



Robert
Bird
Group

Stormwater Management Report **High Street, Penrith**

Issue: F – Development Application

5th October 2021

Prepared For: TOGA Group

Project No.: 17665C

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REVIEWER:

[Signature]

Reviewer of Issue / Amendment
Signing for and on behalf of
Robert Bird Group Pty Ltd

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Appendix A Robert Bird Group Technical Drawings

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1.0 Introduction

Robert Bird Group (RBG) has been engaged by Toga Development & Construction (TOGA) to provide civil engineering services in relation to the High Street, Penrith Development Project (Project) located at 634-652 High Street and 87-91 Union Road, Penrith.

This report provides reference information, standards and inputs, a description of the existing site and proposed works, discussion on pre- and post-development analysis, results and sizing of the proposed stormwater drainage works. This report also provides a summary of the flood mitigation strategy.

1.1 Project Description

The site is located to the south of High Street and east of Mulgoa Road. Additionally, the site is bordered by Union Road to the south, John Tipping Grove to the west and Union lane to the east.

The development is to involve a new roadway connection, public domain works, landscaping, commercial and multi storey residential apartments.



Figure 1- Site Location and Area

1.2 Standards and Reference Information

The standards and reference information applicable to the design include:

- Penrith Development Control Plan, Published 2014
- Penrith City Council Stormwater Drainage Guidelines for Building Developments – Adopted 28th November 2016
- Penrith City Council – Design Guidelines for Engineering works for Subdivision and Developments. – 20 November 2013
- Penrith City Council WSUD Technical Guidelines, Version 3 – June 2015

- Draft Nepean River PMF Flood Levels, Worley Parsons RMA March 2017 (preliminary only and not yet adopted as of 9th August 2017)
- Australian Rainfall and Runoff (1987) (AR&R)
- AS3500 National Plumbing and Drainage Code
- Consultant Drawings (Latest revision as per date of this report)
- Site survey information – Received 8/12/2017 – “V17-0430 – Toga - Penrith Locate”
- Managing Urban Stormwater Runoff: Soils and Construction, 4th Edition (“Blue Book”)
- Cardno Flood Impact Assessment (16th March 2018)

1.3 Limitations

A number of limitations apply to the designs, listed as follows:

- This report has been prepared for TOGA for the Project only
- This report shall not be used for any purposes other than that outlined above
- The report has been based on the information available and understanding of the proposed works by RBG
- This report is based on the documentation listed in Section 1.2 of this report

1.4 Design Package Documentation

This design package consists of the following RBG documentation:

- RBG Drawings as listed in Appendix A;
- This Stormwater Management Report;
- Water Sensitive Urban Design (WSUD);
- WSUD Operation and Maintenance Guidance;
- Music Model.



2.0 Stormwater Quantity Assessment

2.1 Assessment Methodology

The majority of the runoff from the development is to be captured and detained by the On-Site Detention (OSD) system using gravity flow.

The OSD system is to cater for all storm durations up to and including the 1% Annual Exceedance Probability (AEP) and is designed to restrict the discharge in the post-development scenario to the 20% AEP peak flow's pre-development conditions.

A sub section of the site is proposed to bypass the OSD system. This region is the proposed road reserve, which is understood to be dedicated to Penrith City Council in the future.

2.2 Rainfall Data

As outlined in the Stormwater Drainage Guidelines in Appendix E, the following rainfall intensities have been used in the design.

Table 1 - Design Rainfall Intensities for Penrith

Duration	20% AEP (mm/hr)	5% AEP (mm/hr)	1% AEP (mm/hr)
5Mins	125.86	166.29	219.79
6Mins	117.91	155.84	205.25
10Mins	96.27	127.08	168.09
20Mins	69.81	92.01	121.44
30Mins	56.56	74.59	98.42
1Hr	38.38	50.60	66.79
2Hrs	25.43	33.46	44.1
3Hrs	16.69	26.10	28.74
6Hrs	13.03	17.06	22.4
12Hrs	8.54	11.23	14.80
24Hrs	5.56	7.44	9.97
48Hrs	3.52	4.86	6.67
72Hrs	2.62	3.68	5.11

2.3 Pre-Development Analysis

The pre-development catchments and discharge flows are as indicated on engineering plans C6-51. The existing site is comprised of outdoor parking and an existing structure. The flows for all existing catchments have been estimated using the Rational Method. All areas have assumed pervious and impervious areas as shown on C6-51, based on site visits. The adopted time of concentration is 5 minutes.

Each catchment discharges into council network via sheet flow into an existing gutter, where it is then collected via gully pits as shown in C6-51. There is a northern and southern point of discharge that will be affected by the development. The pre-development discharge flows are shown in Table 2.

Table 2 - Existing Catchment Discharge

Discharge	Catchments Comprising Points	Area (m ²)	20% AEP Peak Flow (L/s)	1% AEP Peak Flow (L/s)
Northern	INT02, INT03, & INT04	1270	39.5	68.9
Southern	EX11	4905	108.5	189.6



2.4 Post-Development Analysis

The proposed architectural layout has been divided into catchments as indicated on engineering drawing C6-56. Two types of catchments are proposed for the post-development scenario.

1. Catchments that can be captured and detained;
2. Catchments that bypass the detention system and discharge directly to the existing roadway.

2.4.1 Detained Catchments

The catchment within the building footprint is proposed to be collected and detained using an OSD tank. The catchments and OSD have been modelled using the software DRAINS and rainfall data described in Section 2.2. The results of the analysis and the configuration of the OSD tank is described in Section 2.4.4

2.4.2 Bypass Catchments

Due to site and future ownership constraints, it is not possible to capture and detain a portion of development area. The site area that we have calculated to be ultimately TOGA owned post expected road dedication to council is less than the total site area, with approximately 20% of the site dedicated to the future roadway.

The areas that cannot be captured are indicated on engineering drawing C6-56.

2.4.3 Northern Discharge

Based on survey and Council records the existing northern discharge is via a 300x150 culvert. This existing culvert runs over an existing 600 diameter Sydney water asset and therefore cannot be lowered without relocating the water main. The existing 300x150 culvert has enough capacity to service Toga's site only. During stages 1 and 2 stormwater is to flow into the proposed raingarden and consequently will be conveyed via a low flow pipe to the southern network. Water that bypass's the raingarden will be conveyed through gutter flow into an existing pit on High Street as per the current conditions.

Under the Ultimate scenario, as requested by council, the stormwater network needs to be designed to allow for the proposed site at 614-632 High Street, to connect into the existing network. Currently under existing conditions for 614-632 High Street both High Street and Union Lane fall away from our stormwater line. For this reason RBG have only allowed for a portion of the site that may flow onto the new road to be captured within the ultimate design. However this site has not been surveyed, so it is unknown what the exact portion currently falls towards Toga's site. For this reason an appropriate value of 25% of the development has been allowed for. This additional flow will result in the existing system being over capacity and water surcharging at the pits located on the north east corner of the Toga development. An upgrade to a 450x300mm Culvert will alleviate the capacity issues.

2.4.4 Site Discharge

The allowable Site Discharge has been determined using a pre- vs post- development analysis. Table 3 shows the allowable site discharge which was determined by subtracting the pre-development from the post-development. A positive flow indicates that the flows are being reduced.



Table 3 - Discharge Values

Point of Discharge, AEP Flows (m³/s)	Pre-Development Peak Flows (L/s)	Post-Development Peak Flows (L/s)	Reduction in flow (L/s)
North, 20%	39.4	26	+13.4
South 20%	108.5	108	+0.5
North, 1%	84.3	41	+43.3
South, 1%	239.4	214	+25.4

2.4.5 DRAINS Model Analysis and OSD Design

The pre-development and post-development scenario was modelled using the computer software DRAINS. A depiction of the analysis can be seen in Figure 2.

For the post-development hydrological analysis, the proposed drainage network was modelled and peak flows have been analysed and compared to the pre-development scenarios. The 20%, 10% and 1% AEP storm events were modelled by using ILSAX hydrological model. This allowed the verification of the results from Table 3 and to appropriately size the orifice plate within the tank.

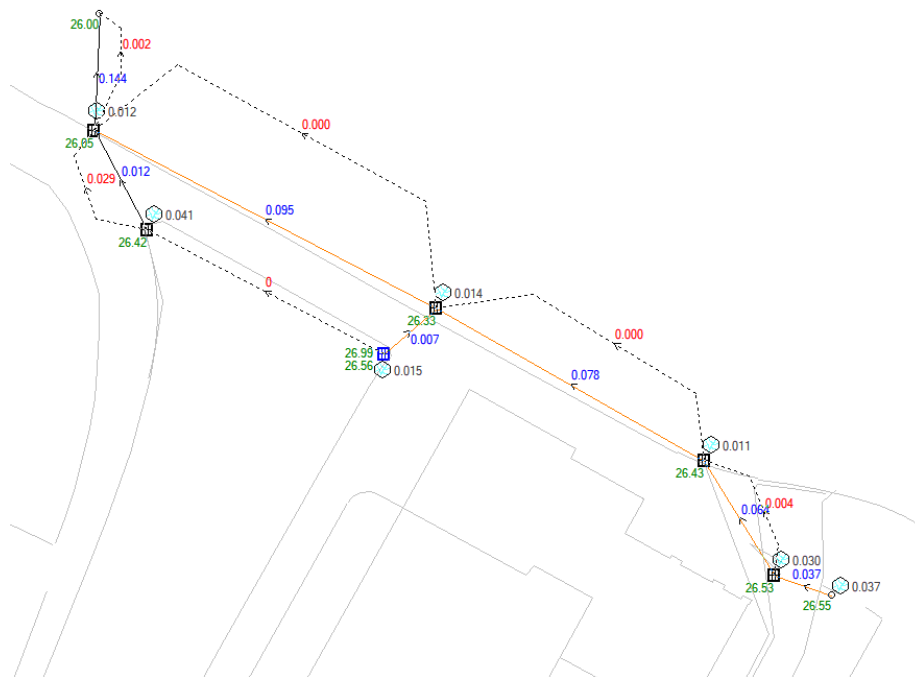
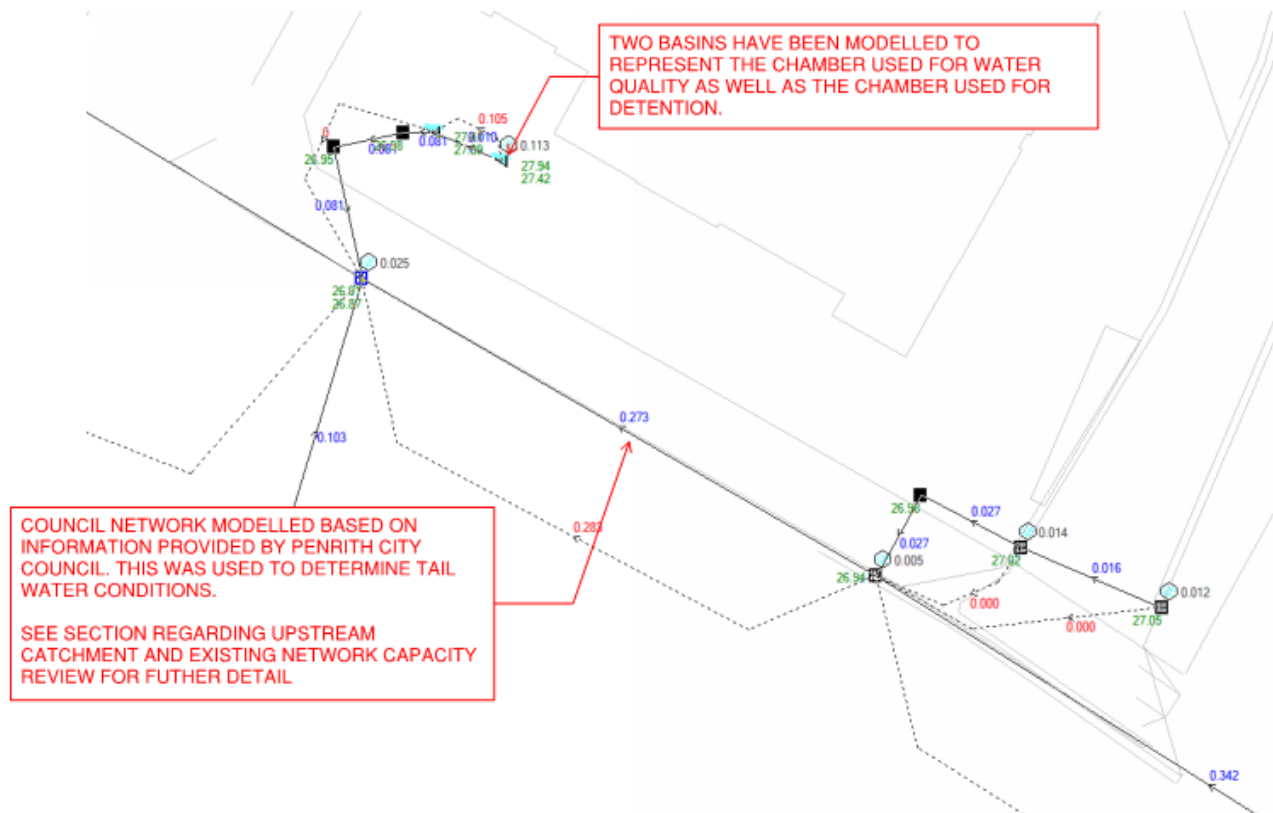


Figure 2 – Northern Ultimate-Development with 20% AEP Design Storm



Using DRAINS, the following has been determined:

- OSD Volume = 55m³
- Orifice Diameter = 260mm

Through the Pre-DA consultation phase, it was noted that the site would not specifically require On Site Detention.

Capacity of the existing network would be required to be assessed to confirm that a direct connection was possible.

The pre-development scenario was modelled using the computer drainage network software DRAINS.

Not all data has been surveyed at the time of this submission, however the following inputs and assumptions were adopted:

- Two Sag pits located on Union Lane are assumed to connect to Union Road, and have catchment areas of 0.45ha and 0.55ha.
- A 525mm Dia line runs through Union Road with minimal gradient (0.3%).
- The residences along Union Rd discharge to the street via kerb connections as noted on site.
- GIS information was incorporated to assess catchment areas.

- A total of a 2.07ha catchment was assumed to be upstream from the connection point at Union Road.

The capacity assessment indicated that direct connection (without OSD) into the existing infrastructure would not be in line with Penrith City Council guidelines and that a detention system should be applied to restrict flows to pre-developed conditions. This system has been proposed for the Development Application review.

3.0 Stormwater Quality Improvements

For RBG's approach to improving Stormwater Quality and Water Sensitive Urban Design (WSUD) please refer 17665C-TG RPT-C-WSUD. For information regarding the WSUD operations and maintenance schedule please refer to 17665C-TG REPORT-C-O&M.

3.1 Water Conservation and BASIX

A full BASIX assessment has been undertaken by EMF Griffiths and a report has been prepared as part of this development application.

The investigation has shown that BASIX compliance can be achieved through general measures, planting of indigenous or low water use species of vegetation and installation of a 20m³ Rainwater Harvesting tank.

Please refer to the EMF Griffiths report for further BASIX details.



4.0 Flooding and Overland Flow Review

A full flooding and overland flow assessment has been performed by Cardno Pty. Ltd. RBG have summarised the flooding review below for quick reference within this document.

4.1 Penrith Council Flood Planning Constraints

Penrith is located within a flood plain, for this reason Penrith City Council has strict flood planning constraints. Penrith City Council have listed their key flood planning constraints under section 3.5 (Flood Planning) of their DCP. These key constraints have been subdivided by the Council based on the classification of the proposed development. RBG's interpretation of this proposed redevelopment is that it is a mix of two different development criteria:

- Residential – New Developments
- Industrial/Commercial – New Developments

The constraints associated with the project relate to the finished floor level of the lowest allowable residential area as well as the crest of basement driveways.

RBG understands that 1% AEP plus freeboard (of 0.5m) is sufficient to meet Penrith City Council requirements. Table 7 summarises the two sources of data to date as they pertain to this stipulation.

Table 4 - 1% AEP Flood Summary

Report	Finished Floor Levels (1% AEP + 500mm Freeboard)	Garages and non-habitable floor levels (1%AEP + 100mm Freeboard)	Crest of driveway ramps, pedestrian entry points and any opening to the basement (1%AEP + 300mm Freeboard)
Cardno 1% AEP Flood Impact RL (m)	28.1	27.7	27.9
Worley Parsons RMA 1% AEP Flood Impact RL (m)	27.1	26.7	26.9

Discussions were had in relation to the building Ground Level FFL and it was decided that an RL of 28.15m would be sufficient to meet the 1% AEP and freeboard criteria.

At the entrance to the basement along Union Road the flood value is less than the values shown in Table 4. This is because the flood levels shown in Table 4 represent the high points throughout the site and does not take into account that the flood level at the basement entrance along Union Road is lower. In determining the driveway crest RL consultation with Council has been undertaken and an appropriate value of 27.60 has been agreed between all parties.

In terms of overland flow, the new roadway was originally modelled slightly higher than the eastern boundary. Cardno ran a simulation and it showed that there was a slight 3cm rise in the flood levels at the site's North Eastern boundary.

The latest simulation has showed a 2cm increase in flood waters for the interim case at the edge of the High Street Roundabout. It is however noted that the surface levels have been lowered in this area to provide a roadway connection and that the new pipe network, although not significant, has not been included in the assessment.



5.0 Conclusion

This Stormwater Management Report outlines the concept design principles that are intended for the management of stormwater runoff associated with the proposed development.

During the concept planning for the Development Application due consideration has been given to the relevant Council requirements, best practice principles, and guidelines.

Flooding and Overland Flow, general Stormwater Drainage, On Site Detention, existing network Pipe Capacities and Water Quality have all been assessed and summarised.



