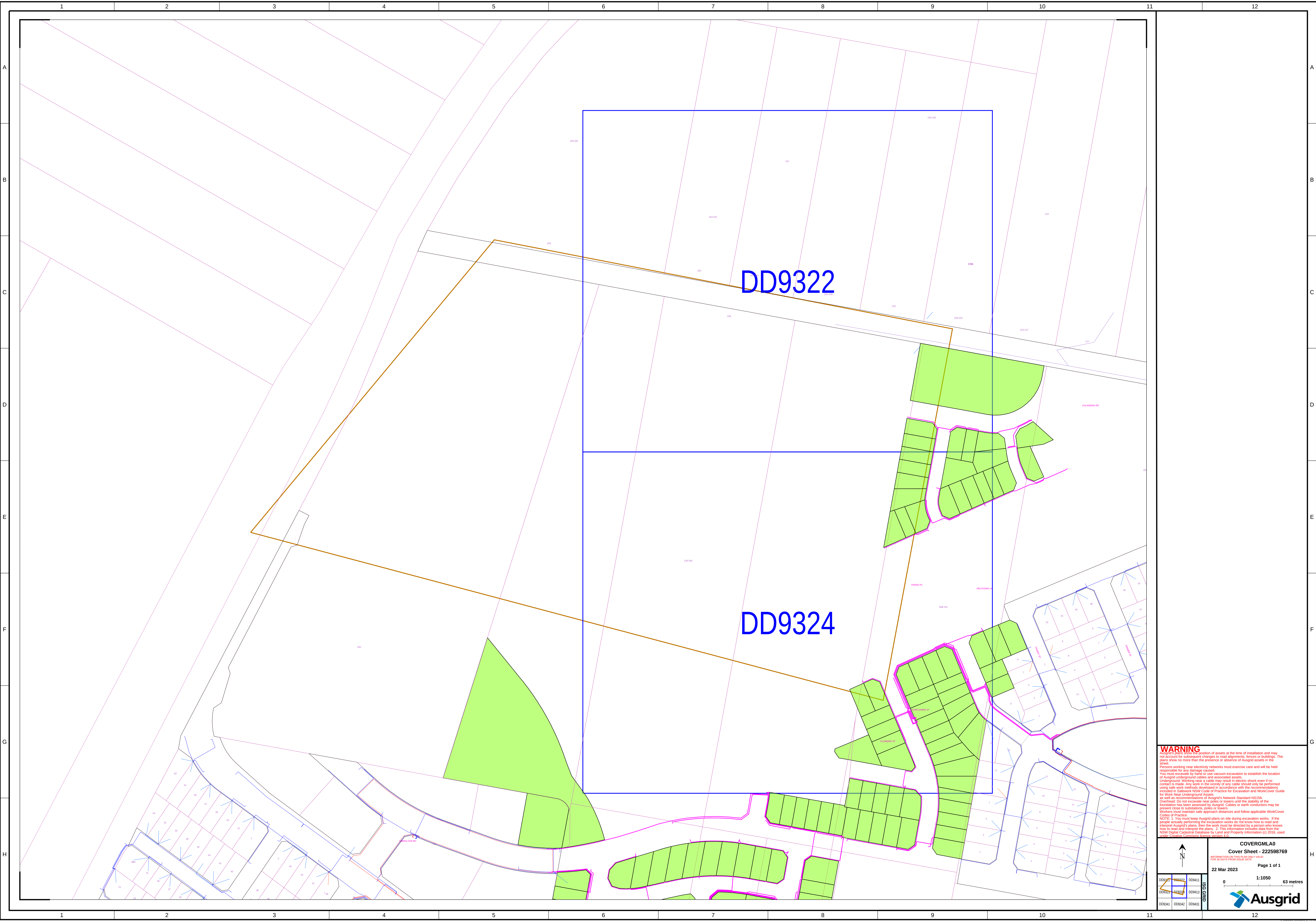






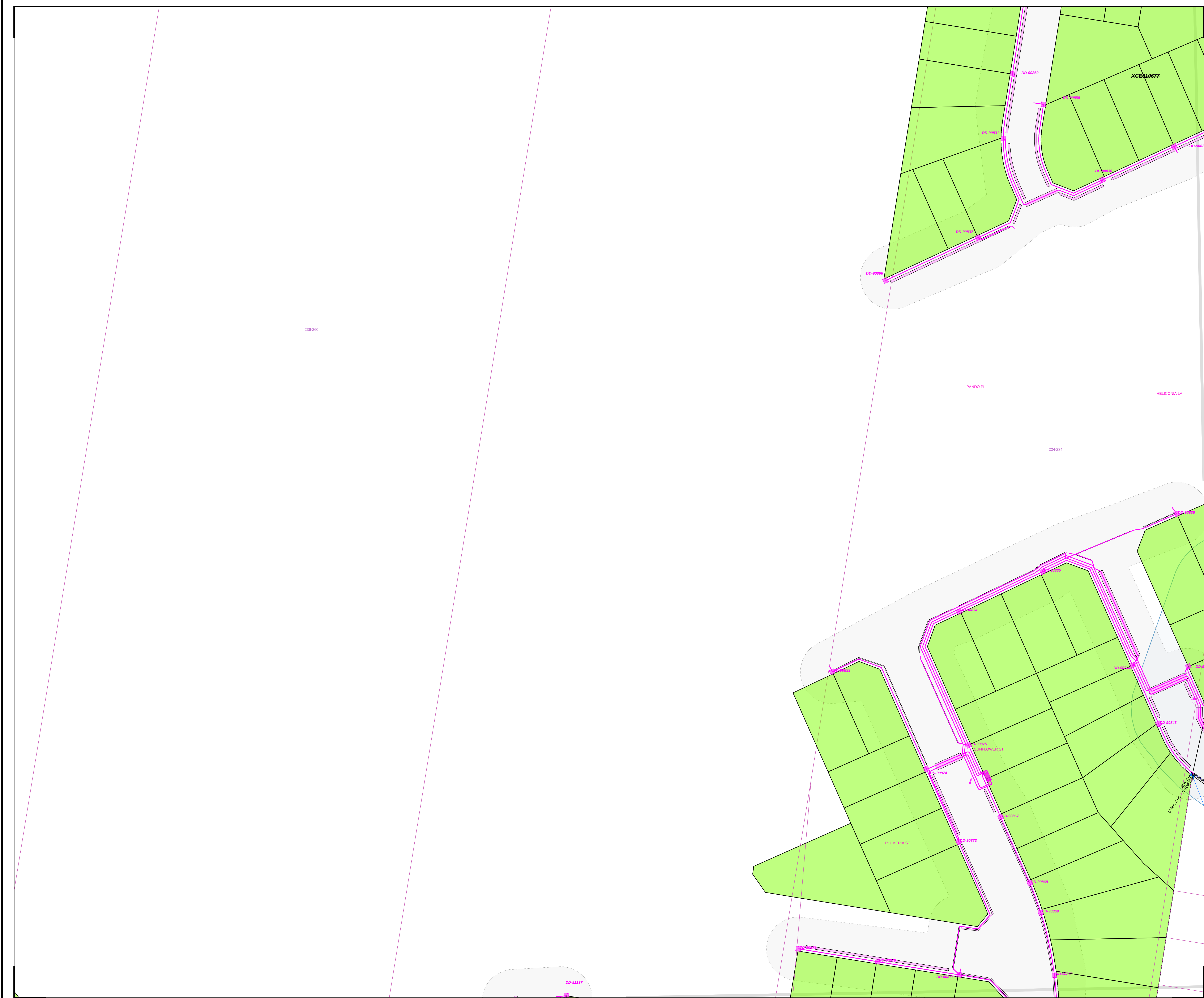
Emergency Contacts

You must immediately report any damage to the **nbn**TM network that you are/become aware of. Notification may be by telephone - 1800 626 329.



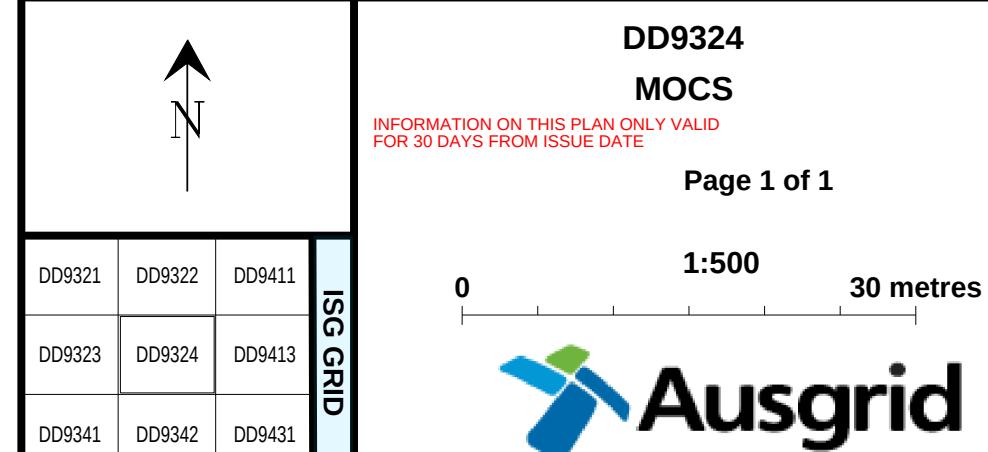
WARNING
Ausgrid's plans show the position of assets at the time of installation and may not account for subsequent changes to road alignments, fences or buildings. The plans show no more than the presence or absence of Ausgrid assets in the street.
Persons working near electricity networks must exercise care and will be held responsible for any damage caused.
You must excavate by hand or use vacuum excavation to establish the location of Ausgrid underground cables and associated assets.
Underground Working near a cable may result in electric shock even if no contact is made. Any work in the vicinity of any cable should only be performed using safe work methods developed in accordance with the recommendations included in SafeWork NSW Code of Practice for Excavation and WorkCover Guide for Work Near Underground Assets
as well as recommendations of Ausgrid's Network Standard NS156.
Overhead: Do not excavate near poles or towers until the stability of the structure has been assessed by Ausgrid. Cables or earth conductors may be present close to substations, poles or towers.
Roadway: Maintain safe approach distances and follow applicable WorkCover Codes of Practice.
NOTE: 1. You must keep Ausgrid plans on site during excavation works. If the people actually performing the excavation works do not know how to read and interpret Ausgrid's plans, then the work must be directed by a person who knows how to read and interpret the plans. 2. This information includes data from the NSW Digital Cadastral Database by Land and Property Information (c) 2016, used under Creative Commons license version 4.0.

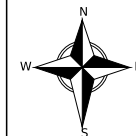
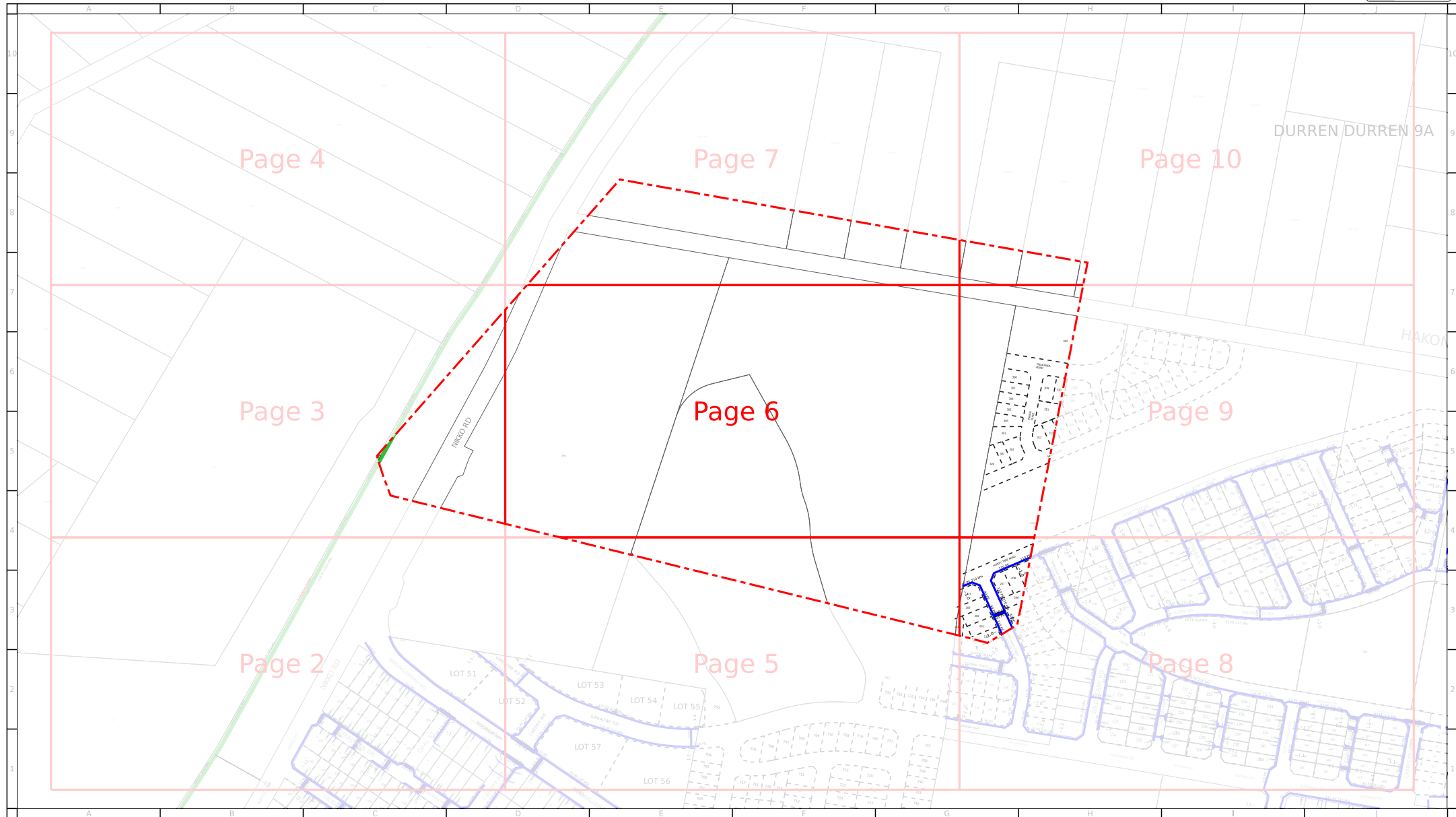




JOINT DETAIL REPORT

No.	Alt-Py	PRCyr	Joint Location
Map: 00832			
5			
6			
9			
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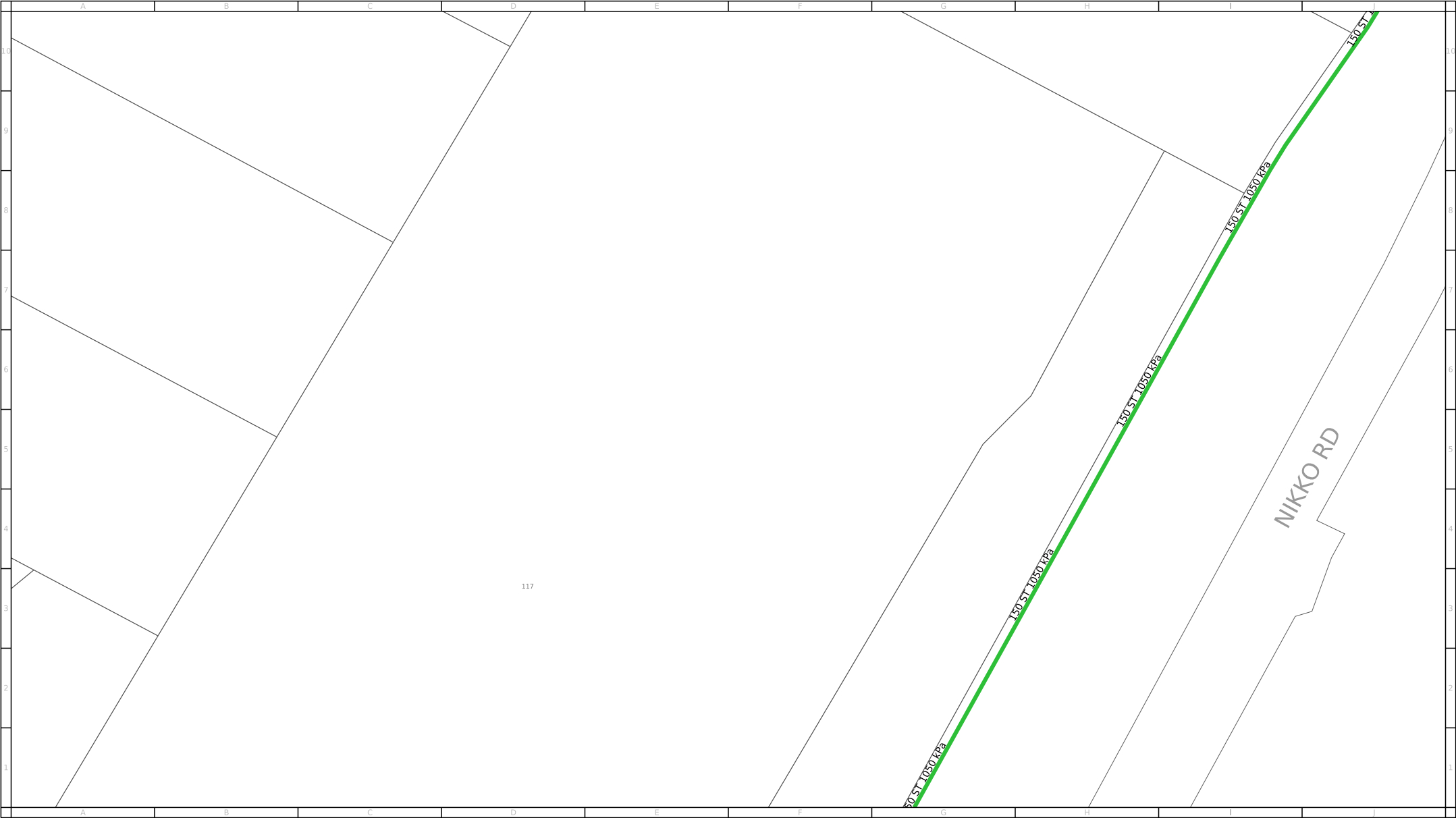
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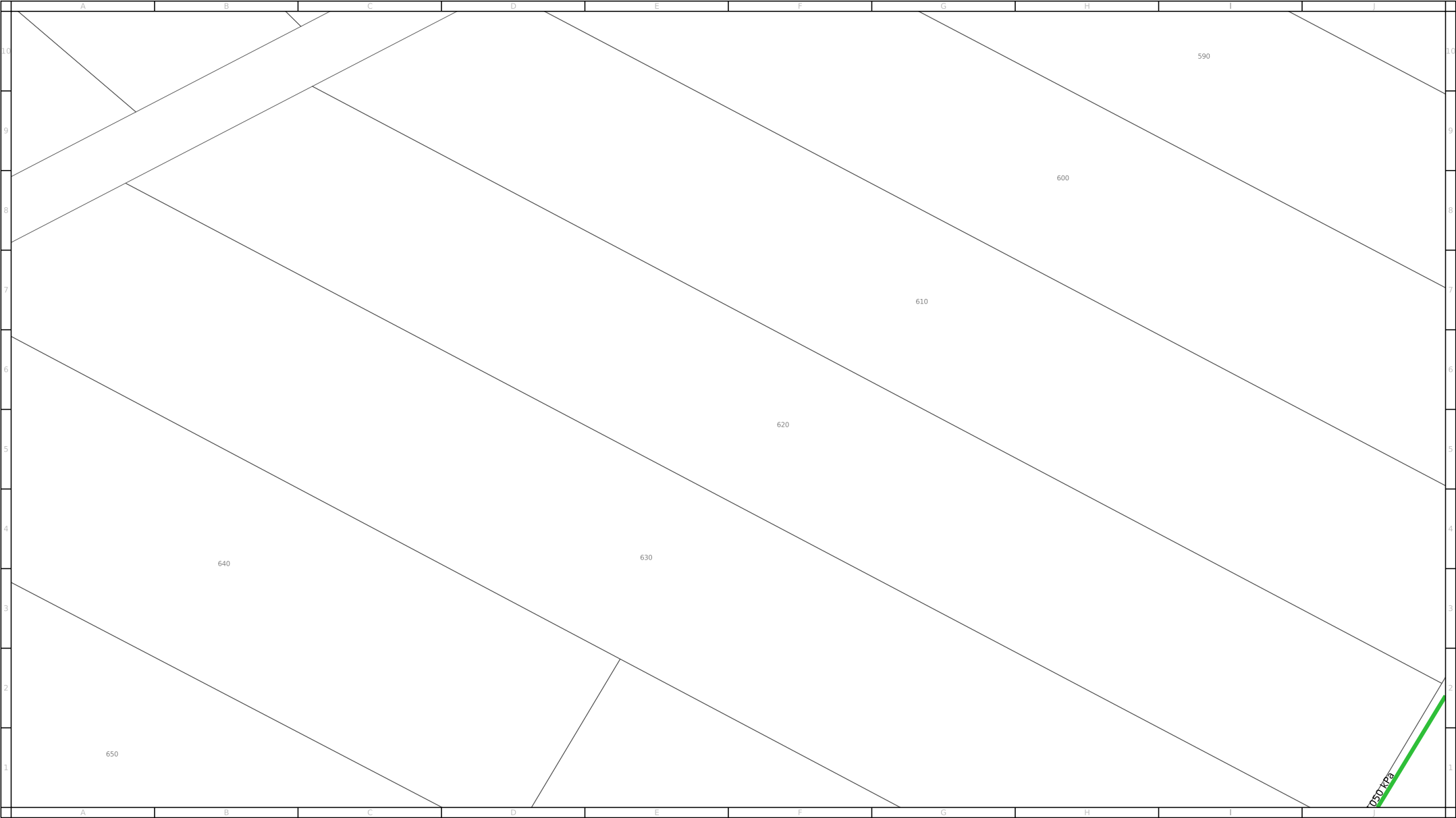
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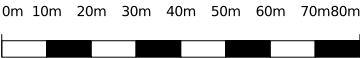


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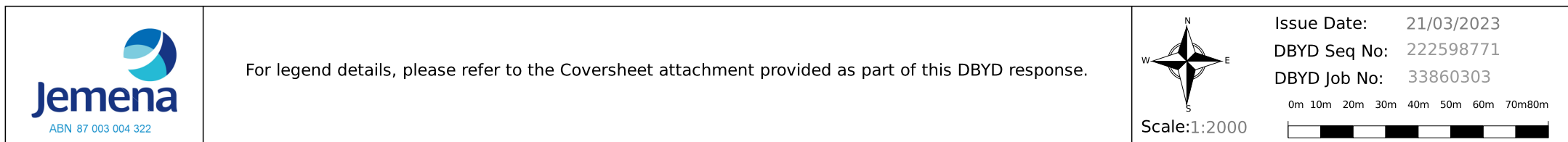


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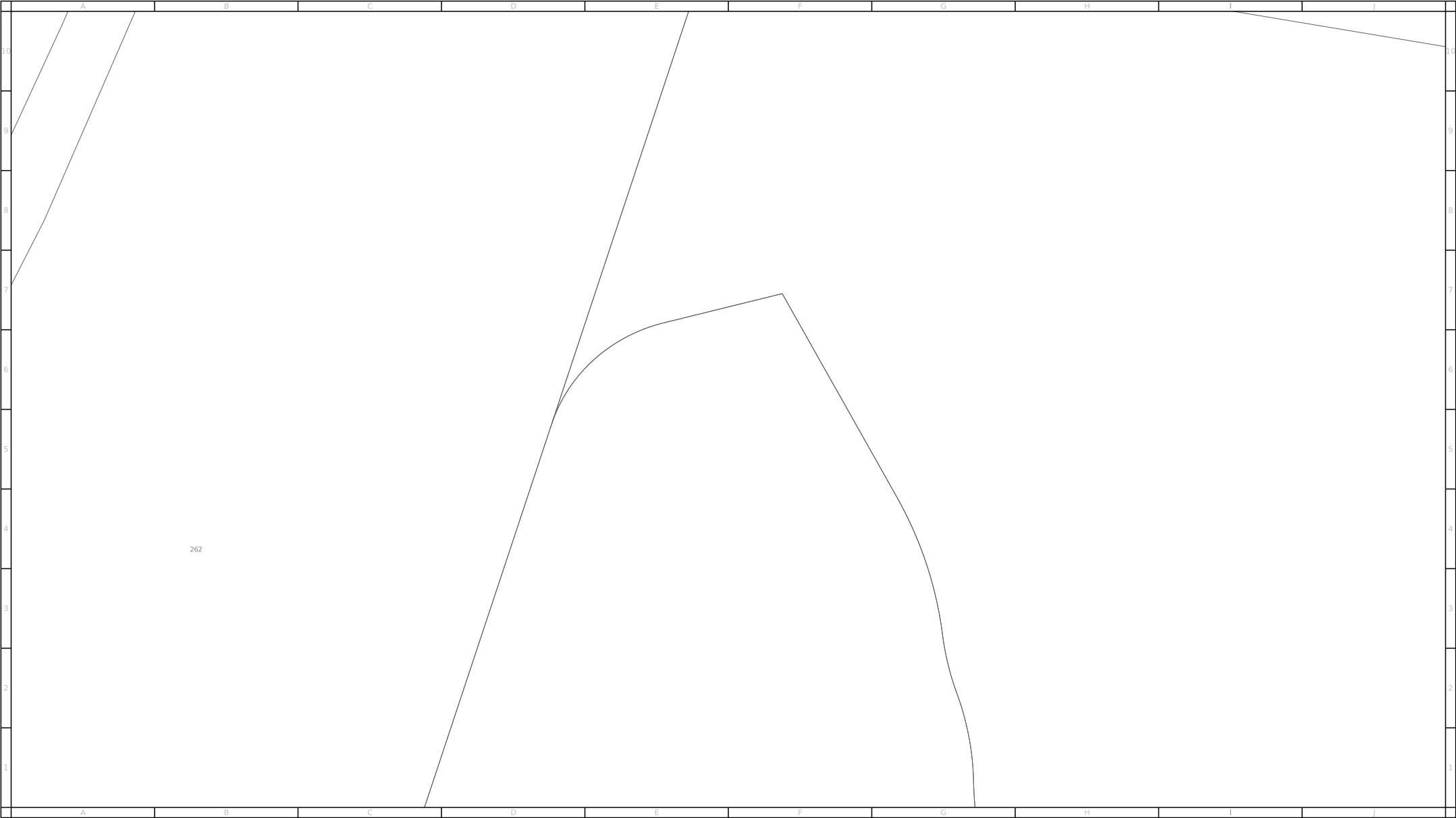
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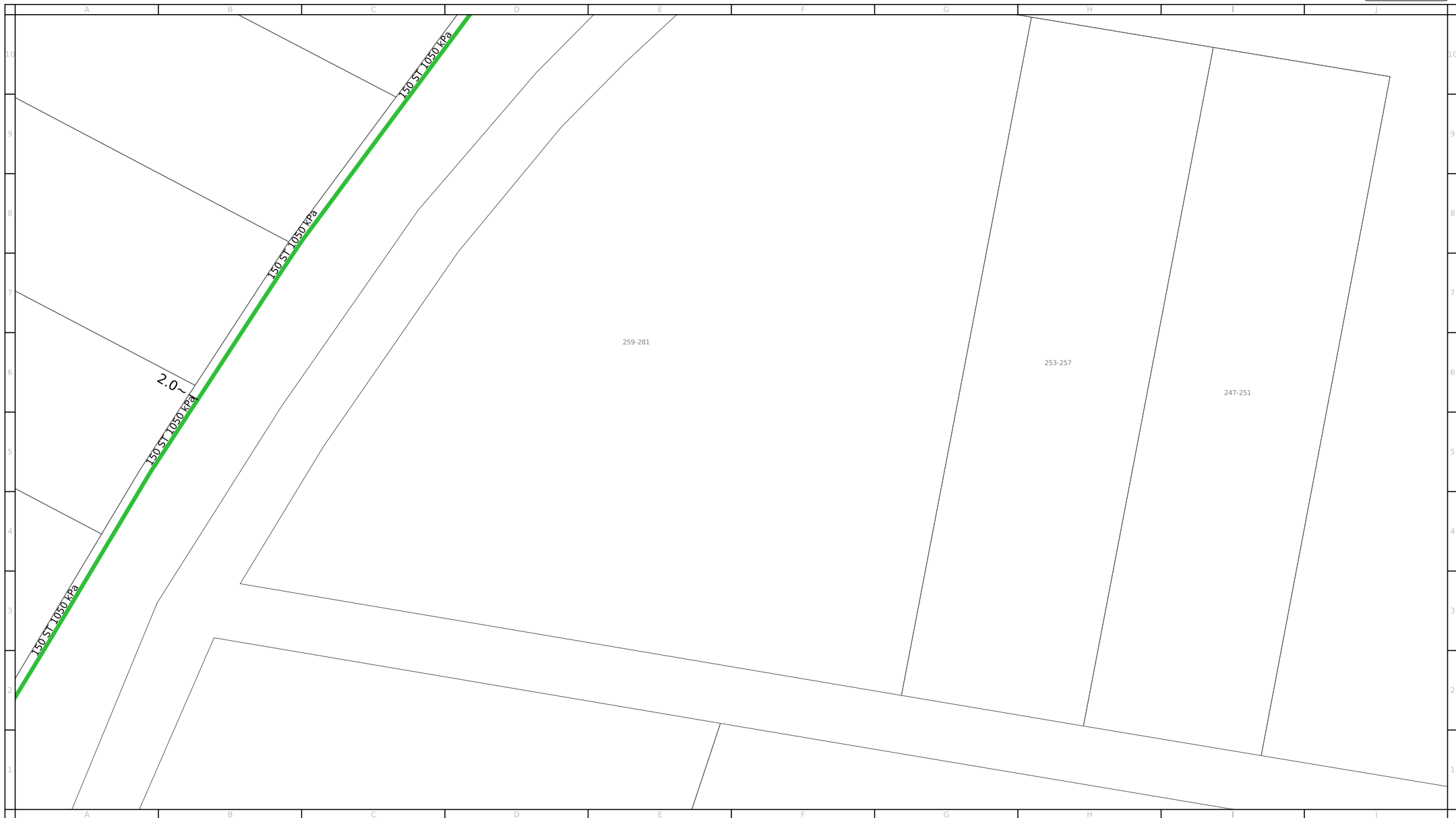
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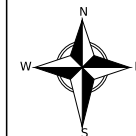
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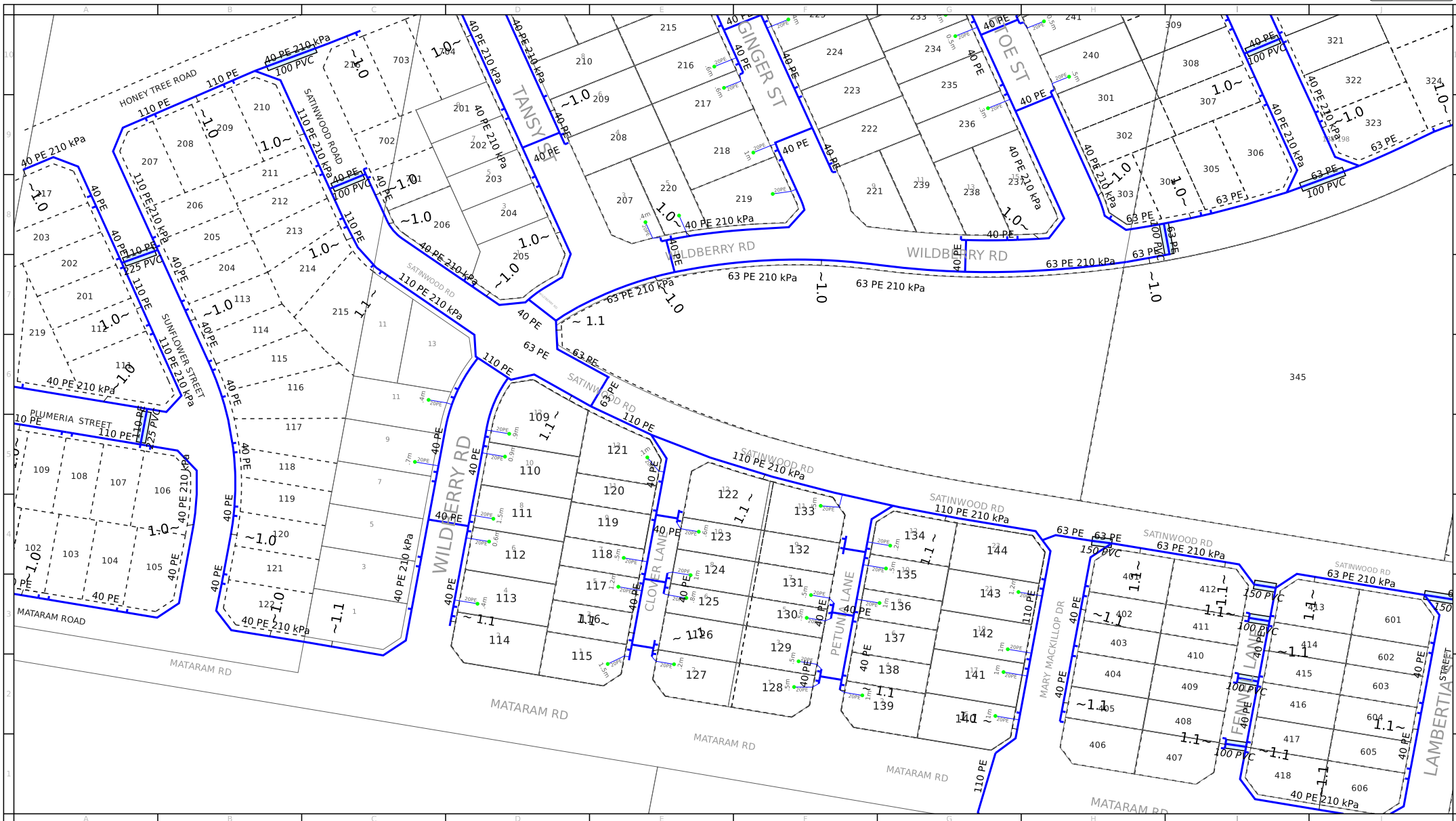
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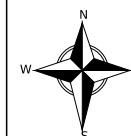
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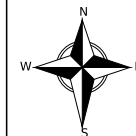
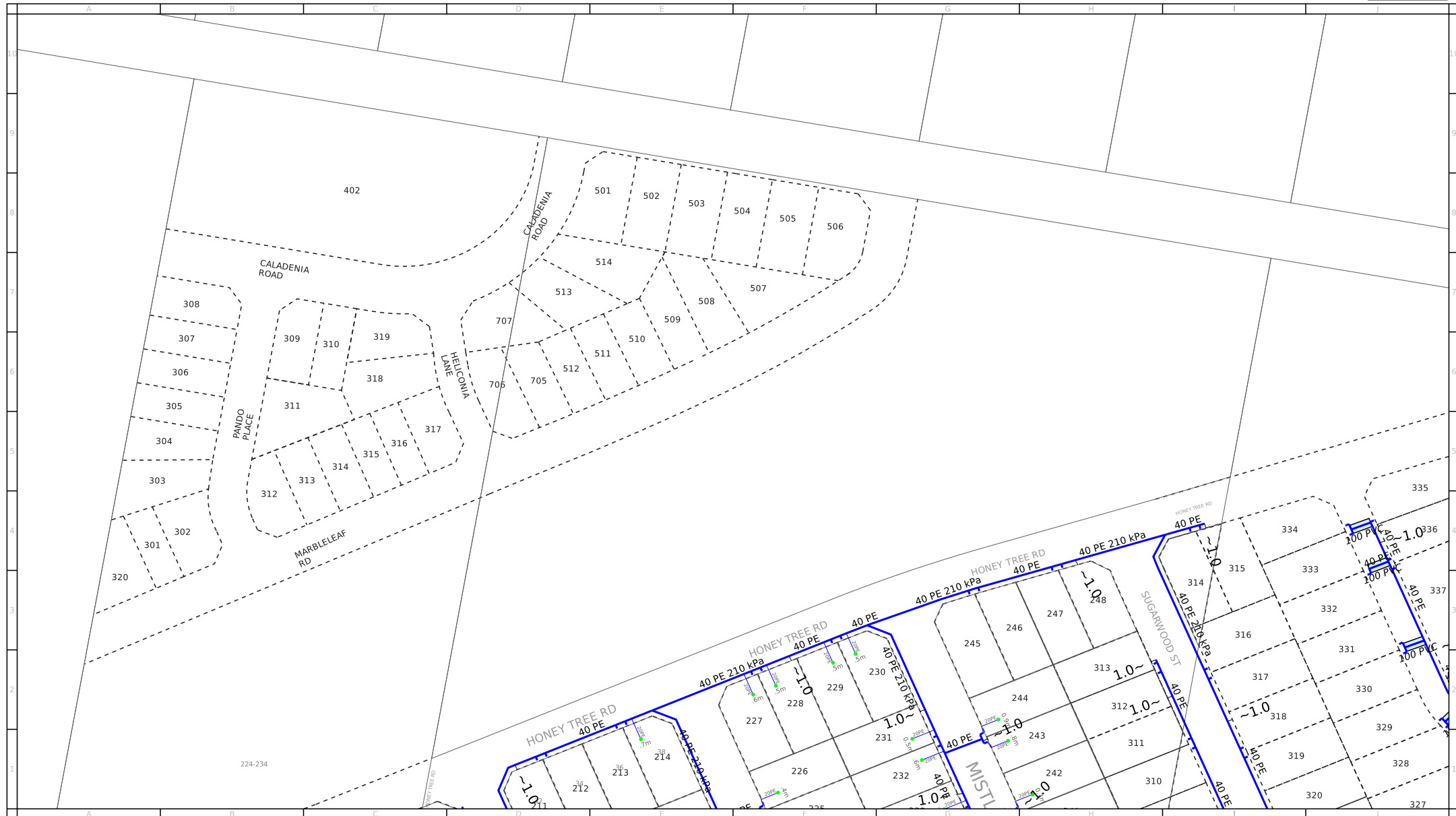
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APPENDIX B: NORTHROP CIVIL ENGINEERING REPORT



Civil Engineering Report:

Warnervale Town Centre Stage 8 - 10

236 – 260 Hakone Road, Woongarrah NSW 2259

**CIVIL
ENGINEERING
REPORT**

PREPARED FOR

Colliers International
17 Chuter Street, McMahon's Point
Sydney NSW 2000

Tel: 02 9437 1300

Ref: SY171245-01-CR03

Rev: 1

Date: 09.07.2018

PREPARED BY

Northrop Consulting Engineers
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Tel: 02 9241 4188

CIVIL ENGINEERING REPORT:

Activity Schedule

Date	Revision	Issue	Prepared By	Approved By
09.07.2018	1	Preliminary Issue	C. Gao	P. Cornish

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1. GENERAL

1.1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Colliers International (Colliers) to prepare the Civil Engineering design and documentation in support of a Development Application submission to Central Coast Council for the proposed Warnervale Town Centre – Stage 8 - 10 development at 236-260 Hakone Road, Woongarah.