Appendix A

RBG Technical Drawings



634-652 HIGH STREET & 87-91 UNION ROAD

PENRITH

CIVIL ENGINEERING DRAWING SET

ISSUED FOR DEVELOPMENT APPLICATION

Sheet List Table	
Sheet Number	Sheet Title
C0-00	COVER SHEET, LOCALITY PLAN AND SHEET LIST
C0-02	SURVEY REFERENCE PLAN
C1-01	EROSION AND SEDIMENT CONTROL PLAN
C1-10	EROSION AND SEDIMENT CONTROL DETAILS
C2-01	BULK EARTHWORKS PLAN
C3-00	GENERAL ARRANGEMENT PLAN
C3-05	STAGING PLAN – STAGE 1 – CONNECTING TO EXISTING ROUND ABOUT
C3-06	STAGING PLAN – STAGE 2 – CONNECTING TO SIGNALISED INTERSECTION
C3-07	STAGING PLAN – STAGE 3 ULTIMATE ROAD DESIGN
C3-10	CIVIL DETAILS
C3-15	TYPICAL ROAD CROSS SECTIONS – SHEET 1 OF 2
C3-16	TYPICAL ROAD CROSS SECTIONS – SHEET 2 OF 2
C3-20	ROADWAY LONGITUDINAL SECTION ULTIMATE ROAD
C3-40	ROADWAY CROSS SECTIONS – SHEET 1
C4-01	PAVEMENT LAYOUT PLAN
C4-10	PAVEMENT DETAILS
C6-01	STORMWATER MANAGEMENT PLAN
C6-10	STORMWATER DETAILS
C6-20	STORMWATER LONGSECTIONS
C6-22	STORMWATER LONGSECTIONS – ULTIMATE STAGE 3 DESIGN
C6-25	WATER QUALITY PLAN
C6-26	ON SITE DETENTION TANK TYPICAL DETAILS
C6-30	BIORETENTION SYSTEM TYPICAL ARRANGEMENT DETAILS
C6-51	PRE-DEVELOPMENT CATCHMENT PLAN
C6-56	POST-DEVELOPMENT CATCHMENT PLAN



LOCALITY PLAN
SCALE NTS

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
2	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
8	ISSUED FOR APPROVAL	RG	CW	05.10.21

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Title
**COVER SHEET, LOCALITY PLAN
AND SHEET LIST**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
18.06.18

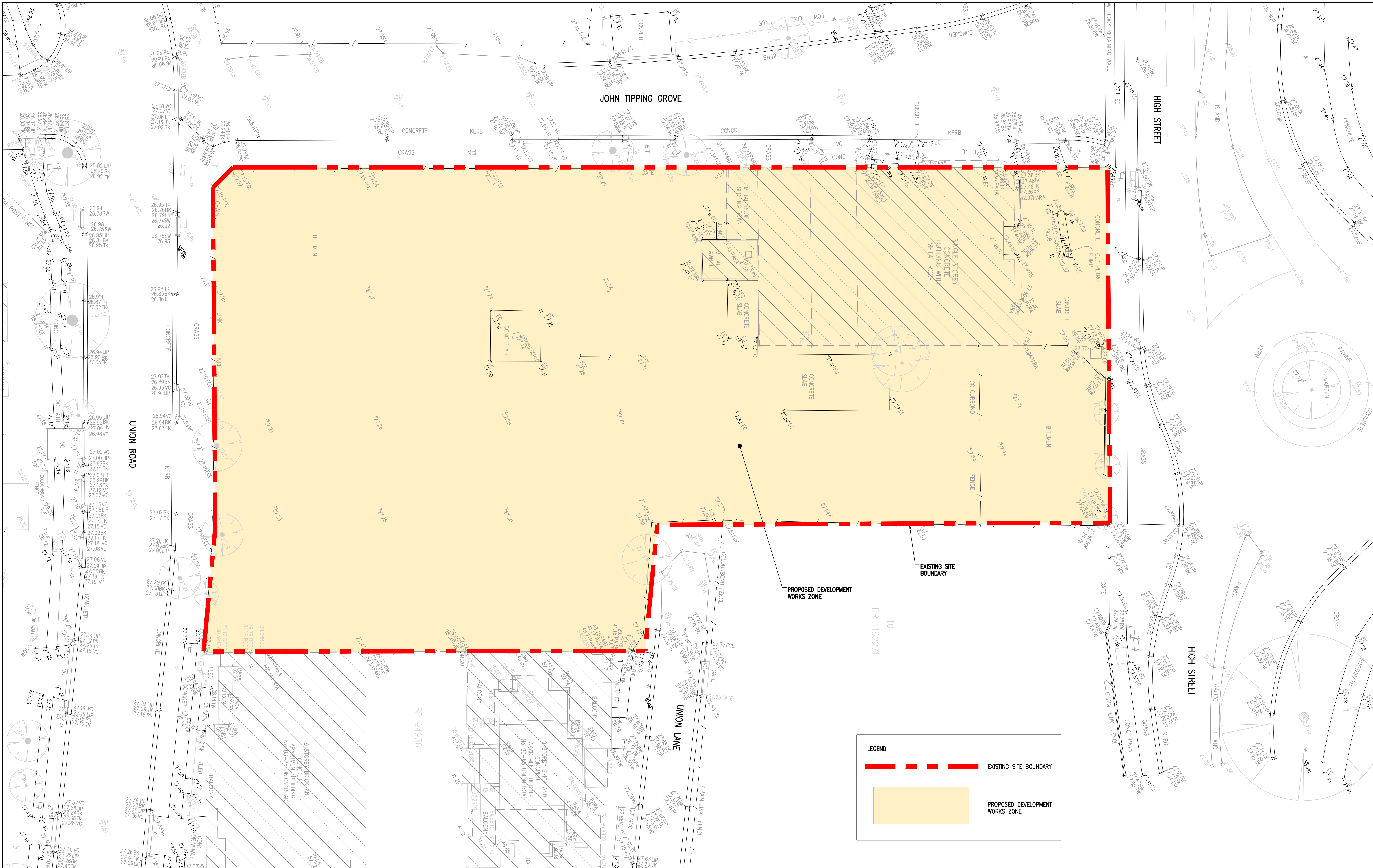
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S.MANANDHAR
Designer
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Job Number
17665C

Design Checker
C.ROPE
Approved
C.WAITE
Revision
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Revision



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Client

TOGA

Title
SURVEY REFERENCE PLAN

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
13.02.20

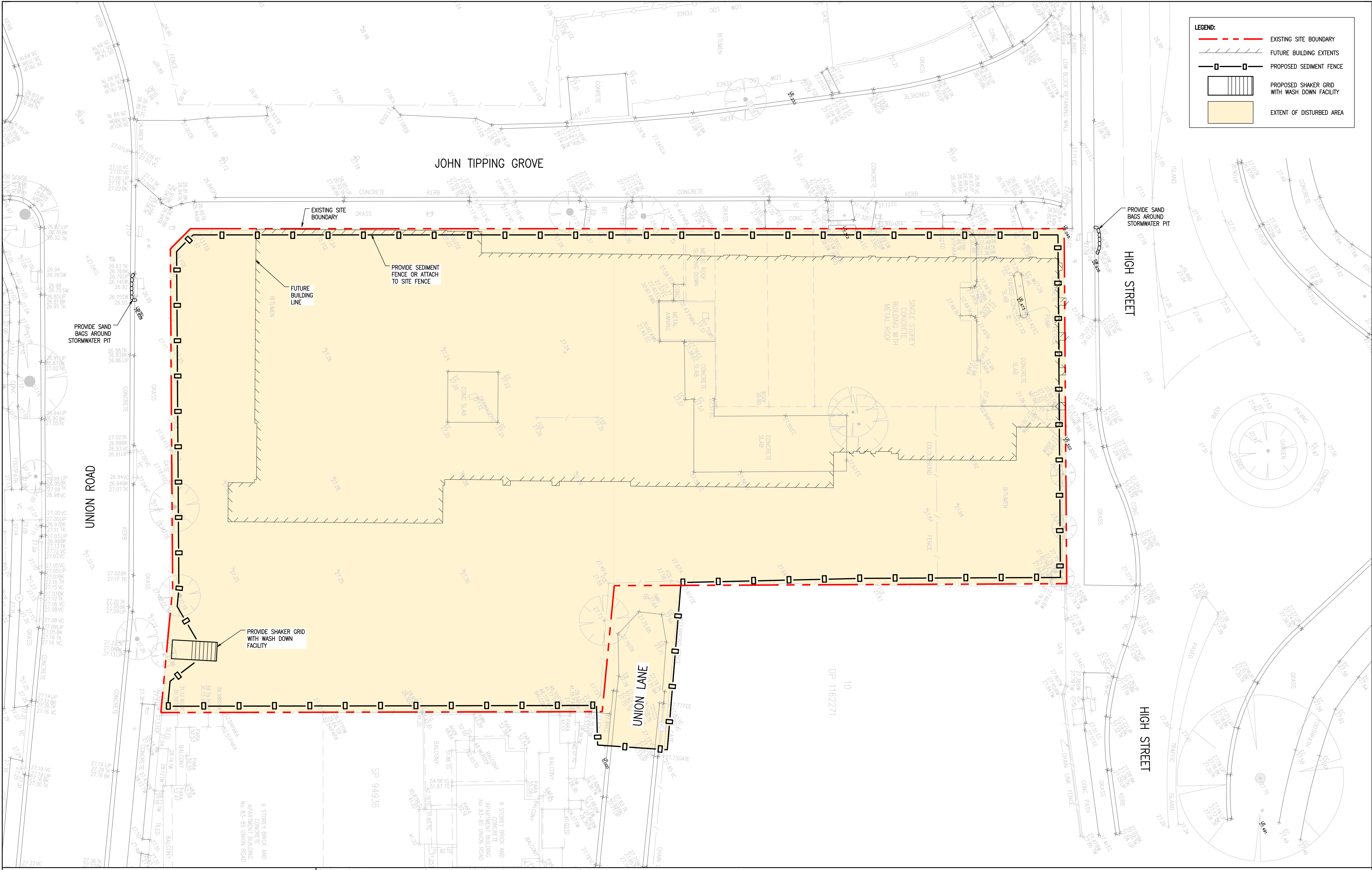
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S.MANANDHAR
Designer
Z.JONES

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
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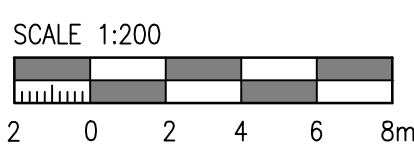
Drawing Number
C0-02

Revision
7



LEGEND:

- EXISTING SITE BOUNDARY
- FUTURE BUILDING EXTENTS
- PROPOSED SEDIMENT FENCE
- PROPOSED SHAKER GRID WITH WASH DOWN FACILITY
- EXTENT OF DISTURBED AREA



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Client

EROSION AND SEDIMENT CONTROL PLAN

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
13.02.20

Drawn
S.MANANDHAR
Designer
R.ATHERTON

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

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C1-01

Revision
7

GENERAL NOTES:

- A1. THIS SOIL AND WATER MANAGEMENT PLAN IS TO BE READ IN CONJUNCTION WITH OTHER ENGINEERING PLANS RELATING TO THIS DEVELOPMENT.
- A2. CONTRACTORS WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE UNDERTAKEN AS INSTRUCTED IN THIS SPECIFICATION AND CONSTRUCTED FOLLOWING THE PENRITH CITY COUNCIL REQUIREMENTS AND TO LANDCOM – MANAGING URBAN STORMWATER: SOIL AND CONSTRUCTION, 4th EDITION, MAR 2004.
- A3. REFER GEOTECHNICAL REPORT FOR EARTHWORKS AND PARAMETERS.
- A10. ALL CONSTRUCTION VEHICLES SHALL ENTER AND EXIT THE SITE VIA THE APPROVED CONSTRUCTION ENTRY/EXIT ROUTE.
- A11. ALL VEHICLES LEAVING THE SITE SHALL BE CLEANED AND INSPECTED BEFORE LEAVING.
- A12. MAINTAIN ALL STORMWATER PIPES AND PITS CLEAR OF DEBRIS AND SEDIMENT. INSPECT STORMWATER SYSTEM AND CLEAN OUT AFTER EACH STORM EVENT.
- A13. CLEAN OUT ALL EROSION AND SEDIMENT CONTROL DEVICES AFTER EACH STORM EVENT.
- A14. ALL DISTURBED AREAS SHALL BE REVEGETATED AS SOON AS THE RELEVANT WORKS HAVE BEEN COMPLETED.
- A15. KERB INLET SOCKS TO BE PROVIDED ON DOWNSTREAM PITS.

SITE MAINTENANCE NOTES:

- SM1. THE CONTRACTOR WILL INSPECT THE SITE AT LEAST WEEKLY AND AT THE CONCLUSION OF EVERY STORM EVENT TO:
- A) ENSURE THAT DRAINS OPERATE PROPERLY AND TO EFFECT AND NECESSARY REPAIRS.
- B) REMOVED SPILLED SAND OR OTHER MATERIALS FROM HAZARD AREAS, INCLUDING LANDS CLOSER THAN 5 METRES FROM AREAS OF LIKELY CONCENTRATED OR HIGH VELOCITY FLOWS ESPECIALLY WATERWAYS AND PAVED AREAS.
- C) REMOVED TRAPPED SEDIMENT WHENEVER THE DESIGN CAPACITY OF THAT STRUCTURES HAS BEEN EXCEEDED.
- D) ENSURE REHABILITATION LANDS HAVE EFFECTIVELY REDUCED THE EROSION HAZARD TO INITIATE UPGRADING OR REPAIR AS NECESSARY.
- E) CONSTRUCT ADDITIONAL EROSION AND OR SEDIMENT CONTROL WORKS AS MIGHT BECOME NECESSARY TO ENSURE THE DESIRED PROTECTION IS GIVEN TO DOWNSLOPE LANDS AND WATERWAYS. MAKE ONGOING CHANGES TO THE PLAN WHERE IT PROVES INADEQUATE IN PRACTICE OR IS SUBJECT TO CHANGES IN CONDITIONS ON THE WORK–SITE OR ELSEWHERE IN THE CATCHMENT.
- F) MAINTAIN EROSION AND SEDIMENT CONTROL STRUCTURES IN A FULLY FUNCTIONING CONDITION UNTIL ALL EARTHWORK ACTIVITIES ARE COMPLETED AND THE SITE IS REHABILITATED.
- G) FILL IN AND COMPACT ALL TRENCHES IMMEDIATELY AFTER SERVICES HAVE BEEN LAID.
- SM2. THE CONTRACTOR WILL KEEP A LOGBOOK MAKING ENTRIES AT LEAST WEEKLY, IMMEDIATELY BEFORE FORECAST RAIN AND AFTER RAINFALL. ENTRIES WILL INCLUDE:
- A) THE VOLUME AND INTENSITY OF ANY RAINFALL EVENTS.
- B) THE CONDITION OF ANY SOIL AND WATER MANAGEMENT WORKS.
- C) THE CONDITION OF VEGETATION AND ANY NEED TO IRRIGATE.
- D) THE NEED FOR DUST PREVENTION STRATEGIES
- THE LOGBOOK WILL BE KEPT ON–SITE AND MADE AVAILABLE TO ANY AUTHORISED PERSON UPON REQUEST. IT WILL BE GIVEN TO THE PROJECT MANAGER AT THE CONCLUSION OF THE WORKS.

SEDIMENT CONTROL NOTES:

- SC1. SEDIMENT FENCES WILL BE INSTALLED AS SHOWN ON THE PLAN AND ELSEWHERE AT THE DISCRETION OF THE SITE CONTRACTOR TO CONTAIN SOIL AS NEAR AS POSSIBLE TO THEIR SOURCE.
- SC2. SEDIMENT FENCES WILL NOT HAVE CATCHMENT AREAS EXCEEDING 900 SQUARE METRES AND HAVE A STORAGE DEPTH OF AT LEAST 0.6 METRES.
- SC3. SEDIMENT FENCES SHOULD LAST FOR UP TO SIX MONTHS BUT REQUIRE REGULAR MAINTENANCE AND WEEKLY CHECKS. IT MUST REMAIN VERTICAL AND KEYED INTO THE SOIL. DAMAGED FENCES MUST BE REPAIRED PROMPTLY.
- SC4. SEDIMENT FENCES NEED TO BE TRENCHED IN AT LEAST 150mm AND BURIED SO THE WATER FLOWS THROUGH AND NOT UNDERNEATH.
- SC5. SEDIMENT REMOVED FROM ANY TRAPPING DEVICES WILL BE RELOCATED WHERE FURTHER POLLUTION TO DOWNSLOPE LANDS AND WATERWAYS CANNOT OCCUR.
- SC6. STOCKPILES ARE NOT TO BE LOCATED WITHIN 5 METERS OF HAZARD AREAS INCLUDING AREAS OF HIGH VELOCITY FLOWS SUCH AS WATERWAYS, PAVED AREAS AND DRIVEWAYS.
- SC7. WATER WILL BE PREVENTED FROM DIRECTLY ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR WATER HAS BEEN TREATED BY AN APPROVED DEVICE.
- SC8. TEMPORARY SEDIMENT TRAPS WILL REMAIN IN PLACE UNTIL AFTER THE LANDS THEY ARE PROTECTING ARE COMPLETELY REHABILITATED.
- SC9. ACCESS TO SITES SHOULD BE STABILIZED TO REDUCE THE LIKELIHOOD OF VEHICLES TRACKING SOIL MATERIALS ONTO PUBLIC ROADS AND ENSURE ALL–WEATHER ENTRY/EXIT.

LAND DISTURBANCE NOTES:

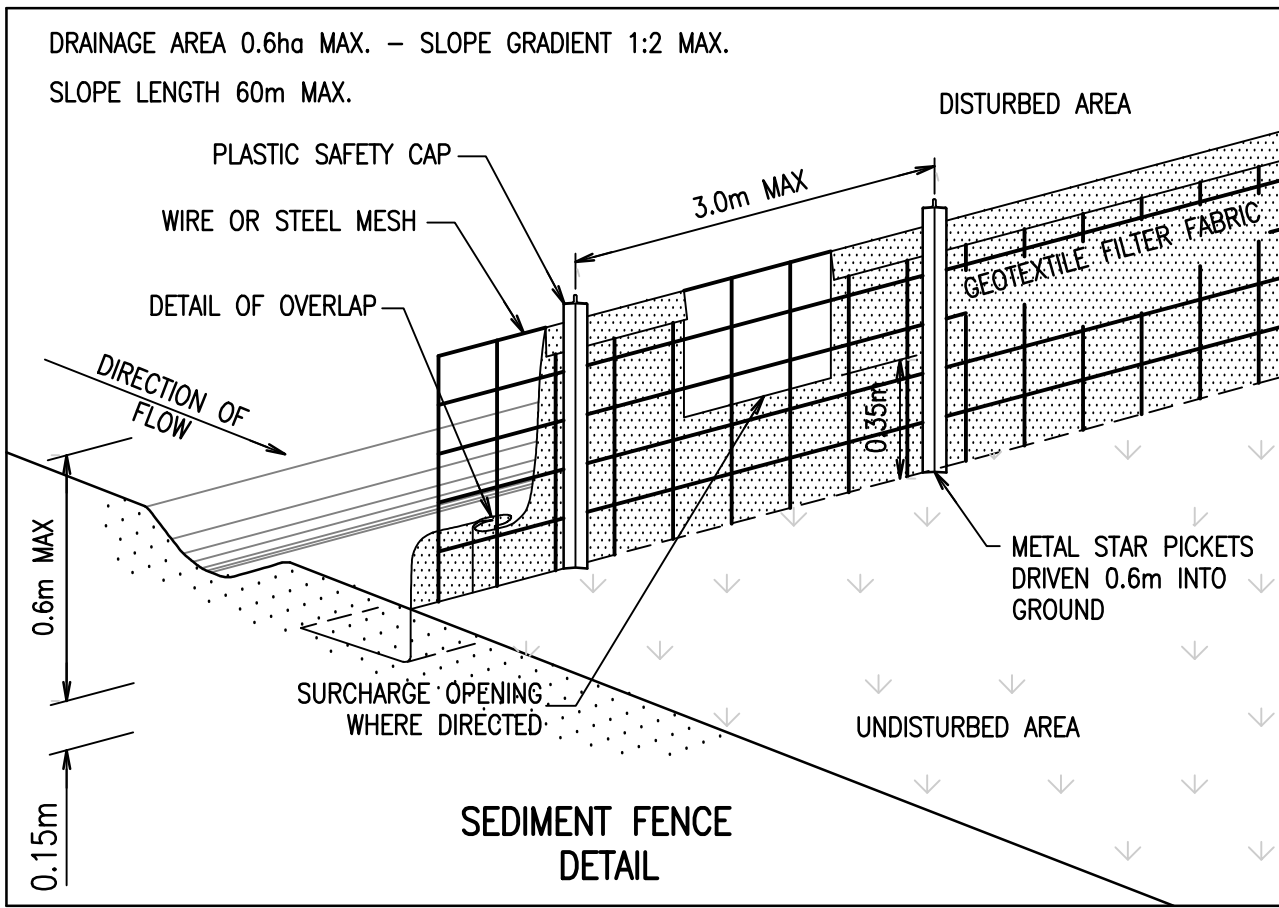
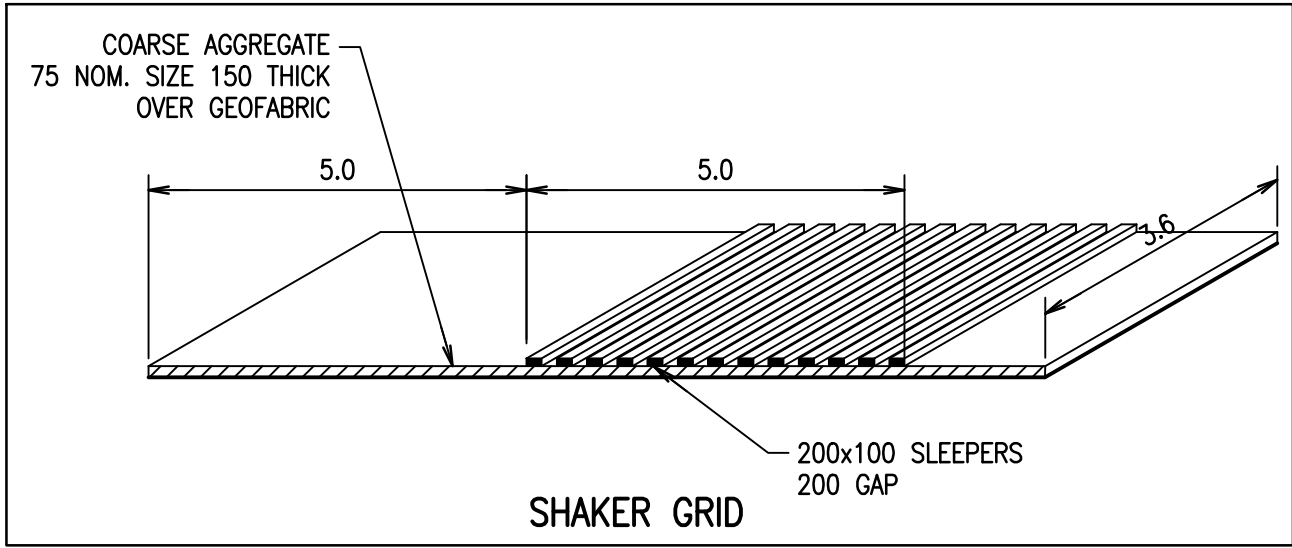
- LD1. ACCESS AREAS ARE TO BE LIMITED TO A MAXIMUM WIDTH OF 10 METERS THE SITE MANAGER WILL DETERMINE AND MARK THE LOCATION OF THESE ZONES ON–SITE. ALL SITE WORKERS WILL CLEARLY RECOGNIZE THOSE BOUNDARIES THAT, WHERE APPROPRIATE, ARE IDENTIFIED WITH A BARRIER FENCING (UPSLOPE) AND SEDIMENT FENCING (DOWNSLOPE) OR SIMILAR MATERIALS.
- LD2. ENTRY TO LANDS NOT REQUIRED FOR CONSTRUCTION OR ACCESS IS PROHIBITED EXCEPT FOR ESSENTIAL THINNING OF PLANT GROWTH.
- LD3. WORKS ARE TO PROCEED IN THE FOLLOWING SEQUENCE:
- A) INSTALL ALL BARRIER AND SEDIMENT FENCING WHERE SHOWN ON THE PLAN.
- B) CONSTRUCT THE STABILISED SITE ACCESS.
- C) CONSTRUCT DIVERSION DRAINS AS REQUIRED.
- D) INSTALL MESH AND GRAVEL INLETS FOR ANY ADJACENT KERB INLETS.
- E) INSTALL GEOTEXTILE INLET FILTERS AROUND ANY ON–SITE DROP INLET PITS.
- F) CLEAR SITE AND STRIP AND STOCKPILE TOPSOIL IN LOCATIONS SHOWN ON THE PLAN.
- G) UNDERTAKE ALL ESSENTIAL CONSTRUCTION WORKS ENSURING THAT ROOF AND/OR PAVED AREA STORMWATER SYSTEMS ARE CONNECTED TO PERMANENT DRAINAGE AS SOON AS PRACTICABLE.
- H) GRADE LOT AREAS TO FINAL GRADES AND APPLY PERMANENT STABILISATION (LANDSCAPING) WITHIN 20 DAYS OF COMPLETION OF CONSTRUCTION WORKS.
- I) REMOVE TEMPORARY EROSION CONTROL MEASURES AFTER THE PERMANENT LANDSCAPING HAS BEEN COMPLETED.
- LD4. ENSURE THAT SLOPE LENGTHS DO NOT EXCEED 80 METRES WHERE PRACTICABLE. SLOPE LENGTHS ARE DETERMINED BY SILTATION FENCING AND CATCH DRAIN SPACING.

SOIL EROSION CONTROL NOTES:

- SE1. EARTH BATTERS WILL BE CONSTRUCTED WITH AS LOW A GRADIENT AS PRACTICABLE BUT NO STEEPER, UNLESS OTHERWISE NOTES, THAN THAT RECOMMENDED BY GEOTECHNICAL REPORT.
- SE2. ALL WATERWAYS, DRAINS, SPILLWAYS AND THEIR OUTLETS WILL BE CONSTRUCTED TO BE STABLE IN AT LEAST THE 1:20 YEAR ARI, TIME OF CONCENTRATION STORM EVENT.
- SE3. WATERWAYS AND OTHER AREAS SUBJECT TO CONCENTRATED FLOWS AFTER CONSTRUCTION ARE TO HAVE A MAXIMUM GROUND COVER C–FACTOR OF 0.05 (70% GROUND COVER) WITHIN 10 WORKING DAYS FROM COMPLETION OF FORMATION. FOOT AND VEHICULAR TRAFFIC WILL BE PROHIBITED IN THESE AREAS.
- SE4. STOCKPILES AFTER CONSTRUCTION ARE TO HAVE A MAXIMUM GROUND–COVER C–FACTOR OF 0.1% (60% GROUND–COVER) WITHIN 10 WORKING DAYS FROM COMPLETION OF FORMATION.
- SE5. ALL LANDS, INCLUDING WATERWAYS AND STOCKPILES DURING CONSTRUCTION ARE TO HAVE A MAXIMUM GROUND COVER C–FACTOR OF 0.15 (50% GROUND COVER) WITHIN 20 WORKING DAYS FROM INACTIVITY EVEN THOUGH WORKS MAY CONTINUE LATER.
- SE6. PERMANENT REHABILITATION OF LANDS AFTER CONSTRUCTION WILL ACHIEVE A GROUND–COVER C–FACTOR OF LESS THAN 0.1 AND LESS THAN 0.05 WITHIN 60 DAYS. NEWLY PLANTED LANDS WILL BE WATERED REGULARLY UNTIL AN EFFECTIVE COVER IS ESTABLISHED AND PLANTS ARE GROWING VIGOROUSLY. FOLLOW–UP SEED AND FERTILISER WILL BE APPLIED AS NECESSARY.

WASTE CONTROL NOTES:

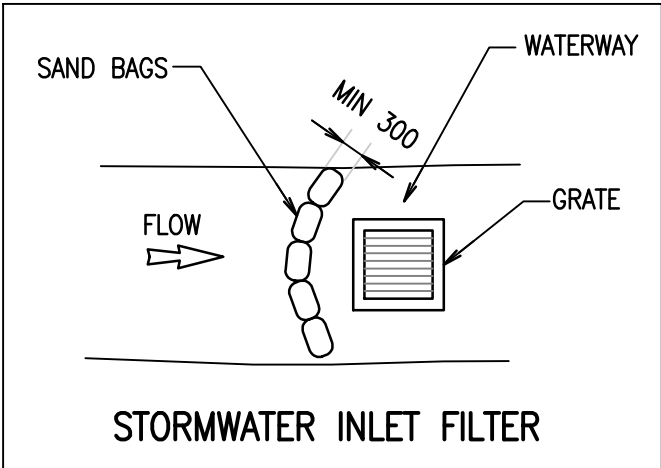
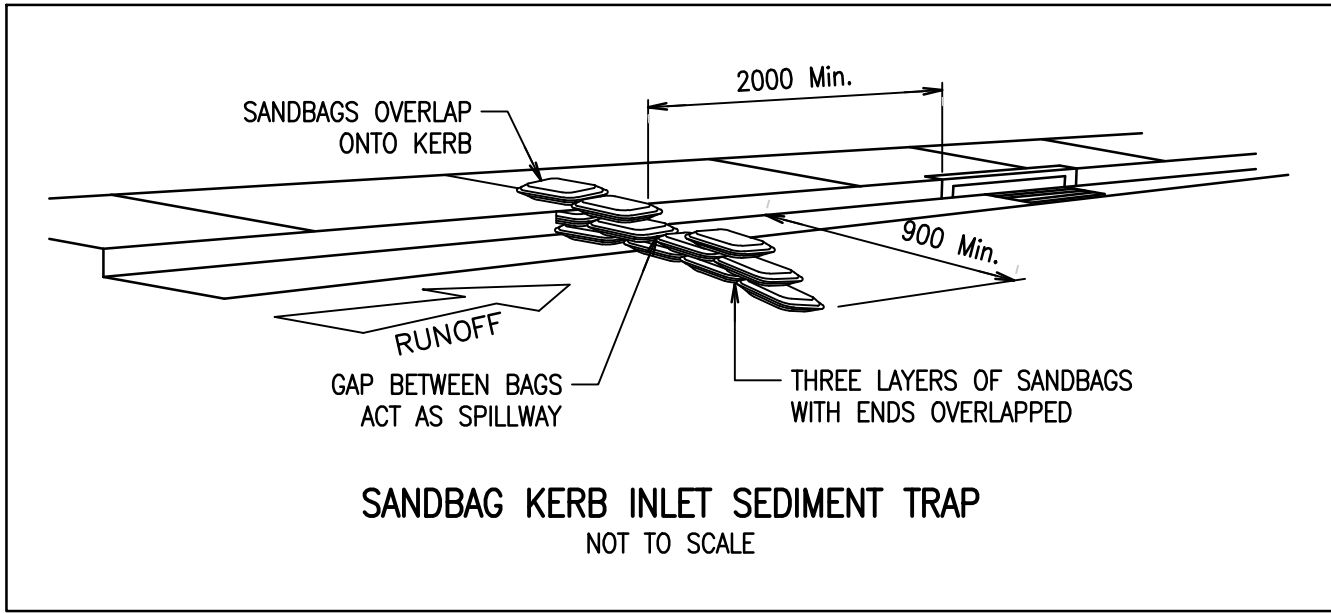
- WC1. ACCEPTABLE BINS WILL BE PROVIDED FOR ANY CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHING, LIGHTWEIGHT WASTE MATERIALS AND LITTER. CLEARANCE SERVICES WILL BE PROVIDED AT LEAST WEEKLY. DISPOSAL OF WASTE WILL BE IN A MANNER APPROVED BY THE SITE CONTRACTOR.
- WC2. ALL POSSIBLE POLLUTANT MATERIALS ARE TO BE STORED WELL CLEAR OF ANY POORLY DRAINED AREAS, FLOW PRONE AREAS, STREAMBANKS, CHANNELS AND STORMWATER DRAINAGE AREAS. STORE SUCH MATERIALS IN A DESIGNATED AREA UNDER COVER WHERE POSSIBLE AND WITHIN CONTAINMENT BUNDS.
- WC3. ALL SITE STAFF AD SUBCONTRACTORS ARE TO BE INFORMED OF THEIR OBLIGATION TO USE WASTE CONTROL FACILITIES PROVIDED.
- WC4. ANY DE–WATERING ACTIVITIES ARE TO BE CLOSELY MONITORED TO ENSURE THAT WATER IS NOT POLLUTED BY SEDIMENT, TOXIC MATERIALS OR PETROLEUM PRODUCTS.
- WC5. PROVIDE DESIGNATED VEHICULAR WASHDOWN AND MAINTENANCE AREAS WHICH ARE TO HAVE CONTAINMENT BUNDS.



INSTALLATION

1. EXCAVATE A TRENCH AT LEAST 150mm DEEP.
2. DRIVE POSTS 500–600mm INTO GROUND AT A MAXIMUM SPACING OF 3.0m CENTRES.
3. PLACE AND FIX SUPPORT MESH (FS2) TO POST.
4. LAY BIDIM GEOTEXTILE (SF 2000) AGAINST THE SUPPORT MESH AND FIX BY TIE WIRE, STAPLES OR HOC RINGS.
5. PLACE BIDIM IN TRENCH AND BACKFILL WITH SOIL.
6. SOIL ON BOTH SIDES OF THE FENCE MUST BE COMPACTED TO AVOID SEEPAGE UNDER THE BARRIER.

NOTE:
POSITION OF SEDIMENT FENCE AS DIRECTED BY MANAGING CONTRACTOR. FENCE TO REMAIN IN PLACE UNTIL EXCAVATION IS BELOW FOOTPATH LEVEL. PROVIDE 2mx2m TURFED AREA ON DOWNSTREAM SIDE OF FENCE AT SURCHARGE OPENINGS.



Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
2	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
6	ISSUED FOR DEVELOPMENT APPLICATION	RC	CR	21.02.20
7	ISSUED FOR APPROVAL	RC	CW	05.10.21

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6	ISSUED FOR DEVELOPMENT APPLICATION	RC	CR	21.02.20
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Client

Title
**EROSION AND SEDIMENT CONTROL
DETAILS**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

Drawn
S.MANANDHAR
Designer
R.ATHERTON

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C1–10

Revision
7



NOTES:

1. TEMPORARY BATTERS FOR BASEMENT AND ROADS NOT ACCOUNTED FOR
2. TOTAL CUT = 11,800m³
3. TOTAL FILL = 50m³
4. BALANCE = 11,750m³ OF CUT
5. TOTAL DEPTH OF BASEMENT EXCAVATION BELOW FFL ASSUMED TO BE 250mm.
6. COMPACTION, SHRINK/SWELL RATIO'S, AND SEPARATION OF TOPSOIL/EXISTING PAVEMENTS NOT INCORPORATED IN ASSESSMENT.

CARPARK DEPTH RANGE		Upper_value	metres	Colour
Lower_value				
-999	to	-3.5	metres	
-3.5	to	-3	metres	
-3	to	-2.5	metres	
-2.5	to	-2	metres	
-2	to	-1.75	metres	
-1.75	to	-1.5	metres	
-1.5	to	-1.25	metres	
-1.25	to	-1	metres	
-1	to	-0.75	metres	
-0.75	to	-0.5	metres	
-0.5	to	-0.25	metres	
-0.25	to	0	metres	
0	to	0.25	metres	
0.25	to	0.5	metres	
0.5	to	1	metres	
1	to	999	metres	

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	RA	CR	06.06.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
4	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	02.03.20
5	ISSUED FOR APPROVAL	RG	CW	05.10.21

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	RA	CR	06.06.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
4	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	02.03.20
5	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 248



Title
BULK EARTHWORKS PLAN

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
18.06.18

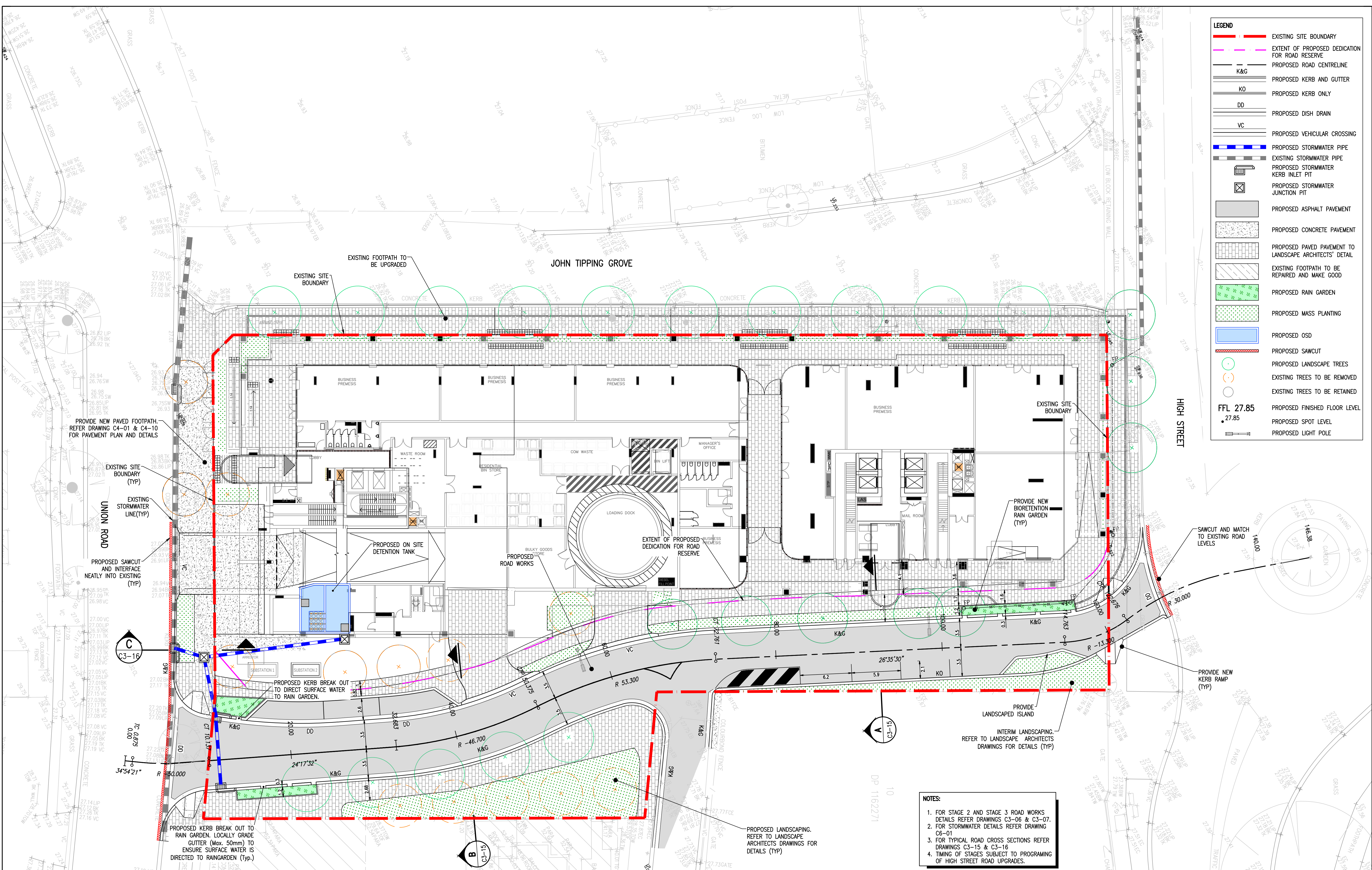
Drawn
R.ATHERTON
Designer
R.ATHERTON

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C2-01

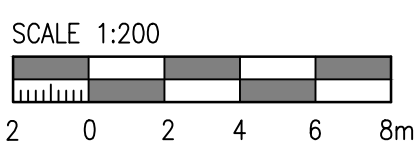
Revision
5



LEGEND

- EXISTING SITE BOUNDARY
- EXTENT OF PROPOSED DEDICATION FOR ROAD RESERVE
- PROPOSED ROAD CENTRELINE
- PROPOSED KERB AND GUTTER
- PROPOSED KERB ONLY
- PROPOSED DISH DRAIN
- PROPOSED VEHICULAR CROSSING
- PROPOSED STORMWATER PIPE
- EXISTING STORMWATER PIPE
- PROPOSED STORMWATER KERB INLET PIT
- PROPOSED STORMWATER JUNCTION PIT
- PROPOSED ASPHALT PAVEMENT
- PROPOSED CONCRETE PAVEMENT
- PROPOSED PAVED PAVEMENT TO LANDSCAPE ARCHITECTS' DETAIL
- EXISTING FOOTPATH TO BE REPAIRED AND MAKE GOOD
- PROPOSED RAIN GARDEN
- PROPOSED MASS PLANTING
- PROPOSED OSD
- PROPOSED SAWCUT
- PROPOSED LANDSCAPE TREES
- EXISTING TREES TO BE REMOVED
- EXISTING TREES TO BE RETAINED
- FFL 27.85
- 27.85
- PROPOSED FINISHED FLOOR LEVEL
- PROPOSED SPOT LEVEL
- PROPOSED LIGHT POLE

- NOTES:**
- FOR STAGE 2 AND STAGE 3 ROAD WORKS DETAILS REFER DRAWINGS C3-06 & C3-07.
 - FOR STORMWATER DETAILS REFER DRAWING C6-01
 - FOR TYPICAL ROAD CROSS SECTIONS REFER DRAWINGS C3-15 & C3-16
 - TIMING OF STAGES SUBJECT TO PROGRAMMING OF HIGH STREET ROAD UPGRADES.