This report covers the works shown as the Northrop Drawing Package required for the development of the site including:

- Erosion and Sediment control;
- Earthworks;
- Stormwater Drainage;
- Stormwater Detention;
- Stormwater Quality / Water Sensitive Urban Design;
- Roadworks and Pavements;

1.2 Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

1. Development Application Civil Documentation prepared by Northrop:
 - DAC01.01 Coversheet, Drawing Schedule and Locality Plan
 - DAC03.01 General Arrangement Plan
 - DAC03.10 Staging Plan
 - DAC05.01 Concept Sediment and Erosion Control Plan
 - DAC05.10 Sediment and Erosion Control Details
 - DAC05.11 Typical Sediment Basin Plan and Section
 - DAC06.01 Earthworks Cut and Fill Plan
 - DAC06.10 Earthworks Cut and Fill Sections – Sheet 01
 - DAC06.11 Earthworks Cut and Fill Sections – Sheet 02
 - DAC07.01 Siteworks and Stormwater Management Plan – Sheet 01
 - DAC07.02 Siteworks and Stormwater Management Plan – Sheet 02
 - DAC07.03 Siteworks and Stormwater Management Plan – Sheet 03
 - DAC07.04 Siteworks and Stormwater Management Plan – Sheet 04
 - DAC07.05 Siteworks and Stormwater Management Plan – Sheet 05
 - DAC07.06 Siteworks and Stormwater Management Plan – Sheet 06
 - DAC07.07 Siteworks and Stormwater Management Plan – Sheet 07
 - DAC07.08 Siteworks and Stormwater Management Plan – Sheet 08
 - DAC09.01 Signage and Linemarking Plan – Sheet 01
 - DAC09.02 Signage and Linemarking Plan – Sheet 02
 - DAC13.01 Typical Road Cross Sections – Sheet 01
 - DAC13.02 Typical Road Cross Sections – Sheet 02
 - DAC14.01 Road Longitudinal Sections – Sheet 01
 - DAC14.02 Road Longitudinal Sections – Sheet 02
 - DAC14.03 Road Longitudinal Sections – Sheet 03
 - DAC14.04 Road Longitudinal Sections – Sheet 04
 - DAC14.05 Road Longitudinal Sections – Sheet 05

- DAC14.06 Road Longitudinal Sections – Sheet 06
 - DAC14.07 Road Longitudinal Sections – Sheet 07
 - DAC17.01 Bio Retention Basin Plan
 - DAC17.10 Bio Retention Basin Sections and Details
 - DAC20.01 Details – Sheet 01
 - DAC20.02 Details – Sheet 02
 - DAC21.01 Turning Path Plan
2. Water Sensitive Urban Design Technical Guideline No 3 Device Selection Guide, Wyong Shire Council November 2010;
 3. Development Control Plan 2013, Part 4 Subdivision Guideline, Wyong Shire Council;
 4. Greening Wyong Strategy Part Two – Section 1 Technical Guidelines;
 5. Volume 1 Civil Works Design Guidelines, Wyong Shire Council;
 6. Volume 2 Civil Works Construction Specification, Wyong Shire Council;
 7. Warnervale Town Centre Development Control Plan 2012, Planning & Infrastructure;
 8. Wyong Council Standard Drawings;
 9. NSW MUSIC Modelling Guidelines prepared by NSW Local Land Services August 2015;
 10. Using MUSIC in Sydney's Drinking Water Catchment prepared by WaterNSW 2012.

1.3 The Development

1.3.1 Site Locality

The Warnervale Town Centre – Stage 8 - 10 is located at 236-260 Hakone Road, within the suburb of Woongarra in the Central Coast Council (Council) Local Government Area (LGA). The site is approximately 14.3 hectares and is bound by:

- Existing rural residential lots to the east and west;
- Hakone Road to the north; and
- Proposed Warnervale Town Centre Stage 6 – 7 to the south.

The existing Warnervale Town Centre – Stage 8 – 10 site is largely undeveloped rural land dominated by woodlands. The southwest corner of site is a former Council landfill that is currently being remediated, which will form part of Stage 8. The northern part of the site falls to the north towards Hakone Road and southern part of the site falls towards the rural residential lot on the east.

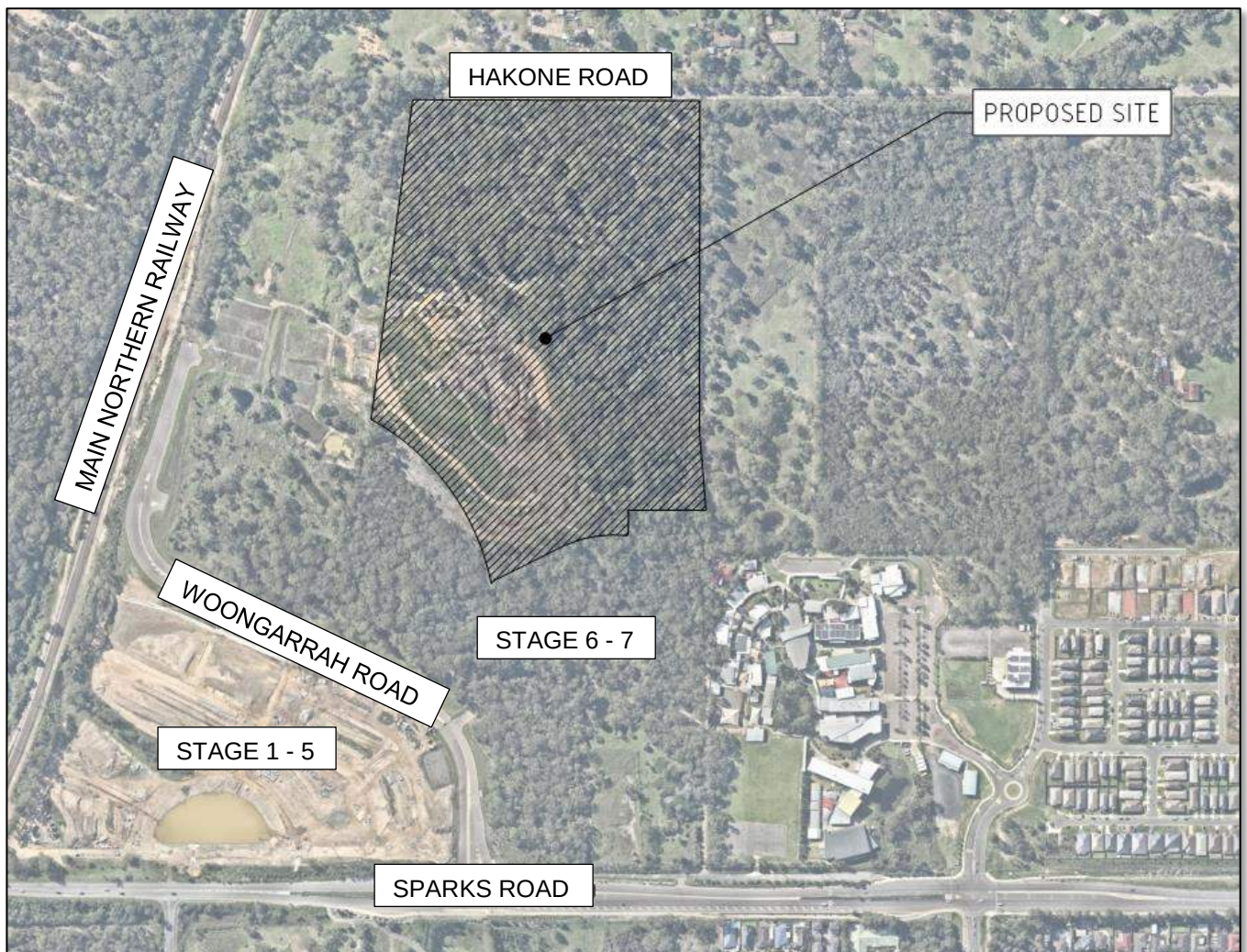


Figure 1 - Site Plan (Source: Nearmap 2017)

1.3.2 Proposed Development

The proposed development site Warnervale Town Centre – Stage 8 - 10 is located at 236-260 Hakone Road, Woongarra. It is formally known as Lot 1 in DP376264 and Lot 54&55 in DP 7527. The development consist of three (3) stages and is proposed with the following:

- 89 residential lots;
- 21 mixed use lots;
- Distributor street;
- Collector streets;
- Local street;
- Stormwater drainage;
- Water quality & detention basins; and
- Service utilities including sewer, potable water, gas, power, lighting and NBN.

The following considerations were taken in order to provide an efficient and effective site grade:

- Maximum and minimum road grades as per the Part 4 Subdivision Guideline, Wyong Shire Council DCP in order to facilitate a safe and comfortable road design;
- Stormwater drainage layouts to convey significant storm events and ensure no flood affected lots;
- Tie in to precinct boundary conditions including road interface works to Hakone Road.

The proposed staging plan is presented in Figure 2.

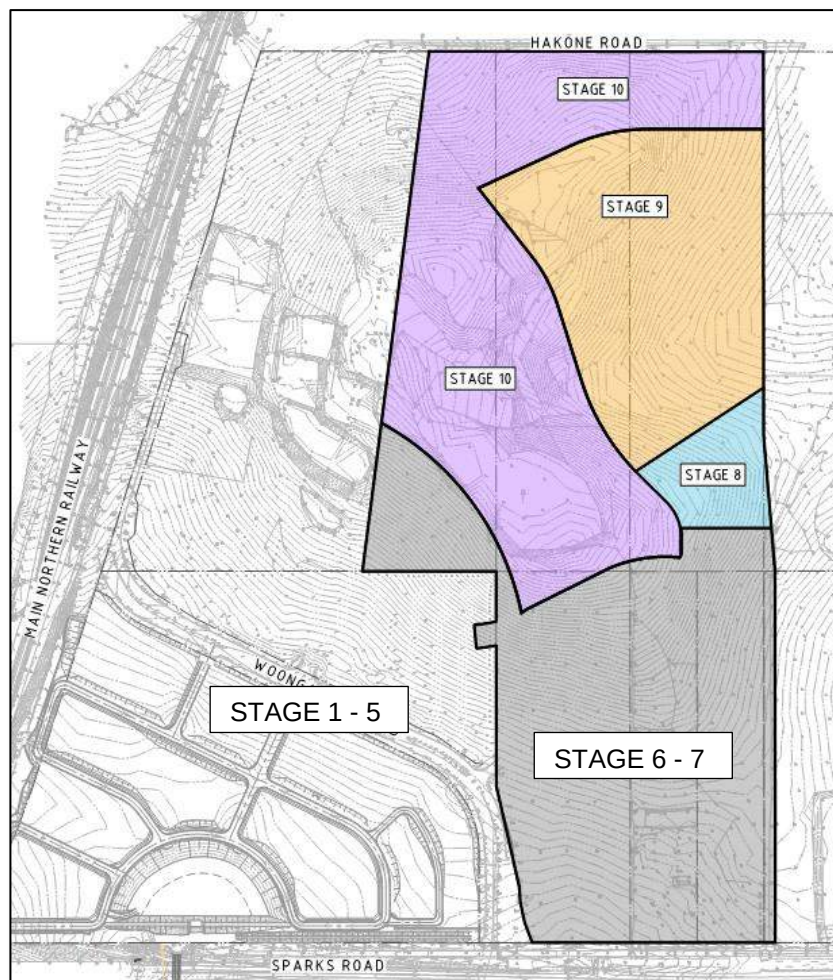


Figure 2 – Staging Plan

2. EROSION AND SEDIMENT CONTROL

The objectives of the erosion and sediment control for the development site are to ensure:

- Adequate erosion and sediment control measures are applied prior to the commencement of construction and are maintained throughout construction; and
- Construction site runoff is appropriately treated in accordance with Central Coast Council requirements.

As part of the works, the erosion and sedimentation control will be constructed in accordance with Council requirements and the NSW Department of Housing Manual, "Managing Urban Stormwater Soil & Construction" 2004 (Blue Book) prior to any earthworks commencing on site. The Concept Sediment and erosion control measures are documented in Northrop's Development Application drawing DAC05.01 and DAC05.10.

2.1 Sediment Basin

Temporary sediment basins have been designed to capture site runoff during construction and have been located at the lowest points of the site. The construction of the basins will be undertaken in stages to enable maximum runoff capture assisted by diversion swales and direct runoff to the basin.

Calculations to determine the concept design basin size have been based on available geotechnical information regarding soil types and through the use of the Soils and Construction Volume 1 Manual.

To ensure the sediment basins are working effectively they will be maintained throughout the construction works. Maintenance includes ensuring adequate settlement times or flocculation and pumping of clean water to reach the minimum storage volume at the lower level of the settling zone. The settling zone will be identified by pegs to clearly show the level at which design storage capacity is available.

The pumped water from the sediment basins can be reused for dust control during construction.

Overflow weirs are to be provided to control over flows for rainfall events in excess of the design criteria which caters for a storm event up to and including the 1% AEP storm event.

The concept sediment basin sizing is summarised in the Table 1. Detailed sediment basin sizing, configuration and location shall form part of the Construction Certificate application.

Table 1 - Concept Sediment Basin Volumes

Basin	Total Catchment Area (Ha)	Volume Required (m ³)	Volume Provided (m ³)
Basin 1	2.3090	749	765
Basin 2	0.7890	256	258
Basin 3	4.3752	1420	1431
Basin 4	0.7598	247	258

2.2 Sediment and Erosion Control Measures

Prior to any earthworks commencing on site, sediment and erosion control measure shall be implemented generally in accordance with Construction Certificate drawings and the "Blue Book". The measures shown on the drawings are intended to be a minimum treatment only as the contractor will be required to modify and stage the erosion and sedimentation control measures to suit the construction program, sequencing and techniques. These measures will include:

- A temporary site security/safety fence is to be constructed around the site, the site office area and the proposed sediment basin;
- Sediment fencing provided downstream of disturbed areas, including any topsoil stockpiles;
- Dust control measures including covering stockpiles, installing fence hessian and watering exposed areas;
- Placement of hay bales or mesh and gravel inlet filters around and along proposed catch drains and around stormwater inlets pits; and
- The construction of a temporary sediment basins as noted above in Section 2.1;
- Stabilised site access at the construction vehicle entry/exits.
- Any stockpiled material, including topsoil, shall be located as far away as possible from any associated natural watercourses or temporary overland flow paths.
- Sediment fences shall be installed to the downstream side of stockpiles and any embankment formation.
- All stockpiles and embankment formations shall be stabilised by hydroseeding or hydromulching on formation.

3. EARTHWORKS

The proposed works will generally consist of earthworks cut and fill operations to form design levels of the proposed lots, roads and basins. The levels have been designed to optimise road grades and minimise cut to fill material across the site. The levels for the site have generally been maintained within 1m of existing. This is represented on Northrop's Cut and Fill Plan DAC06.01.

The earthworks quantities are summarised in Table 2:

Table 2 - Concept Earthworks Volumes

Earthworks	Volume (m ³)
Cut	50,930
Fill	19,827
Balance	31,103 (Export)

The individual lots within the development have been graded such to provide lots for future residential dwellings (approx. 3% - 15% maximum). The earthworks cut/fill volumes provided are concept only and are subject to change pending final coordination and detailed design. It should be noted the above-mentioned cut/fill operations have been calculated based on the following assumptions:

- No allowance for stripping of topsoil;
- No allowance for earthworks bulking factors;
- No allowance for spoil generated from utility service and stormwater drainage trenching;
- No allowance for spoil generated from water quality media;
- No boxing of pavements.

3.1 Construction Sequencing

The sequence for the earthworks will generally include:

- Provision of site establishment erosion and sediment control measures typically outlined in this report's section Erosion & Sediment Control;
- Clearing of vegetation from the proposed development site and either removal or mulching;
- Demolition of existing structures and pavements (as required);
- Stripping and stockpiling of topsoil suitable for reuse;
- Inspection of exposed natural material to ensure conformity with design assumptions and requirements;
- Placement of cut to fill layers not greater than 200mm in thickness and compacted to not less than 98% Standard Maximum Dry Density (SMDD); and
- Spread topsoil to a maximum depth of 200mm and hydroseed or hydromulch disturbed areas.

4. STORMWATER MANAGEMENT

4.1 Objectives and Controls

The stormwater strategy for the Warnervale Town Centre – Stage 8 – 10 development has been developed in accordance with Central Coast Council Development Plan (DCP) and Water Sensitive Urban Design guidelines.

The DCP outlines the following aims:

- a) To protect the key hydrologic characteristics of Porter's Creek Wetland and Wallarah Creek;
- b) To recommend that hydrologic performance objectives for development within the Porter's Creek Wetland and Wallarah Creek catchments are listed and preliminary storage requirements are provided as indicated on Figure 4.1 in section 4 Public Open Space;
- c) To guide development consistent with the principles of Water Sensitive Urban Design (WSUD);
- d) To ensure that stormwater runoff achieves best practice standards, through the development of an appropriate treatment train at a lot scale and streetscape;
- e) To limit changes in flow rate and flow duration within the receiving waterways as a result of development;
- f) To protect the receiving wetlands and waterway ecosystems through:
 - Preservation of both the flooding and drying hydrology from the development area to the wetlands;
 - Preservation of the pre-development flows within Wallarah Creek which influence stream disturbance (3mth and 1.5yr ARI);
- g) To minimise impacts of flood flows discharging from the WTC on downstream waterways;
- h) To mitigate the impacts of urban development on stormwater quality through incorporating best practice stormwater management principles and strategies in development; and
- i) To safeguard the environment by improving the quality of water run-off.

4.2 Stormwater Management Overview

A stormwater management plan for the Warnervale Town Centre – Stage 8 – 10 development has been prepared by Northrop in order to satisfy the aims of the DCP as stated above. The key elements of the stormwater management plan are listed below:

Stormwater Quantity Management

The stormwater quantity management aims to attenuate post-development flows to below or equal pre-development flows by means of on-site detention storage to minimise impacts of flow discharging into downstream waterways as a result of the proposed development.

Stormwater Quality

The stormwater quality management aims to reduce the pollutant load of post-development stormwater runoff using a series of treatment devices including Gross Pollutant Traps and bio-retention basins, prior to discharge into receiving waters.

Stormwater quantity and quality management measures will be discussed in sections 4.4 and 4.5 of this report respectively.

4.3 Ultimate Stormwater Management Strategy

The ultimate stormwater management strategy for the Warnervale Town Centre precinct has been outlined in the Warnervale Town Centre Development Control Plan 2012. Figure 3 below has been subtracted from the DCP illustrating the location of proposed regional basins within the Warnervale Town Centre precinct.

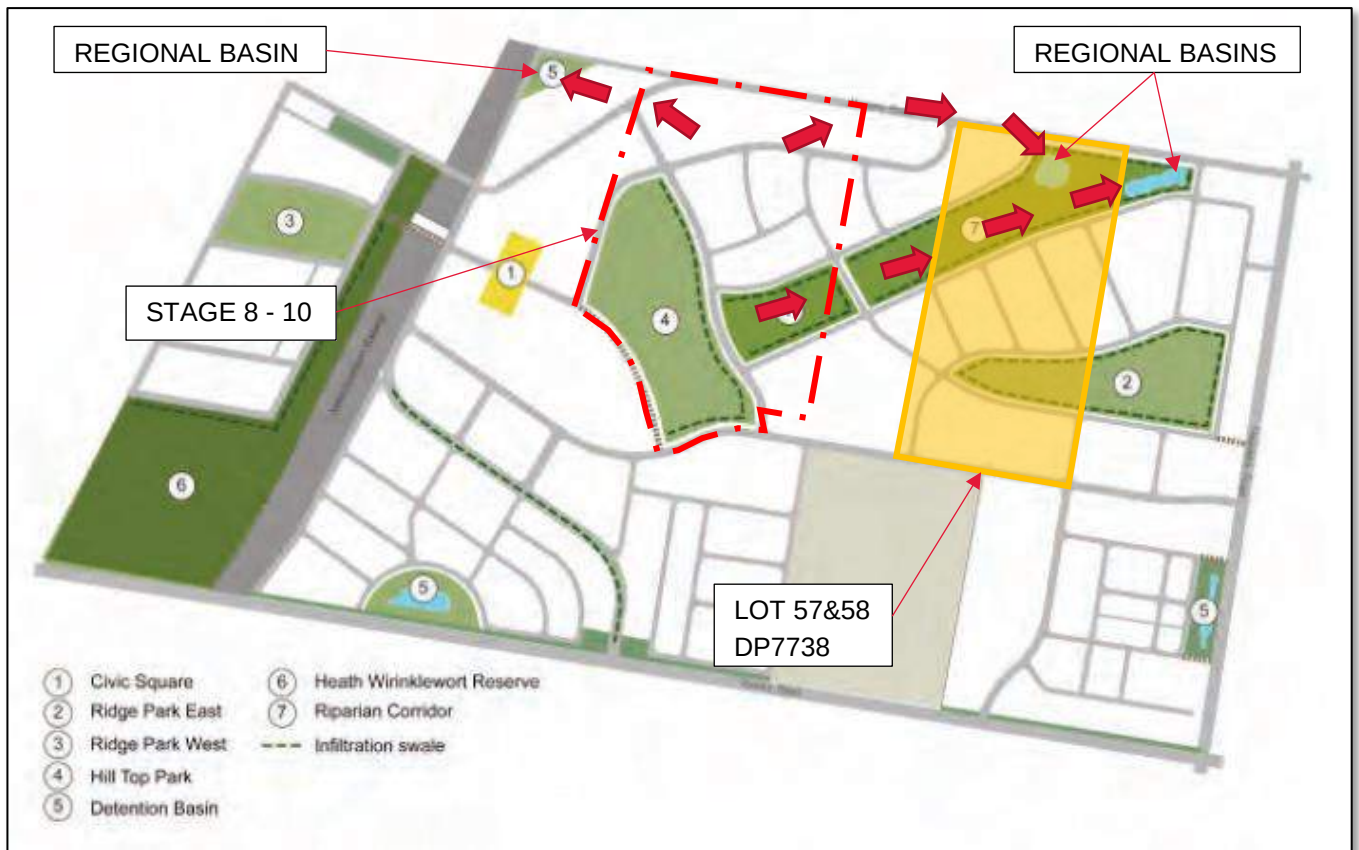


Figure 3 – Warnervale Town Centre Ultimate Water Cycle Management Strategy

The Warnervale Town Centre – Stage 8 – 10 site falls within two drainage catchments of proposed regional basins identified in Warnervale Town Centre DCP. The northwest part of the site falls towards the western basin and the remaining of the site falls towards the eastern basins via the riparian corridor. As such, the stormwater runoff will ultimately discharge into the three regional basins for stormwater quantity attenuation and stormwater quality treatment. Pits and pipes network will be designed to accommodate for the ultimate development scenario.

At the time of lodgement, the development application of Lot 57 & 58, DP3378 along with the two regional basins to the east of the site have been lodged and under assessment of Central Coast Council.

A temporary basin have been designed to cater for the post-development site runoff from west part of the site until a point in time where the downstream regional basin has been constructed. Upon commissioning the western regional basin, the temporary basin within the development will be decommissioned. Interim stormwater quantity and quality management controls will be discussed in section 4.4 and 4.5.

4.4 Stormwater Quantity Management

4.4.1 Existing Catchment

The existing catchment scenario is based on existing conditions prior to any kind of construction or demolition associated with the proposed development. The existing catchment area for the Warnervale Town Centre – Stage 8 – 10 development is approximately 12.8ha in size and consists of a combination of sparse to dense bushland and grassland areas. The existing catchment has been split into three (3) sub-catchments based on existing site topography.

Figure 4 below shows the pre-development catchment plan.

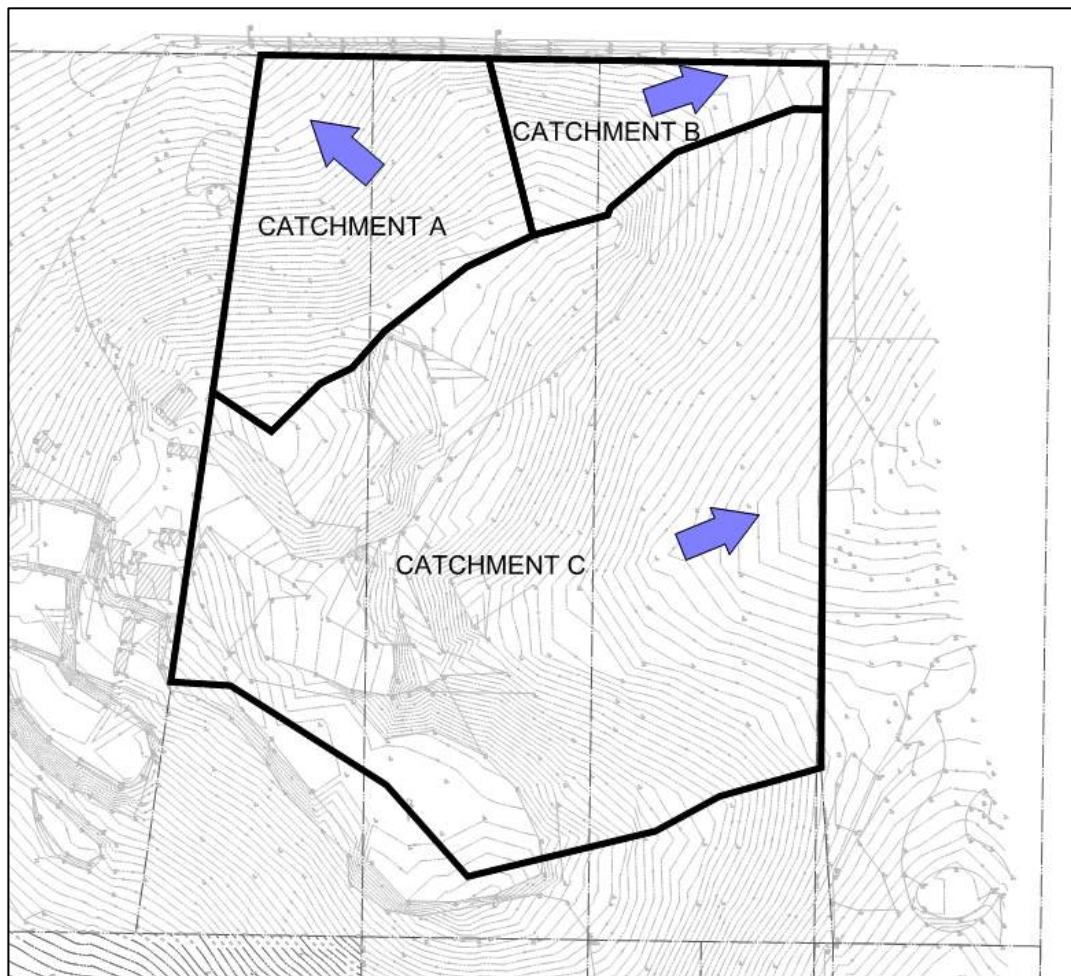


Figure 4 – Existing Catchment Plan

4.4.2 Interim Stormwater Quantity Management Strategy

The proposed site grading for the Warnervale Town Centre – Stage 8 – 10 development has been designed so that post-development discharge locations resemble closely to that of the existing conditions. The proposed development has been divided into three (3) sub-catchments as shown in Figure 5 and detailed in Table 3.

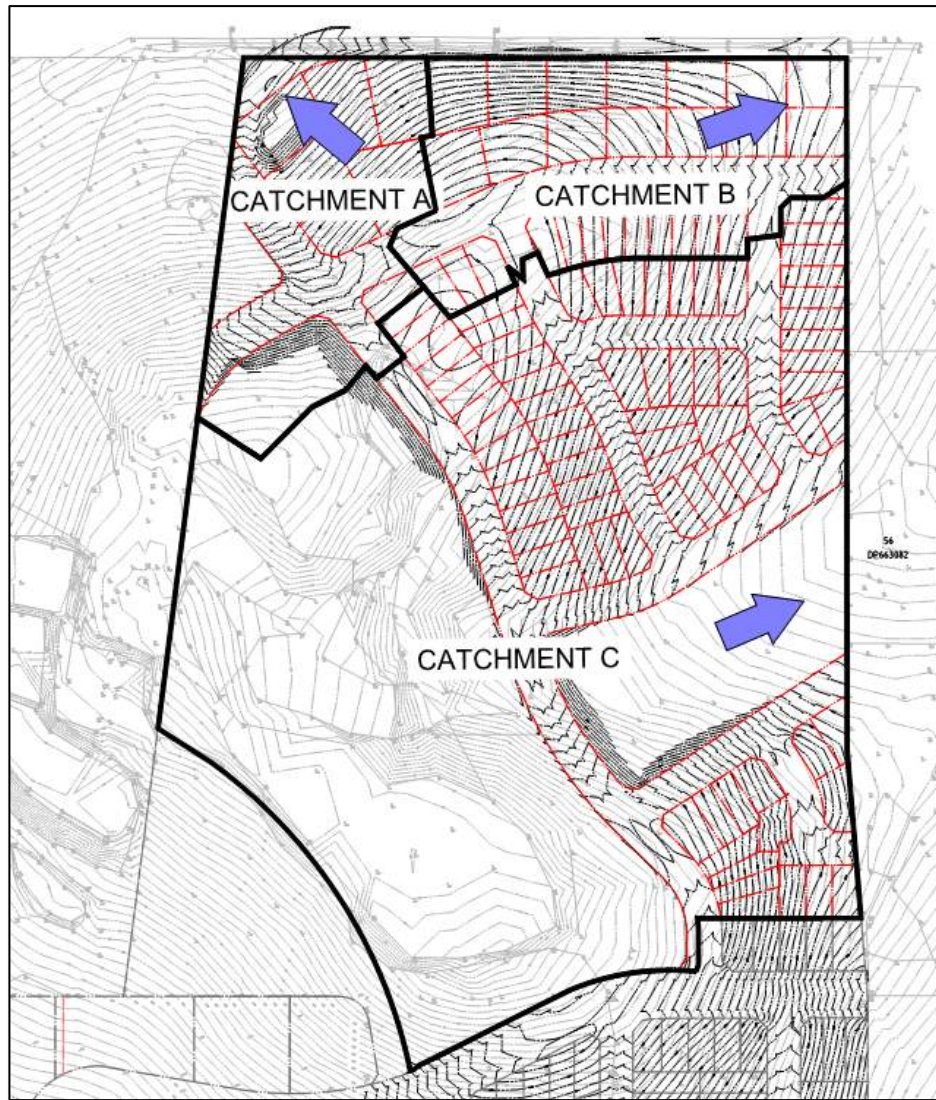


Figure 5 – Post-development Catchment Plan

Table 3 – Post-development Catchment Areas

Catchment	Area (ha)	Runoff-Condition	Discharge Location
Catchment A	1.706	Fully Developed Flow	Proposed Interim Basin
Catchment B	2.128	Fully Developed Flow	Downstream Basin
Catchment C	10.489	Fully Developed Flow from Lots & Pre-development Flow	Downstream Basin

Post-development flow from the catchments above will be managed in the following three ways:

- Catchment A – Provide interim on-site detention basin

An on-site detention basin has been proposed at the lowest point of Catchment A to limit flows in post-development conditions to equal or below pre-development runoff. By detaining stormwater runoff on-site, the proposed development will not burden drainage networks in Hakone Road and downstream receiving systems.

- Catchment B – Freely discharge into Hakone Road drainage network

Post-development flow from Catchment B will be discharged directly into the downstream regional basin via Hakone Road drainage network for attenuation and treatment. The pits and pipes network have been designed to accommodate for the ultimate development scenario.

At the time of lodgement, the development application of Lot 57 & 58, DP3378 along with the downstream regional basins to the east of the site have been lodged and under assessment of Central Coast Council. Stormwater detention facility has not been proposed within Stage 8 – 10 for Catchment B.

- Catchment C – Freely discharge into the riparian corridor

A HEC-RAS model has been established to compare the flood impacts on the downstream riparian corridor located in Lot 56, DP663082 between existing site conditions and post-development conditions during the 100 year storm event. Modelling results suggest that under the post-development conditions, water level entering the riparian corridor will be raised by only 30mm. The product velocity depth product has increased however not exceeding 0.4m²/s. This is considered safe flow according to Wyong Council Civil Works Design Guideline.

Therefore, post-development flow can be considered safe when discharging directly across downstream neighbouring property into the regional basin. Stormwater detention facility has not been proposed within Stage 8 – 10 for Catchment C.

4.4.3 Hydrological Modelling

The hydrology of the existing catchment and sizing of the detention basin were modelled using XP-RAFTS software. Two models have been developed; a pre-development model in XP-RAFTS was established to assess the post development permissible site discharge (PSD) based on flows from the existing undeveloped site. A post development model was then constructed in XP-RAFTS in order to estimate the detention volume required for the proposed development.

The XP-RAFTS Model is based on the following:

- Design rainfall Intensity Frequency Duration (IFD) data as well as hydrological modelling parameters were obtained from Wyong Council's Civil Works Design Guideline;
- Roughness of $n=0.040$ for pervious and $n=0.015$ for impervious were obtained from Wyong Council's Civil Works Design Guideline;
- Vectored slopes have been calculated based on the site survey prepared by Bannister & Hunter Pty Ltd and designed road grading using the average area method;
- Under pre-development condition, rural catchments with a nominal 5% impervious fraction have been adopted;
- Under post-development condition, residential catchments with a nominal 80% impervious fraction have been adopted;
- Under post-development condition, commercial catchments with a nominal 90% impervious fraction have been adopted.

Additionally the model adopted the following assumptions and parameters:

Table 4 – RAFTS ARBM Parameters

Parameter	Adopted Values	Initial Values
Storage Capacities		
Impervious (IMP)	0.50	0.0
Interception (ISC)	1.00	0.0

Depression (DSC)	1.00	0.0
Upper soil (USC)	25.00	20.00
Lower soil (LSC)	50.00	40.00
Infiltration		
Dry soil sorptivity (SO)	3.00	
Hydraulic conductivity (KO)	0.33	
Lower soil drainage factor (LDF)	0.05	
Groundwater recession:		
Constant rate (KG)	0.94	
Variable rate (GN)	1.00	
Evapo-Transpiration		
Proportion of rainfall intercepted by vegetation (IAR)	0.70	
Max potential evapo-transpiration:		
Upper soil (UH)	10.00	
Lower soil (LH)	10.00	
Proportion of evapo-transpiration from upper soil zone (ER)	0.70	
Ratio of potential evaporation to A class pan (ECOR)	0.90	

The OSD basins are assumed to have the following characteristics:

- Internal batter slopes of 1(V): 3(H);
- Bio-retention basin separate to main OSD basin with 300mm extended detention zone;
- A low flow control pit to control 50% and 20% AEP events; and
- A weir and a high flow control pits to control flows up to and including the 1% AEP peak event

4.4.4 XP-RAFTS Model Results

The modelling results demonstrate that the Basins will limit the post-development runoff to less than the existing peak flow for all storms up to and including 1% AEP event. Table 5 below shows the catchment modelling results.

Table 5 - Pre and Post Developed Flow Results

ARI (years)	Permissible Site Discharge (m ³ /s)	Attenuated Site Discharge (m ³ /s)	Basin Stage (m)	Basin Storage (m ³)
2	0.393	0.340	0.299	59
5	0.565	0.543	0.399	105
10	0.681	0.674	0.435	117
20	0.834	0.803	0.471	129
50	0.928	0.861	0.487	134
100	1.064	0.927	0.522	146

The basin configurations are summarised in Table 6 below:

Table 6 – Basin A Configurations

Criteria	Value
Low level outlet 1	900mm x 900mm Surface Inlet Pit RL36.90 375mm diameter orifice pipe IL35.90
Low level outlet 2	900mm x 900mm Surface Inlet Pit RL 37.20 600mm diameter orifice pipe IL35.80 Connected to low lever outlet 1 control pit
High Level Outlet	Spillway Weir = 5m RL37.50
Filter Base RL	RL36.60
Basin Base RL	RL36.60

4.5 Stormwater Quality Management

4.5.1 Adopted Water Quality Objectives

The stormwater quality management aims to reduce the pollutant load of stormwater runoff using a series of treatment devices prior to discharging into receiving waters.

Stormwater quality management measures have been modelled using MUSIC software. The targets for stormwater quality outlined by Central Coast Council are presented in below:

Table 7 - Water Quality Targets

Pollutant	% Reduction Post-Development Average Annual Load Reduction
Total Suspended Solids (TSS)	80
Total Phosphorous (TP)	45
Total Nitrogen (TN)	45

4.5.2 Interim Stormwater Quality Management Scheme

The proposed water quality treatment train incorporated to meet the required targets includes bio-retention basin with raingarden (bio-retention system) and proprietary Gross Pollutant Traps (GPT).

GPT's have been located to target the pollutant reduction of gross pollutants, litter, grit, sediments and associated oils prior to stormwater discharging into the bio-retention basin or downstream receiving systems. Bio-retention basins consisting of a vegetated surface with an underlying porous filter medium and perforated drainage pipe have been provided to remove nutrients such as nitrogen and phosphorous.

Post-development flow from the catchments above will be managed in the following three ways:

- Catchment A – Provide temporary bio-retention basin

A proprietary GPT and a temporary bio-retention basin have been proposed in Catchment A to reduce pollutant loads from the proposed development prior to discharging into drainage network in Hakone Road.

- Catchment B – Freely discharge into Hakone Road drainage network

Pollutant loads generated from Catchment B will be treated by the future downstream regional basin via Hakone Road drainage network. Proprietary GPT's will be provided by downstream development prior to discharging into the regional basins to reduce gross pollutant load and a portion of phosphors load from runoff collected by Hakone Road pits and pipes network.

At the time of lodgement, the development application of Lot 57 & 58, DP3378 along with the downstream regional basins to the east of the site have been lodged and under assessment of Central Coast Council. Bio-retention basin and GPT have not been proposed for Catchment B.

- Catchment C – Freely discharge into the riparian corridor

Pollutant loads generated from the Catchment C will be contained within the riparian corridor and treated by the future downstream regional basin. A proprietary GPT has been proposed prior to discharging into the riparian corridor to reduce gross pollutant load and a portion of phosphors load.

At the time of lodgement, the development application of Lot 57 & 58, DP3378 along with the downstream regional basins to the east of the site have been lodged and under assessment of Central Coast Council. Bio-retention basin has not been proposed for Catchment C.

4.5.3 Rainfall Data

Historical rainfall records were obtained from the Bureau of Meteorology for Station No. 066062 at Sydney Observatory Hill. The MUSIC analysis was undertaken using a 6min time step for years 1973-1993 historical data. The Evapotranspiration values have been adopted from Wyong Council Civil Works Design Guideline 2005.

4.5.4 Methodology

The water quality modelling software MUSIC v6 was used to analyse the performance of the treatment train. Figure 6 below shows the MUSIC node and link diagram used to describe the proposed treatment train. The model has been built to assess the adequacy of the Stormwater treatment measure proposed and to ensure that the quality of stormwater meets the objectives prior to stormwater runoff leaving the site.

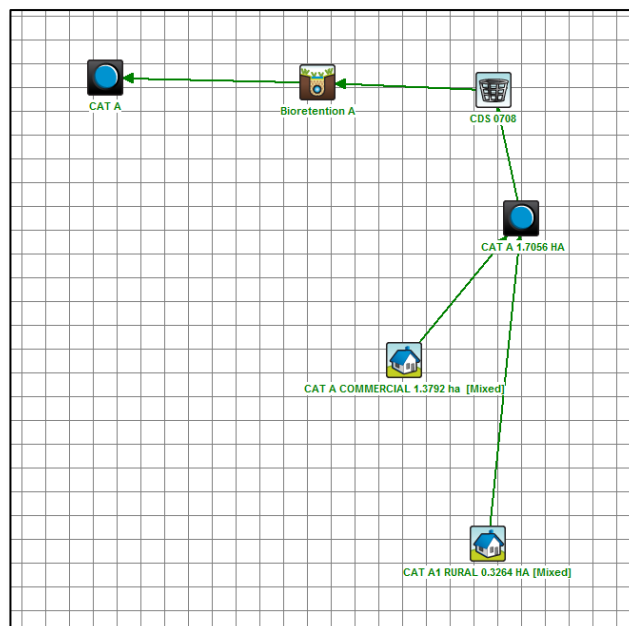


Figure 6 - MUSIC Link and Node Diagram

The following rainfall and runoff parameters have been adopted.

Table 8 - Rainfall Runoff Parameters

Parameter	Recommended Values
Rainfall Threshold (mm/day)	1.0
Soil Storage Capacity (mm)	200
Initial Storage (% of Capacity)	30
Field Capacity (mm)	80
Infiltration Capacity Coefficient – a	200
Infiltration Capacity Exponent – b	1.0
Initial Depth (mm)	10
Daily Recharge Rate (%)	50
Daily Baseflow Rate (%)	0.16
Daily Deep Seepage Rate (%)	2.0

The pollutant concentration parameters used in the model were based on information provided in “Using MUSIC in Sydney’s Drinking Water Catchment”, Sydney Catchment Authority, 2012. The parameters are listed in Table 9:

Table 9 - Water Quality Parameters for MUSIC Source Nodes

Land- Use Category		Log TSS (mg/L)		Log TP (mg/L)		Log TN (mg/L)	
		Storm Flow	Base flow	Storm Flow	Base Flow	Storm Flow	Base Flow
Roof Areas	Mean	1.30	0.00	-0.89	0.00	0.30	0.00
	Std Dev	0.32	0.00	0.25	0.00	0.19	0.00
Road Areas	Mean	2.43	1.20	-0.30	-0.85	0.34	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
Other Impervious Areas	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
Pervious Areas	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12
Commercial Areas	Mean	2.15	1.20	-0.60	-0.85	0.30	0.11
	Std Dev	0.32	0.17	0.25	0.19	0.19	0.12

The parameters used for the basins are presented in Table 10 below:

Table 10 - Basin Parameters

	Basin A
Filter Area (m ²)	155
Extended Detention Depth (m)	0.3
Filter Depth (m)	0.4
TN Content of Filter Media (mg/kg)	800
Orthophosphate Content of Filter Media (mg/kg)	40

4.5.5 MUSIC Model Results

The results of the analysis show the treatment train will achieve the water quality targets set out in Council's DCP. The water quality model provides an indication of the pollutant removal rates expected when the nominated treatment train of water quality measures is applied to the proposed development. The results are presented in Table 11.

Table 11 - MUSIC Model Results – Basin A

Pollutant	Before Treatment	After Treatment	% Reduction	% Objective	Compliance
Total Suspended Solids (kg/yr)	2890	363	87.4	80	OK
Total Phosphorus (kg/yr)	4.73	1.71	63.9	45	OK
Total Nitrogen (kg/yr)	35.1	19.1	45.5	45	OK

4.6 Stormwater Drainage Network

The stormwater drainage system within the development site has been designed using 12D software including a Hydraulic Grade Line (HGL) assessment. The system will be designed for a minimum 5 year ARI event, with a designated overland flowpath to cater for storm events up to a 100 year ARI event, with freeboard to adjacent properties as prescribed in Wyong Shire Council Civil Works Design Guideline.

The runoff from roof catchments will be collected in a series of gutters and down pipes and will be delivered to the internal stormwater drainage system. In some circumstances (properties that slope away from the street) inter-allotment systems will be used in order to transfer roof drainage. Private easements will be established for the inter-allotment drainage.

Pit and pipe sizing have been designed in accordance with Council's requirements for street flow widths and depth/velocity. A minimum pipe diameter of 375mm have been adopted for the street drainage. A minimum pipe diameter of 150mm and maximum of 300mm have been adopted for the inter-allotment drainage.

5. ROADWORKS AND PAVEMENTS

5.1 Roads

The layout of road network has generally been developed based on the Warnervale Town Centre DCP. The proposed internal roads will be designed as “distributor street”, “collector street” and “local street” with a 23.4m, 16.6m and 17.9m wide road reserve respectively. Roads within the proposed development site are to generally be constructed in accordance with the width requirements of the Wyong Shire Council DCP Part 4: Subdivision.

5.2 Connectivity

The internal road system of the proposed Stage 8 – 10 development will be connected via a temporary road to Hakone Road along the western boundary of the site.

Connections to the east and west are also provided for future developments.

5.3 Design and Posted Speed

The internal roads of the development are proposed in accordance with Part 4: Subdivision of Wyong Council's DCP. The posted speeds are outlined below with a design speed of 10km/h above the posted speed being adopted:

- Distributor Road – 50km/h
- Collector Street – 50km/h
- Local Street – 50km/h

5.4 Horizontal and Vertical Geometry

The road geometry has been designed in accordance with Part 4: Subdivision of Wyong Council's DCP. Absolute minimum sight distances have been used for vertical geometry where site constraints have warranted.

5.5 Pathways

Footpaths and cycle paths are planned and designed in accordance with Part 4: Subdivision of Wyong Council's DCP. The pathways are to be paved with a general cross fall of 4.0% within the verge.

5.6 Pavement Design

Pavements have been designed in accordance with Part 4: Subdivision of Wyong Council's DCP.

- An ESA of 2×10^7 has been adopted for distributor road;
- An ESA of 4.6×10^6 has been adopted for collector roads;
- An ESA of 1.9×10^6 has been adopted for local roads.

The pavement design for each type of road in the development is as follows:

- Distributor Road (Pavement Type 1)
 - 100mm thickness AC10 Wearing Course; on
 - Single coat primer seal; on
 - 300mm thickness DGB20 base material; Compacted to 98% MMDD; on
 - 200mm thickness select subgrade material;
- Collector Street (Pavement Type 2)

- 40mm thickness AC14 Wearing Course; on
 - Single coat primer seal; on
 - 150mm thickness DGB20 base material; Compacted to 98% MMDD; on
 - 150mm thickness DGS40; compacted to 98%MMDD; on
 - 380mm thickness select subgrade material.
- Local Street (Pavement Type 3)
 - 30mm thickness AC10 Wearing Course; on
 - Single coat primer seal; on
 - 150mm thickness DGB20 base material; Compacted to 98% MMDD; on
 - 150mm thickness DGS40 subbase material; compacted to 95%MMDD; on
 - 300mm thickness select subgrade material.

The above pavement design has been based on assumed CBR values. Actual CBR values to be confirmed by further detailed investigations and testing.

6. CONCLUSION

Based on preliminary investigations, analyses and designs, it is anticipated that no significant issues will be encountered during the detailed design for earthworks, roadworks and drainage infrastructure works associated with the Warnervale Town Centre – Stage 8 – 10 development.

Sediment and erosion control measures have been designed to capture the site runoff during construction for the proposed development in accordance with the 'Bluebook'. Four temporary sediment basins have been designed to capture construction runoff from the site. The construction of the basin will be undertaken in stages to enable the maximum runoff capture assisted by diversion swales to capture and direct runoff to the basin.

A stormwater management strategy has been developed for the proposed development in accordance with Central Coast Council's DCP and Water Sensitive Urban Design Guidelines. A stormwater treatment train has been developed to manage the discharge of pollutants from the west part of the site. The treatment train includes the implementation of GPT's to manage gross pollutants across the site and a bio-retention basin to manage nutrient pollutants generated across the site. Stormwater runoff from the east part of the site will be directly discharged to downstream basins for attenuation and treatment as outlined in Warnervale Town Centre DCP. Satisfactory pollutant load reduction is achieved across the site in the ultimate scenario upon commissioning downstream regional basins.

A temporary on-site detention basin has been proposed to cater for runoff from the west part of the site prior to commission of the downstream regional basin. The existing catchment scenario is based on the pre-developed condition prior to commencement of any works within the site. An XP-RAFTS model has been developed in order to assess the catchment runoff. The post-development stormwater model incorporates the existing catchments as per the pre-developed model, with the inclusion of a post development Stage 8 – 10 site. A comparison of pre to post-development conditions has been undertaken at the discharge locations downstream of Stage 8 – 10.

Based on the results, a minor increase in peak stormwater runoff into the riparian corridor along eastern boundary is observed during interim conditions. Reduction of peak flow is achieved across the site in the ultimate scenario upon commissioning downstream regional basins.

It is shown that connections to the existing road network will provide a safe environment for vehicular and pedestrian access and that the provision of detention and water quality measures will ensure that developed flows do not exceed undeveloped flows and will maintain the downstream water quality in the ultimate scenario.

The Development Application documentation has been designed and developed generally in accordance with the requirements of Central Coast Council and no issues have been identified that would preclude approval of the current application.

APPENDIX A – CIVIL ENGINEERING PLANS

WARNERVALE TOWN CENTRE STAGE 8-10 RESIDENTIAL PRECINCT SUBDIVISION

CIVIL ENGINEERING PACKAGE



LOCALITY PLAN

SOURCE : NEARMAP.COM.AU (©2017)

DRAWING SCHEDULE	
DWG No.	Drawing Title
DAC01.01	COVER SHEET, DRAWING SCHEDULE AND LOCALITY PLAN
DAC03.01	GENERAL ARRANGEMENT PLAN
DAC03.10	STAGING PLAN
DAC05.01	CONCEPT SEDIMENT AND EROSION CONTROL PLAN
DAC05.10	SEDIMENT AND EROSION CONTROL DETAILS
DAC05.11	TYPICAL SEDIMENT BASIN PLAN AND SECTION
DAC06.01	EARTHWORKS CUT AND FILL PLAN
DAC06.10	EARTHWORKS CUT AND FILL SECTIONS - SHEET 01
DAC06.11	EARTHWORKS CUT AND FILL SECTIONS - SHEET 02
DAC07.01	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 01
DAC07.02	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 02
DAC07.03	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 03
DAC07.04	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 04
DAC07.05	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 05
DAC07.06	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 06
DAC07.07	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 07
DAC07.08	SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 08
DAC09.01	SIGNAGE AND LINEMARKING PLAN - SHEET 01
DAC09.02	SIGNAGE AND LINEMARKING PLAN - SHEET 02
DAC13.01	TYPICAL ROAD CROSS SECTIONS - SHEET 01
DAC13.02	TYPICAL ROAD CROSS SECTIONS - SHEET 02
DAC14.01	ROAD LONGITUDINAL SECTIONS - SHEET 01
DAC14.02	ROAD LONGITUDINAL SECTIONS - SHEET 02
DAC14.03	ROAD LONGITUDINAL SECTIONS - SHEET 03
DAC14.04	ROAD LONGITUDINAL SECTIONS - SHEET 04
DAC14.05	ROAD LONGITUDINAL SECTIONS - SHEET 05
DAC14.06	ROAD LONGITUDINAL SECTIONS - SHEET 06
DAC14.07	ROAD LONGITUDINAL SECTIONS - SHEET 07
DAC17.01	BIO RETENTION BASIN PLAN
DAC17.10	BIO RETENTION BASIN SECTIONS AND DETAILS
DAC20.01	DETAILS - SHEET 01
DAC20.02	DETAILS - SHEET 02
DAC21.01	TURNING PATH PLAN

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CLIENT REVIEW	JT	-	PC	06.07.18

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PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10

RESIDENTIAL PRECINCT

SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

DEVELOPMENT APPLICATION

COVER SHEET, DRAWING

SCHEDULE AND LOCALITY PLAN

JOB NUMBER

171245 - 01

DRAWING NUMBER

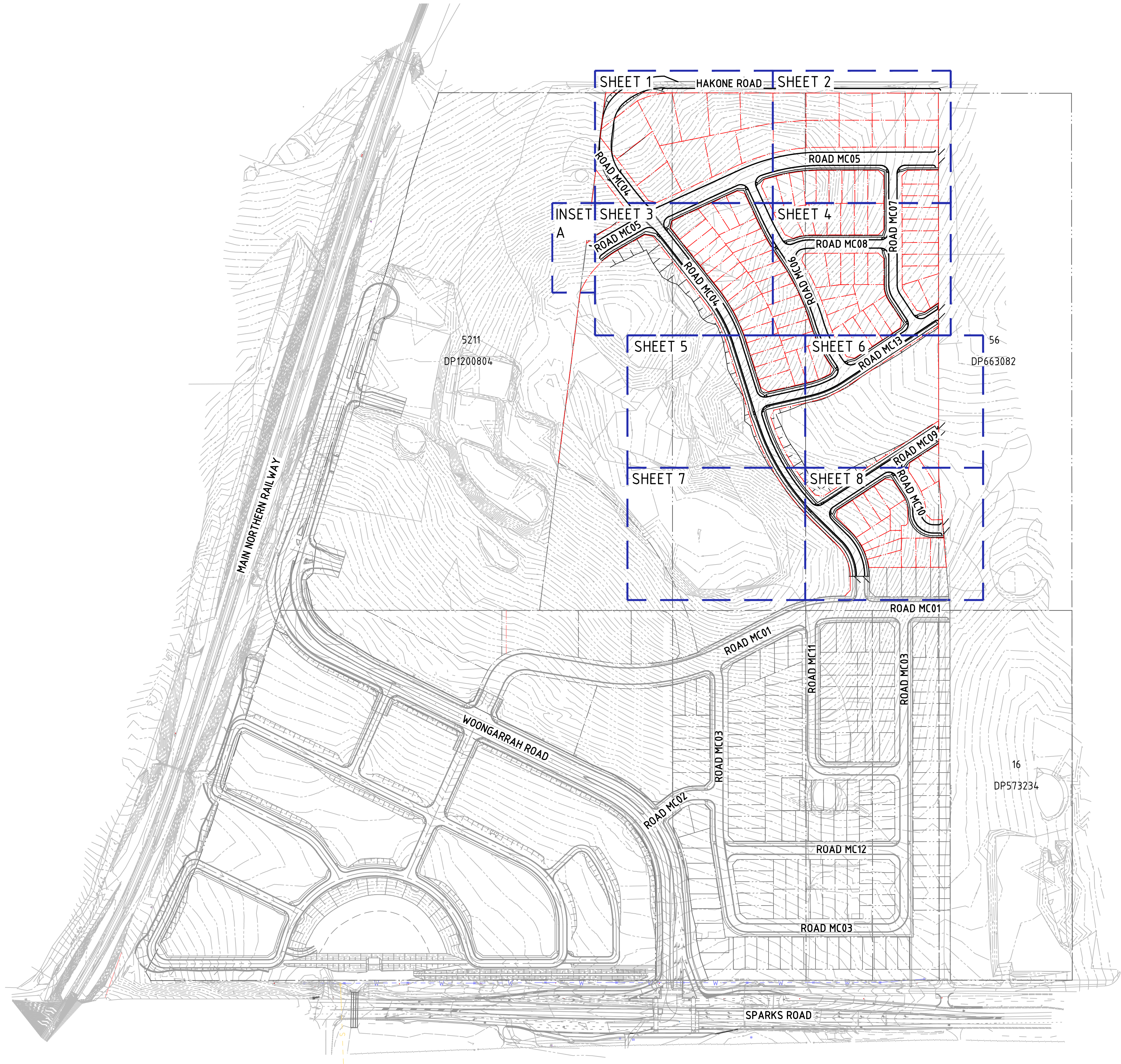
DAC01.01

REVISION

1

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LEGEND	
	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
	EASEMENT LINE

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WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

GENERAL ARRANGEMENT PLAN

JOB NUMBER

171245 - 01

DRAWING NUMBER

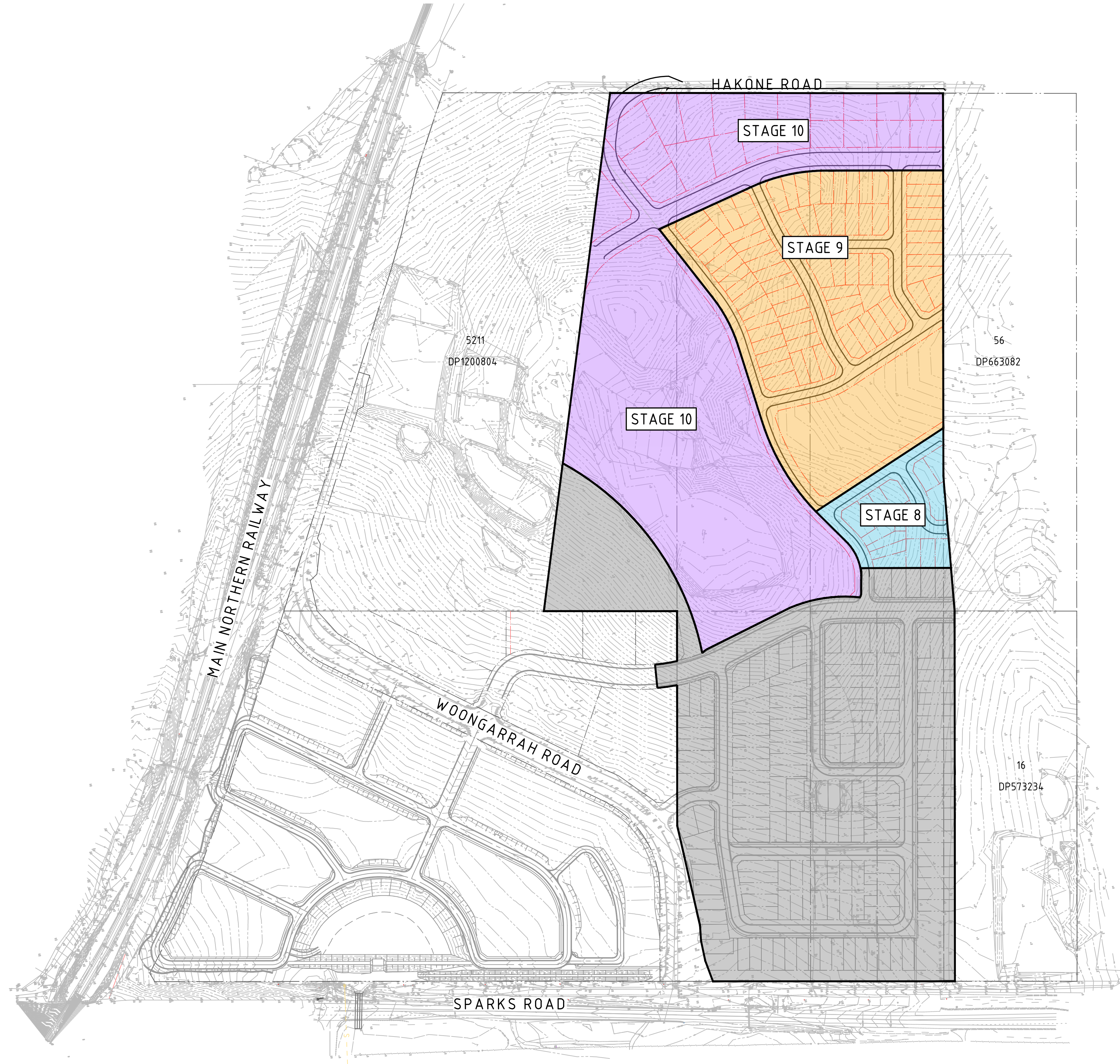
DAC03.01

REVISION

1

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DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



LEGEND	
	PROPOSED LOT BOUNDARY
	EXISTING BOUNDARY LINE
	PROPOSED EASEMENT LINE
	EXISTING EASEMENT LINE
	STAGE 6 - 7
	STAGE 8
	STAGE 9
	STAGE 10
	EXISTING CONTOURS

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WARNERVALE TOWN CENTRE

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DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

STAGING PLAN

JOB NUMBER

171245 - 01

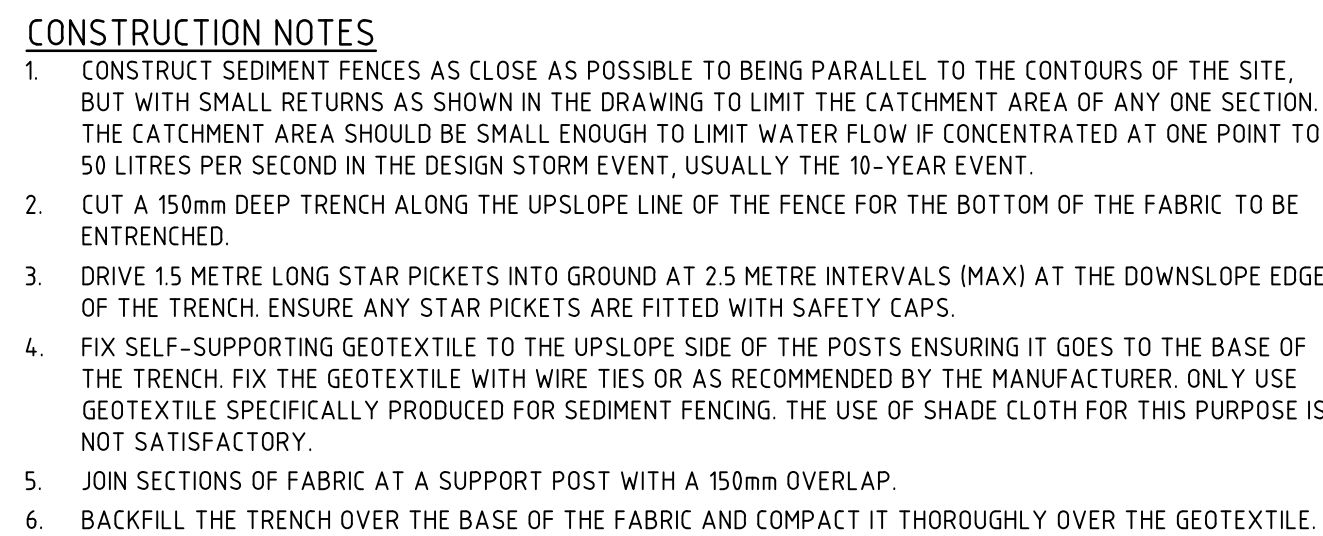
DRAWING NUMBER

REVISION

DAC03.10

1

DRAWING SHEET SIZE = A1



CONSTRUCTION SITE

MINIMUM WIDTH 3m

MINIMUM LENGTH 15m

PROPERTY BOUNDARY

RUNOFF DIRECTED TO SEDIMENT TRAP/FENCE

200mm MINIMUM

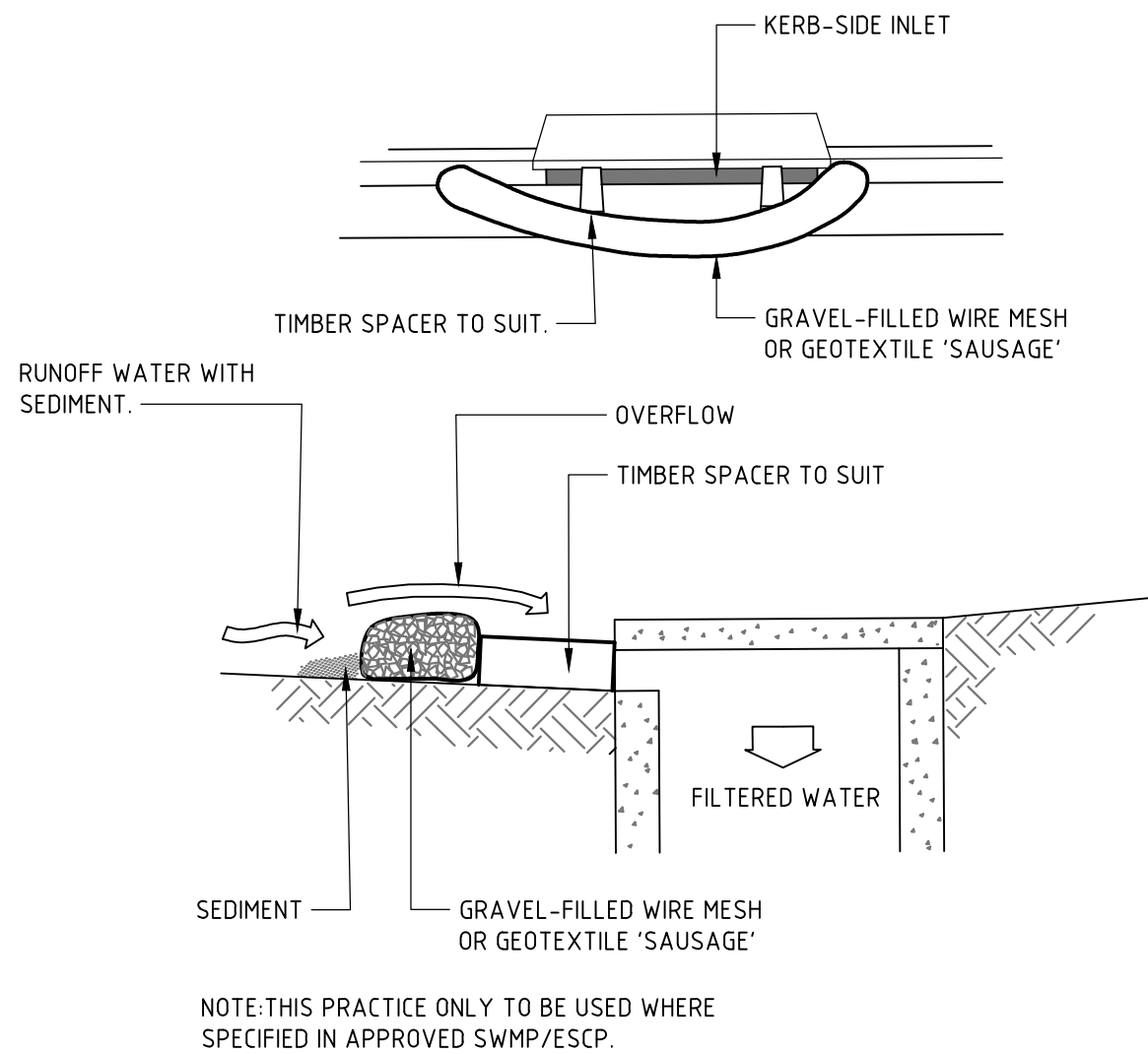
300mm MINIMUM

DB 20 ROADBASE OR 30mm AGGREGATE

GEOTEXTILE FABRIC DESIGNED TO PREVENT INTERMIXING OF SUBGRADE AND BASE MATERIALS AND TO MAINTAIN GOOD PROPERTIES OF THE SUB-BASE LAYERS. GEOTEXTILE MAY BE A WOVEN OR NEEDLE-PUNCHED PRODUCT WITH A MINIMUM CBR BURST STRENGTH (AS3706.4-90) OF 2500 N