Rev	Revision Description	By	App	Date
1	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
7	ISSUED FOR REVIEW	CW	CW	17.10.18
8	ISSUED FOR REVIEW	RG	CW	26.03.19
9	RAIN GARDEN REINSTATED	RG	CW	29.03.19
10	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19

Rev	Revision Description	By	App	Date
11	ISSUED FOR DEVELOPMENT APPLICATION	MC	CW	21.02.20
12	ISSUED FOR APPROVAL	RG	CW	05.10.21

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Client

TOGA

**STAGING PLAN – STAGE 1 –
CONNECTING TO EXISTING ROUND
ABOUT**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

Drawn
S.MANANDHAR

Design
Z.JONES

Design Checker
C.ROPE

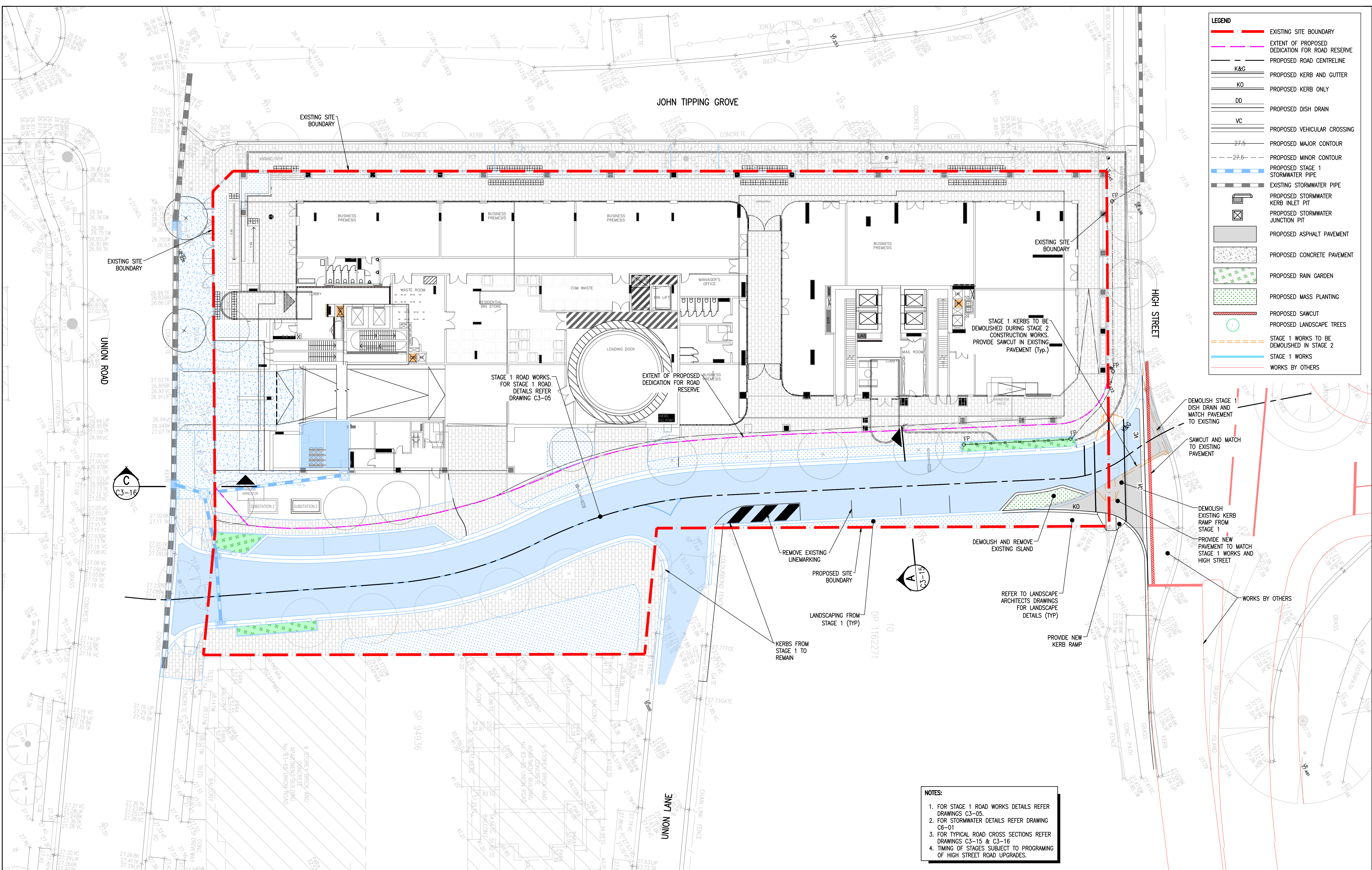
Approved
C.WAITE

Job Number
17665C

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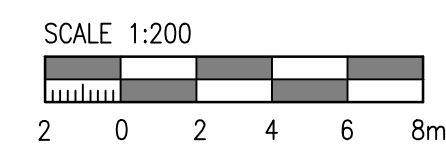
Drawing Number
C3-05

Revision
12



LEGEND	
	EXISTING SITE BOUNDARY
	EXTENT OF PROPOSED DEDICATION FOR ROAD RESERVE
	PROPOSED ROAD CENTRELINE
	PROPOSED KERB AND GUTTER
	PROPOSED KERB ONLY
	PROPOSED DISH DRAIN
	PROPOSED VEHICULAR CROSSING
	PROPOSED MAJOR CONTOUR
	PROPOSED MINOR CONTOUR
	PROPOSED STAGE 1 STORMWATER PIPE
	EXISTING STORMWATER PIPE
	PROPOSED STORMWATER KERB INLET PIT
	PROPOSED STORMWATER JUNCTION PIT
	PROPOSED ASPHALT PAVEMENT
	PROPOSED CONCRETE PAVEMENT
	PROPOSED RAIN GARDEN
	PROPOSED MASS PLANTING
	PROPOSED SAWCUT
	PROPOSED LANDSCAPE TREES
	STAGE 1 WORKS TO BE DEMOLISHED IN STAGE 2
	STAGE 1 WORKS
	WORKS BY OTHERS

- NOTES:
1. FOR STAGE 1 ROAD WORKS DETAILS REFER DRAWINGS C3-05.
 2. FOR STORMWATER DETAILS REFER DRAWING C6-01
 3. FOR TYPICAL ROAD CROSS SECTIONS REFER DRAWINGS C3-15 & C3-16
 4. TIMING OF STAGES SUBJECT TO PROGRAMMING OF HIGH STREET ROAD UPGRADES.



Rev	Revision Description	By	App	Date
1	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
7	ISSUED FOR REVIEW	CW	CR	17.10.18
8	ISSUE FOR REVIEW	RG	CW	26.03.19
9	RAIN GARDEN REINSTATED	RG	CW	29.03.19
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Rev	Revision Description	By	App	Date
11	ISSUED FOR DEVELOPMENT APPLICATION	MC	CW	21.02.20
12	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 248

Client

TOGA

Title
**STAGING PLAN – STAGE 2 –
CONNECTING TO SIGNALISED
INTERSECTION**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

Drawn
S.MANANDHAR
Designer
Z.JONES

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

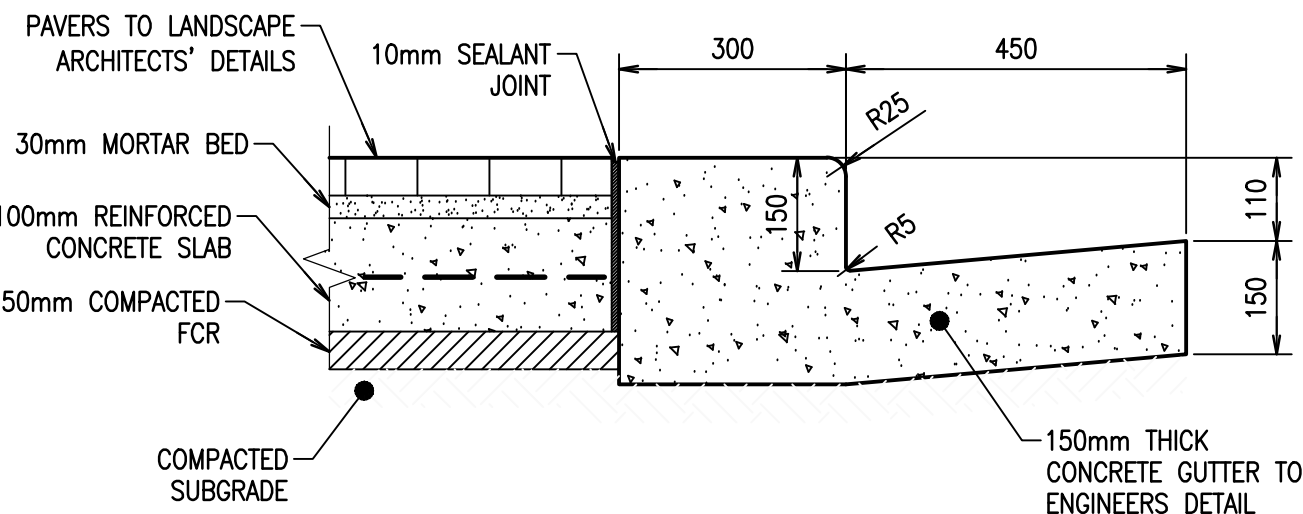
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Drawing Number
C3-06

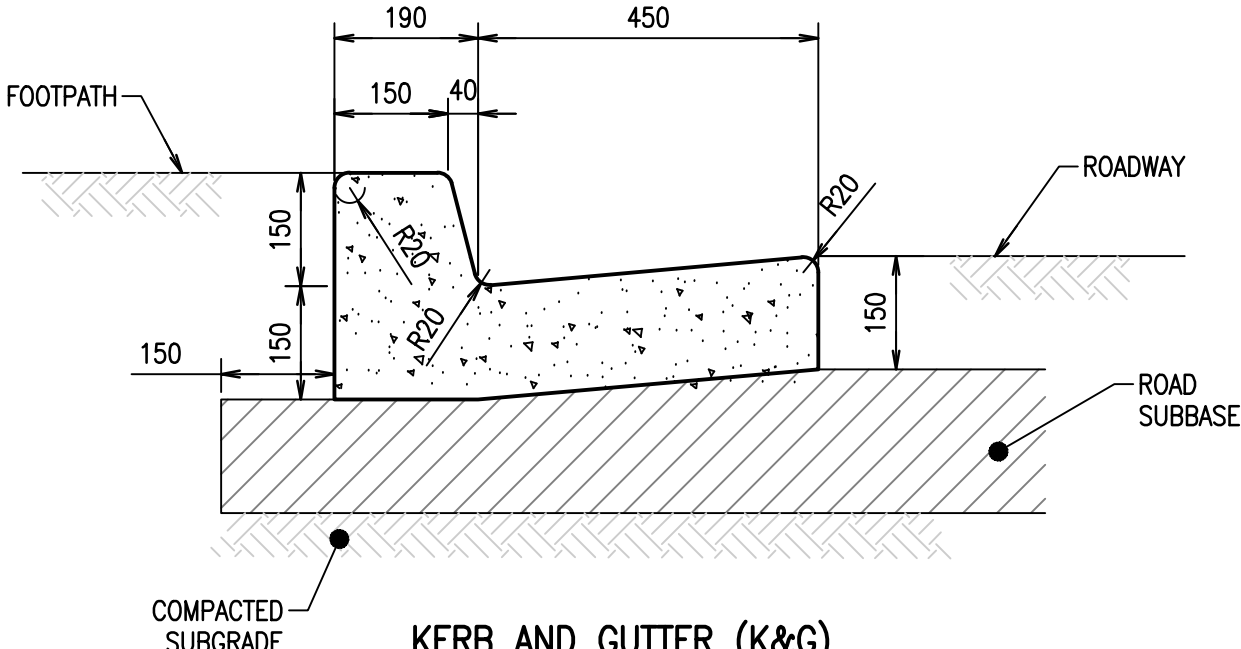
Revision
12

NOTES:

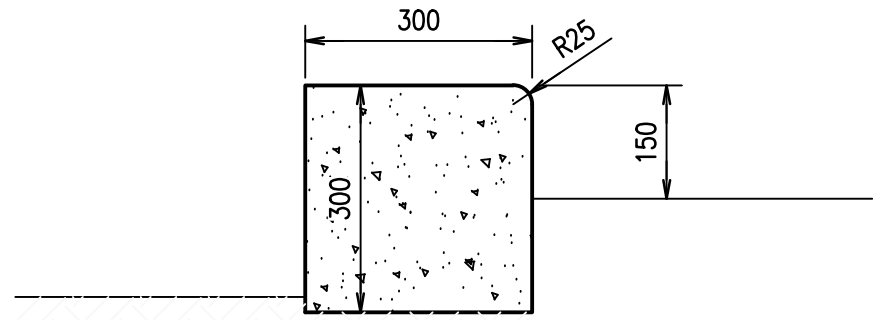
1. CONCRETE COMPRESSIVE STRENGTH (F'c) AT 28 DAYS, TO BE 20MPa FOR KERB AND GUTTER
2. LAYBACKS TO BE 20MPa, REINFORCED WITH SL72 MESH.
3. ROAD SUB-BASE SHALL BE EXTENDED 150mm BEHIND REAR OF KERB AND GUTTER WITH THE THICKNESS TO BE NOT LESS THAN THE ROAD PAVEMENT SUB-BASE THICKNESS.
4. ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE STATED.
5. ALL EXPOSED EDGES TO BE ROUNDED TO 20mm RADIUS.



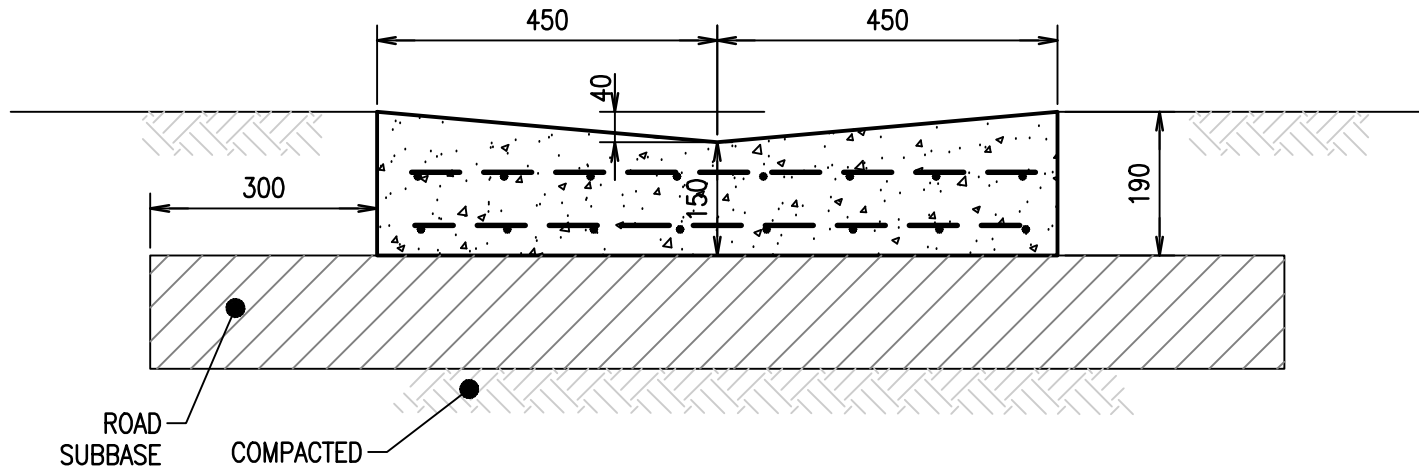
TYPICAL WIDE CONCRETE KERB AND GUTTER (K&G)
SCALE 1:10



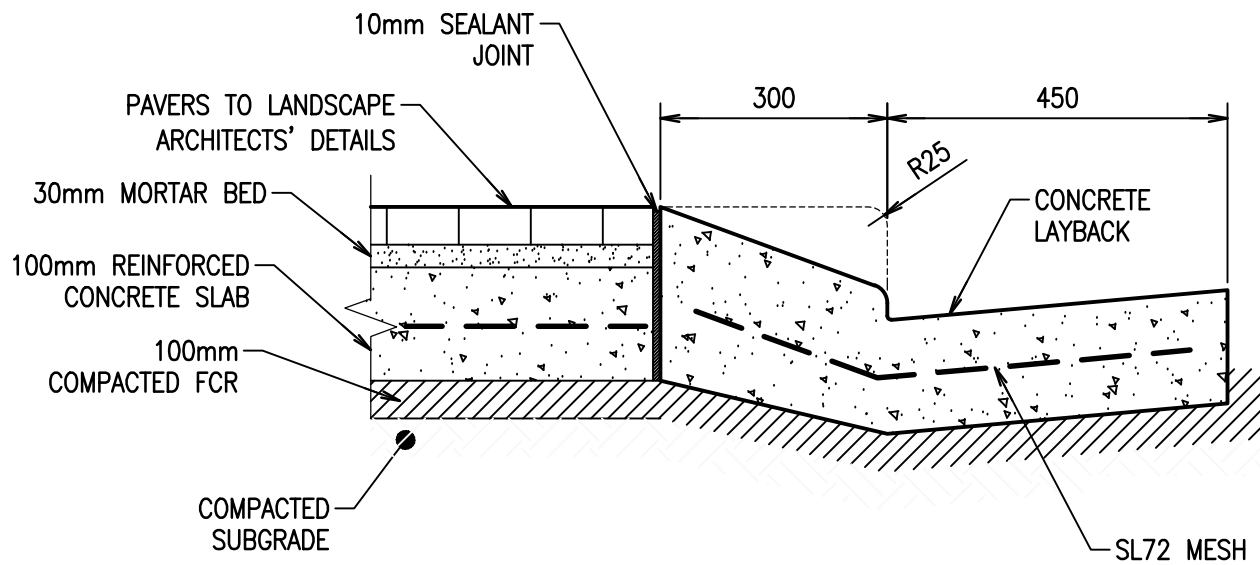
KERB AND GUTTER (K&G)
SCALE 1:10



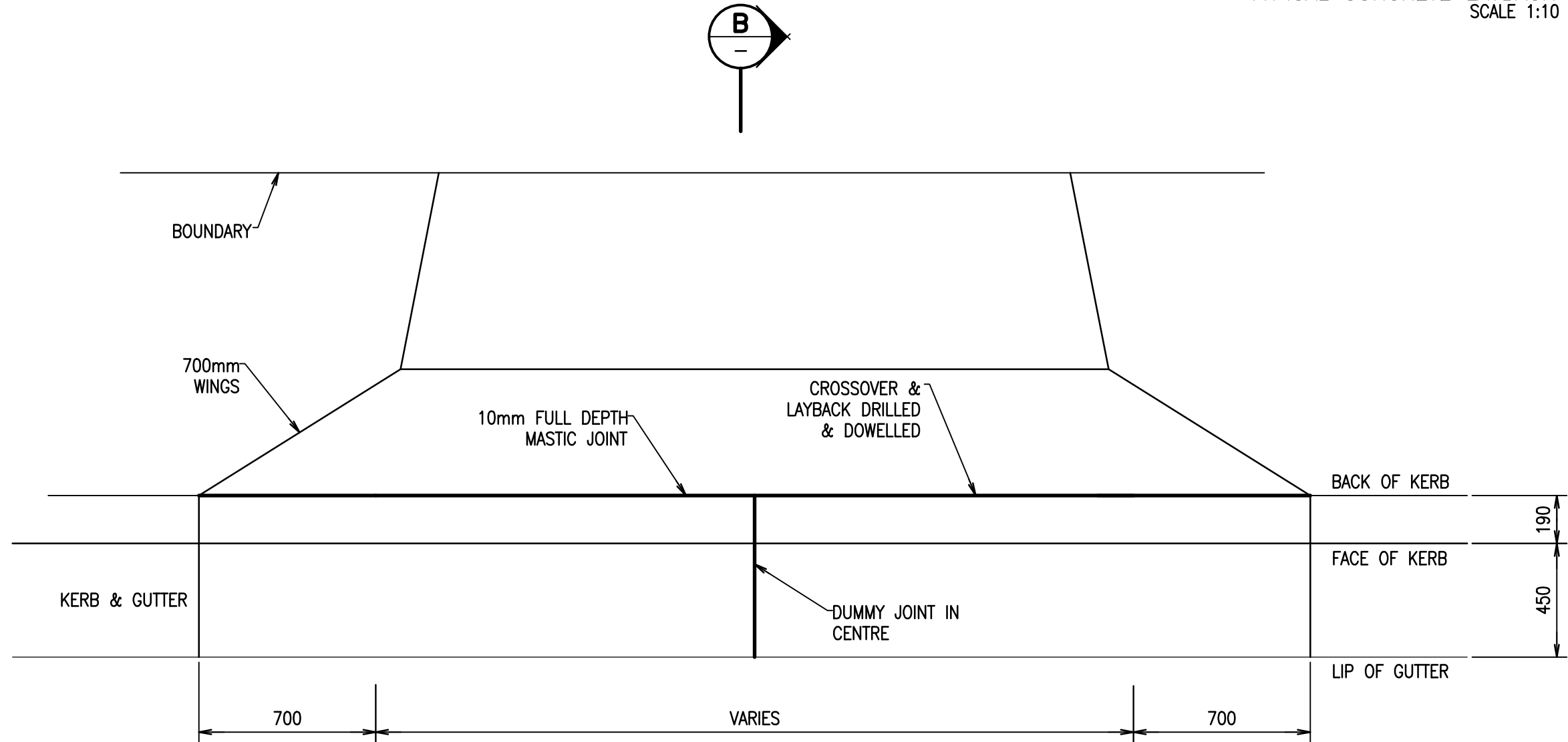
TYPICAL WIDE CONCRETE KERB ONLY (KO)
SCALE 1:10



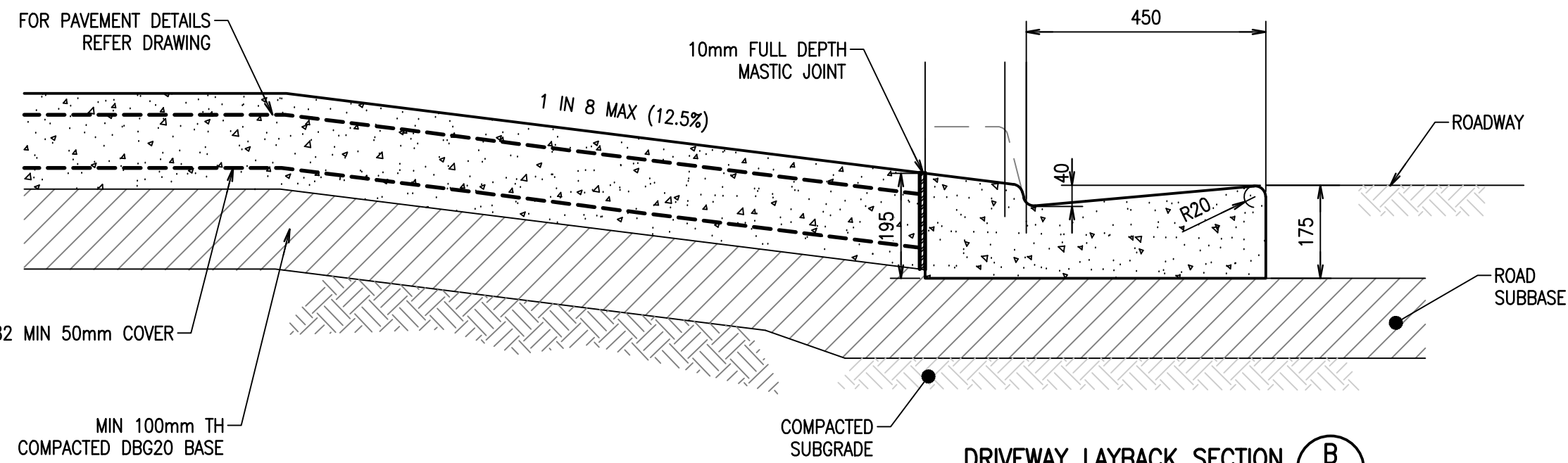
REINFORCED DISH CROSSING (DD)
SCALE 1:10



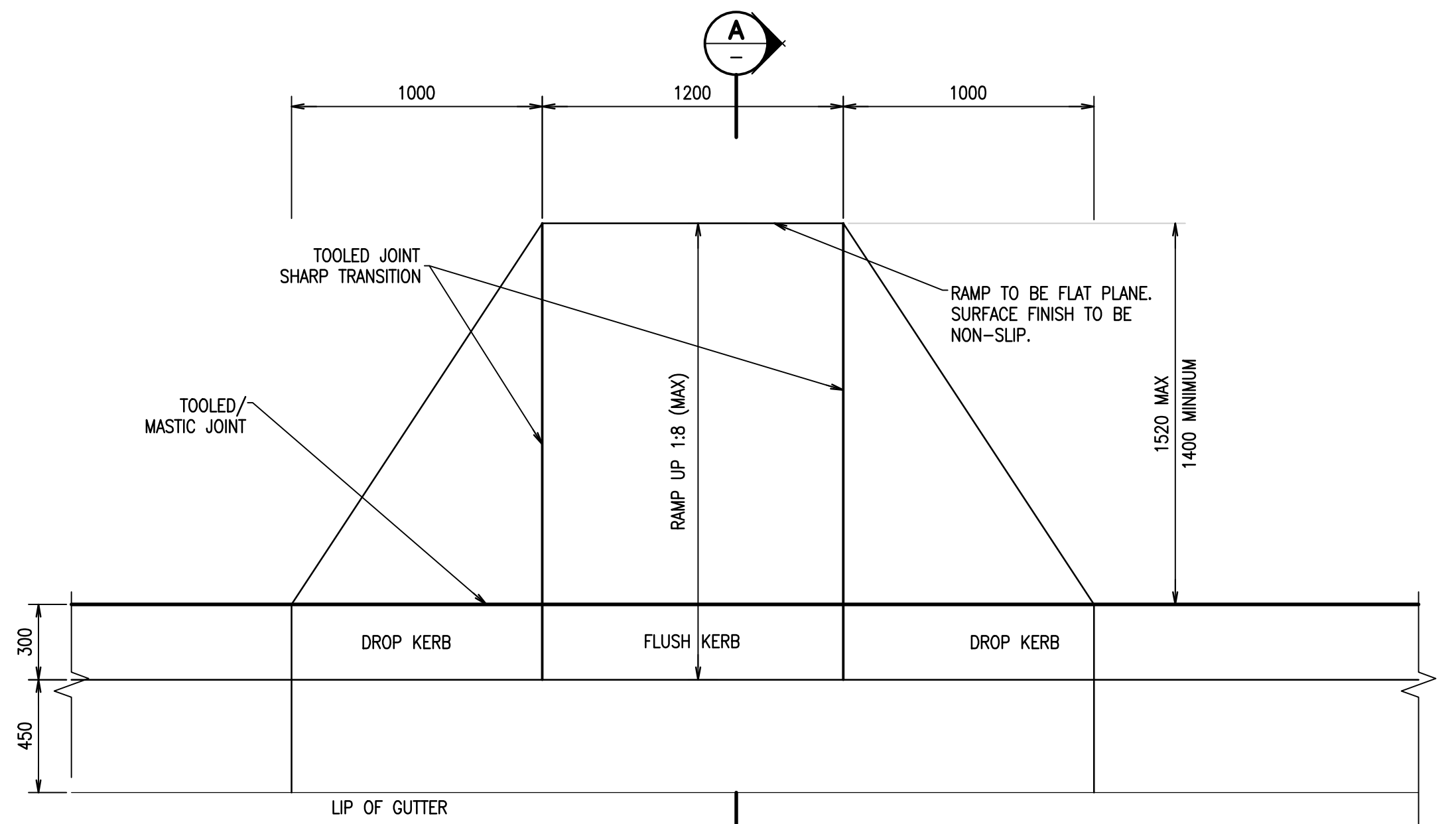
TYPICAL CONCRETE LAYBACK TO PAVING SECTION
SCALE 1:10



VEHICULAR CROSSING PLAN
SCALE 1:20



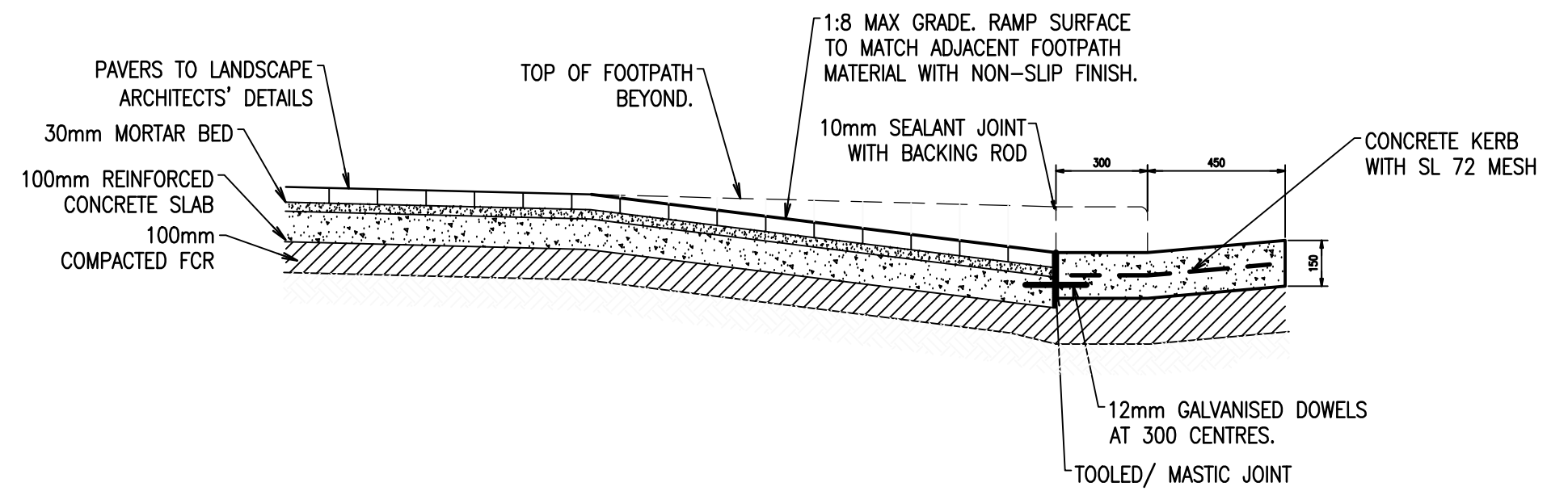
DRIVEWAY LAYBACK SECTION
SCALE 1:10



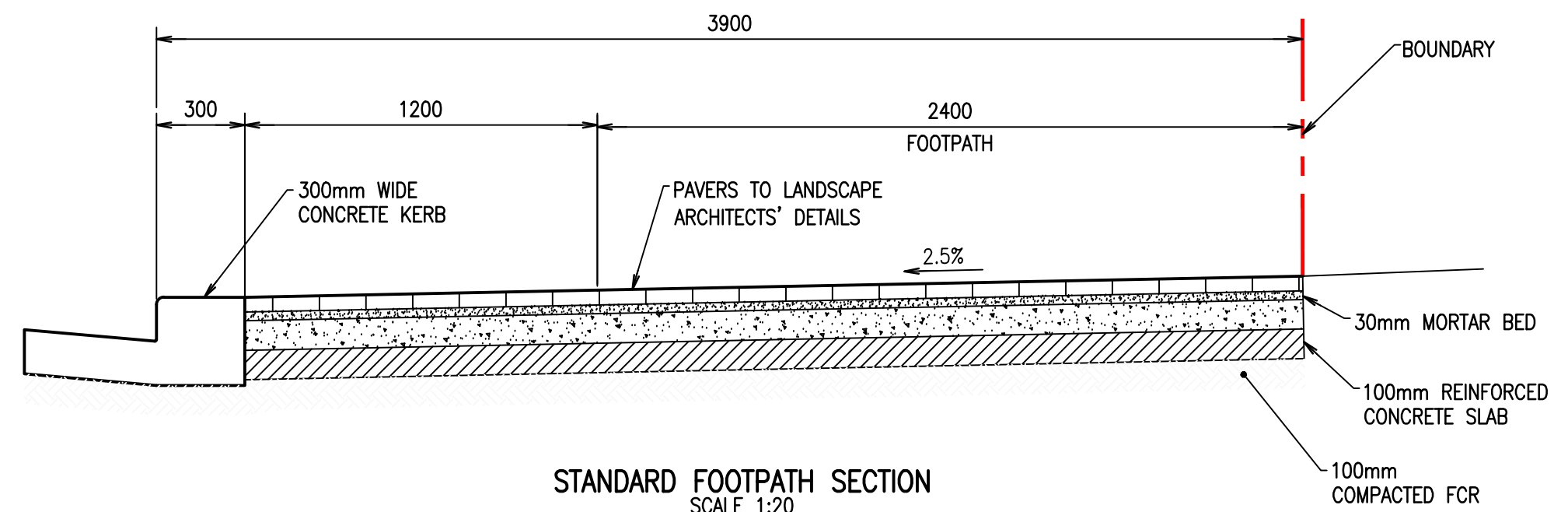
KERB RAMP PLAN
SCALE 1:20

NOTE:
PRAM RAMPS HAVE NO LIP AT INVERT OF GUTTER

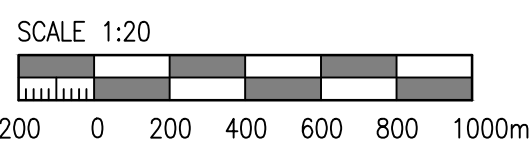
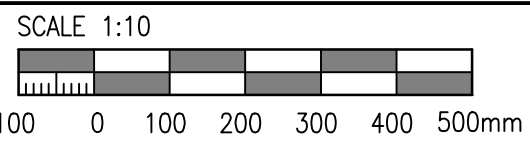
- NOTES:
1. KERB RAMP DETAILS ARE BASED ON AS 1428.1 – "DESIGN FOR ACCESS AND MOBILITY".
 2. CONCRETE TO BE 25MPa (F'c) AT 28 DAYS
 3. KERB RAMP TO BE DOWELLED INTO BACK OF KERB
 4. ALL DIMENSIONS ARE IN MILLIMETRES
 5. SHARP TRANSITIONS ARE CRITICAL IN GUIDING PEDESTRIANS WITH VISION IMPAIRMENTS.



KERB RAMP SECTION
SCALE 1:20



STANDARD FOOTPATH SECTION
SCALE 1:20



Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
2	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
6	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
7	ISSUED FOR APPROVAL	RG	CW	05.10.21

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
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5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
6	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
7	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 246



Client

Title
CIVIL DETAILS

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
24.02.20

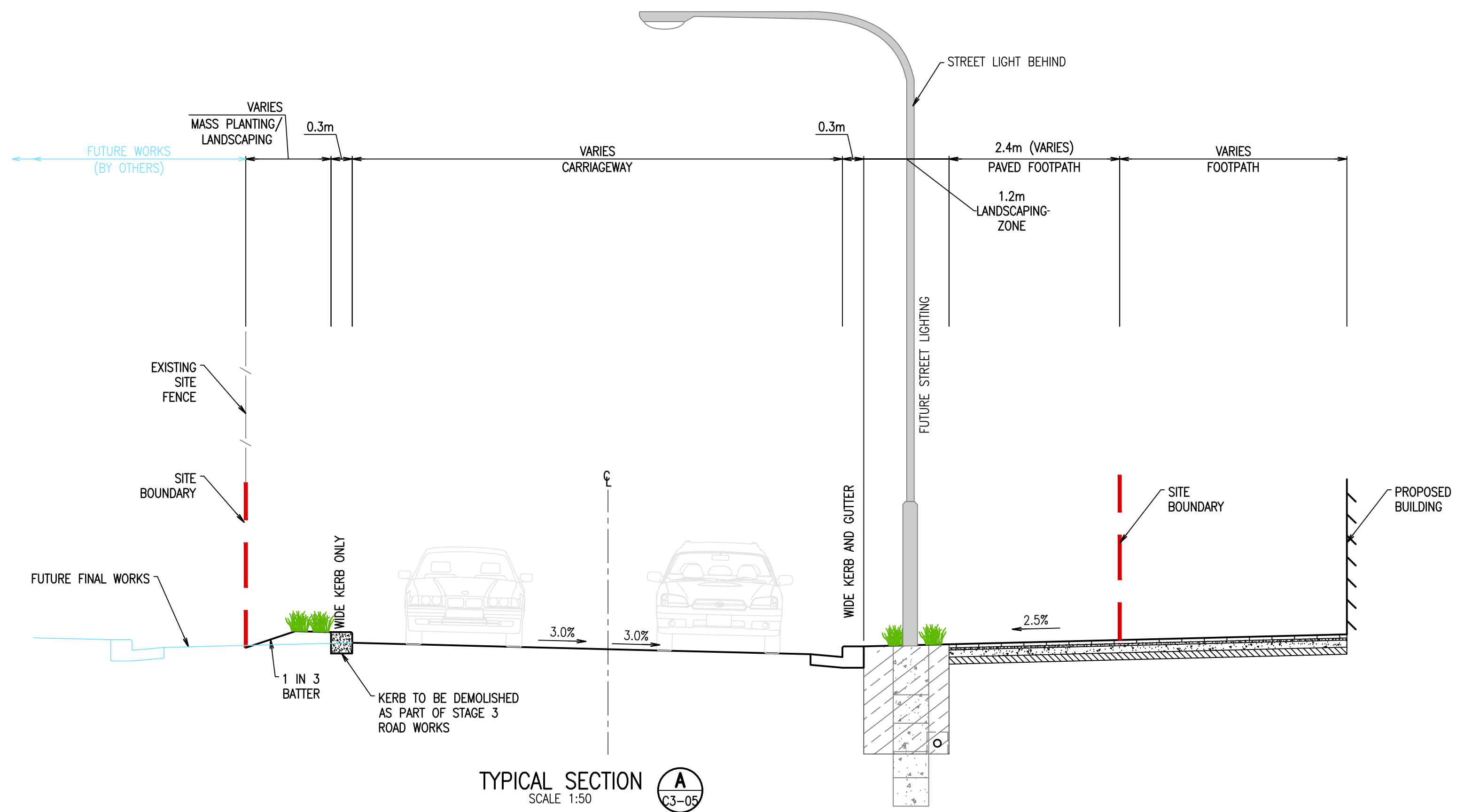
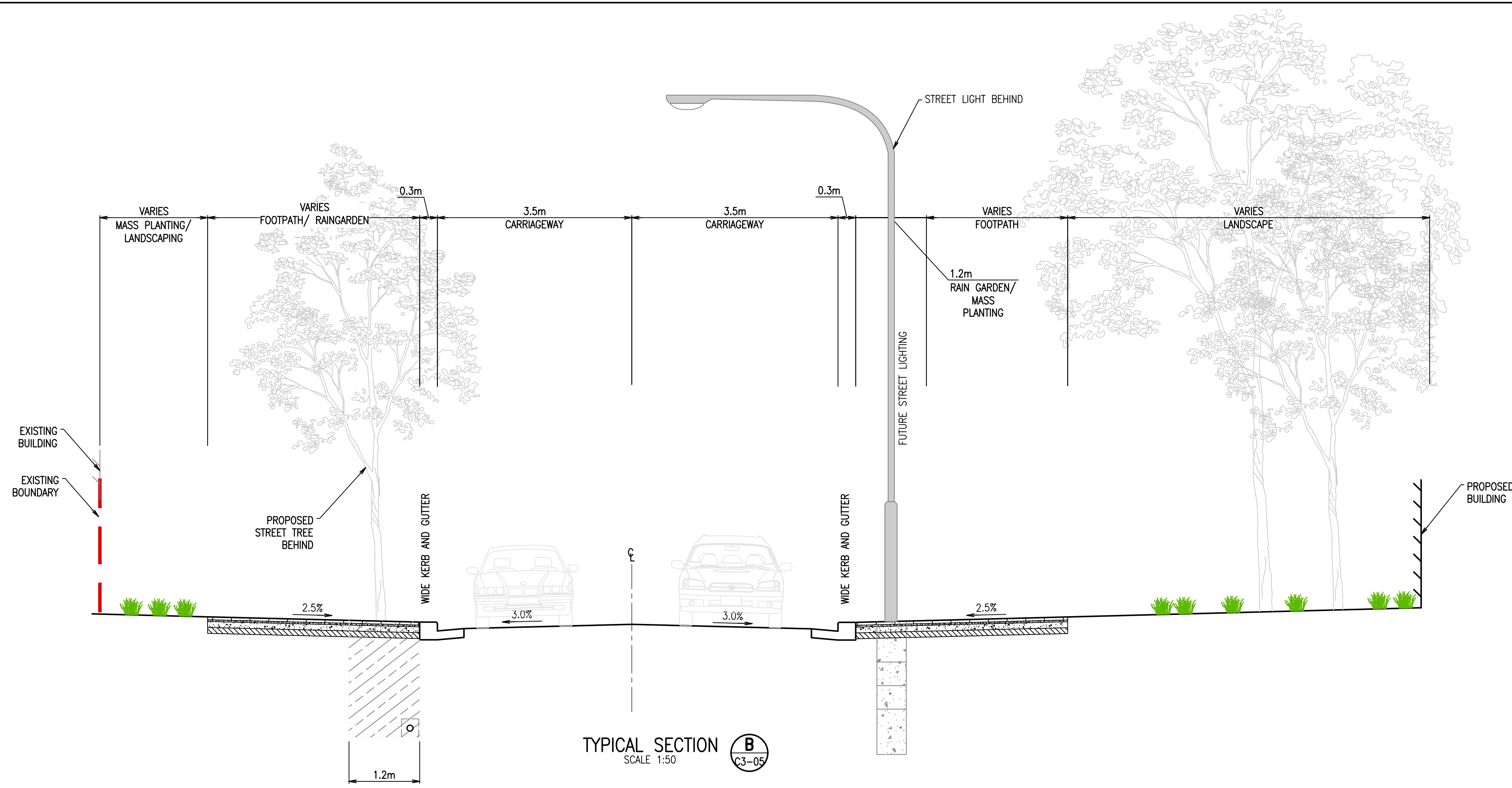
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Design Checker
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Approved
C.WAITE
Job Number
17665C