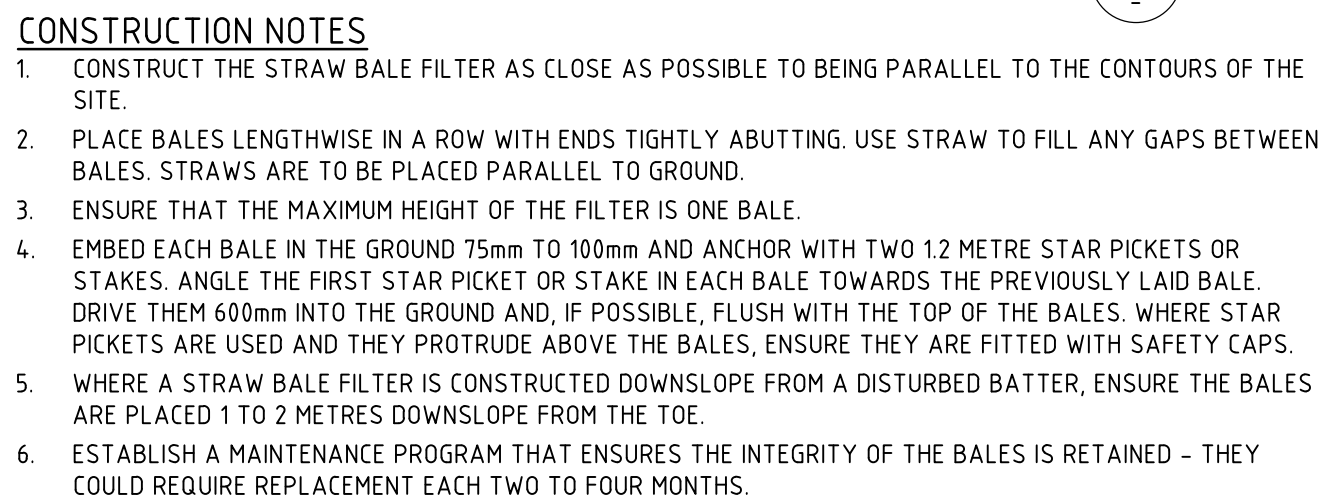
EXISTING ROADWAY

- ## STABILISED SITE ACCESS



-

- ## STOCKPILES



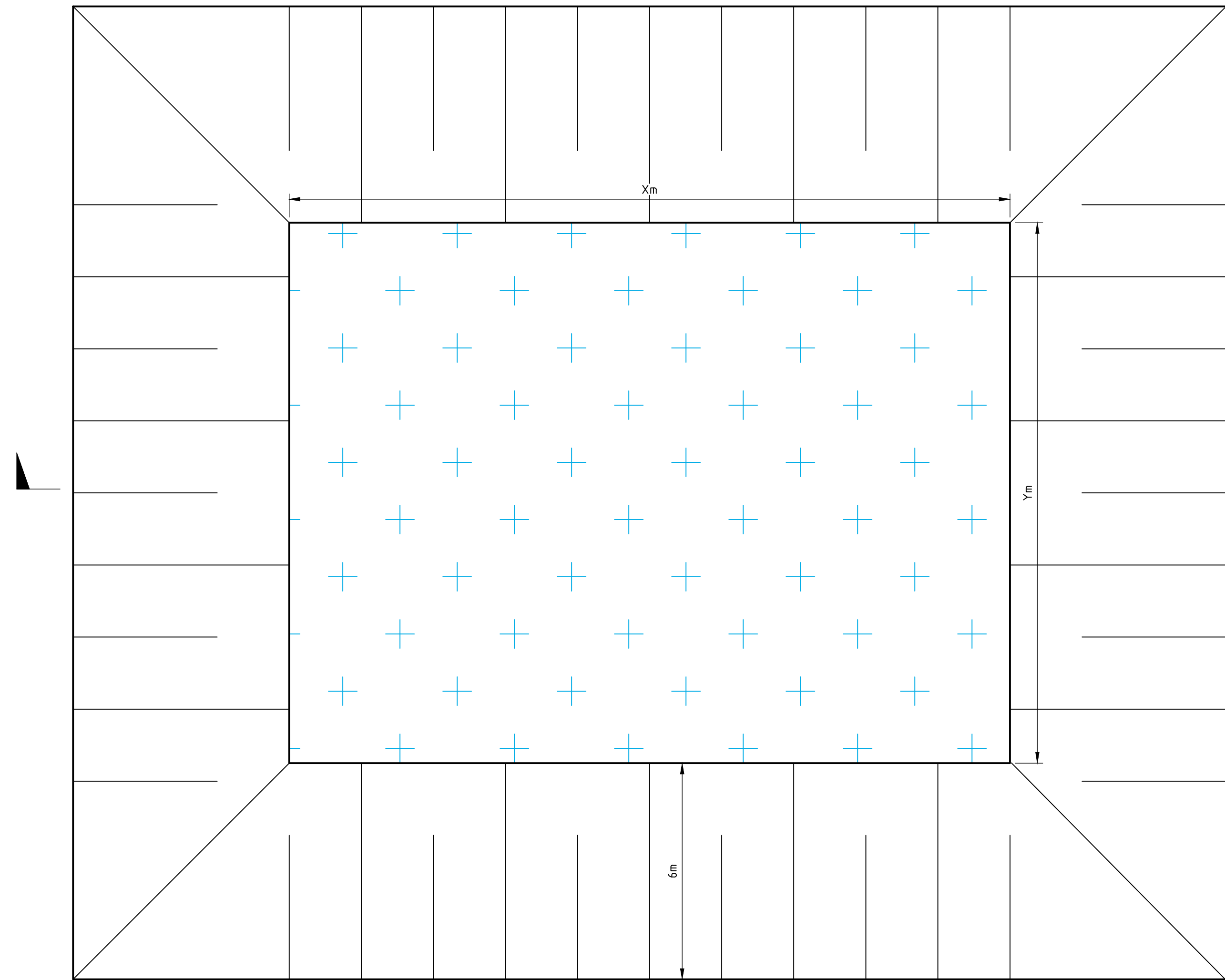
The diagram is divided into two parts. The top part shows a cross-section of a drop inlet with a grate. Labels include: STAR PICKETS (at the edges), 1 METRE MAX. (width of the grate area), DROP INLET WITH GRATE (the top opening), WIRE OR STEEL MESH (14 GAUGE x 150mm OPENINGS) WHERE GEOTEXTILE IS NOT SELF-SUPPORTING (the mesh below the grate), and WOVEN GEOTEXTILE (the layer below the mesh). The bottom part shows a cross-section of a waterway with various features: SANDBAGS (along the edge), WATERWAY (the main channel), EXCAVATION (a hole in the bank), and EARTH BANK (the surrounding land). A 'FLOW' arrow indicates the direction of water movement. A detailed inset shows a 'STAR PICKET FITTED WITH SAFETY CAP' installed into the 'WOVEN GEOTEXTILE', which is 'EMBEDDED 150mm INTO GROUND'. 'RUNOFF WATER WITH SEDIMENT' is shown entering the inlet, and 'FILTERED WATER' is shown exiting. A caption at the bottom states: 'FOR DROP INLETS AT NON-SAG POINTS, SANDBAGS, EARTH BANK OR EXCAVATION USED TO CREATE ARTIFICIAL SAG POINT'.

- ## DROP INLET SEDIMENT TRAP

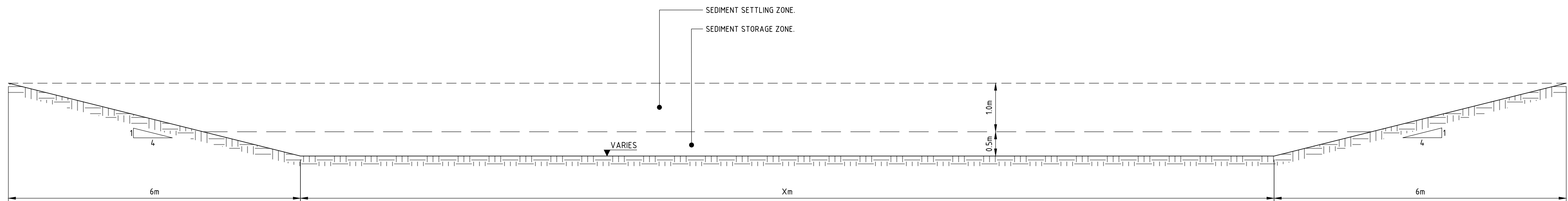
JOB NUMBER		171245 - 01	
DRAWING NUMBER		REVISION	
DAC05.10		1	
DRAWING SHEET SIZE = A1			

TEST ANY EXISTING STORED WATER AND FLOCCULATE AS REQUIRED TO ENSURE WATER QUALITY MEETS THE REQUIREMENTS OF COUNCIL PRIOR TO PUMPING FOR DUST CONTROL. REFER TO APPENDIX 'E' OF 'BLUEBOOK' FLOCCULATION DETAILS.

SEDIMENT BASIN CALCULATIONS									
BASIN	CATCHMENT AREA (ha)	SOIL TYPE	C _r	R x-day y-%ile	V _{s2} (m ³)	V _{s8} (m ³)	V _{required} (m ³)	V _{provided} (m ³)	DIMENSION (m)
1	2.3090	F	0.64	33.8	499	250	749	765	20 x 15 x 1.5
2	0.7890	F	0.64	33.8	171	85	256	258	10 x 7 x 1.5
3	4.3752	F	0.64	33.8	946	473	1420	1431	27 x 24 x 1.5
4	0.7598	F	0.64	33.8	164	82	247	258	10 x 7 x 1.5



PLAN
SCALE 1:100



SECTION
SCALE 1:5

[illegible]

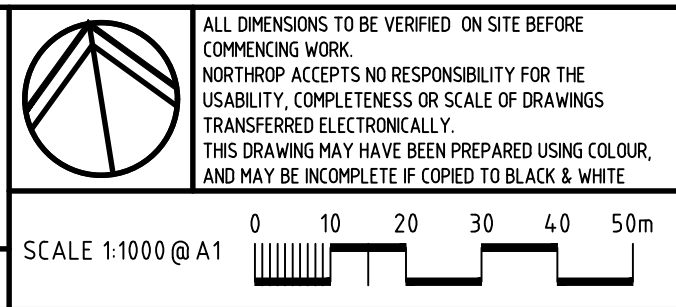
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RESIDENTIAL PRECINCT
SUBDIVISION

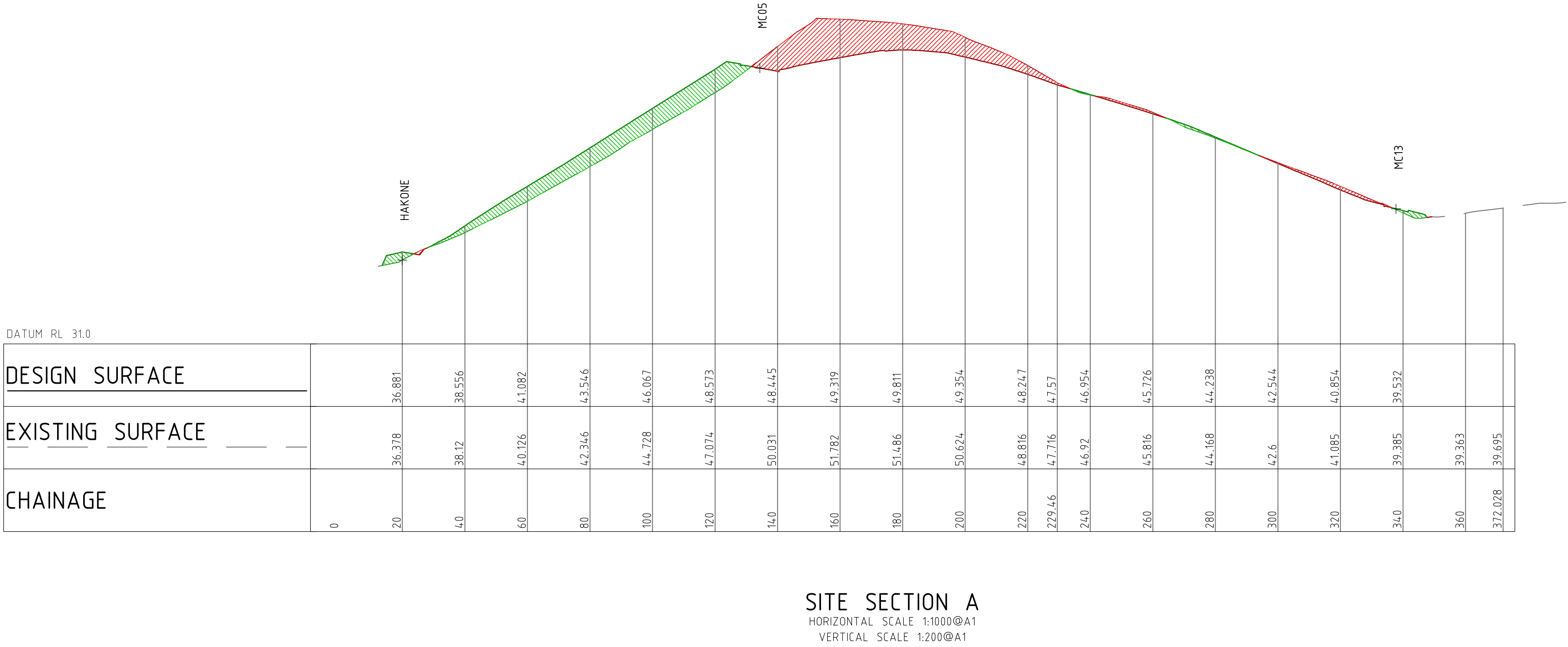
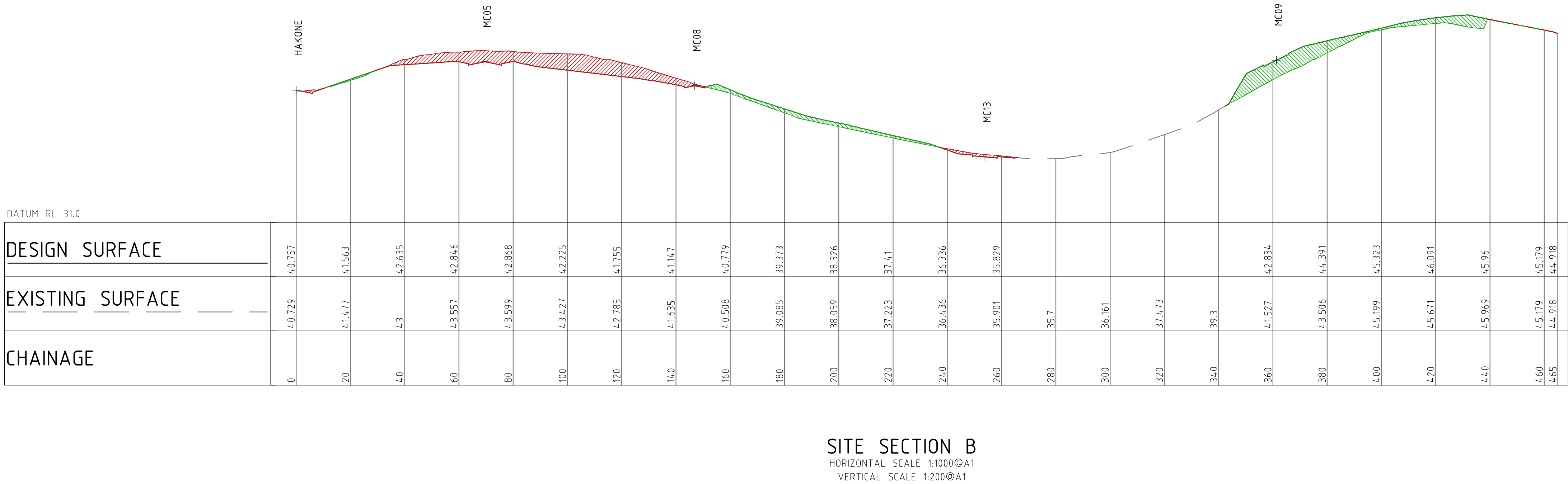
DRAWING TITLE

**CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION**

**TYPICAL SEDIMENT BASIN PLAN
AND SECTION**

JOB NUMBER	
171245 - 01	
DRAWING NUMBER	REVISION
DAC05.11	1
DRAWING SHEET SIZE = A1	

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



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SCALE 1:200 @ A1

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PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

EARTHWORKS CUT AND FILL
SECTIONS - SHEET 01

JOB NUMBER

171245 - 01

DRAWING NUMBER

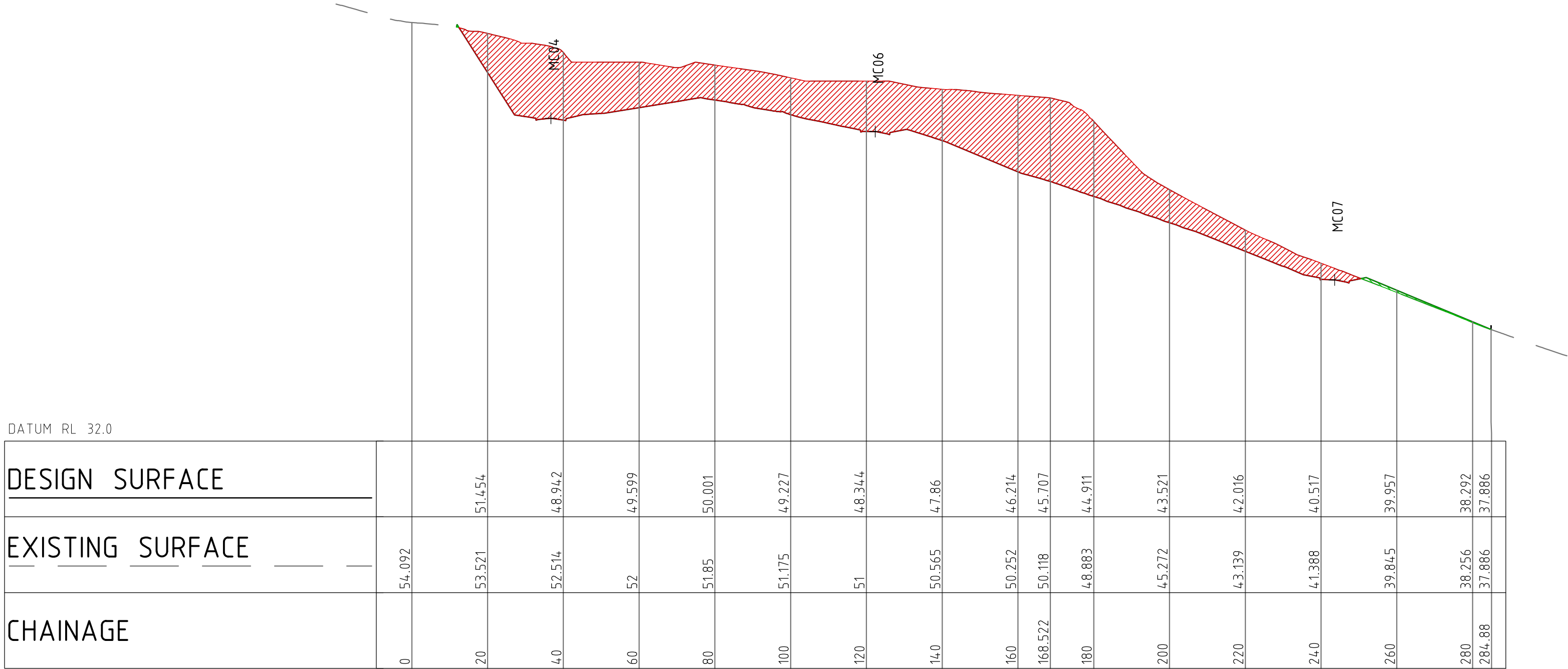
DAC06.10

REVISION

1

DRAWING SHEET SIZE = A1

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



SITE SECTION C
HORIZONTAL SCALE 1:1000@A1
VERTICAL SCALE 1:200@A1



SITE SECTION D
HORIZONTAL SCALE 1:1000@A1
VERTICAL SCALE 1:200@A1

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WARNERVALE TOWN CENTRE
STAGE 8 - 10
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DRAWING TITLE

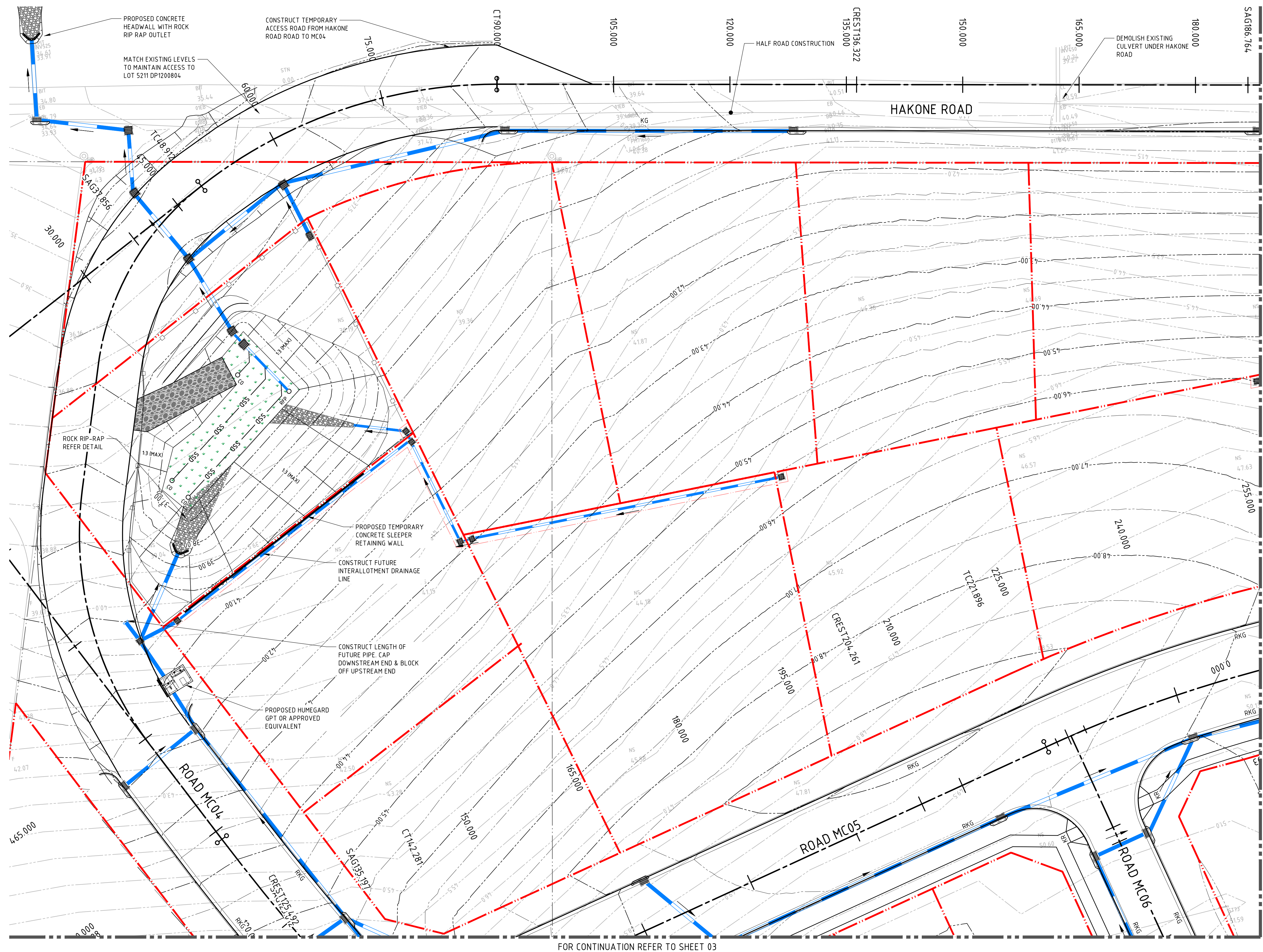
CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION
EARTHWORKS CUT AND FILL
SECTIONS - SHEET 02

JOB NUMBER
171245 - 01

DRAWING NUMBER
DAC06.11

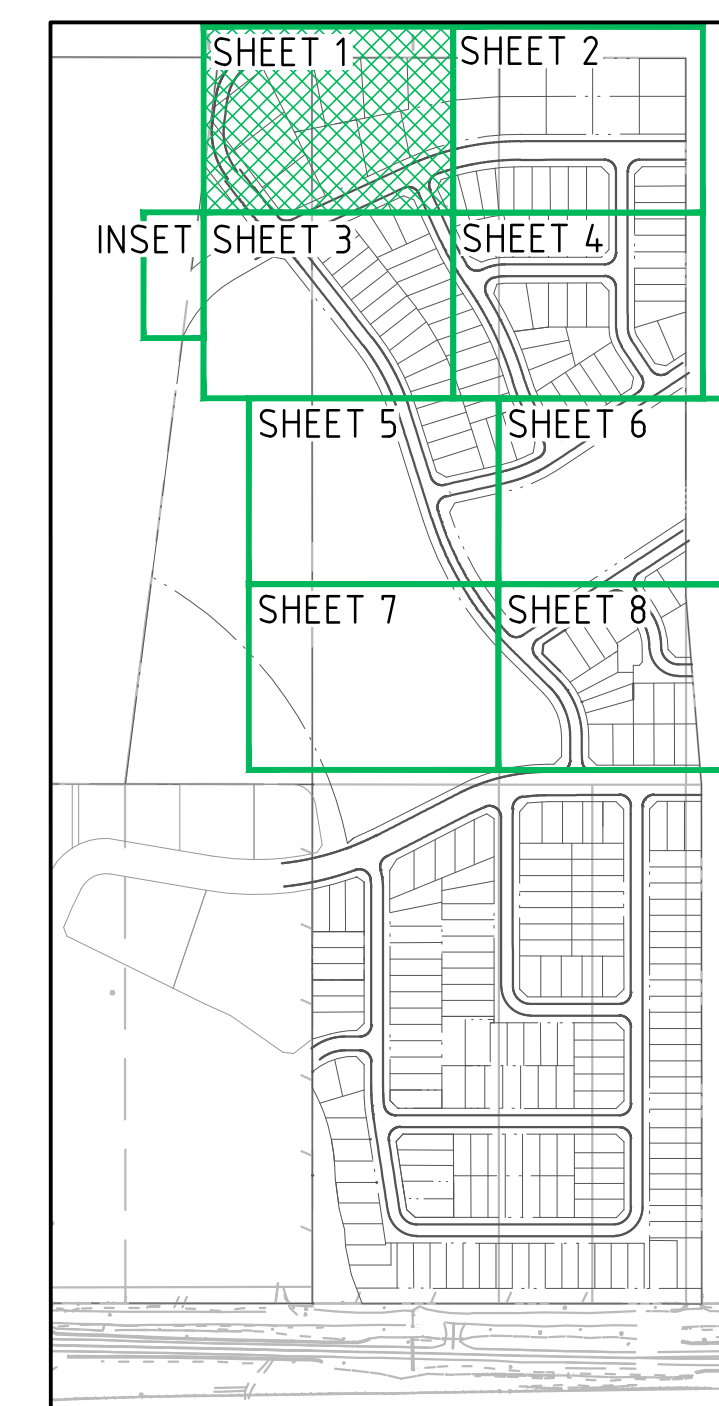
REVISION
1

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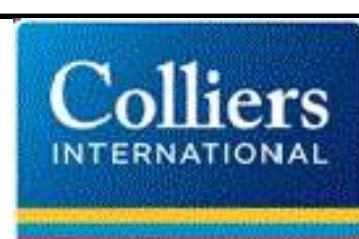


- # LEGEND
- | | |
|--|-----------------------------|
| | PROPOSED LOT BOUNDARY |
| | EXISTING BOUNDARY LINE |
| | EXISTING EASEMENT LINE |
| | ROLL KERB AND GUTTER |
| | KERB AND GUTTER |
| | RETAINING WALL |
| | PROPOSED CONTOURS |
| | EXISTING CONTOURS |
| | KERB RAMP |
| | BATTERS |
| | FENCE |
| | LIMIT OF WORKS |
| | GRASS-LINED CUTOFF DRAIN |
| | STORMWATER FLOW ARROW |
| | STORMWATER PIPE |
| | STORMWATER PIPE CAPPING |
| | EXISTING STORMWATER PIPE |
| | NEW DRAINAGE STRUCTURE |
| | EXISTING DRAINAGE STRUCTURE |
| | CONCRETE HEADWALL |

KEY PLAN



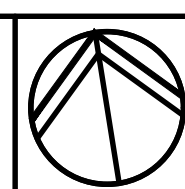
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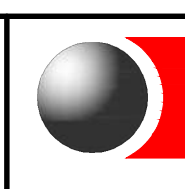
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	PROJECT
--	---------

WARNERVALE TOWN CENTRE

STAGE 8 - 10

RESIDENTIAL PRECINCT

SUBDIVISION

	DRAWING TITLE
--	---------------

**CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION**

**SITWORKS AND STORMWATER
MANAGEMENT PLAN - SHEET 01**

JOB NUMBER

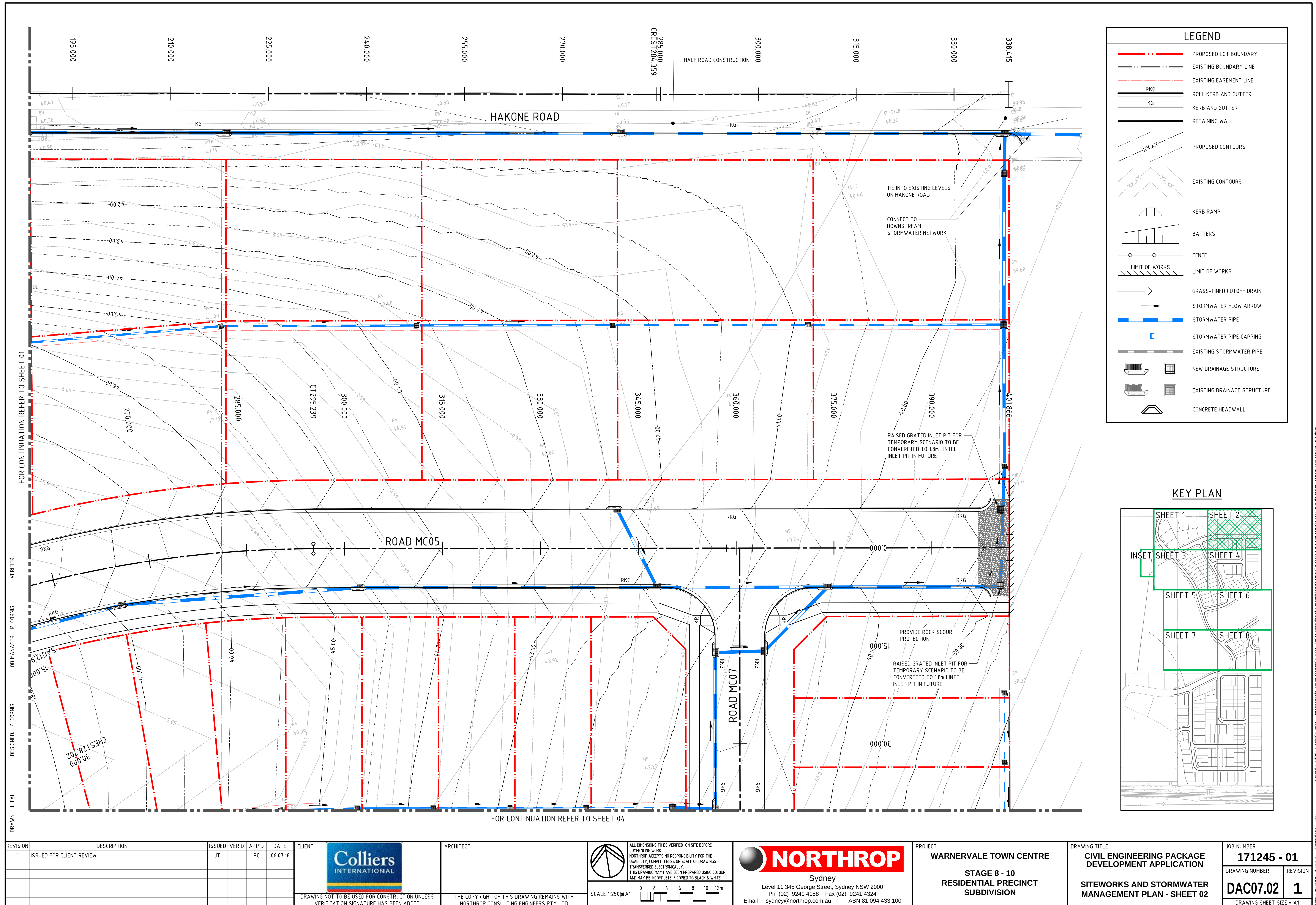
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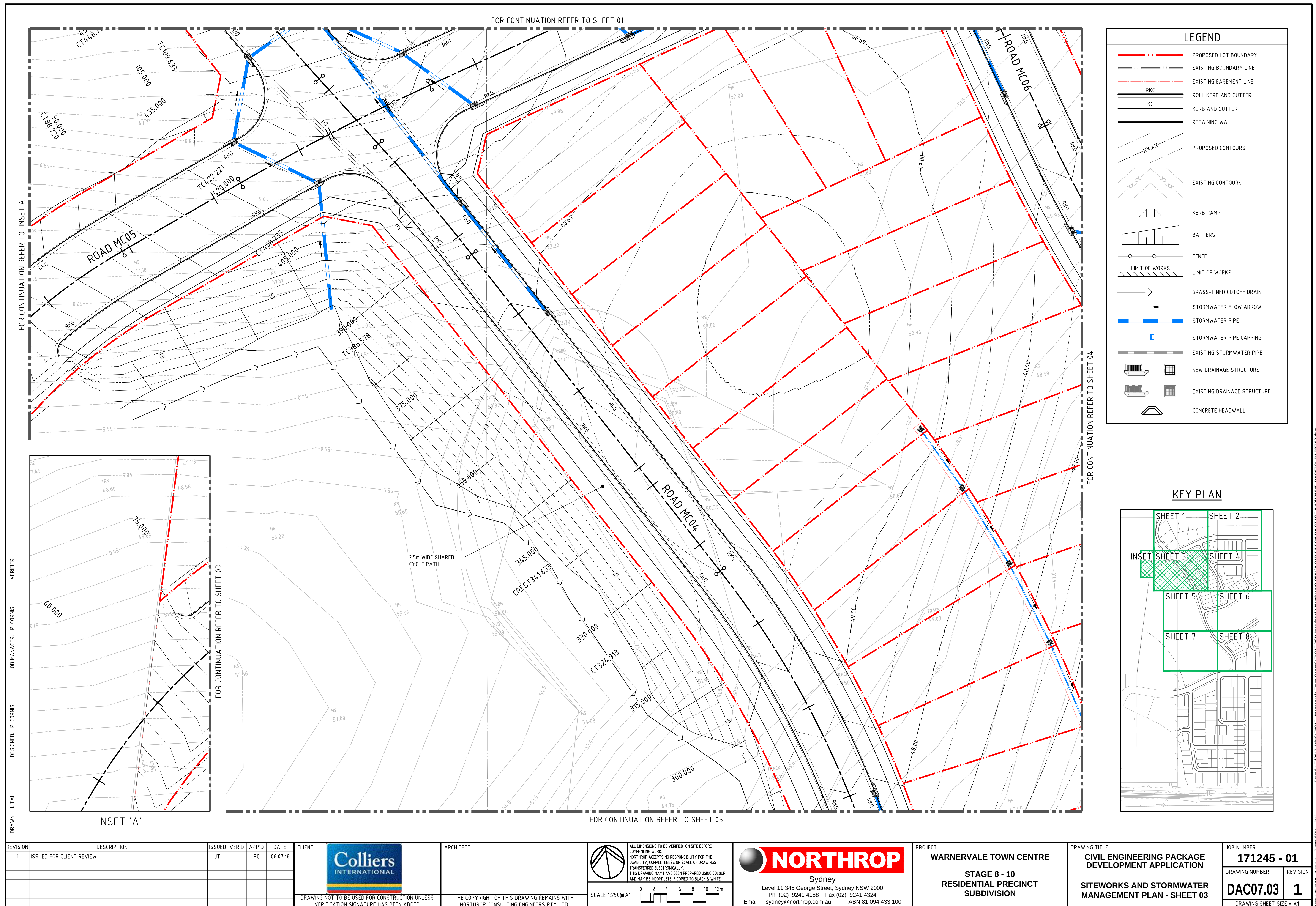
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REVISION