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Drawing Number
C3-10

Revision
7



Rev	Revision Description	By	App	Date
1	ISSUED FOR PRELIMINARY COORDINATION	SM	CW	06.03.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
3	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
7	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
8	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	06.05.19
9	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	02.03.20
10	ISSUED FOR APPROVAL	RG	CW	05.10.21

Rev	Revision Description	By	App	Date
1	ISSUED FOR PRELIMINARY COORDINATION	SM	CW	06.03.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
3	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
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5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
7	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
8	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	06.05.19
9	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	02.03.20
10	ISSUED FOR APPROVAL	RG	CW	05.10.21

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Client

TOGA

Title
**TYPICAL ROAD CROSS SECTIONS -
SHEET 1 OF 2**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

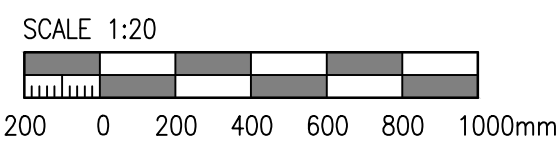
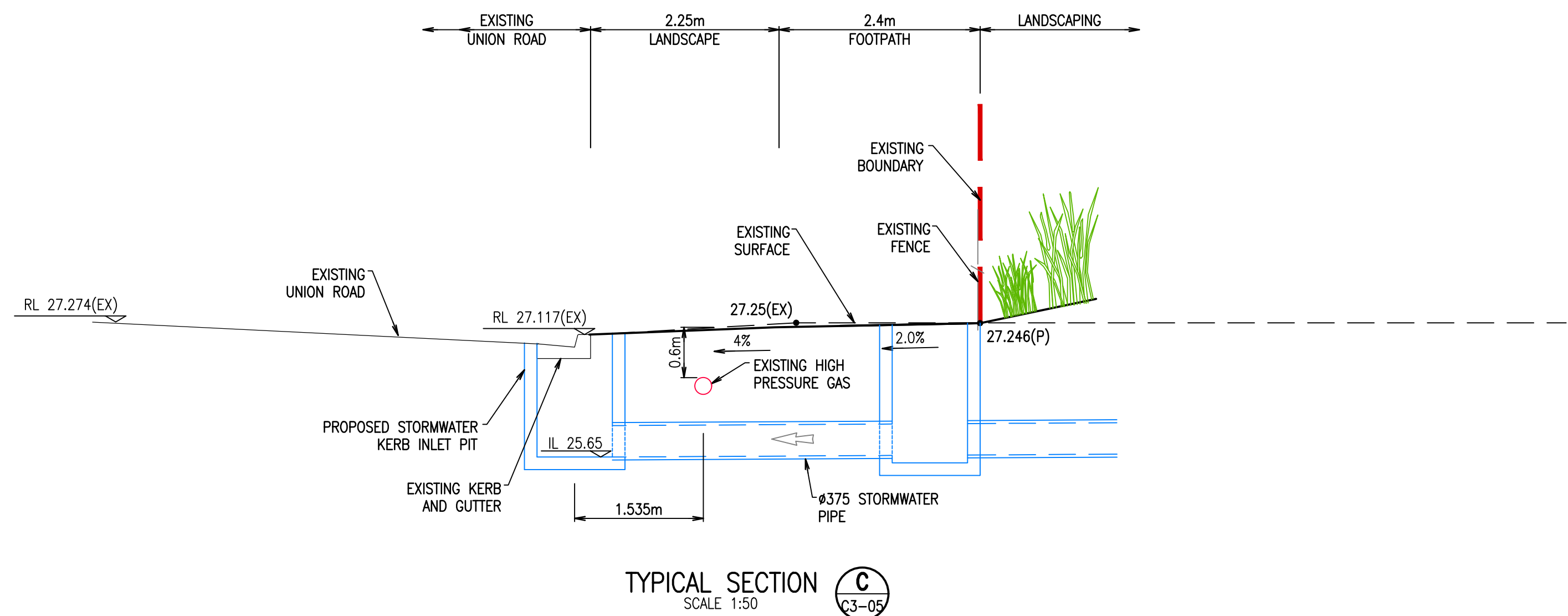
Drawn
S.MANANDHAR
Designer
R.ATHERTON

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

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Drawing Number
C3-15

Revision
10



Rev	Revision Description	By	App	Date
1	ISSUED FOR PRELIMINARY COORDINATION	SM	CW	06.03.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
3	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
8	ISSUED FOR APPROVAL	RG	CW	05.10.21

Rev	Revision Description	By	App	Date
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3	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
8	ISSUED FOR APPROVAL	RG	CW	05.10.21

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Title
**TYPICAL ROAD CROSS SECTIONS -
SHEET 2 OF 2**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

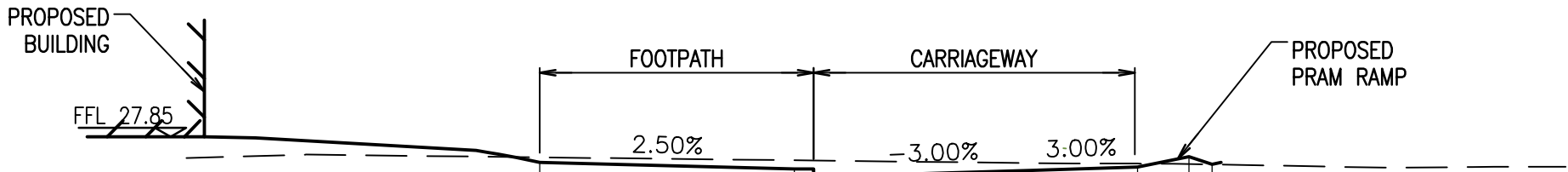
Drawn
S.MANANDHAR
Designer
R.ATHERTON

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

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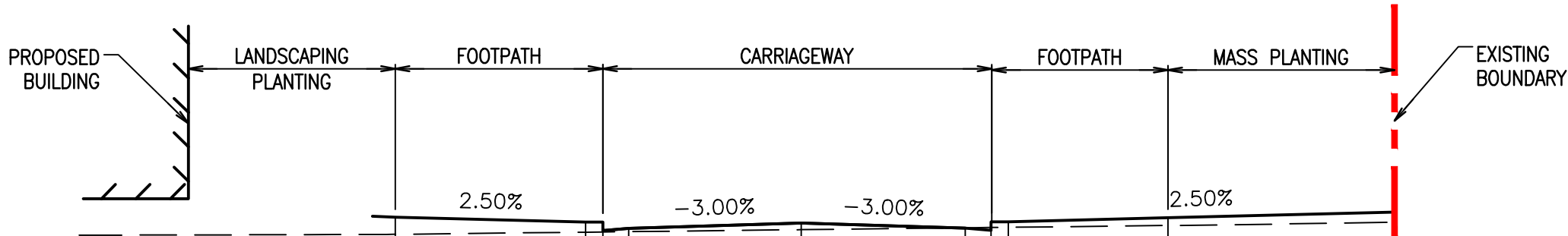
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Revision
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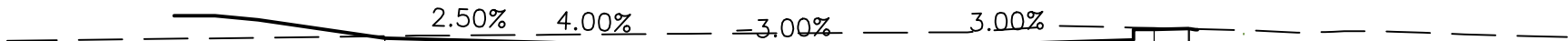
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EXISTING SURFACE					
OFFSETS					

CHAINAGE 120.000



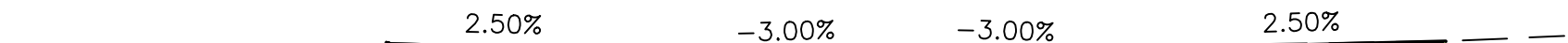
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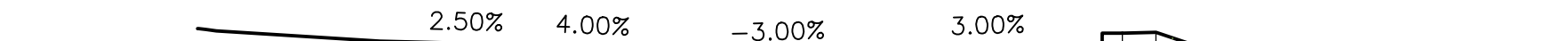
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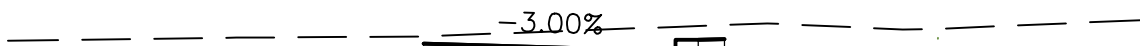
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EXISTING SURFACE					
OFFSETS					

CHAINAGE 20.000



DATUM R.L. 26.00					
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EXISTING SURFACE					
OFFSETS					

CHAINAGE 80.000



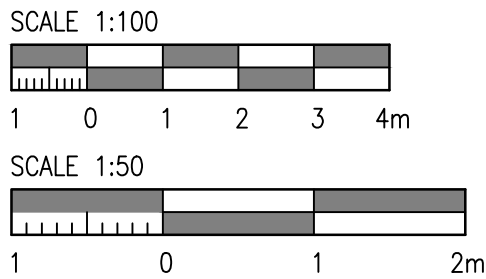
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OFFSETS					

CHAINAGE 9.394



DATUM R.L. 26.00					
DESIGN HEIGHT					
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EXISTING SURFACE					
OFFSETS					

CHAINAGE 60.000



Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
5	ISSUED FOR DEVELOPMENT APPLICATION	RC	CR	21.02.20
6	ISSUED FOR APPROVAL	RC	CW	05.10.21

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
5	ISSUED FOR DEVELOPMENT APPLICATION	RC	CR	21.02.20
6	ISSUED FOR APPROVAL	RC	CW	05.10.21

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ACN 010 580 248



Client

Title
**ROADWAY CROSS SECTIONS –
SHEET 1**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
13.02.20

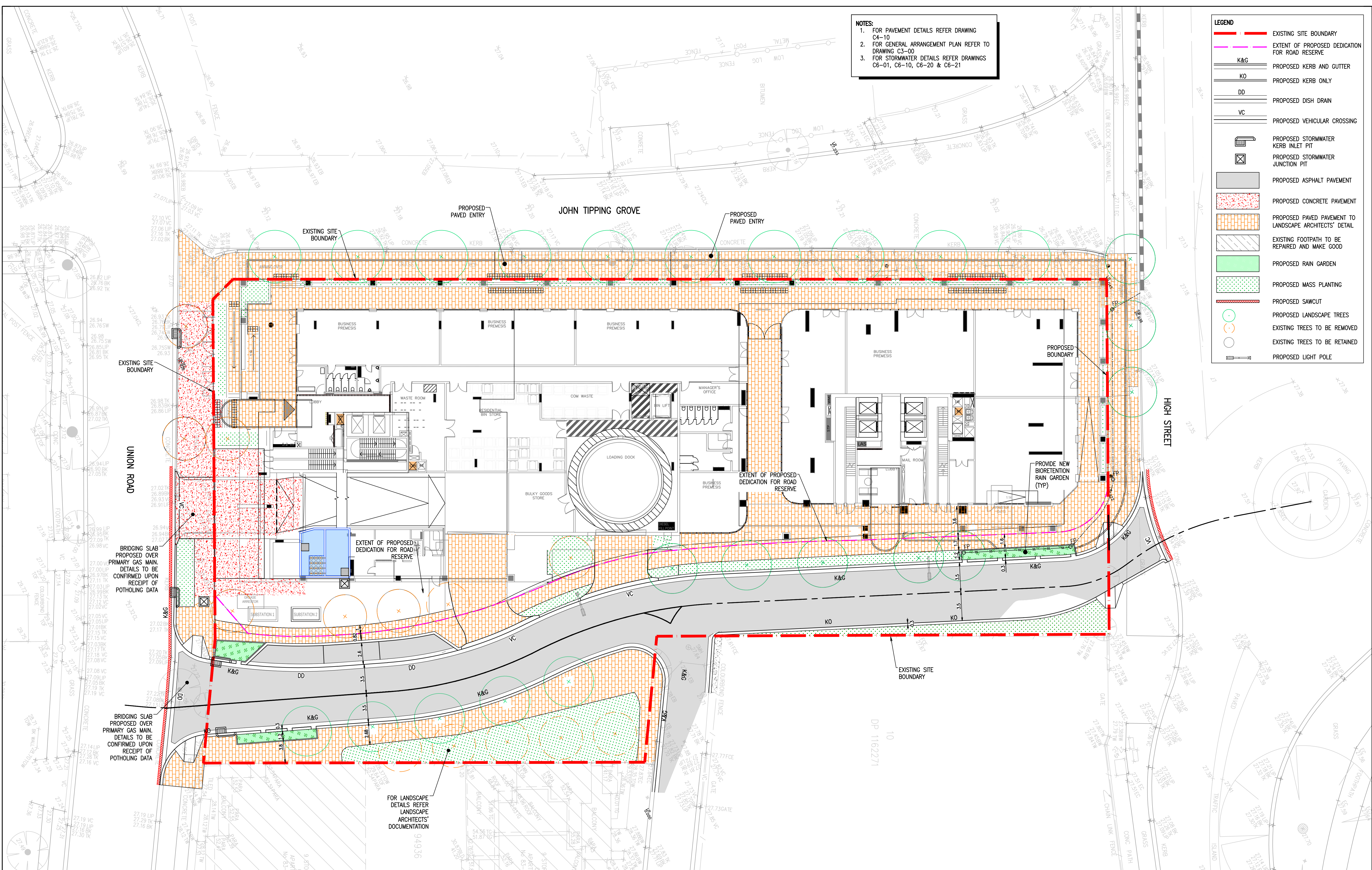
Drawn
S.MANANDHAR
Designer
C.WAITE

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C3-40

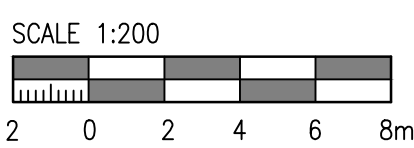
Revision
6



NOTES:
1. FOR PAVEMENT DETAILS REFER DRAWING C4-10
2. FOR GENERAL ARRANGEMENT PLAN REFER TO DRAWING C3-00
3. FOR STORMWATER DETAILS REFER DRAWINGS C6-01, C6-10, C6-20 & C6-21

LEGEND

- EXISTING SITE BOUNDARY
- EXTENT OF PROPOSED DEDICATION FOR ROAD RESERVE
- K&G PROPOSED KERB AND GUTTER
- KO PROPOSED KERB ONLY
- DD PROPOSED DISH DRAIN
- VC PROPOSED VEHICULAR CROSSING
- PROPOSED STORMWATER KERB INLET PIT
- PROPOSED STORMWATER JUNCTION PIT
- PROPOSED ASPHALT PAVEMENT
- PROPOSED CONCRETE PAVEMENT
- PROPOSED PAVED PAVEMENT TO LANDSCAPE ARCHITECTS' DETAIL
- EXISTING FOOTPATH TO BE REPAIRED AND MAKE GOOD
- PROPOSED RAIN GARDEN
- PROPOSED MASS PLANTING
- PROPOSED SAWCUT
- PROPOSED LANDSCAPE TREES
- EXISTING TREES TO BE REMOVED
- EXISTING TREES TO BE RETAINED
- PROPOSED LIGHT POLE



Rev	Revision Description	By	App	Date
1	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
7	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
8	ISSUED FOR DEVELOPMENT APPLICATION	MC	CW	21.02.20
9	ISSUED FOR APPROVAL	RG	CW	05.10.21

Rev	Revision Description	By	App	Date
1	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
7	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
8	ISSUED FOR DEVELOPMENT APPLICATION	MC	CW	21.02.20
9	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 248

Client

TOGA

Title
PAVEMENT LAYOUT PLAN

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

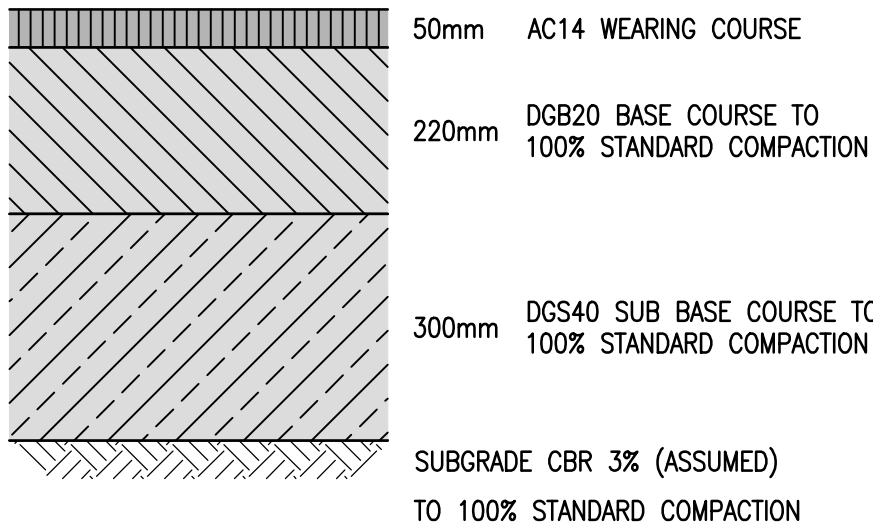
Drawn
S.MANANDHAR
Designer
Z.JONES

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

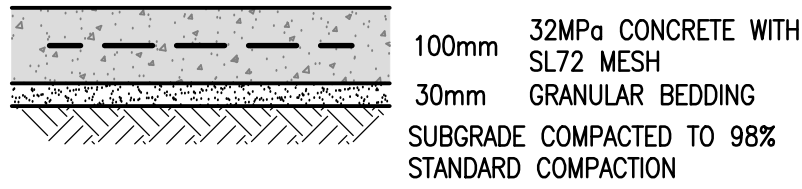
Drawing Number
C4-01

Revision
9

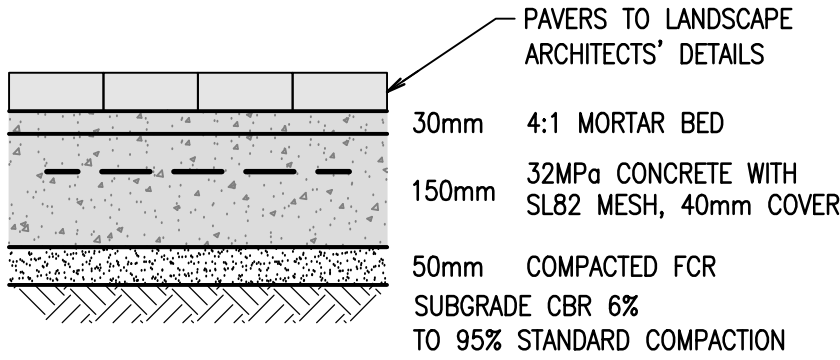


FULL ROAD DEPTH
ASPHALT PAVEMENT
SCALE 1:10

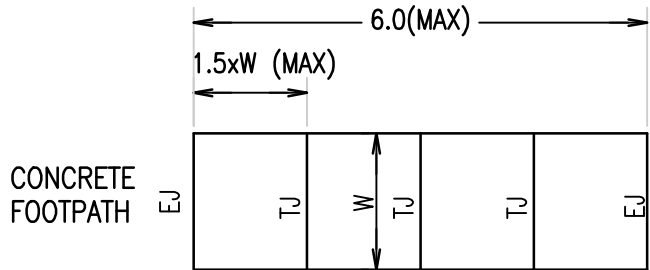
NOTE:
ESAs = 5X10⁵
DESIGN LIFE = 20YRS



CONCRETE FOOTPATH PAVEMENT
TYPICAL DETAIL
SCALE 1:10

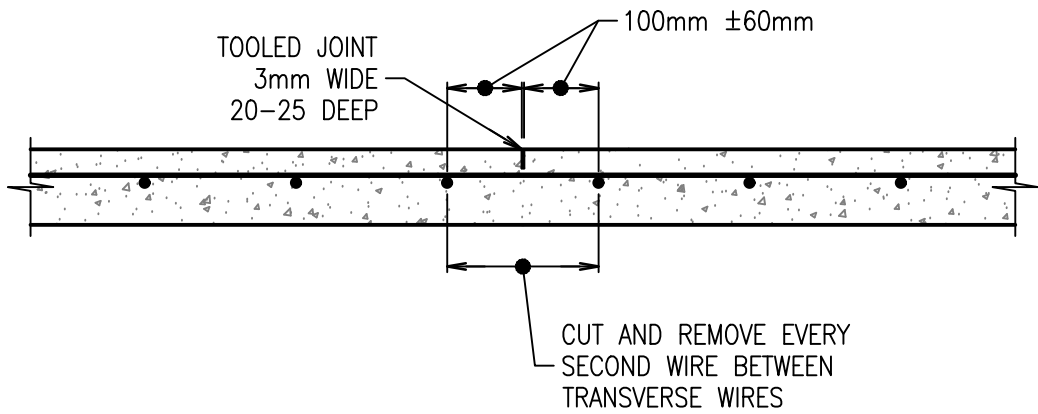


PAVED CONCRETE FOOTPATH PAVEMENT
TYPICAL DETAIL
SCALE 1:10

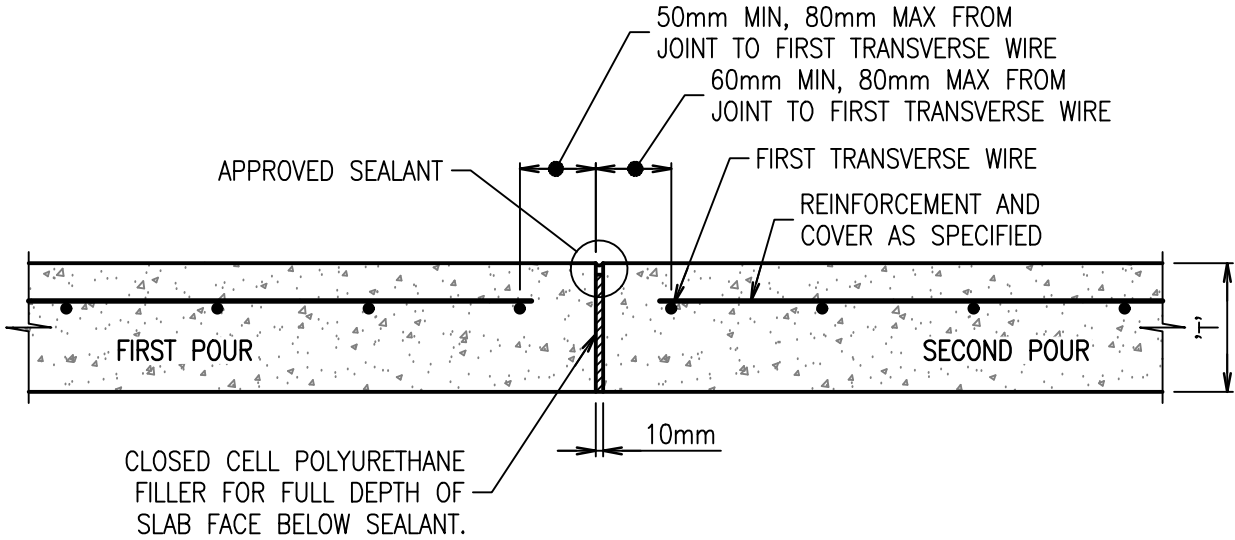


TJ: TROWELLED JOINT
EJ: EXPANSION JOINT

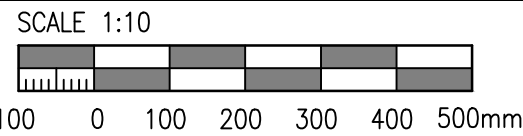
TYPICAL FOOTPATH JOINTING
NTS



TOOLED JOINT (TJ) DETAIL
SCALE 1:10



EXPANSION JOINT (EJ) DETAIL
SCALE 1:10



Rev	Revision Description	By	App	Date
1	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
5	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
6	ISSUED FOR APPROVAL	RG	CW	05.10.21

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1	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
5	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
6	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 248



Title
PAVEMENT DETAILS

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
06.05.19

Drawn
S.MANANDHAR
Designer
R.ATHERTON

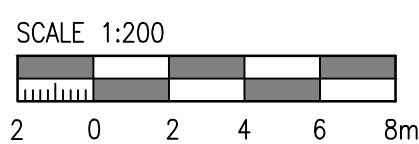
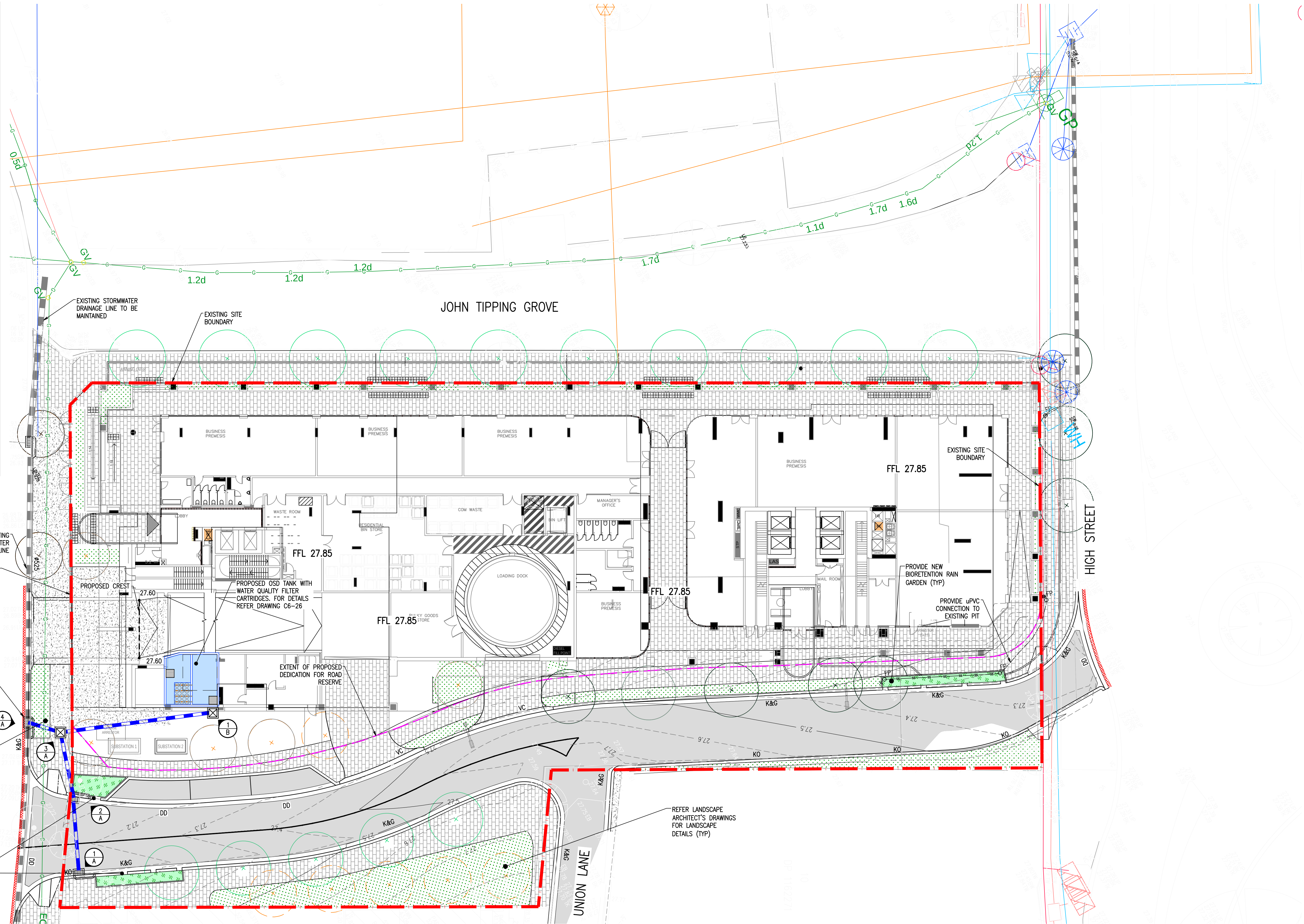
Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C4-10

Revision
6

- LEGEND**
- EXISTING SITE BOUNDARY
 - EXTENT OF PROPOSED DEDICATION FOR ROAD RESERVE
 - PROPOSED ROAD CENTRELINE
 - PROPOSED KERB AND GUTTER
 - PROPOSED KERB ONLY
 - PROPOSED DISH DRAIN
 - PROPOSED VEHICULAR CROSSING
 - PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - PROPOSED STORMWATER PIPE
 - EXISTING STORMWATER PIPE
 - PROPOSED STORMWATER KERB INLET PIT
 - PROPOSED STORMWATER JUNCTION PIT
 - PROPOSED STORMWATER PIPE DIAMETER
 - PROPOSED ASPHALT PAVEMENT
 - PROPOSED CONCRETE PAVEMENT
 - PROPOSED PAVED PAVEMENT TO LANDSCAPE ARCHITECTS' DETAIL
 - EXISTING FOOTPATH TO BE REPAIRED AND MAKE GOOD
 - PROPOSED RAIN GARDEN
 - PROPOSED MASS PLANTING
 - PROPOSED SAWCUT
 - PROPOSED LANDSCAPE TREES
 - EXISTING TREES TO BE REMOVED
 - EXISTING TREES TO BE RETAINED
 - PROPOSED FINISHED FLOOR LEVEL
 - PROPOSED SPOT LEVEL



Rev	Revision Description	By	App	Date
1	PRELIMINARY ISSUE FOR OSD REVIEW	RA	CW	06.03.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
3	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	04.06.18
7	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
8	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
9	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
10	ISSUED FOR DEVELOPMENT APPLICATION	MC	CW	21.02.20

Rev	Revision Description	By	App	Date
11	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 248



Client

Title
STORMWATER MANAGEMENT PLAN

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

Drawn
M.CLAVEL
Designer
Z.JONES

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

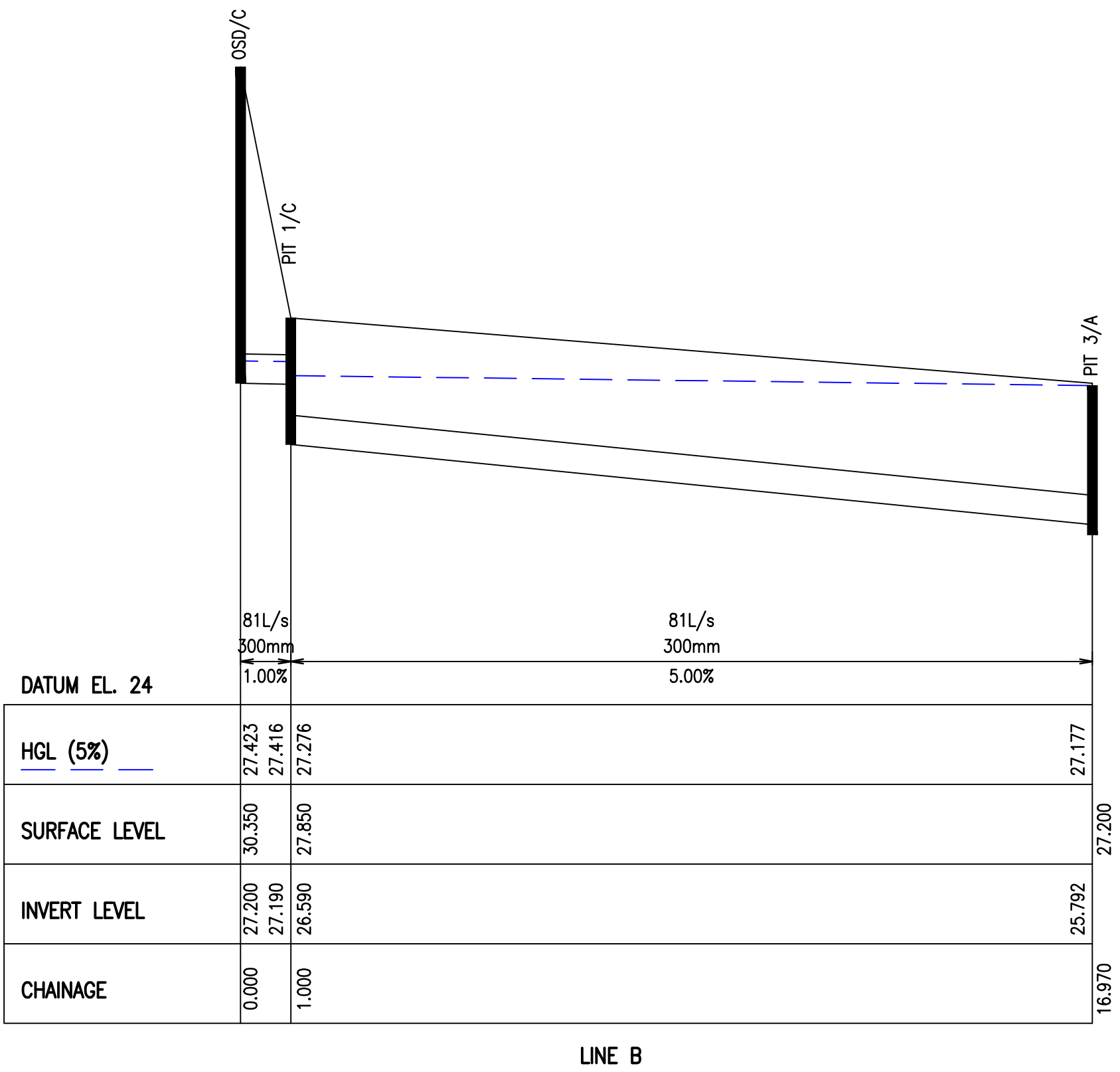
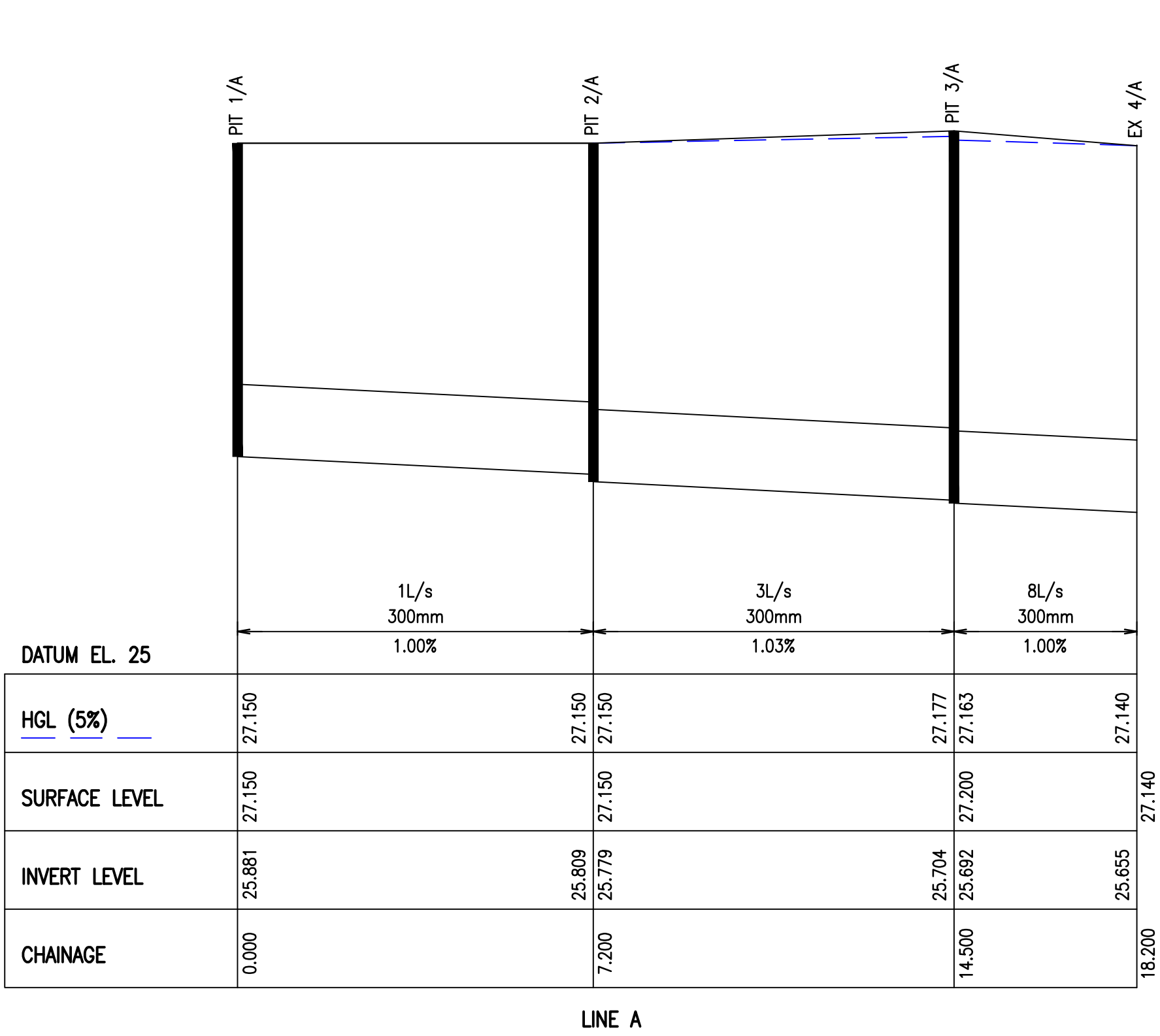
Drawing Number
C6-01

Revision
11

MINIMUM INTERNAL DIMENSIONS FOR
STORMWATER AND INLET PITS

DEPTH TO INVERT OF OUTLET	MINIMUM INTERNAL DIMENSIONS (mm)	
	RECTANGULAR	
	WIDTH	LENGTH
≤600	450	450
>600 ≤900	600	600
>900 ≤1200	600	900
>1200	900	900

- NOTES:
- PIT DEPTHS > 1200 REQUIRE STEP IRONS.
 - PIPE SUPPORT HS3 TYPE IN ACCORDANCE WITH AS3725.
 - ALL PIPES TO BE RCP UNLESS NOTED OTHERWISE.
 - ALL RCP PIPE CLASSES AS NOTED IN BRACKETS ON THE LONGSECTION.
 - MINIMUM COVER OF 400mm DURING CONSTRUCTION.
 - ALL COVERS TO BE IN ACCORDANCE WITH COUNCIL STANDARDS AND SPECIFICATION.