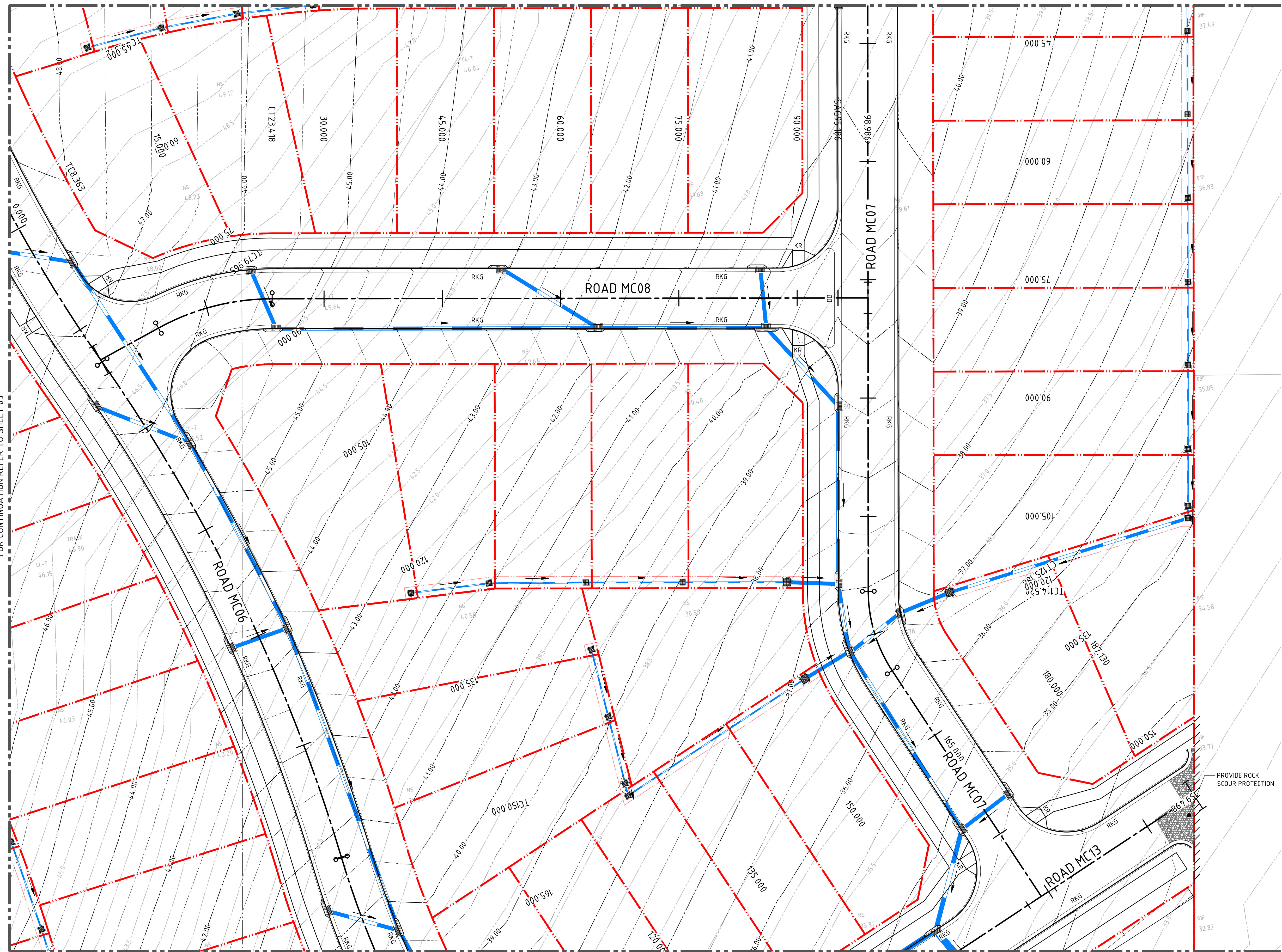
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DRAWING SHEET SIZE = A1



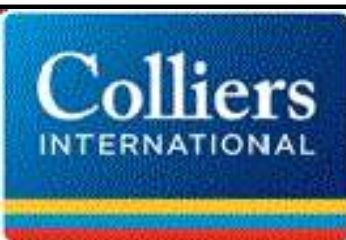


FOR CONTINUATION REFER TO SHEET 06



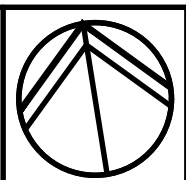
KEY PLAN

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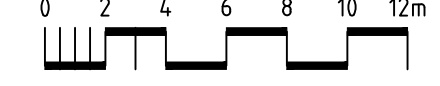
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WARNERVALE TOWN CENTRE

**STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION**

CIVIL ENGINEERING PACKAGE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

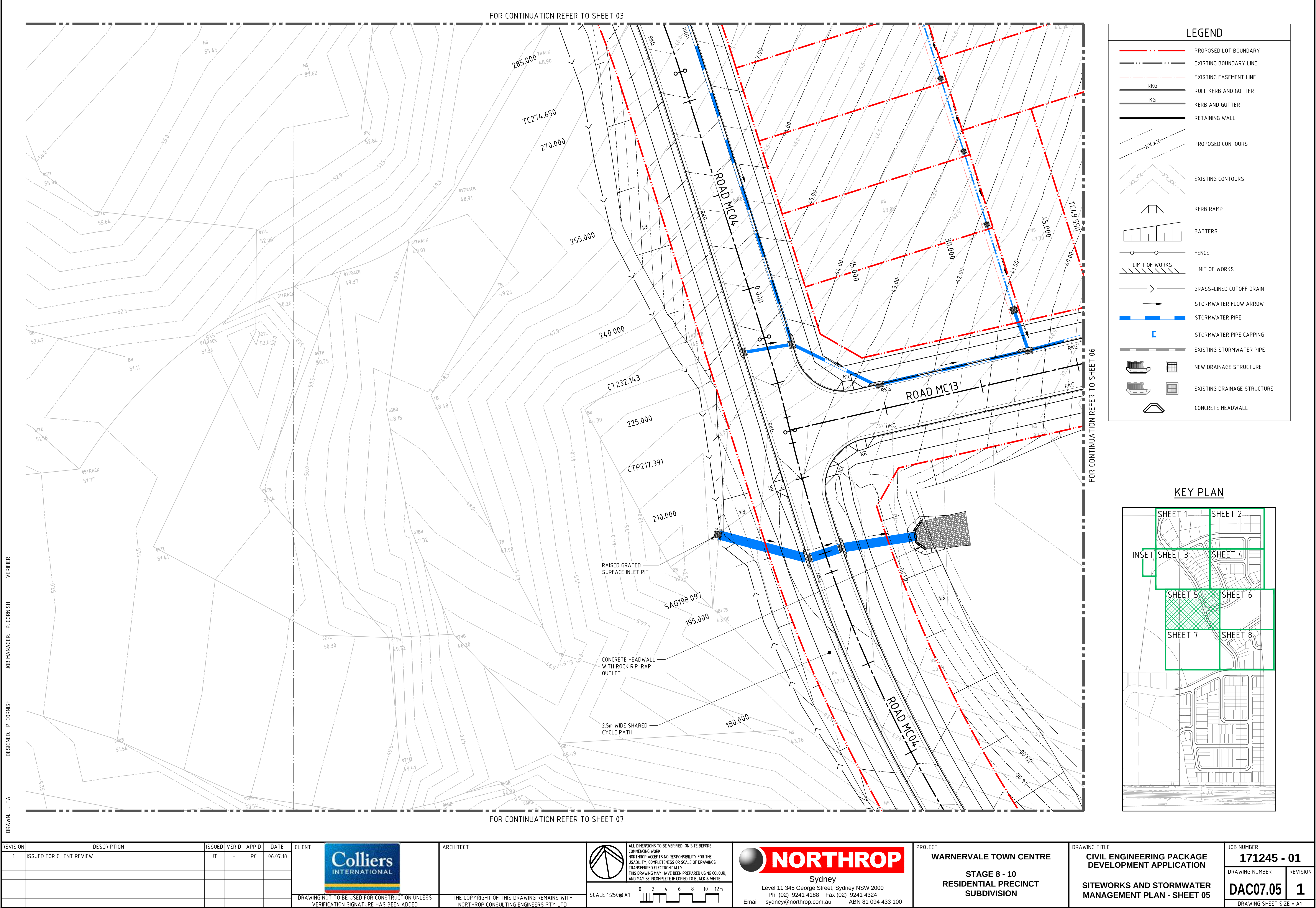
**SITWORKS AND STORMWATER
MANAGEMENT PLAN - SHEET 04**

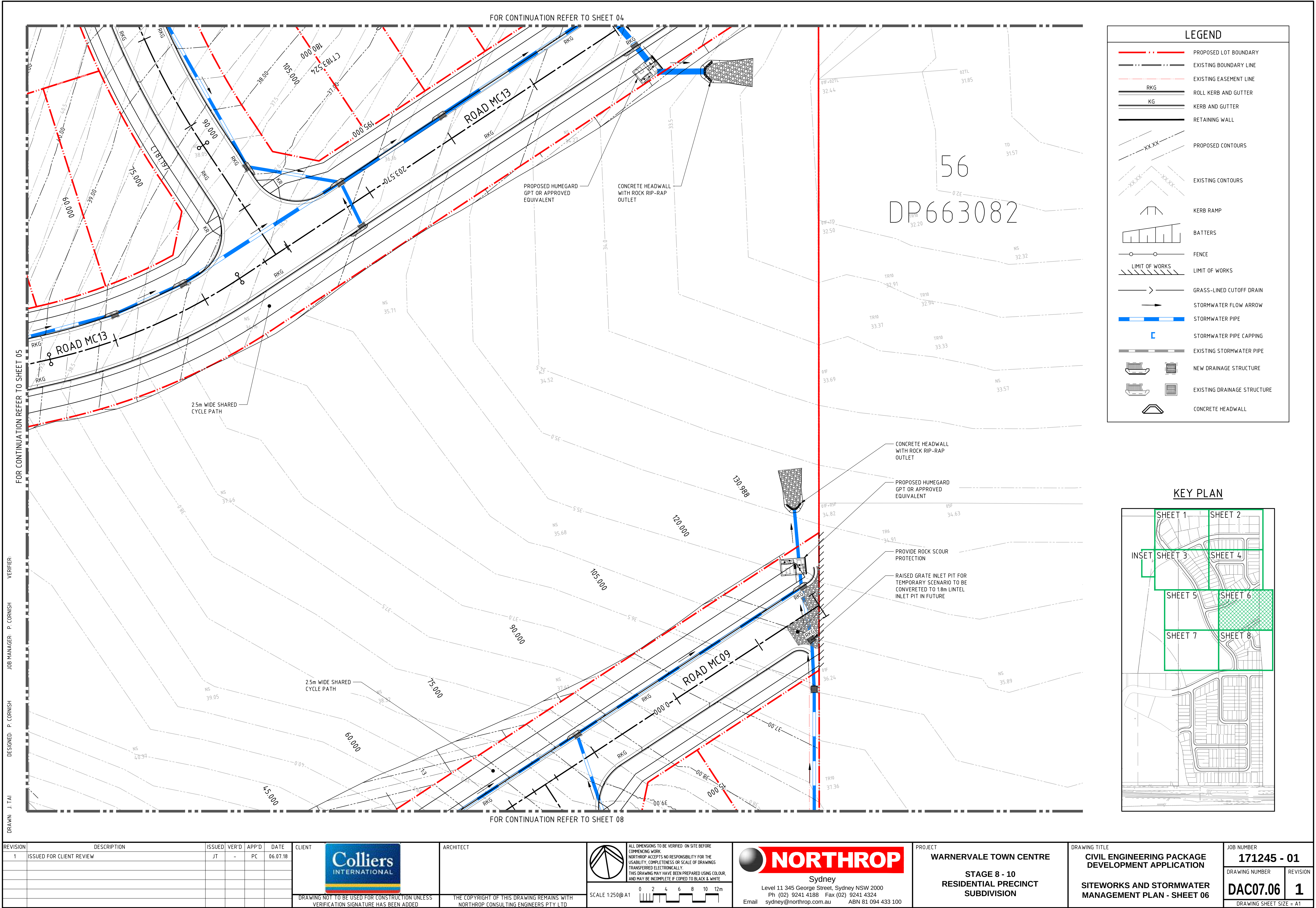
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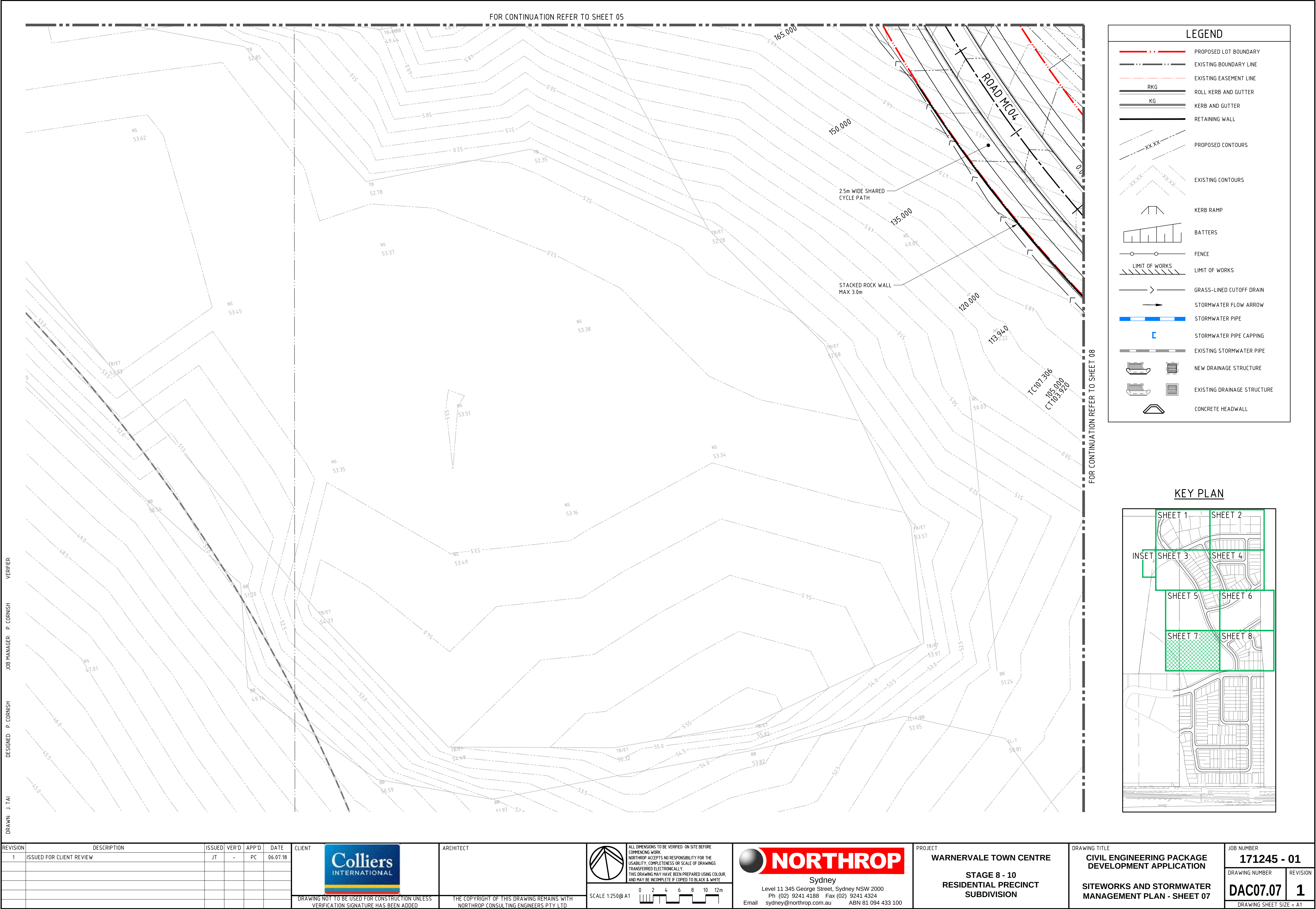
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DAC07.0

DRAWING SHEET SIZE = A1







FOR CONTINUATION REFER TO SHEET 06

FOR CONTINUATION REFER TO SHEET 07

DESIGNED: J.TAI
JOB MANAGER: P. CORNISH
VERIFIER:

Drawn: J.TAI

Drawn: J.TAI

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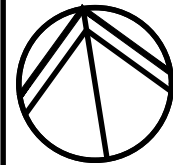
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CLIENT

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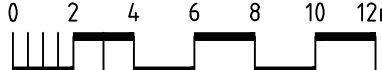
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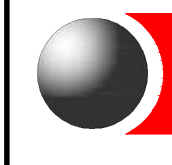
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WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

SITeworks AND STORMWATER
MANAGEMENT PLAN - SHEET 08

JOB NUMBER

171245 - 01

DRAWING NUMBER

DAC07.08

REVISION

1

DRAWING SHEET SIZE = A1

LEGEND



PROPOSED LOT BOUNDARY



EXISTING BOUNDARY LINE



EXISTING EASEMENT LINE



ROLL KERB AND GUTTER



KERB AND GUTTER



RETAINING WALL



PROPOSED CONTOURS



EXISTING CONTOURS



KERB RAMP



BATTERS



FENCE



LIMIT OF WORKS



GRASS-LINED CUTOFF DRAIN



STORMWATER FLOW ARROW



STORMWATER PIPE



STORMWATER PIPE CAPPING



EXISTING STORMWATER PIPE



NEW DRAINAGE STRUCTURE



EXISTING DRAINAGE STRUCTURE



CONCRETE HEADWALL

KEY PLAN

SHEET 1

SHEET 2

INSET SHEET 3

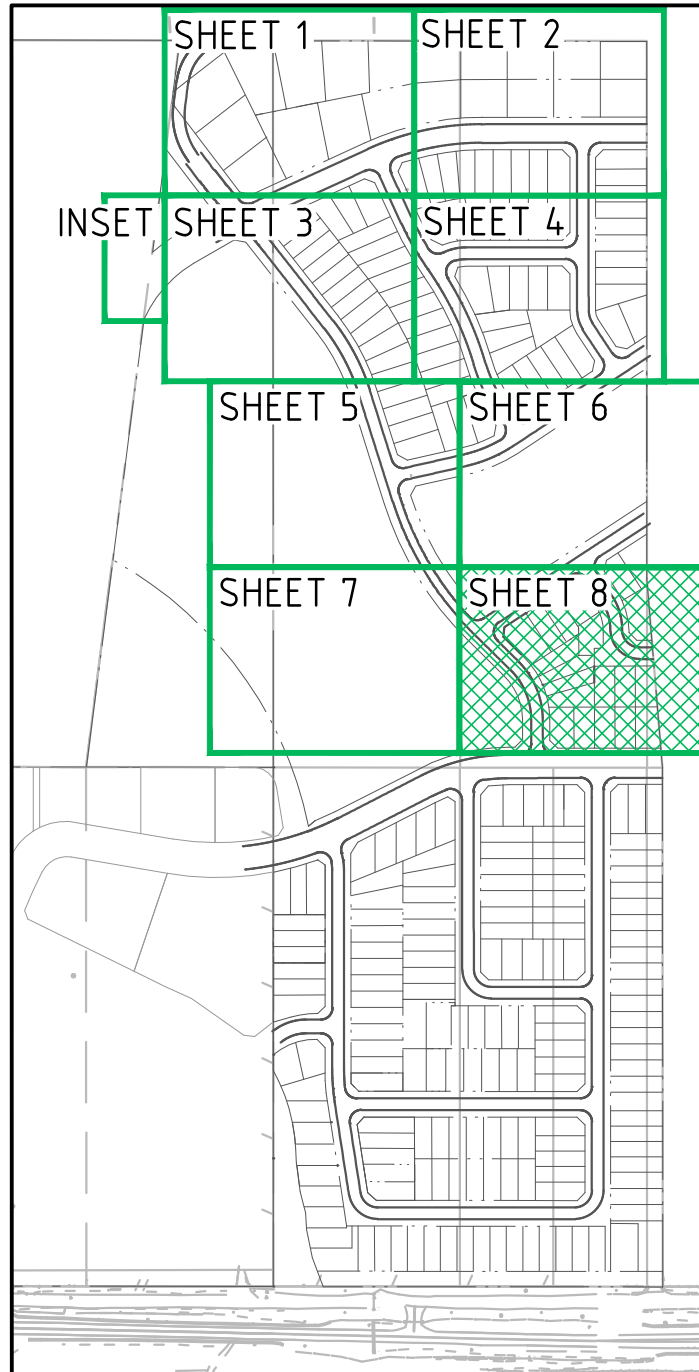
SHEET 4

SHEET 5

SHEET 6

SHEET 7

SHEET 8

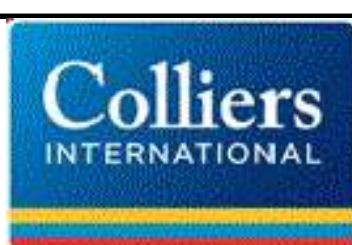


FOR CONTINUATION REFER TO SHEET 1



LEGEND	
	PROPOSED LOT BOUNDARY
	EXISTING BOUNDARY
	STREET SIGNS
	ROAD NAME STREET SIGNS
	GIVE WAY LINE
	GIVE WAY LINE
	STOP LINE
	EDGE LINE
	BARRIER LINES WITH WHITE RAISED PAVEMENT MARKERS AT 3m CENTRES AS PER COUNCIL GUIDELINES
	NO STOPPING LINE
	RA1 - PAVEMENT MARKING

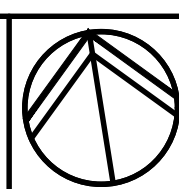
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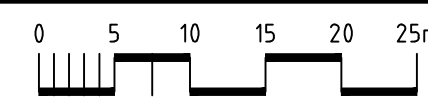
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WARNERVALE TOWN CENTRE

STAGE 8 - 10

RESIDENTIAL PRECINCT

SUBDIVISION

DRAWING TITLE

**CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION**

**SIGNAGE AND LINEMARKING PLAN -
SHEET 02**

JOB NUMBER

171245 - 01

DRAWING NUMBER

REVISION

- **DAC09.02**

DRAWING SHEET SIZE = A1

VERIFIER:

JOB MANAGER: P. CORNISH

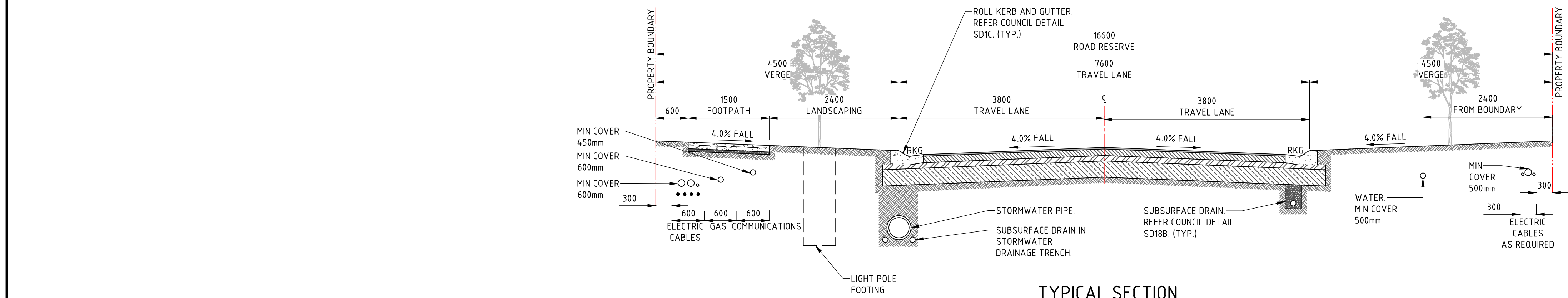
DESIGNED: P. CORNISH

DRAWN: J. TAI

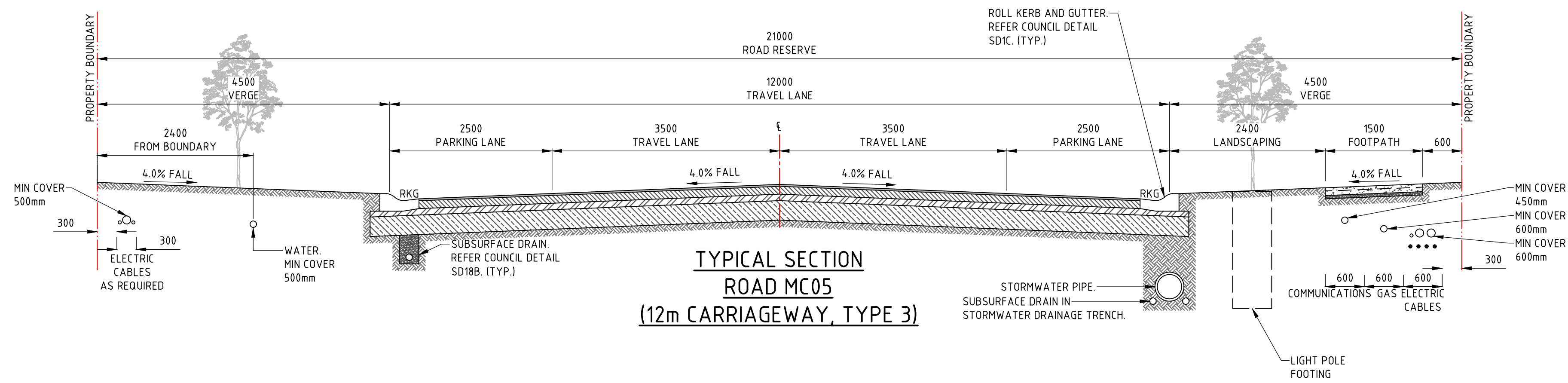
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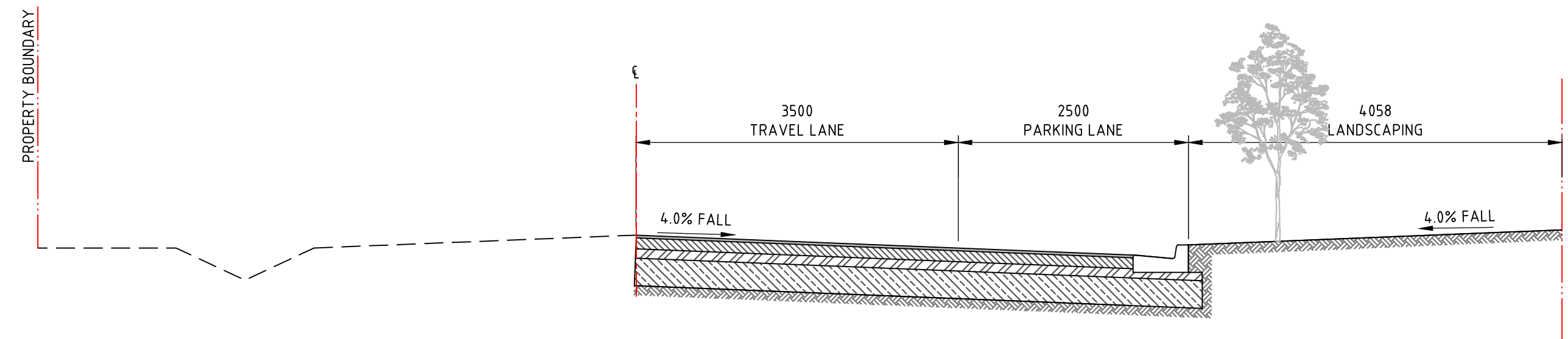
DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



TYPICAL SECTION
ROAD MC06, MC07, MC10
(7.6m CARRIAGEWAY, TYPE 11)



TYPICAL SECTION
ROAD MC05
(12m CARRIAGEWAY, TYPE 3)



TYPICAL SECTION
HAKONE ROAD

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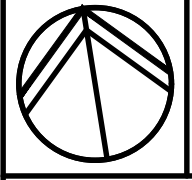
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WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

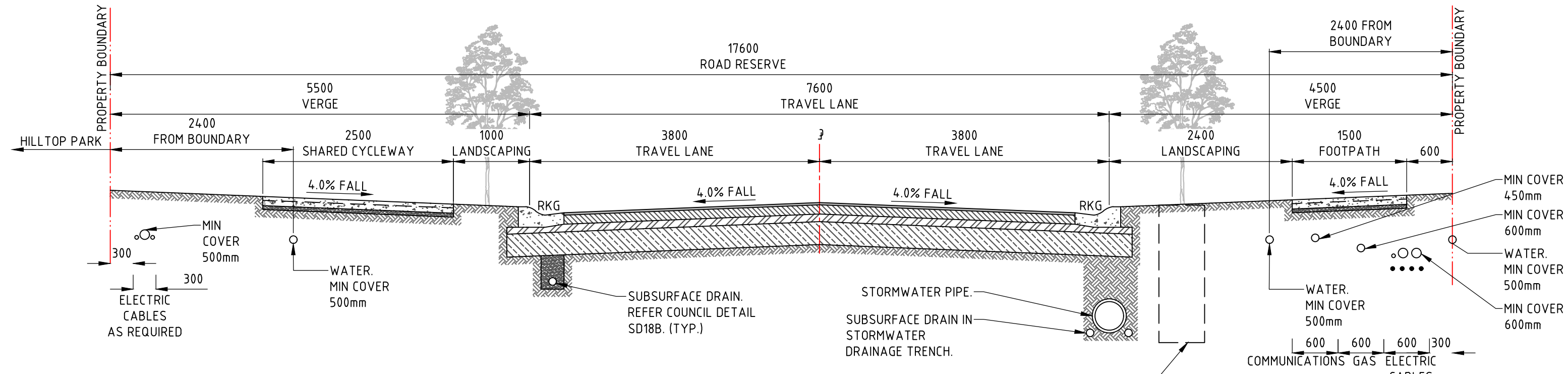
TYPICAL ROAD CROSS
SECTIONS - SHEET 01

JOB NUMBER

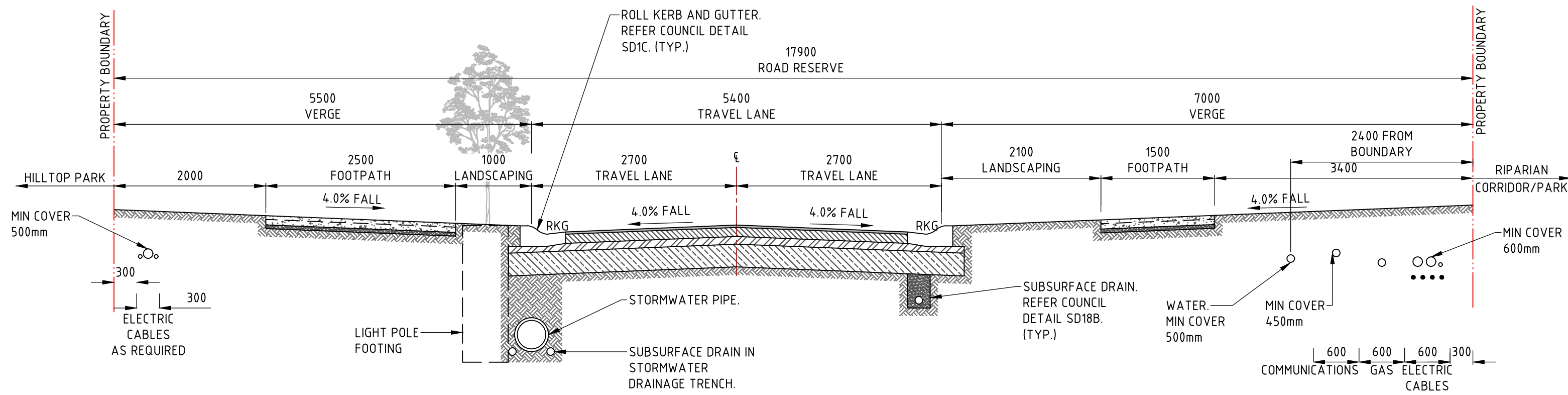
171245 - 01

DRAWING NUMBER	REVISION
DAC13.01	1

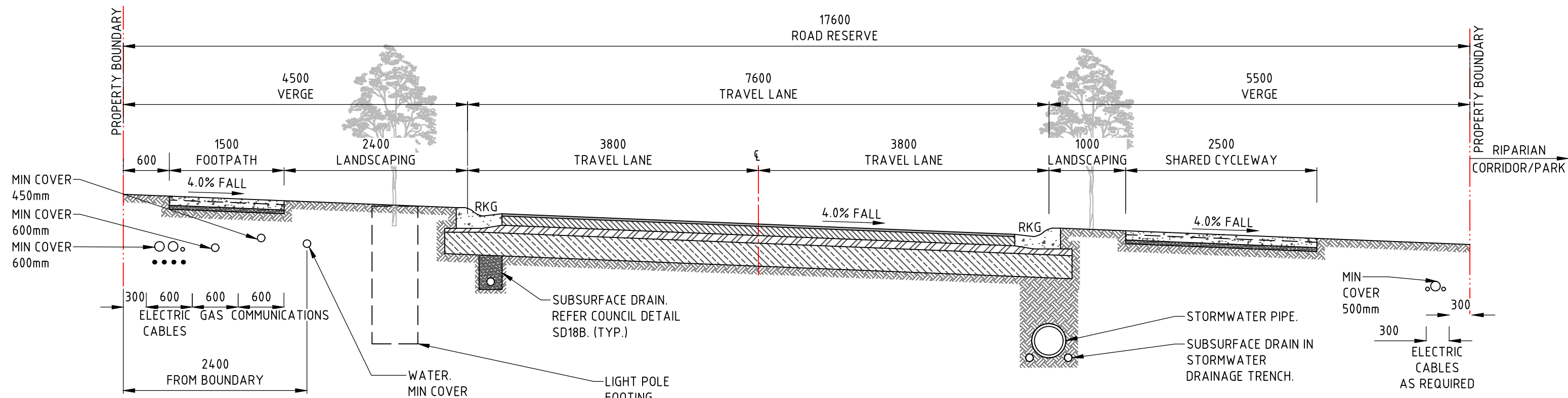
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TYPICAL SECTION
ROAD MC04, CH 30 - CH105 AND CH210 - CH 465
(7.6m CARRIAGEWAY, TYPE 9)



TYPICAL SECTION
ROAD MC04, CH 105 - CH 210
(5.4m CARRIAGEWAY, TYPE 10)



TYPICAL SECTION
ROAD MC09, MC13
(7.6m CARRIAGEWAY, TYPE 9)

VERIFIER: P. CORNISH
JOB MANAGER: P. CORNISH
DESIGNED: P. CORNISH
DRAWN: J.TAI

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0.0 0.5 1.0 1.5 2.0 2.5m

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STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

TYPICAL ROAD CROSS
SECTIONS - SHEET 02

JOB NUMBER
171245 - 01

DRAWING NUMBER
DAC13.02

REVISION
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DRAWING SHEET SIZE = A1

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:

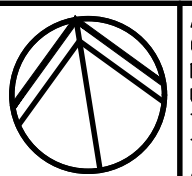
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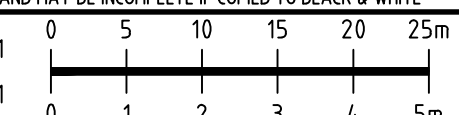
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SCALE 1:100 @ A1



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WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

ROAD LONGITUDINAL SECTIONS
- SHEET 01

JOB NUMBER

171245 - 01

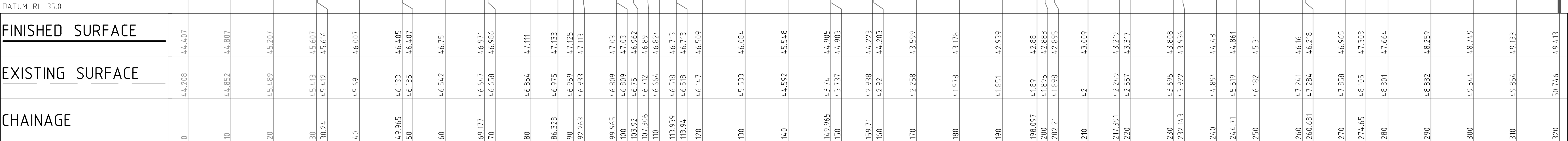
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REVISION

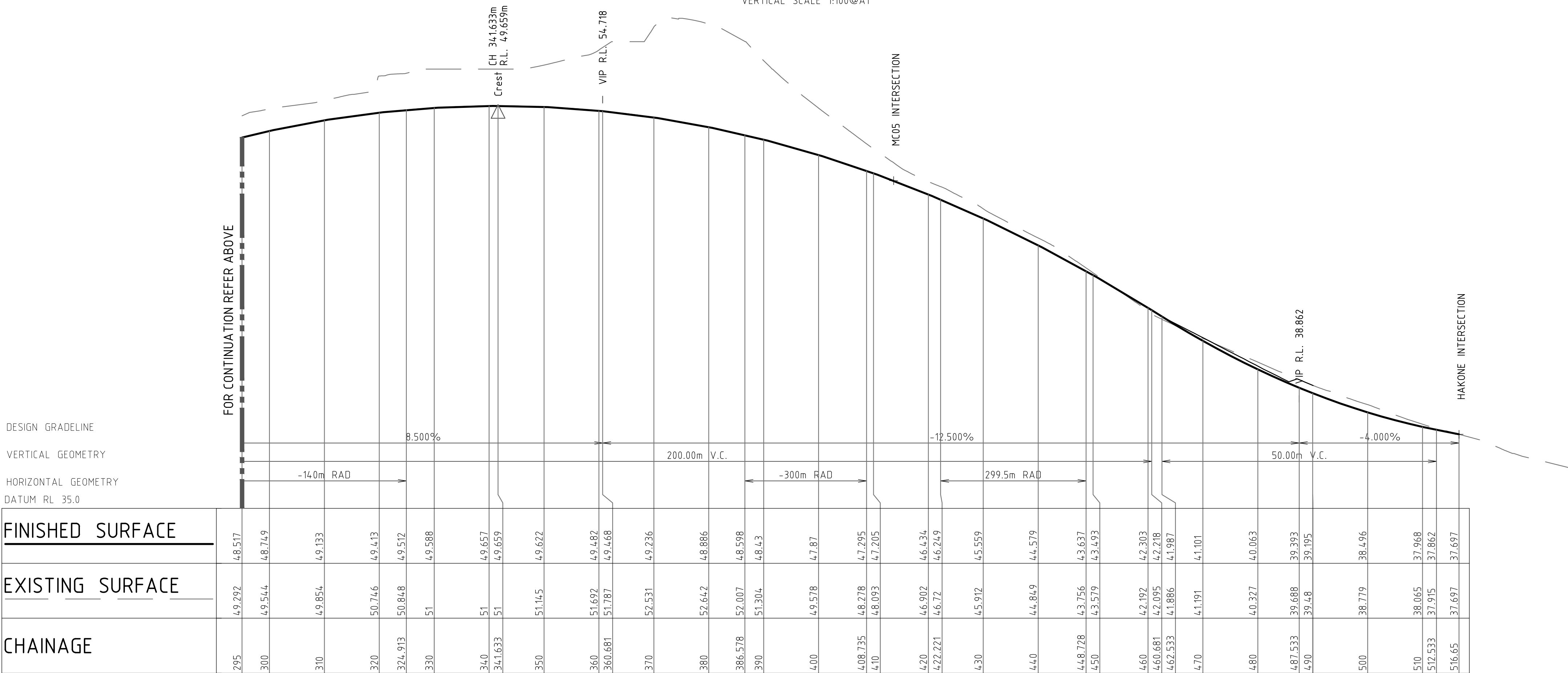
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DRAWING SHEET SIZE = A1



LONGITUDINAL SECTION ALONG MC04

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



LONGITUDINAL SECTION ALONG MC04

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:

DESIGN GRADELINE
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY

DATUM RL 31.0

FINISHED SURFACE		295	47.327	45.185
EXISTING SURFACE		295.239	47.307	45.171
CHAINAGE		300	46.89	44.885
		310	45.777	44.285
		320	45.079	43.685
		330	44.054	43.085
		340	43.083	42.485
		350	42.328	41.885
		360	41.625	41.285
		370	40.971	40.684
		380	40.271	40.084
		390	39.589	39.484
		400	38.902	38.884
		401.866	38.772	38.772

LONGITUDINAL SECTION ALONG MC05

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CLIENT REVIEW.	JT	-	PC	06.07.18

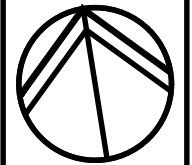


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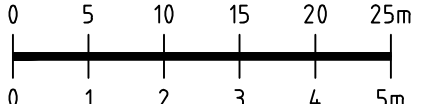
ARCHITECT

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SCALE 1:500 @ A1
SCALE 1:100 @ A1

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PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

ROAD LONGITUDINAL SECTIONS
- SHEET 02

JOB NUMBER

171245 - 01

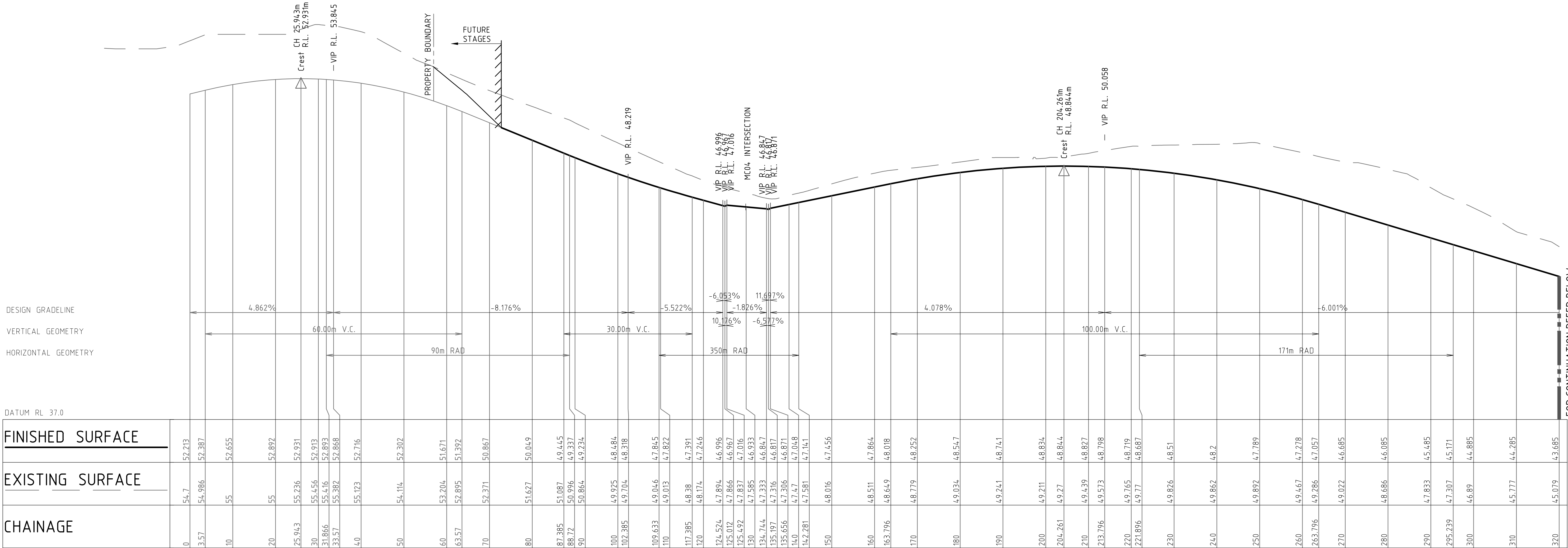
DRAWING NUMBER

DAC14.02

REVISION

1

DRAWING SHEET SIZE = A1



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DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:

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1	ISSUED FOR CLIENT REVIEW.	JT	-	PC	06.07.18

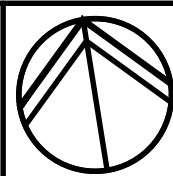
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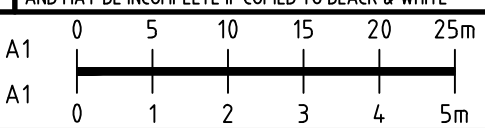
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SCALE 1:100@A1



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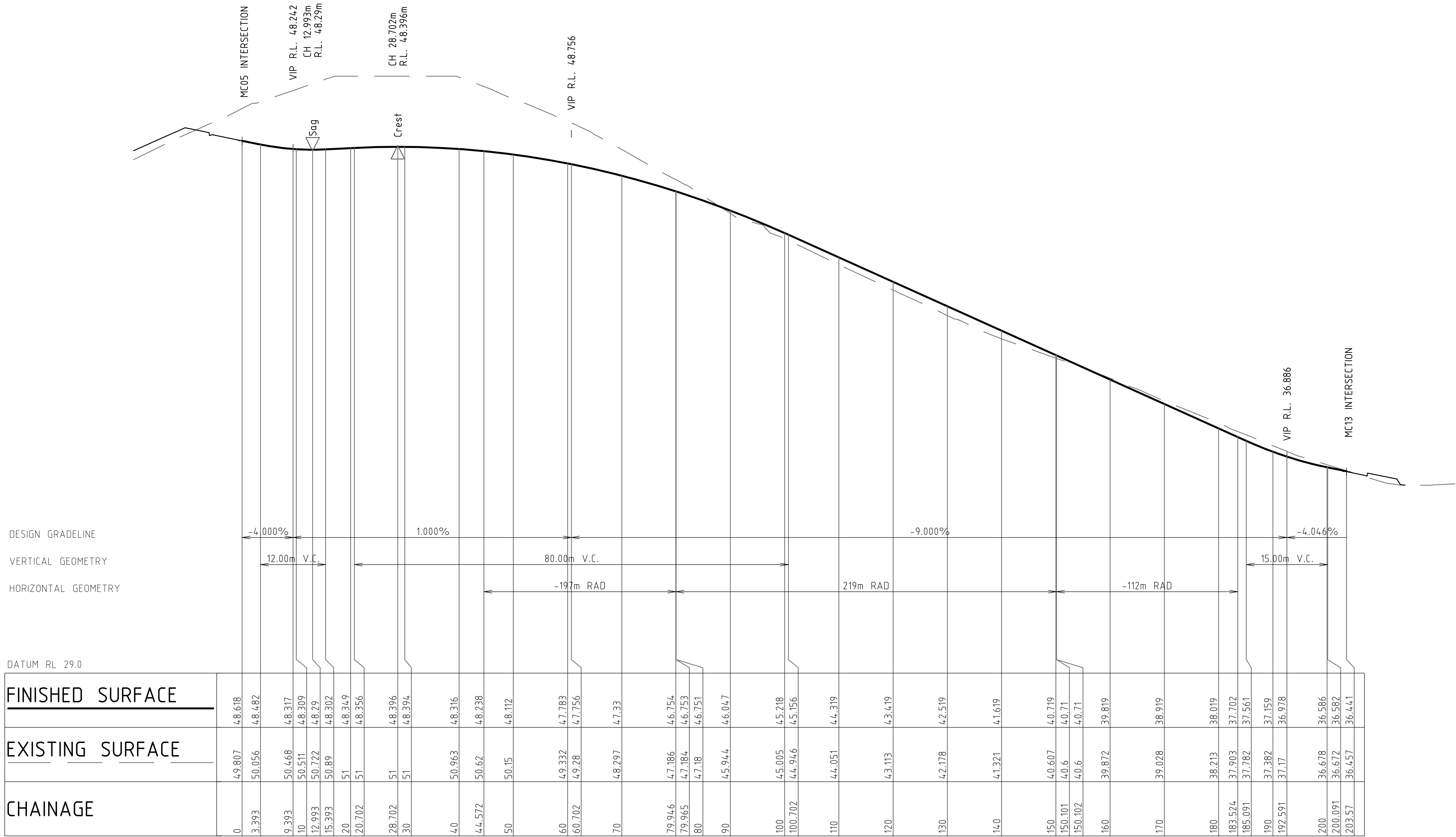
PROJECT
WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

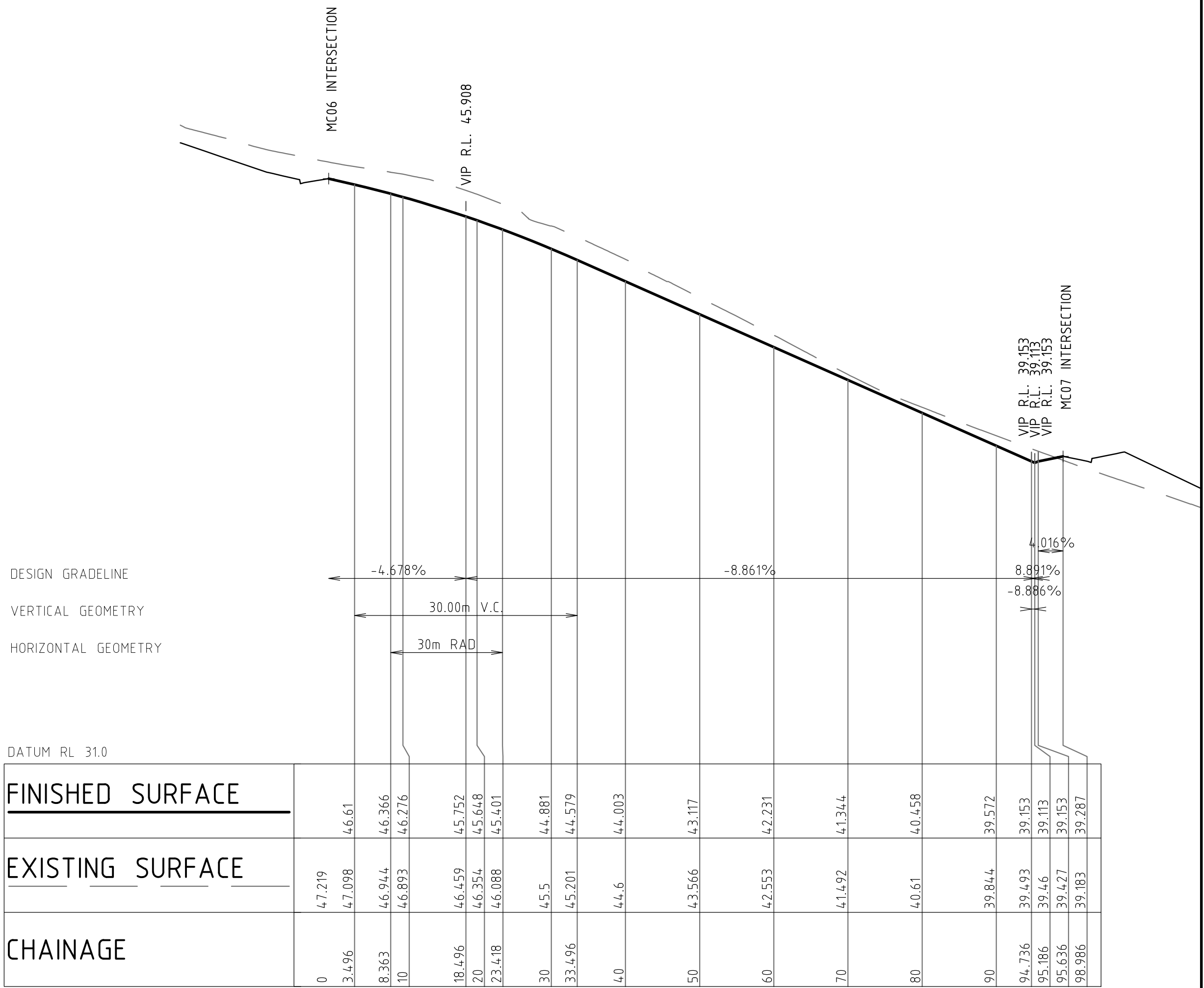
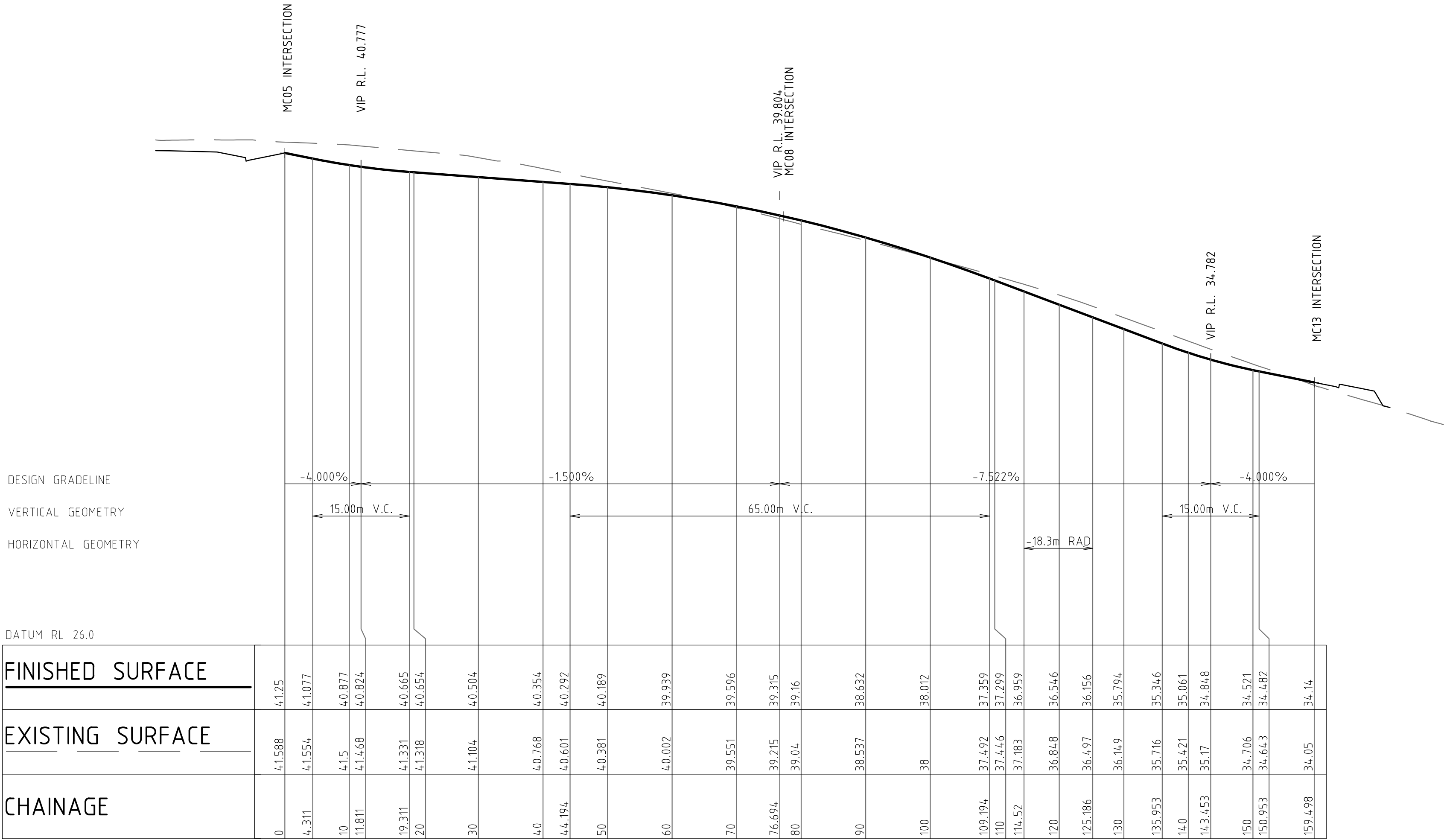
DRAWING TITLE
CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

ROAD LONGITUDINAL SECTIONS
- SHEET 03

JOB NUMBER 171245 - 01	
DRAWING NUMBER DAC14.03	REVISION 1
DRAWING SHEET SIZE = A1	



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DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



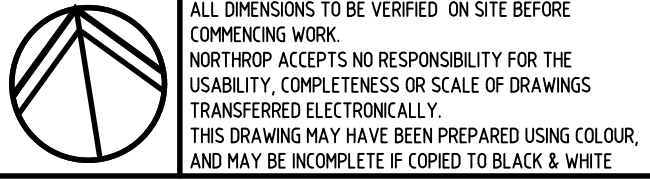
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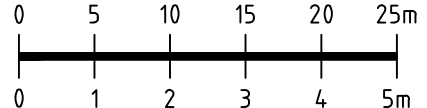
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SCALE 1:500@A1

SCALE 1:100@A1



PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10

RESIDENTIAL PRECINCT

SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

DEVELOPMENT APPLICATION

ROAD LONGITUDINAL SECTIONS

- SHEET 04

JOB NUMBER

171245 - 01

DRAWING NUMBER

DAC14.04

REVISION

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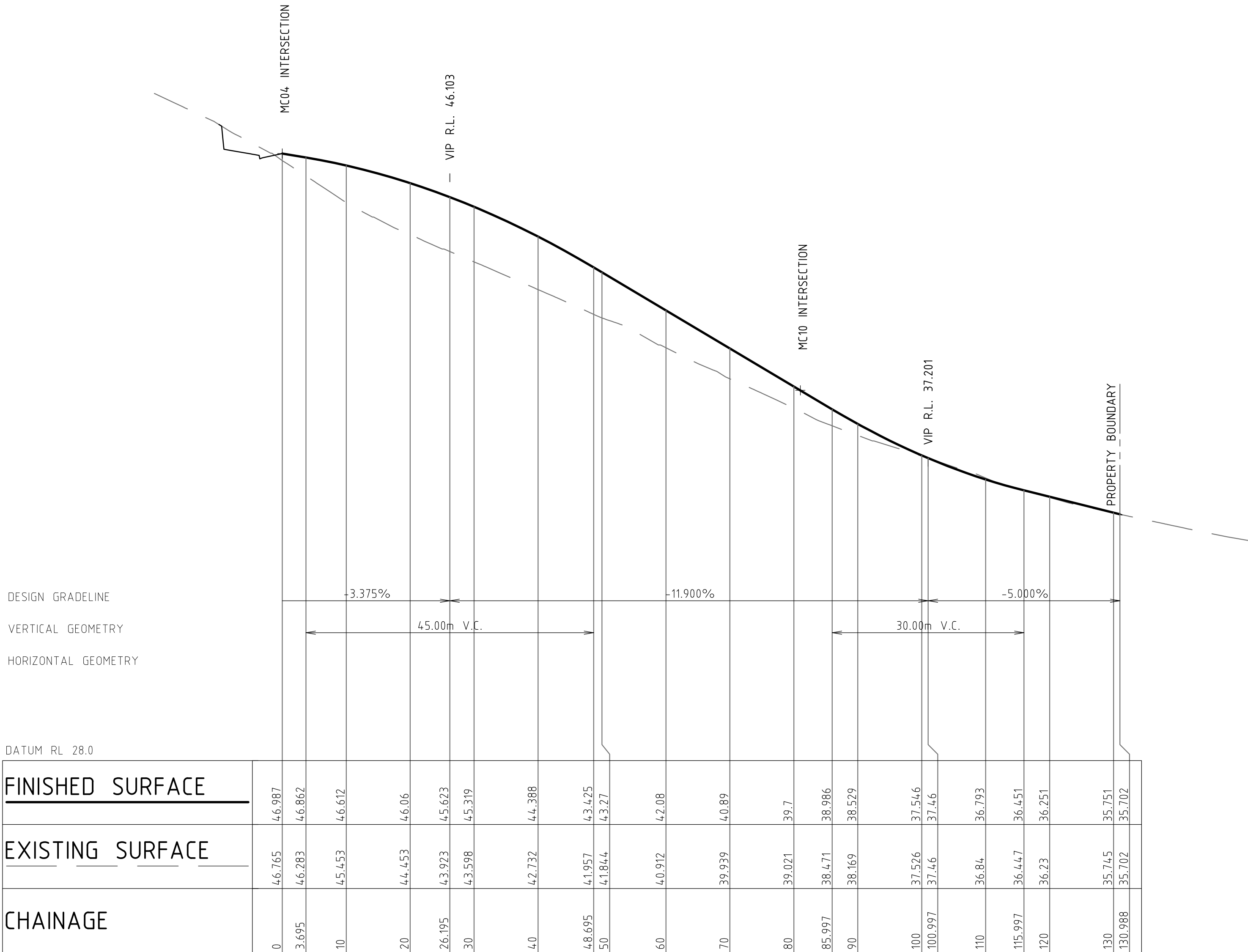
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Plotted By : jai

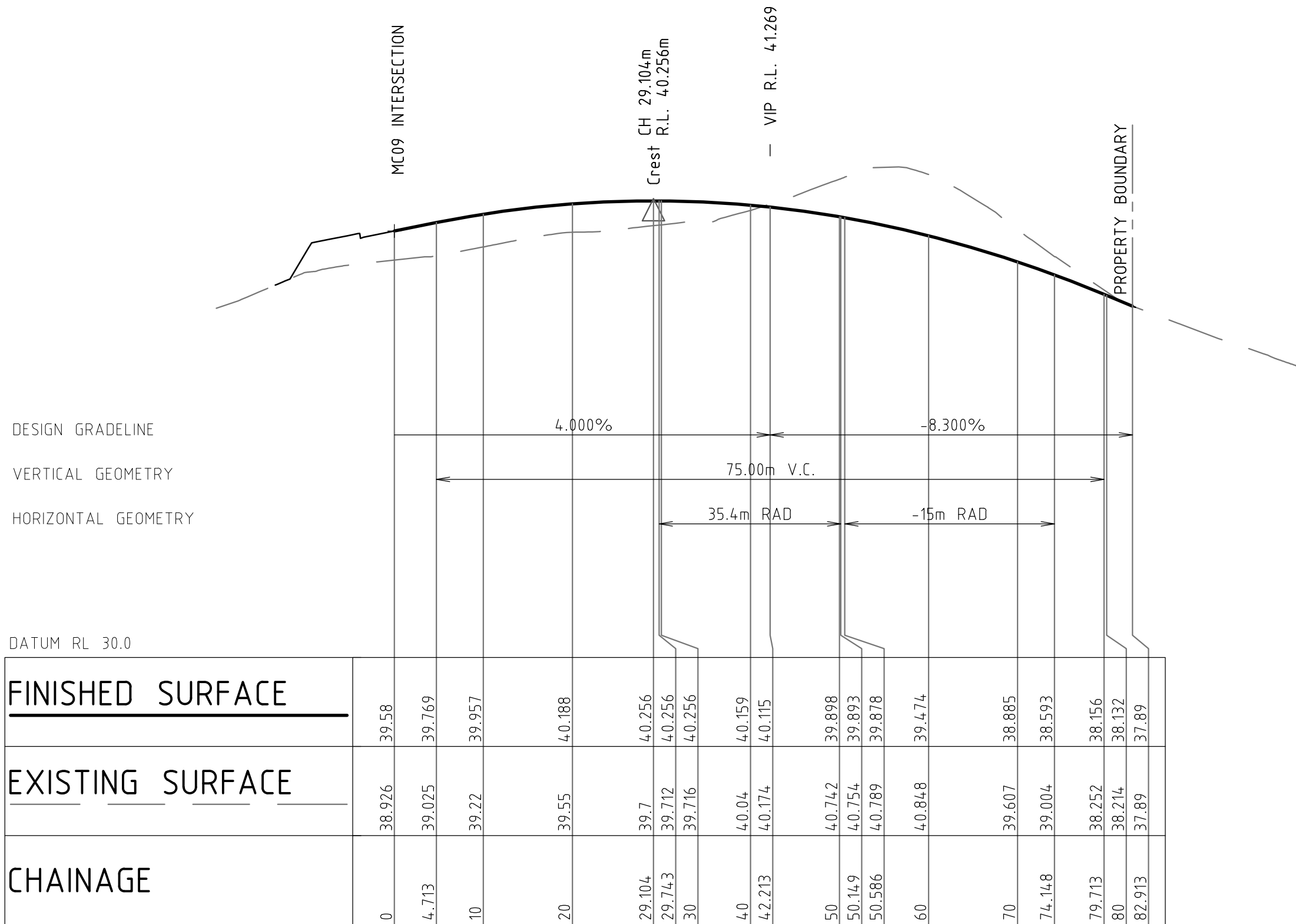
Date : 06-07-18 5:00pm

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



LONGITUDINAL SECTION ALONG MC09

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



LONGITUDINAL SECTION ALONG MC10

HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1

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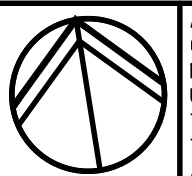
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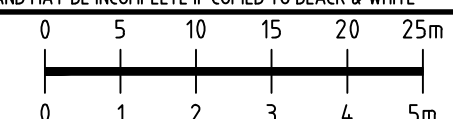
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PROJECT

WARNERVALE TOWN CENTRE
STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION
ROAD LONGITUDINAL SECTIONS
- SHEET 05

JOB NUMBER

171245 - 01

DRAWING NUMBER

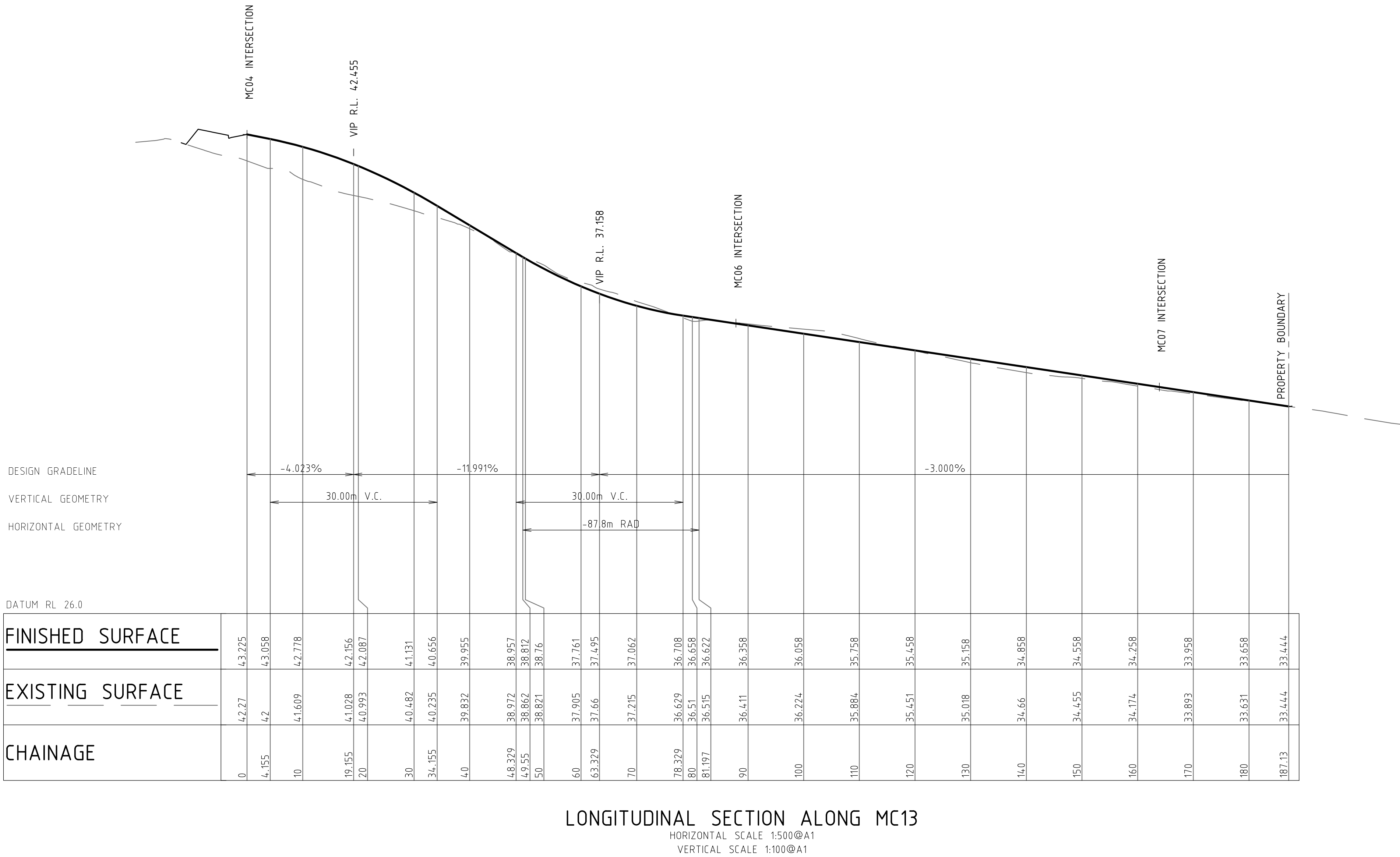
DAC14.05

REVISION

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DRAWING SHEET SIZE = A1

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



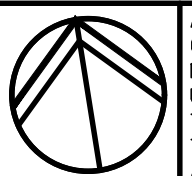
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1	ISSUED FOR CLIENT REVIEW.	JT	-	PC	06.07.18

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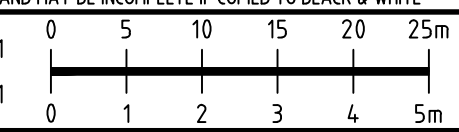


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SCALE 1:500@A1
SCALE 1:100@A1



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PROJECT
WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

ROAD LONGITUDINAL SECTIONS
- SHEET 06

JOB NUMBER	171245 - 01
DRAWING NUMBER	REVISION
DAC14.06	1
DRAWING SHEET SIZE = A1	

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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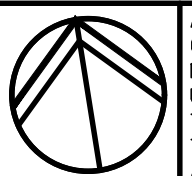
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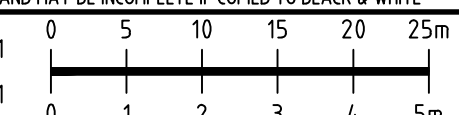
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SCALE 1:100 @ A1



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PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

ROAD LONGITUDINAL SECTIONS
- SHEET 07

JOB NUMBER

171245 - 01

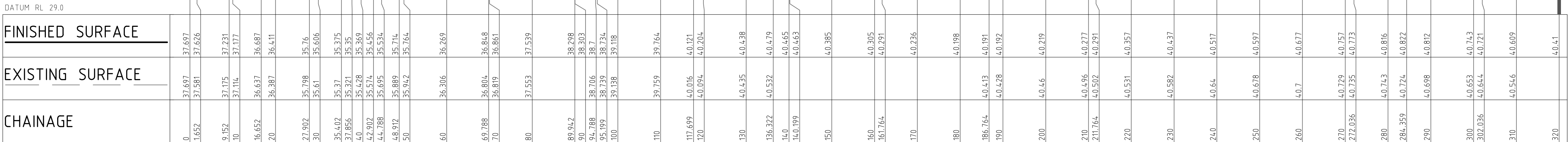
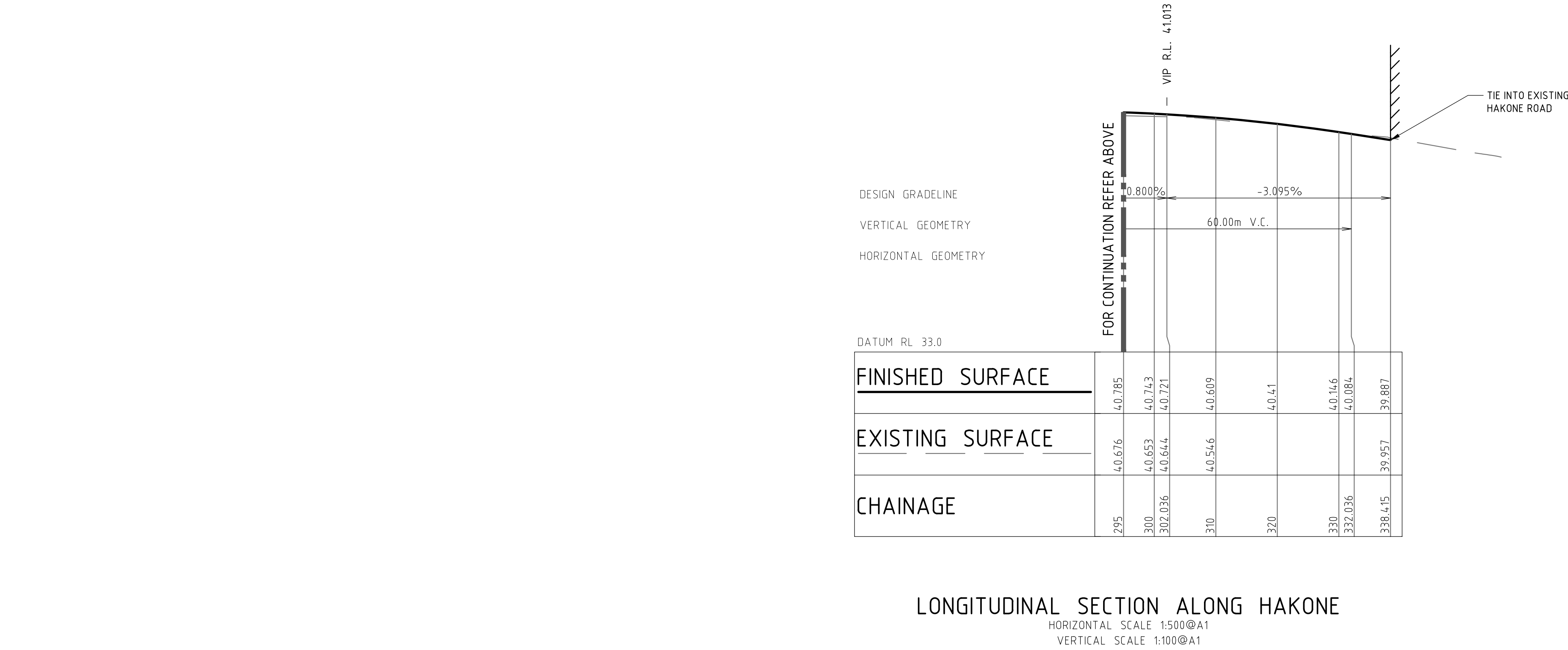
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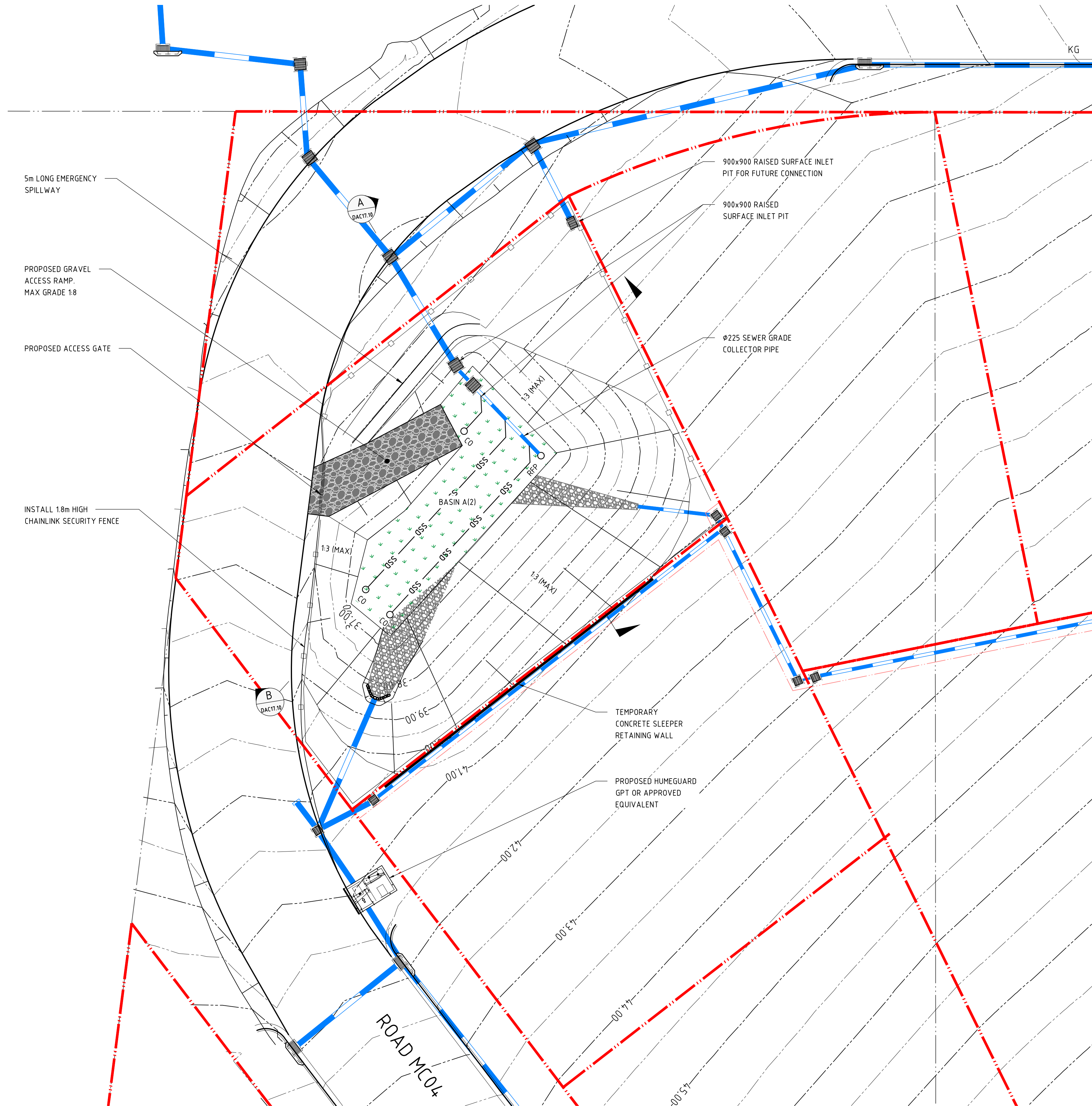
REVISION

1

DRAWING SHEET SIZE = A1



DRAWN: DESIGNED: JOB MANAGER: VERIFIER:



LEGEND	
	PROPOSED BOUNDARY LINE
	PROPOSED KERB
	PROPOSED SPOT HEIGHT
	STORMWATER COLLECTOR PIPE
	GRADED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
	JUNCTION PIT (NEW / EXTG)
	STORMWATER PIT TAG STRUCTURE No / LINE ID
	CONCRETE HEADWALL
	ROCK HEADWALL
	BIORETENTION FILTER
	RIP RAP ENERGY DISSIPATER
	SSD SUBSOIL DRAINAGE LINE
	SUBSOIL DRAINAGE CLEAROUT
	CONTOURS
	EXISTING CONTOURS

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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CLIENT

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SCALE 1:200@A1

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PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10

RESIDENTIAL PRECINCT

SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

DEVELOPMENT APPLICATION

BIO RETENTION BASIN PLAN

JOB NUMBER

171245 - 01

DRAWING NUMBER

REVISION

DAC17.01

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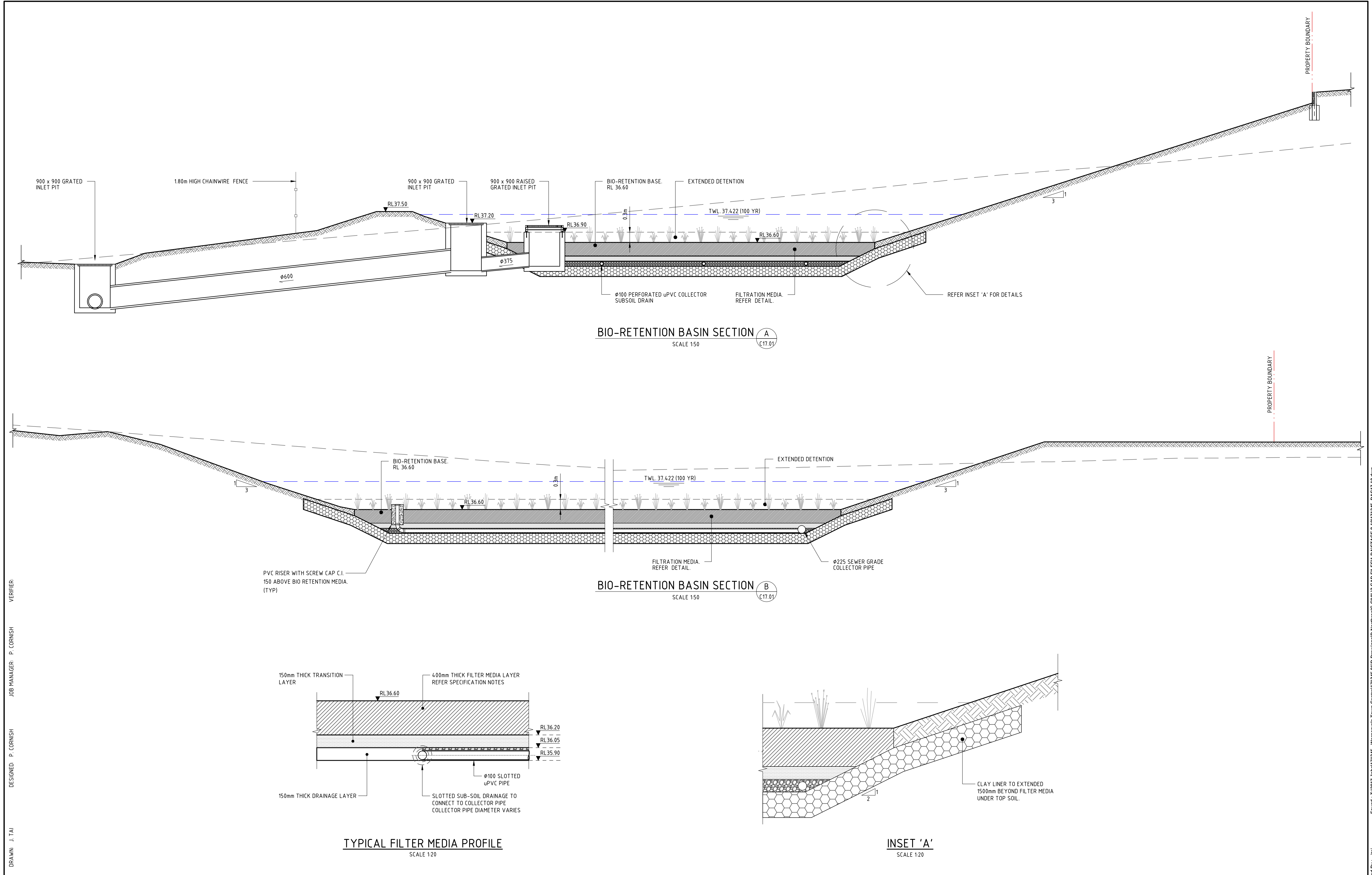
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Plotted By : jai

Date : 06-07-18

5:04pm



VERIFIER: P. CORNISH
JOB MANAGER: P. CORNISH
DESIGNED: P. CORNISH
DRAWN: J.TAI

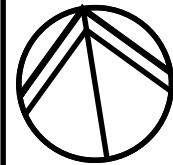
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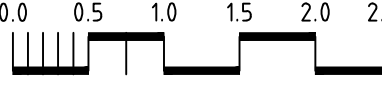
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SCALE 1:50 @ A1





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PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

BIO RETENTION BASIN SECTIONS
AND DETAILS

JOB NUMBER

171245 - 01

DRAWING NUMBER

DAC17.10

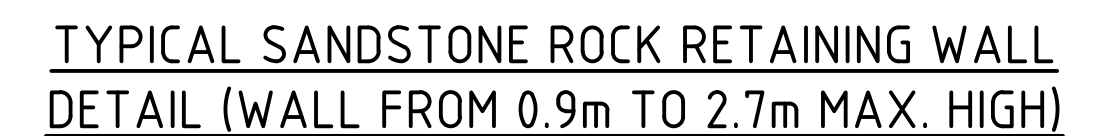
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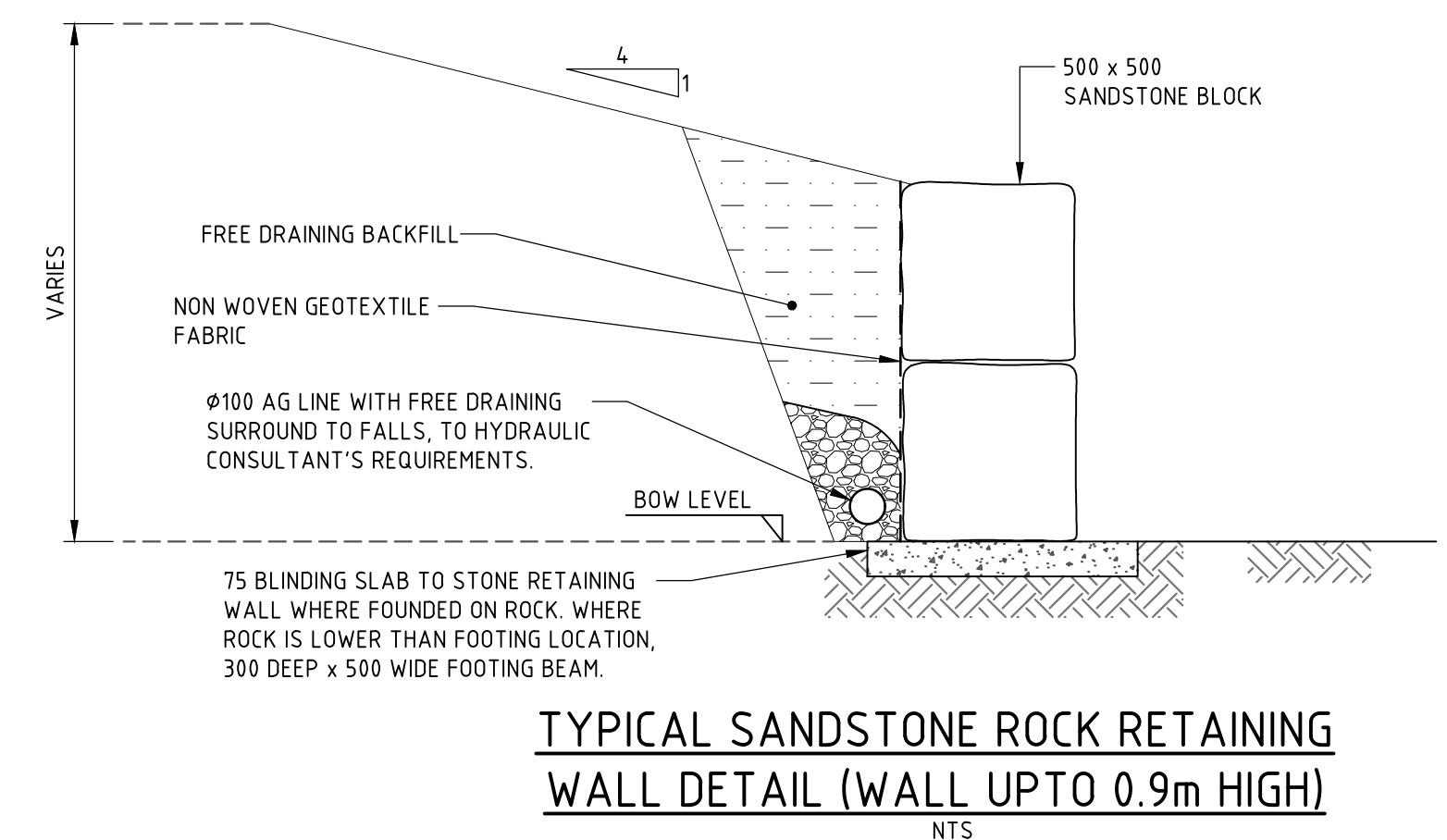
DRAWING SHEET SIZE = A1



- PROVIDE JOINT BETWEEN ALL NEW CONCRETE AND EXISTING STRUCTURES
- JOINT TO BE USED AGAINST ALL WALLS, FOOTINGS, COLUMNS, BACK OF KERB, SERVICE PITS, DRAINAGE PITS AND ALL SLAB PENETRATIONS

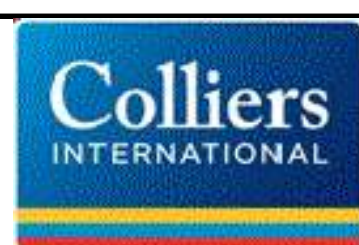


1. BUILDUP TO MAINTAIN STABILITY OF WALL DURING BACKFILLING. INCREASE WIDTH OF WALL ONE BRICK'S WIDTH FOR EVERY 3 COURSES IN HEIGHT. INCREASE FOOTING TO SUIT.
2. PROVIDE WEEPHOLES AT 1000 CENTRES OR ALTERNATELY USE AGRICULTURAL PIPE DRAIN BEHIND WALL.
3. ALL BLOCKWORK SHALL BE INTERLOCKED USING HEADER COURSES. SO THAT THE WALLS ACT AS AN INTEGRAL UNIT.
4. MAX SURCHARGE 5KPa



TYPICAL SANDSTONE ROCK RETAINING
WALL DETAIL (WALL UPTO 0.9m HIGH)

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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SCALE VARIES



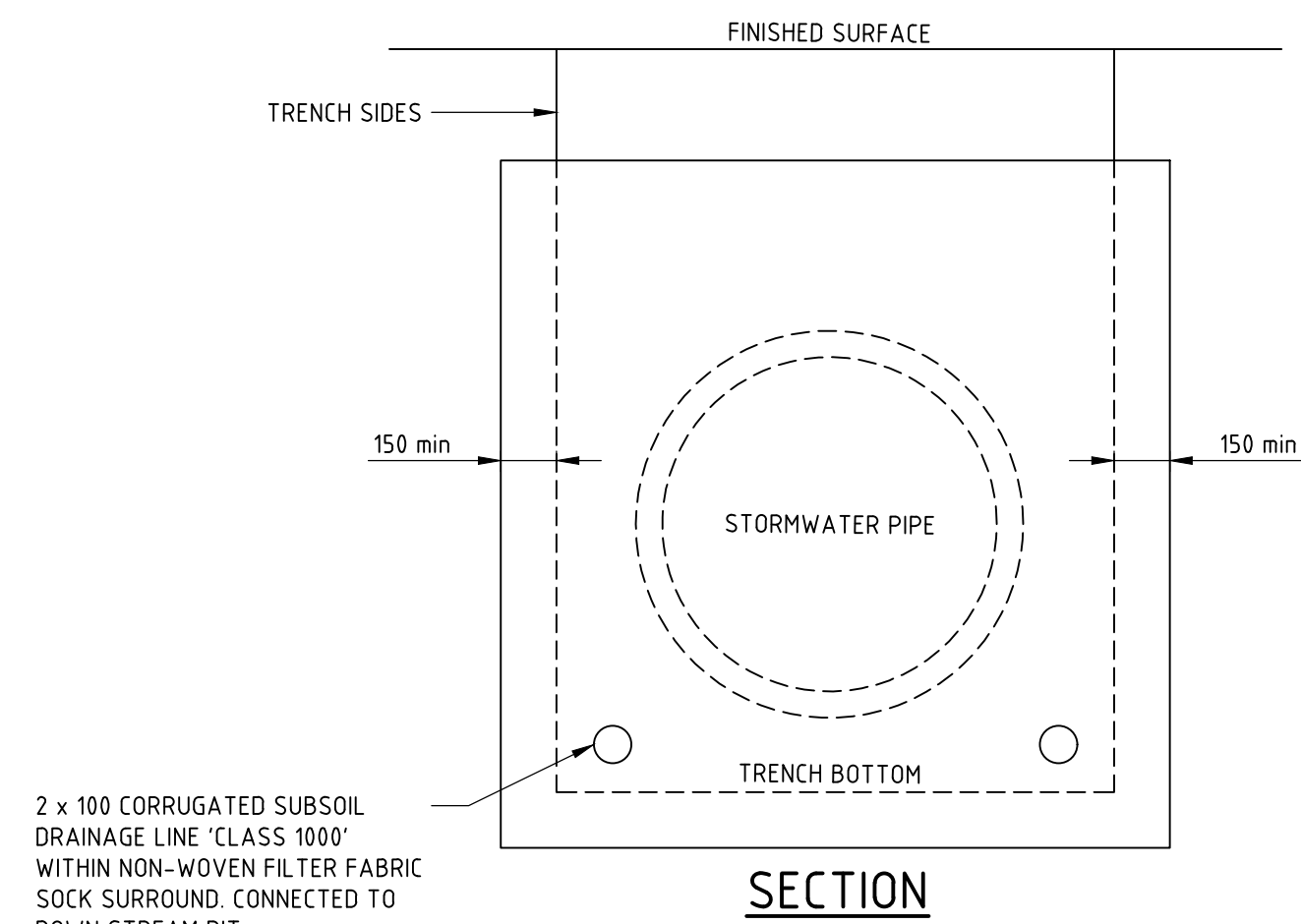
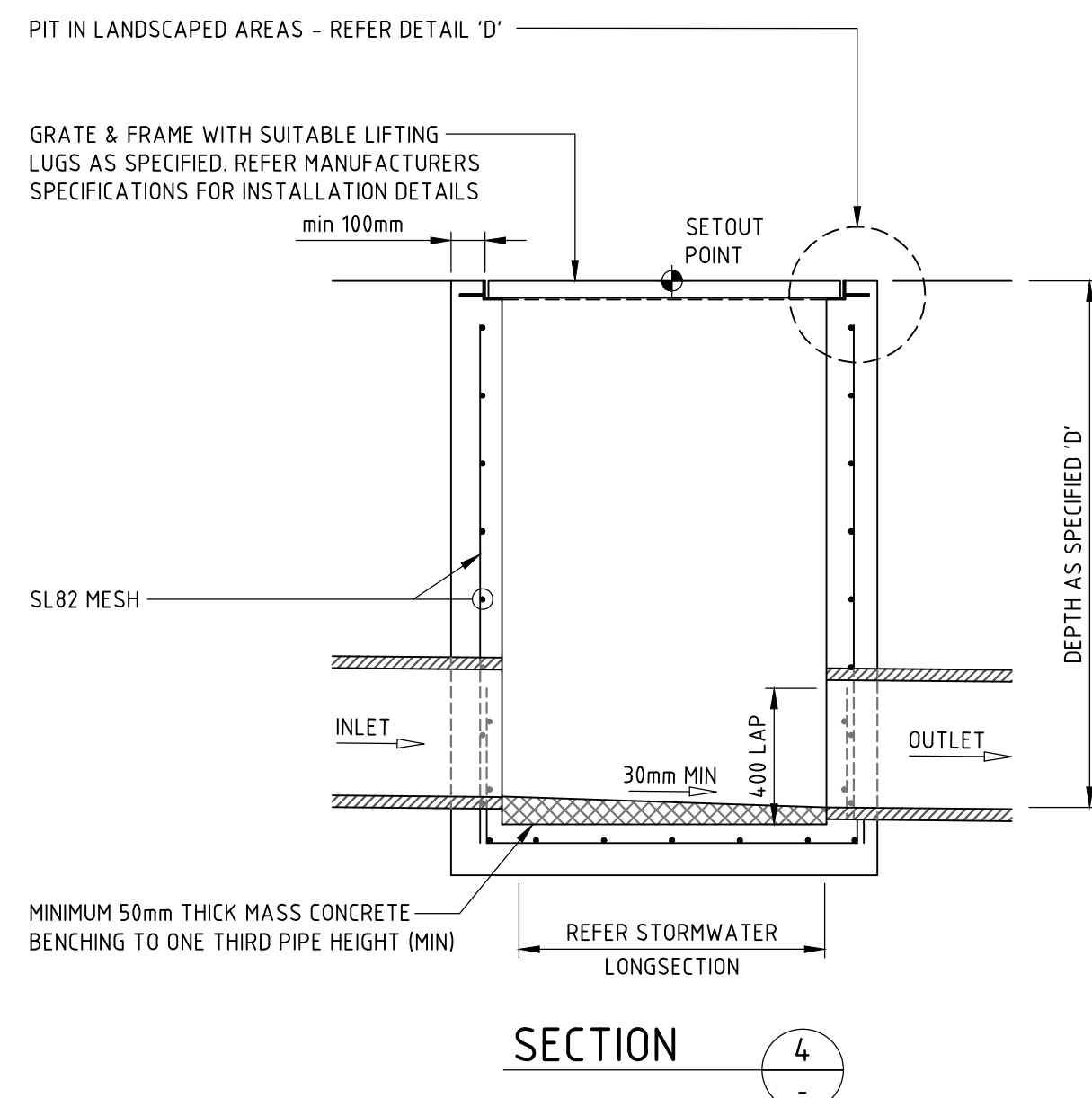
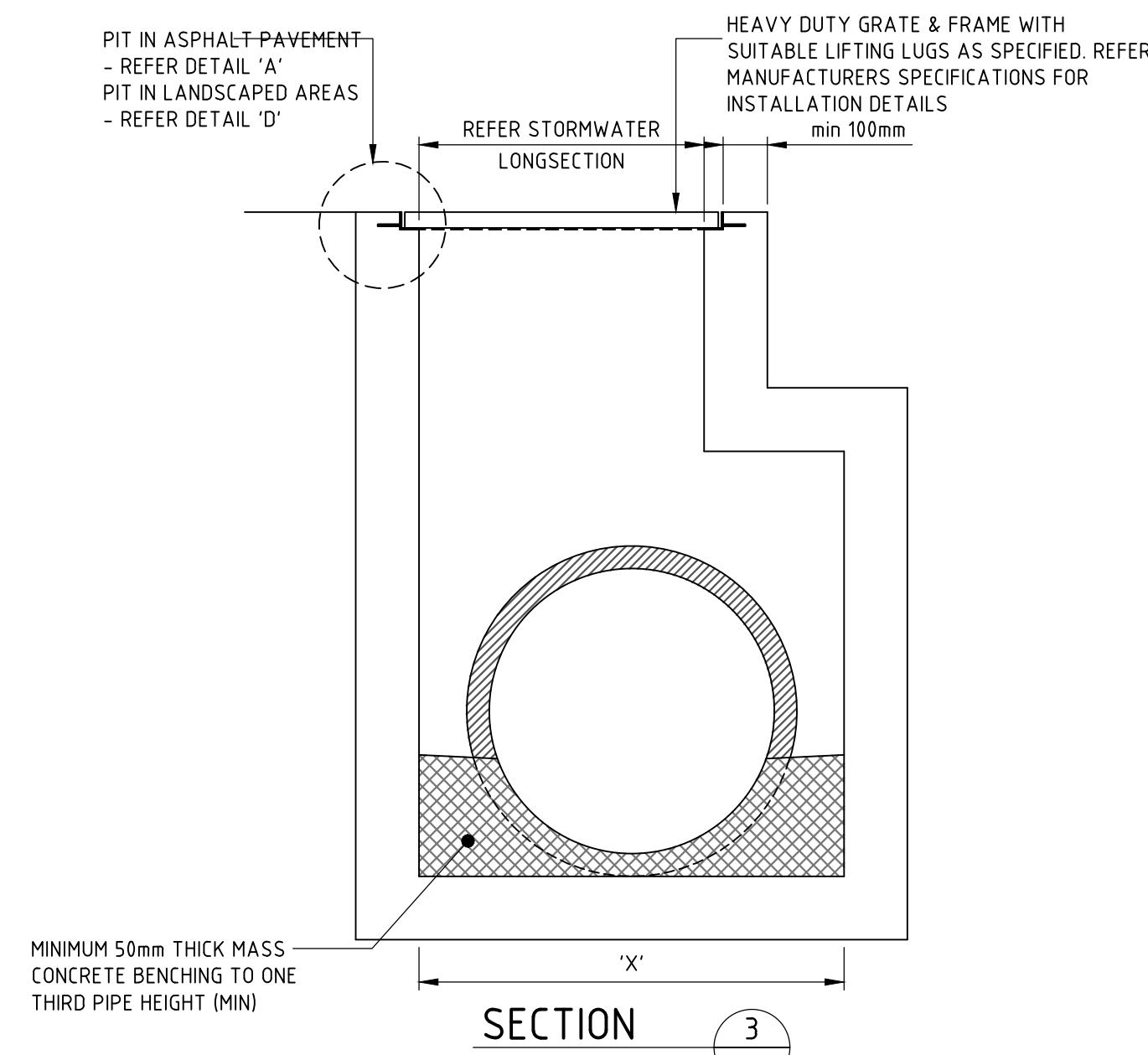
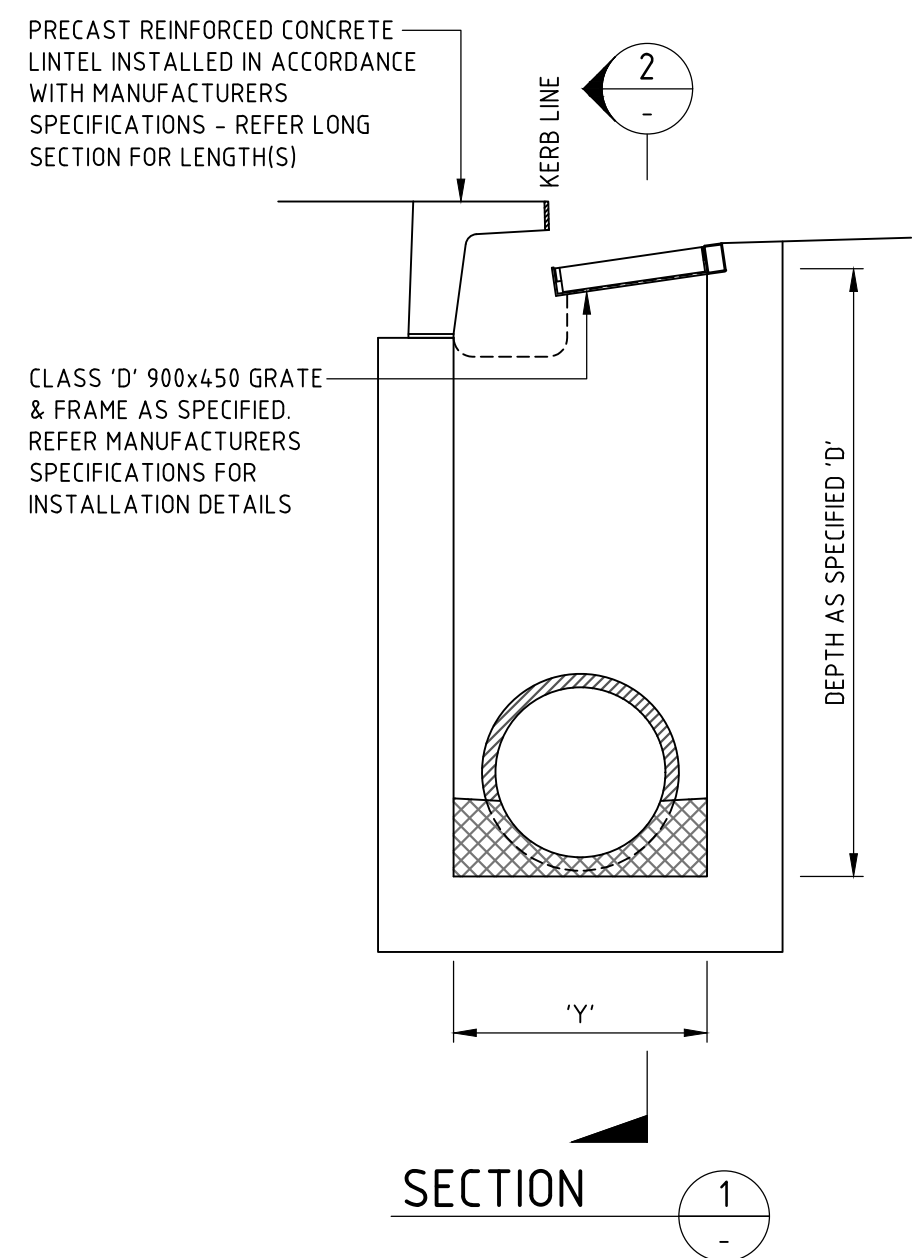
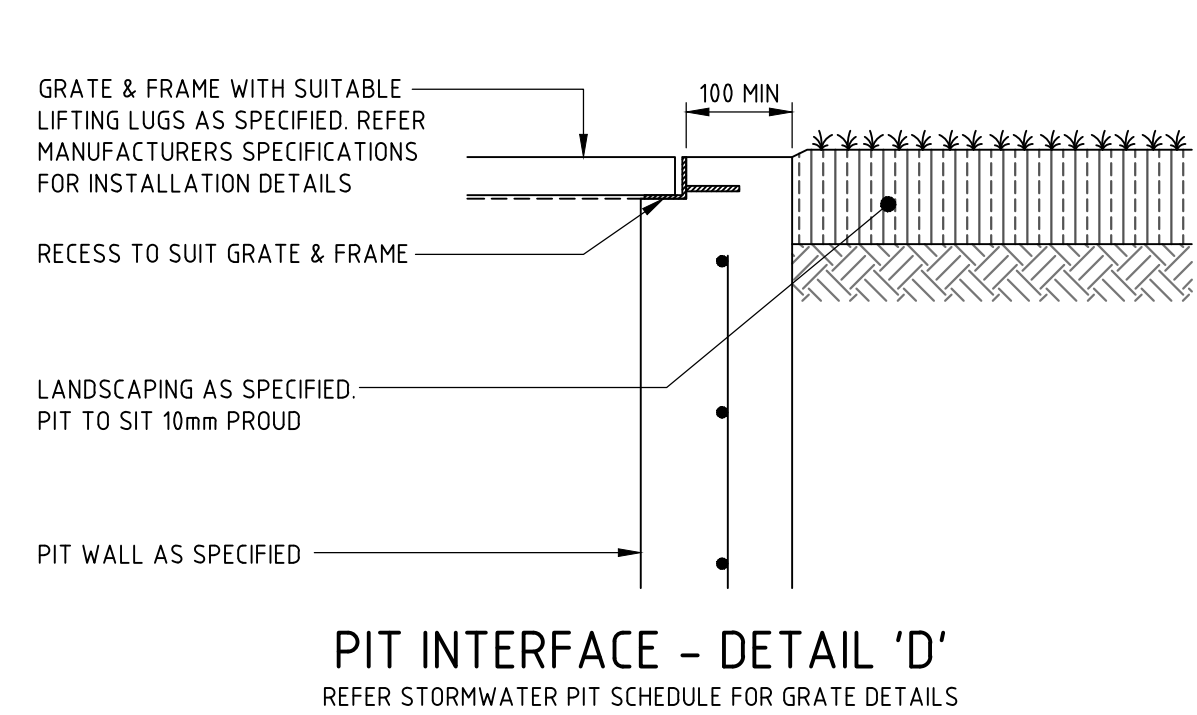
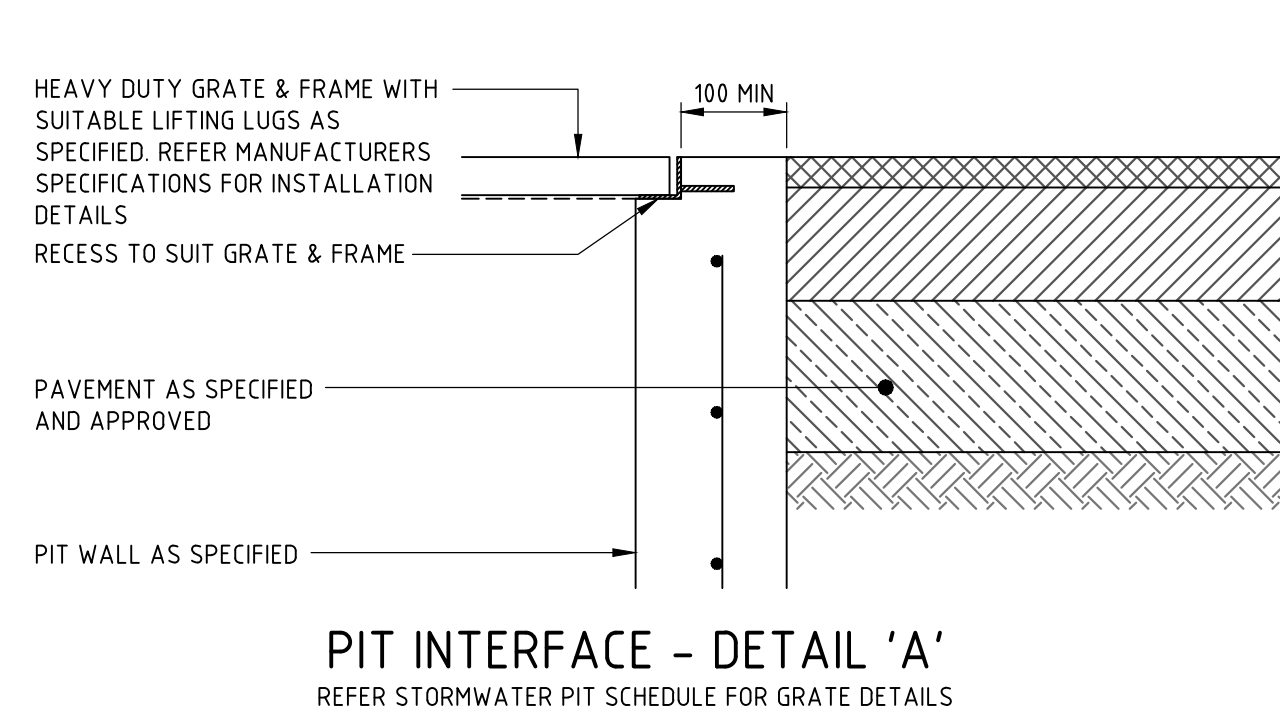
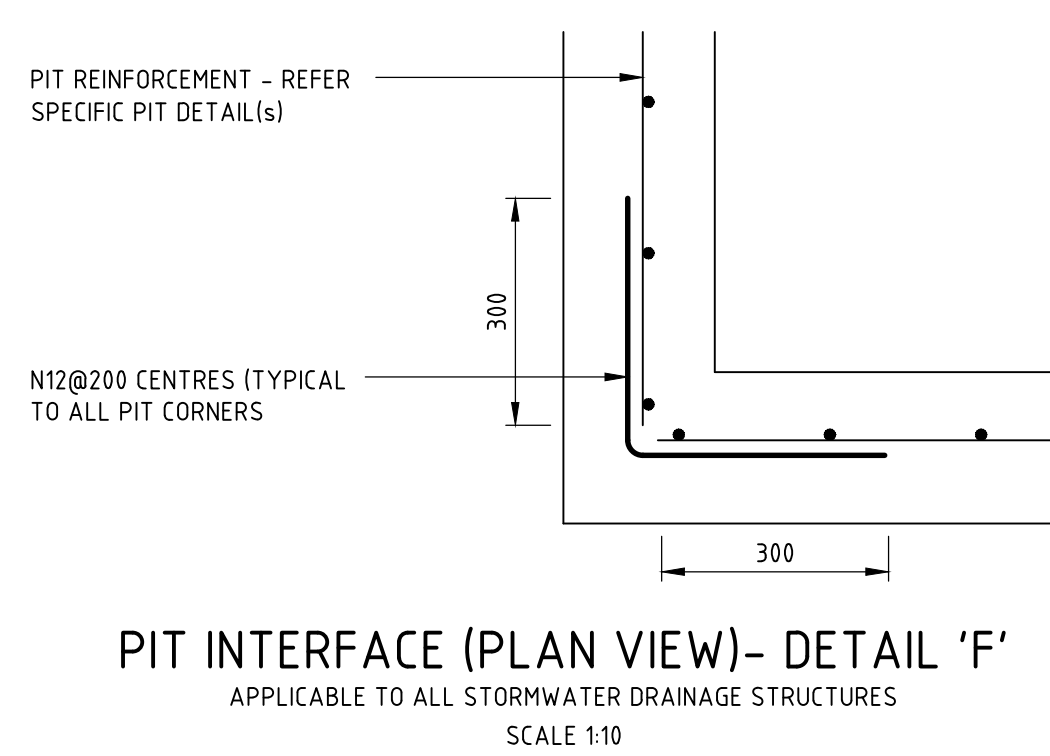
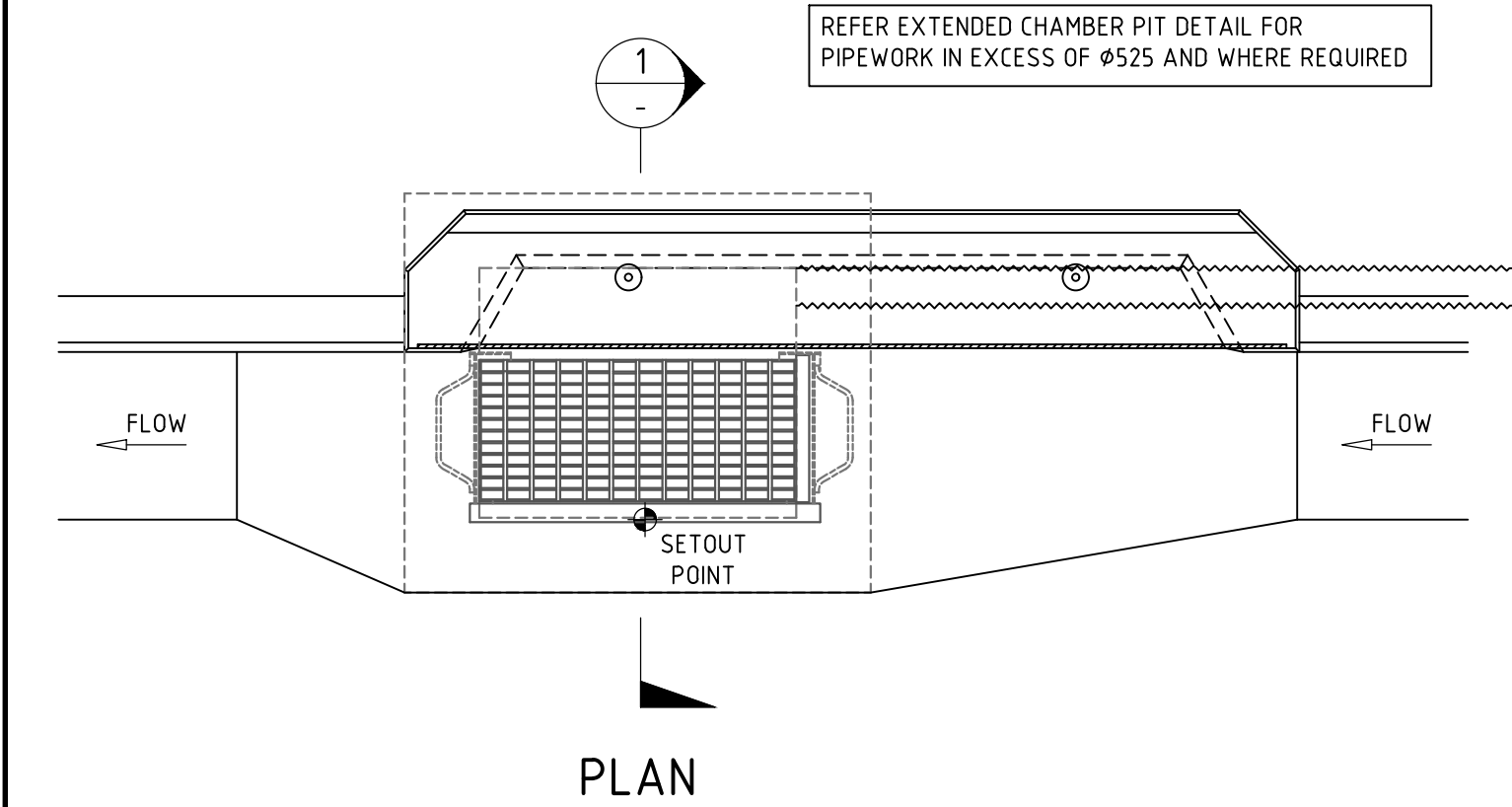
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STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

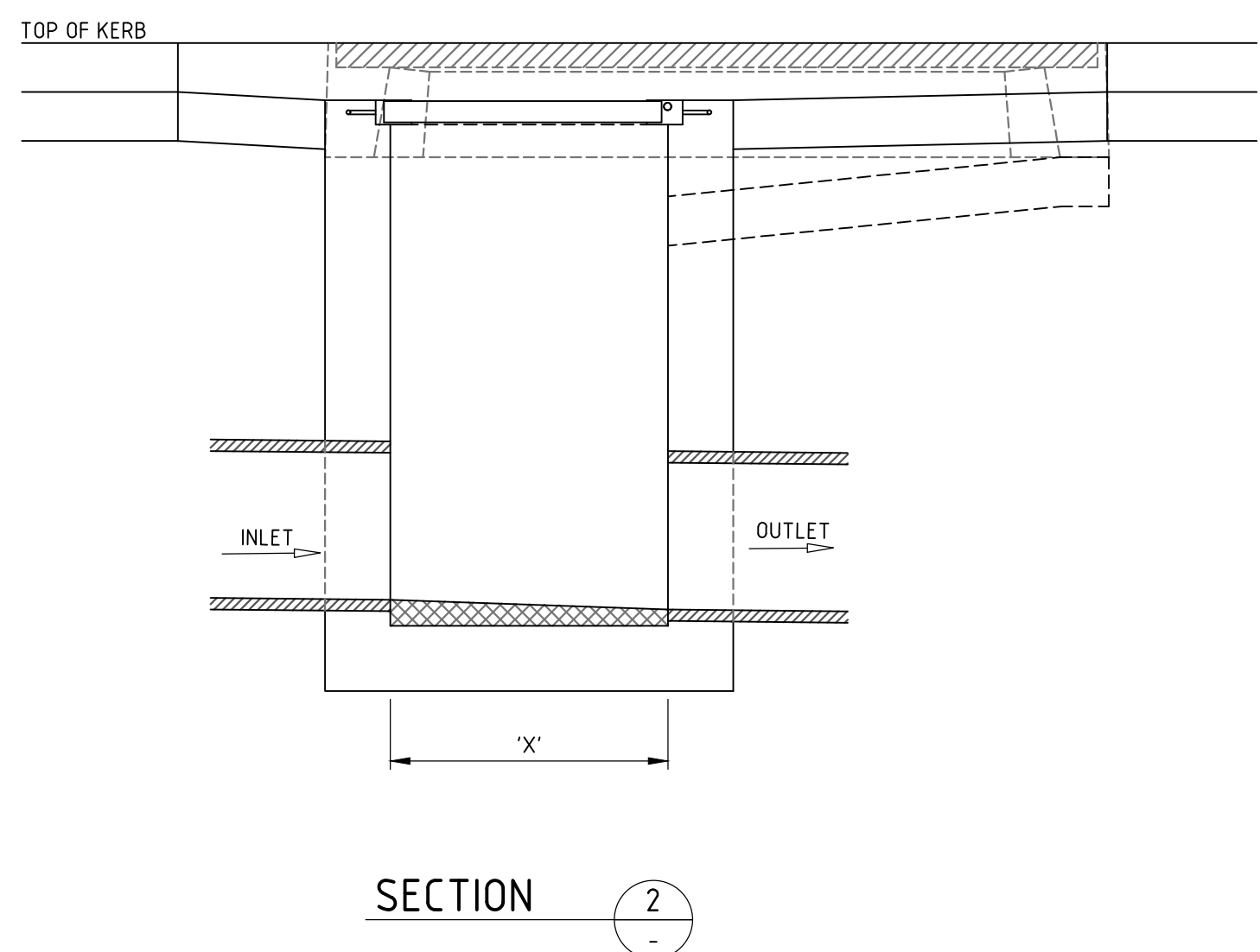
DETAILS - SHEET 01

AC20.01 | 1

DRAWING SHEET SIZE = A1

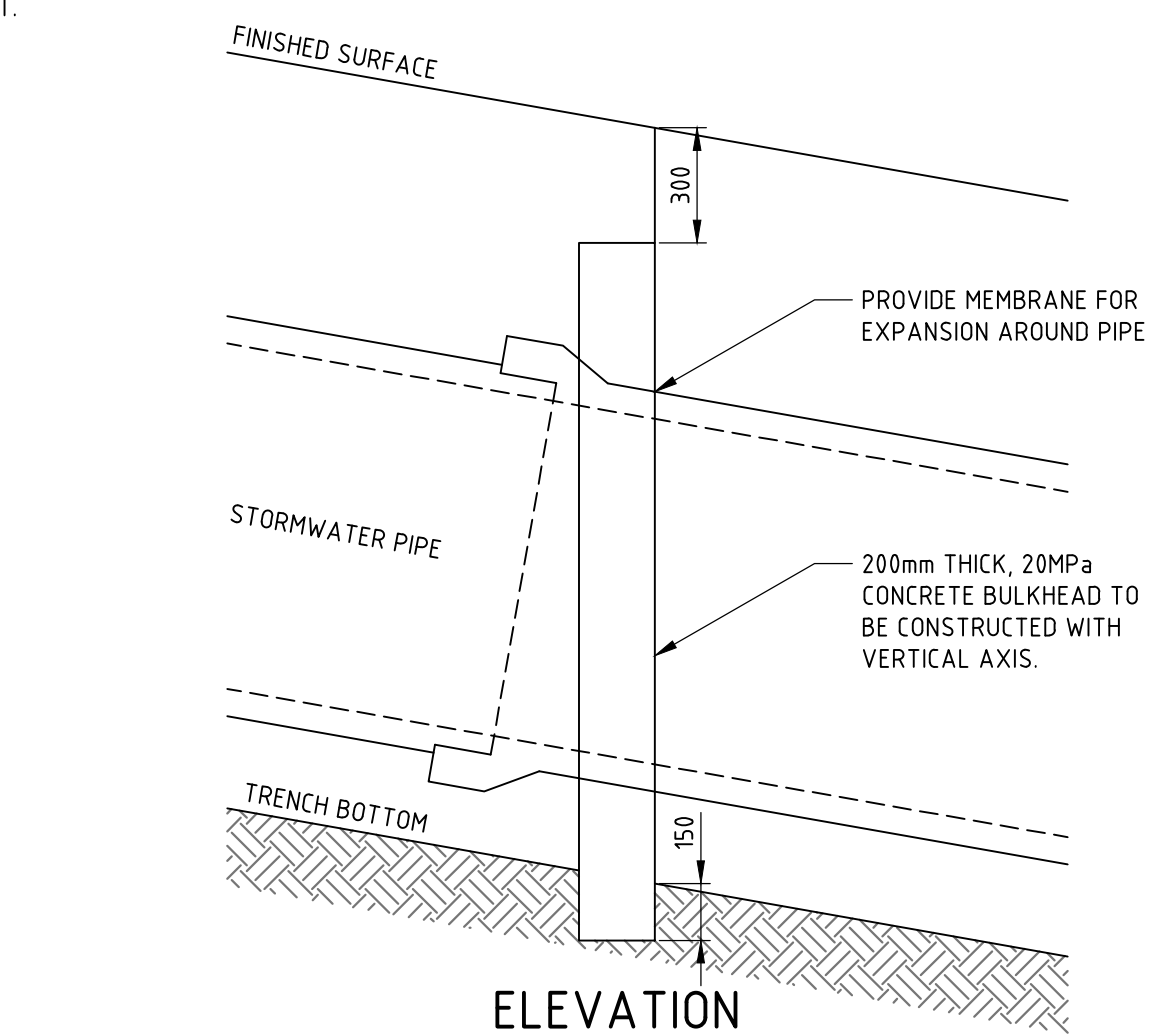
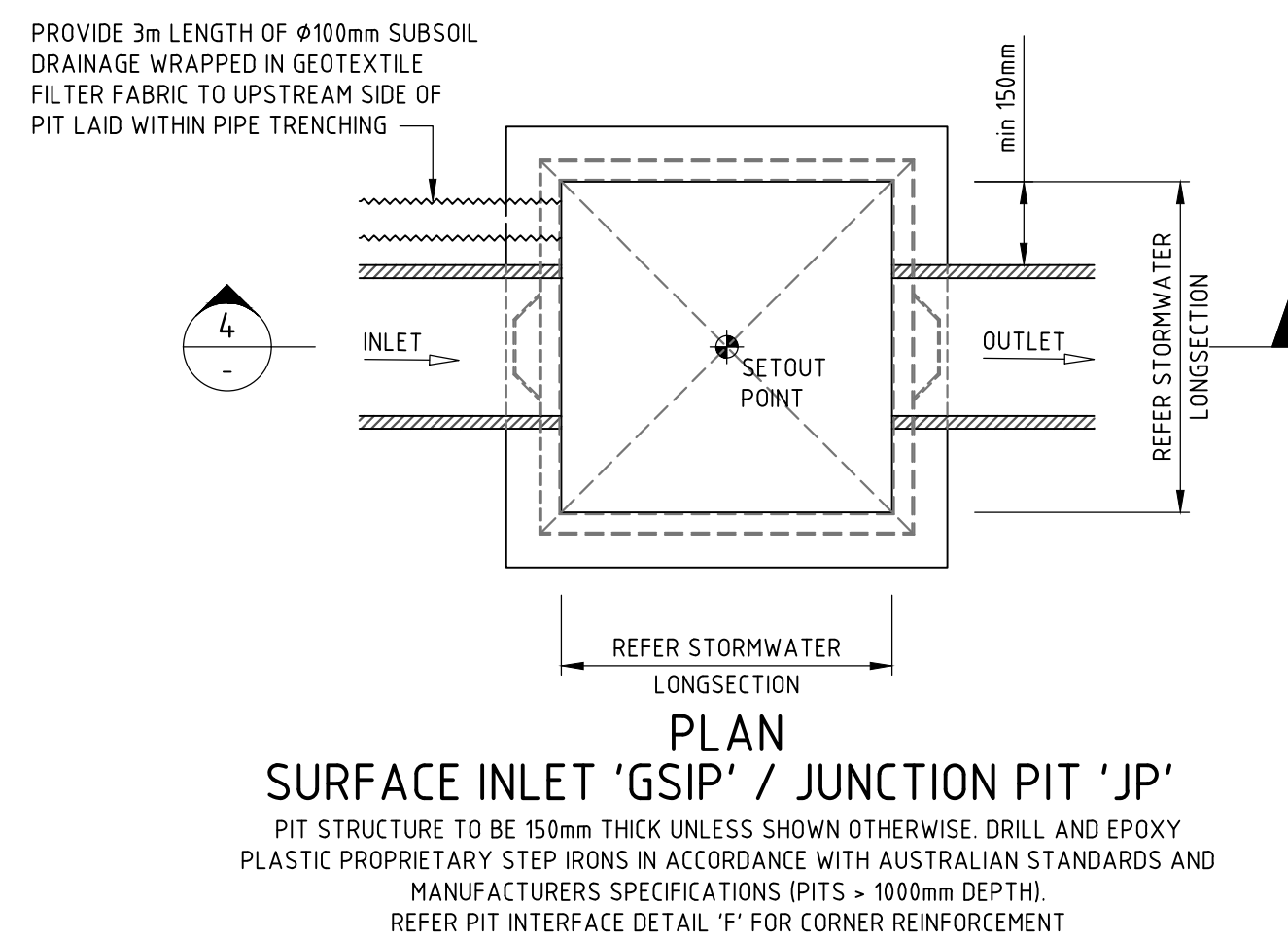
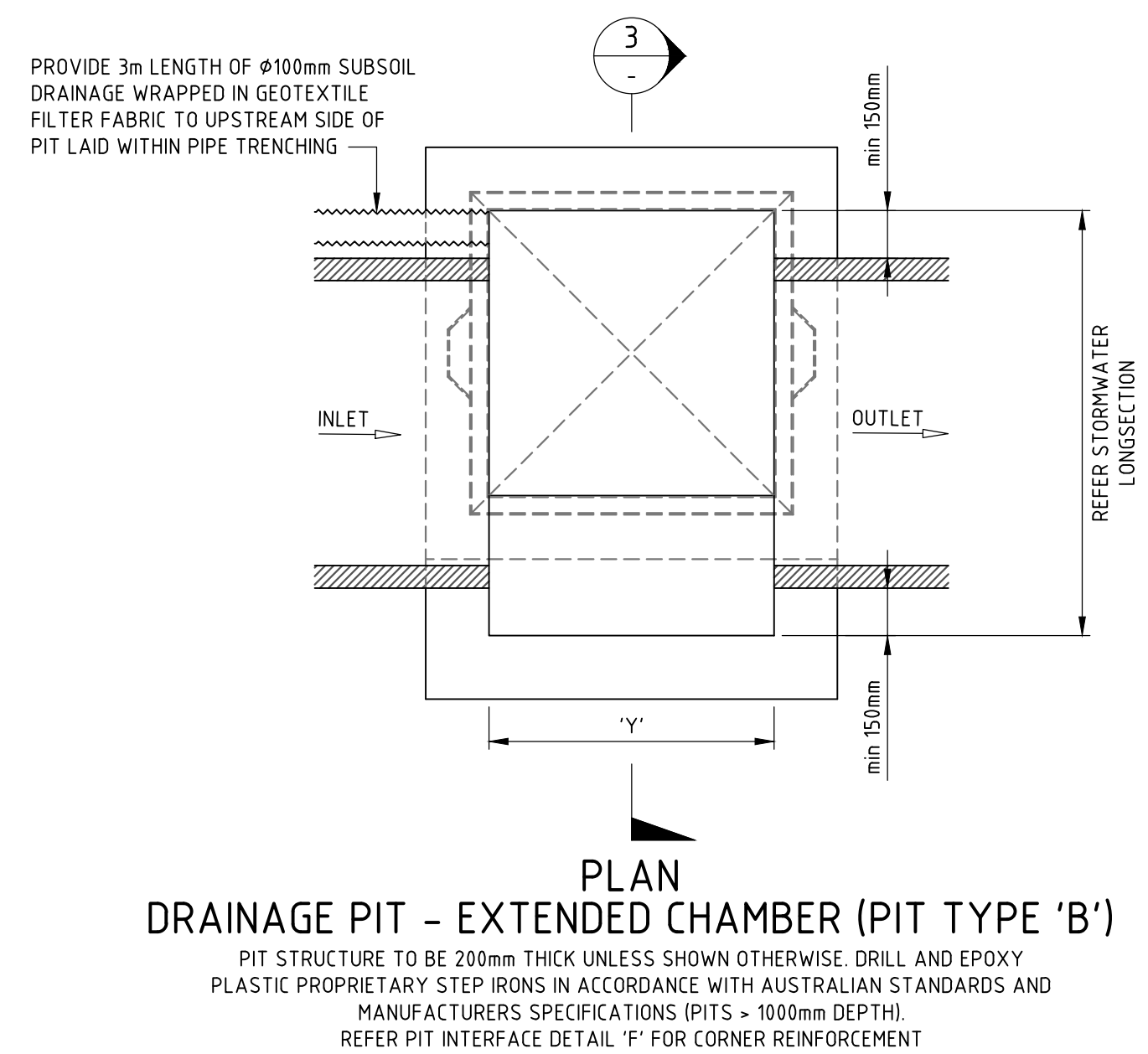


2 x 100 CORRUGATED SUBSOIL DRAINAGE LINE 'CLASS 1000' WITHIN NON-WOVEN FILTER FABRIC SOCK SURROUND. CONNECTED TO DOWN STREAM PIT.



KERB INLET PIT 'G.G.P' (PIT TYPE 'A')

REFER TO COUNCIL STANDARD DRAWING SD.48E (SHEETS 1-3)



STORMWATER DRAINAGE BULKHEAD

BULKHEAD ARE TO BE INSTALLED AT EVERY SECOND JOINT WHERE PIPE GRADE EXCEEDS 7% THE TOP OF THE BULKHEAD SHALL EXTEND TO WITHIN 300mm OF THE FINISHED SURFACE LEVEL OR THE SUBGRADE LEVEL WHERE THE PIPELINE IS UNDER ROAD PAVEMENT.

DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:
DRAWN: J.TAI

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CLIENT REVIEW	JT	-	PC	06.07.18

CLIENT

Colliers INTERNATIONAL

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ARCHITECT

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SCALE 1:20 @ A1

0.0 0.2 0.4 0.6 0.8 1.0m

NORTHROP

Sydney

Level 11 345 George Street, Sydney NSW 2000

Ph (02) 9241 4188 Fax (02) 9241 4324

Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10

RESIDENTIAL PRECINCT

SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

DEVELOPMENT APPLICATION

DETAILS - SHEET 02

JOB NUMBER

171245 - 01

DRAWING NUMBER

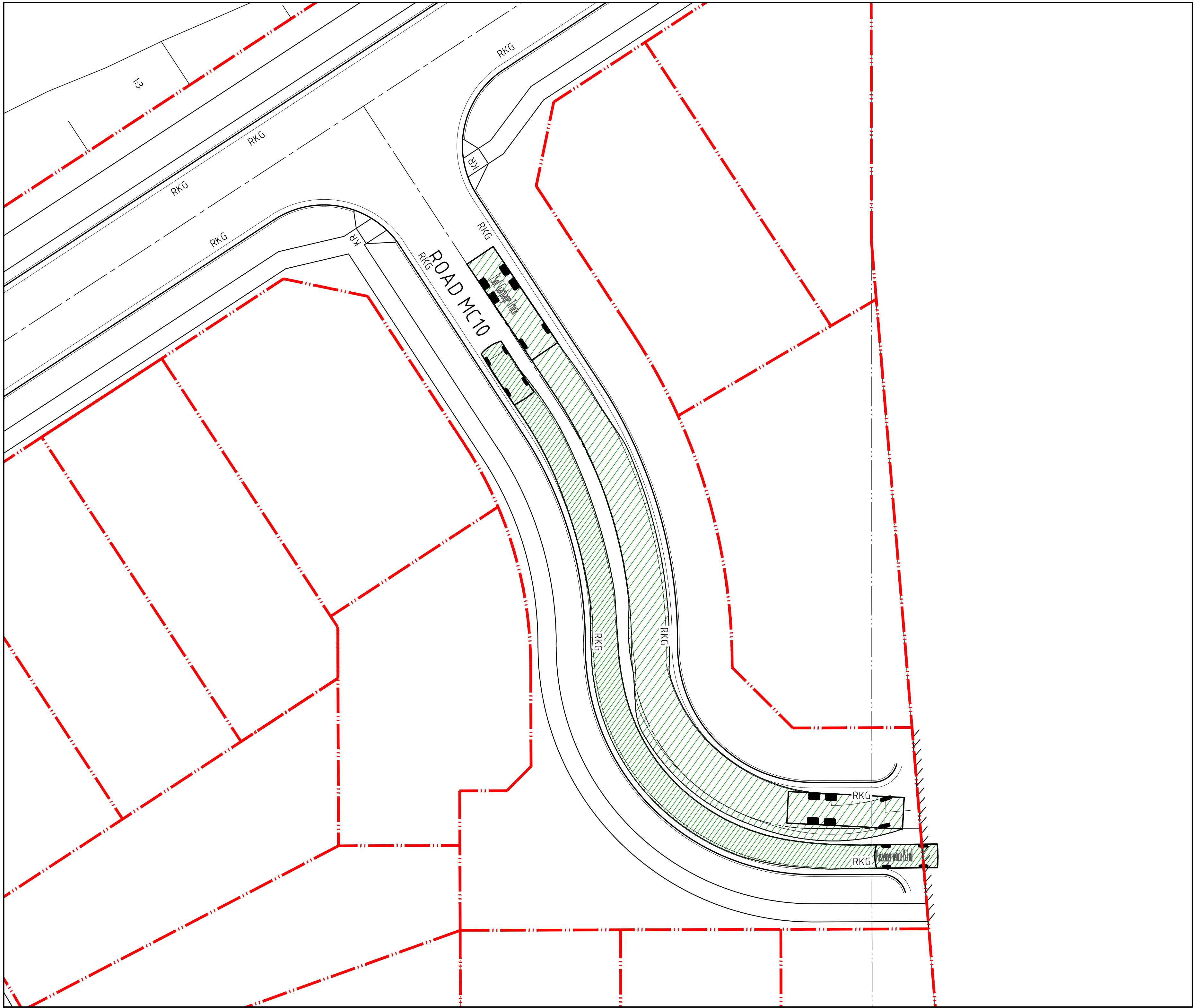
DAC20.02

REVISION

1

DRAWING SHEET SIZE = A1

DRAWN: J.TAI
DESIGNED: P. CORNISH
JOB MANAGER: P. CORNISH
VERIFIER:



PROFILES

SoC Garbage Truck
Overall Length 9.540m
Overall Width 2.600m
Overall Body Height 4.300m
Min Body Ground Clearance 0.417m
Track Width 2.500m
Lock-to-lock time 6.00s
Max Steering Angle (Virtual) 37.00°

B99 Vehicle (Realistic min radius) (2004)
Overall Length 5.200m
Overall Width 1.940m
Overall Body Height 1.878m
Min Body Ground Clearance 0.272m
Track Width 1.840m
Lock-to-lock time 4.00s
Curb to Curb Turning Radius 6.250m



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CLIENT REVIEW	JT	-	PC	06.07.18

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SCALE 1:200@ A1

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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT

WARNERVALE TOWN CENTRE

STAGE 8 - 10
RESIDENTIAL PRECINCT
SUBDIVISION

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
DEVELOPMENT APPLICATION

TURNING PATH PLAN

JOB NUMBER

171245 - 01

DRAWING NUMBER

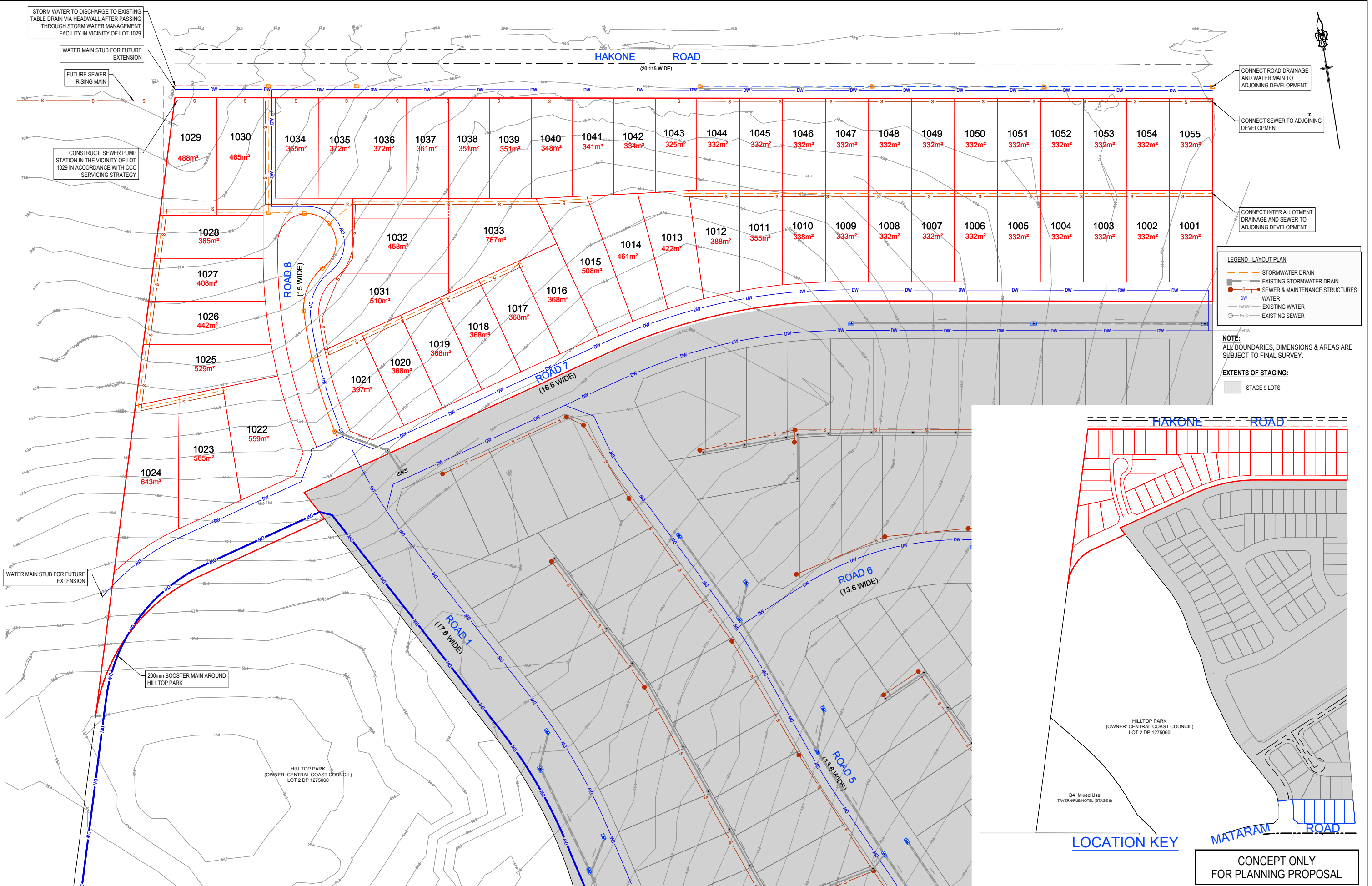
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REVISION

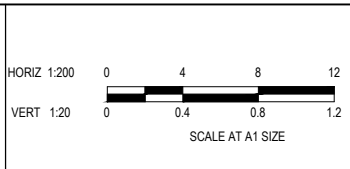
1

DRAWING SHEET SIZE = A1

APPENDIX C: PROPOSED SERVICING PLAN



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REV	DESCRIPTION	DATE	DRN.	APP.	REV	DESCRIPTION	DATE	DRN.	APP.
A	ISSUED FOR INFORMATION	13.12.22	CS						



Designed C. SHEPPEARD
Date 13.12.2022
Drawn C. SHEPPEARD
Checked A. Checker
Date XXXX.XX
Approved Reg. No. PEXXXXXXX
Date
PS Number

BW Beveridge Williams
Development & Infrastructure Consultants
4/5 Colony Cl
Tuggerah NSW 2259
ph: 03 4351 2233
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Project Details
WARNERVALE TOWN CENTRE
STAGE 10
LOT 1, DP 1275060, HAKONE RD, WOONGARRAH

Drawing Title
PROPOSED SERVICING PLAN

Sheet 01 of 12

Scale
1:200 H 1:20 V @ A1

Project Ref 1801942(10)P
Stage No 001
Drawing No 001
Rev A