SCALE 1:100 HORIZONTAL

SCALE 1:20 VERTICAL

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	RA	CW	15.03.18
2	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	MC	CW	21.02.20
8	ISSUED FOR APPROVAL	RG	CW	05.10.21

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	RA	CW	15.03.18
2	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
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4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	18.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	MC	CW	21.02.20
8	ISSUED FOR APPROVAL	RG	CW	05.10.21

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TOGA

Title
**STORMWATER LONGSECTIONS –
SHEET 1 OF 2**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
21.02.20

Drawn
M.CLAVEL
Designer
M.CLAVEL

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

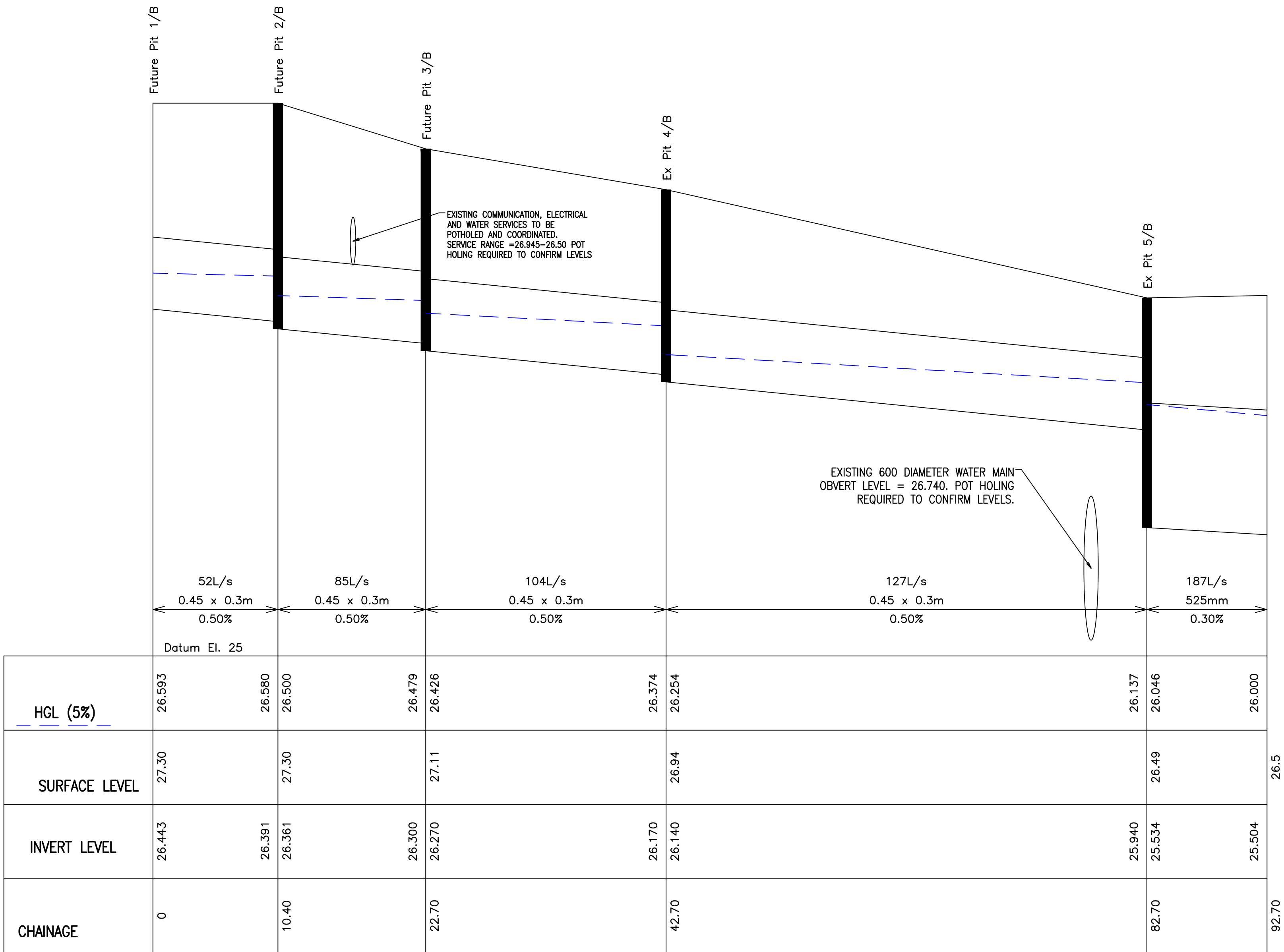
Drawing Number
C6-20

Revision
8

MINIMUM INTERNAL DIMENSIONS FOR
STORMWATER AND INLET PITS

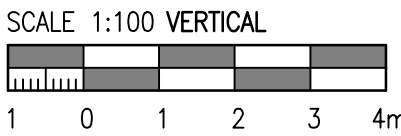
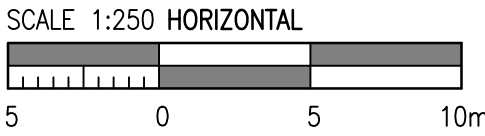
DEPTH TO INVERT OF OUTLET	MINIMUM INTERNAL DIMENSIONS (mm)	
	RECTANGULAR	
	WIDTH	LENGTH
≤600	450	450
>600 ≤900	600	600
>900 ≤1200	600	900
>1200	900	900

- NOTES:
- PIT DEPTHS > 1200 REQUIRE STEP IRONS.
 - PIPE SUPPORT HS3 TYPE IN ACCORDANCE WITH AS3725.
 - ALL PIPES TO BE RCP UNLESS NOTED OTHERWISE.
 - ALL RCP PIPE CLASSES AS NOTED IN BRACKETS ON THE LONGSECTION.
 - MINIMUM COVER OF 400mm DURING CONSTRUCTION.
 - ALL COVERS TO BE IN ACCORDANCE WITH COUNCIL STANDARDS AND SPECIFICATION.



LINE B

NOTE: LINE B IS TO BE CONSTRUCTED IN THE ULTIMATE STAGE 3 ROAD CASE



Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	ZJ	CR	18.06.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
4	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
5	ISSUED FOR APPROVAL	RG	CW	05.10.21

Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	ZJ	CR	18.06.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
4	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
5	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 248



Client

Title
**STORMWATER LONGSECTIONS –
ULTIMATE STAGE 3 DESIGN**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
21.02.20

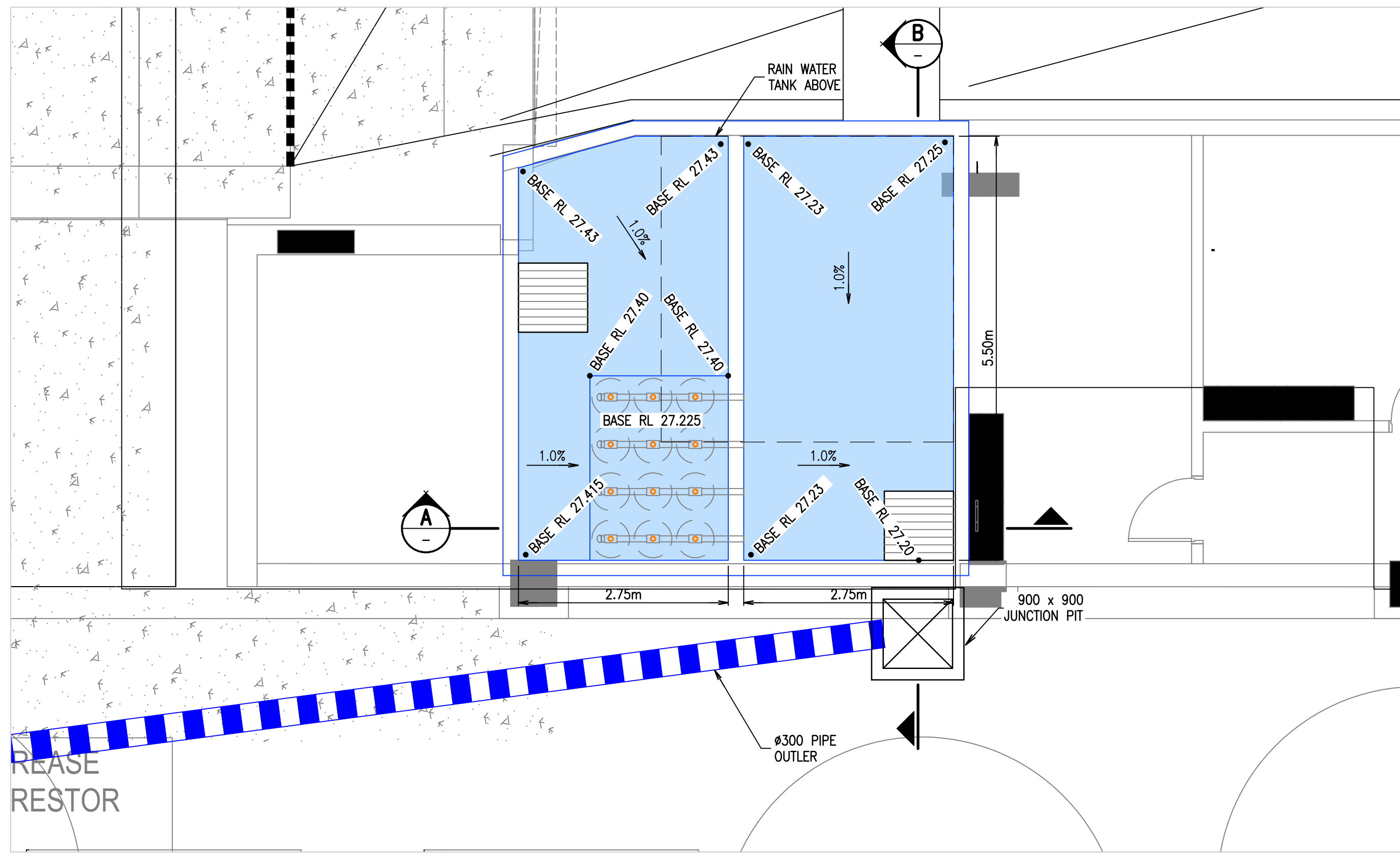
Drawn
S.MANADHAR
Designer
Z.JONES

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

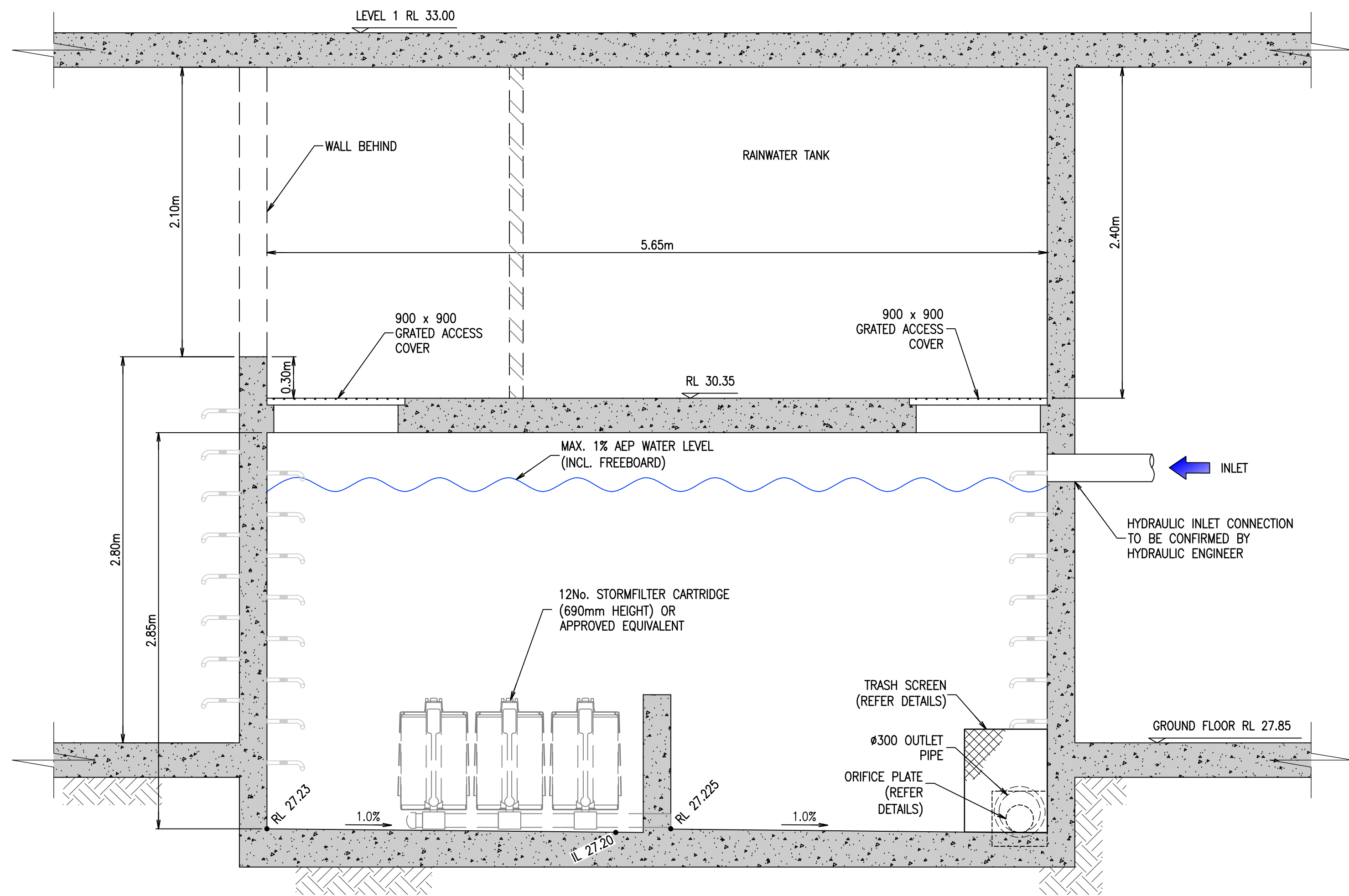
FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C6-22

Revision
5



ON SITE DETENTION TANK PLAN
SCALE 1:50



ON SITE DETENTION TANK SECTION
SCALE 1:25

DRILL 30mm DIA HOLE x 120mm DEEP AND EPOXY INTO WALL WITH EPOXY MORTAR EQUAL TO EPIREZ 633 (NON SAG) - IN PRECAST PITS, DEPTH OF EMBEDMENT IS TO BE IN ACCORDANCE WITH PIT MANUFACTURER'S DETAILS

SIDE ELEVATION

REFER NOTE

PLAN

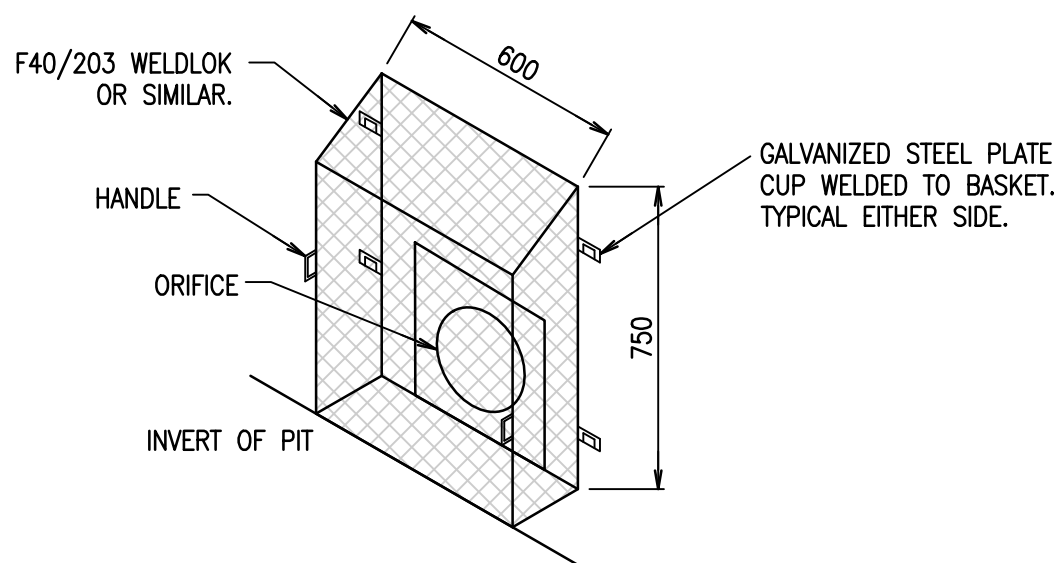
24 DIA GALVANISED MILD STEEL

FRONT ELEVATION

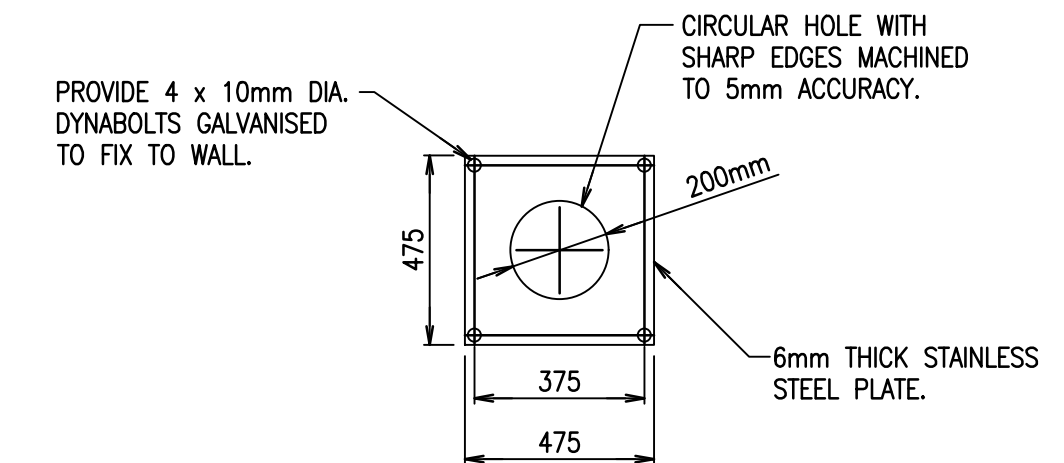
PIT STEP IRON DETAIL
SCALE 1:20

NOTES:

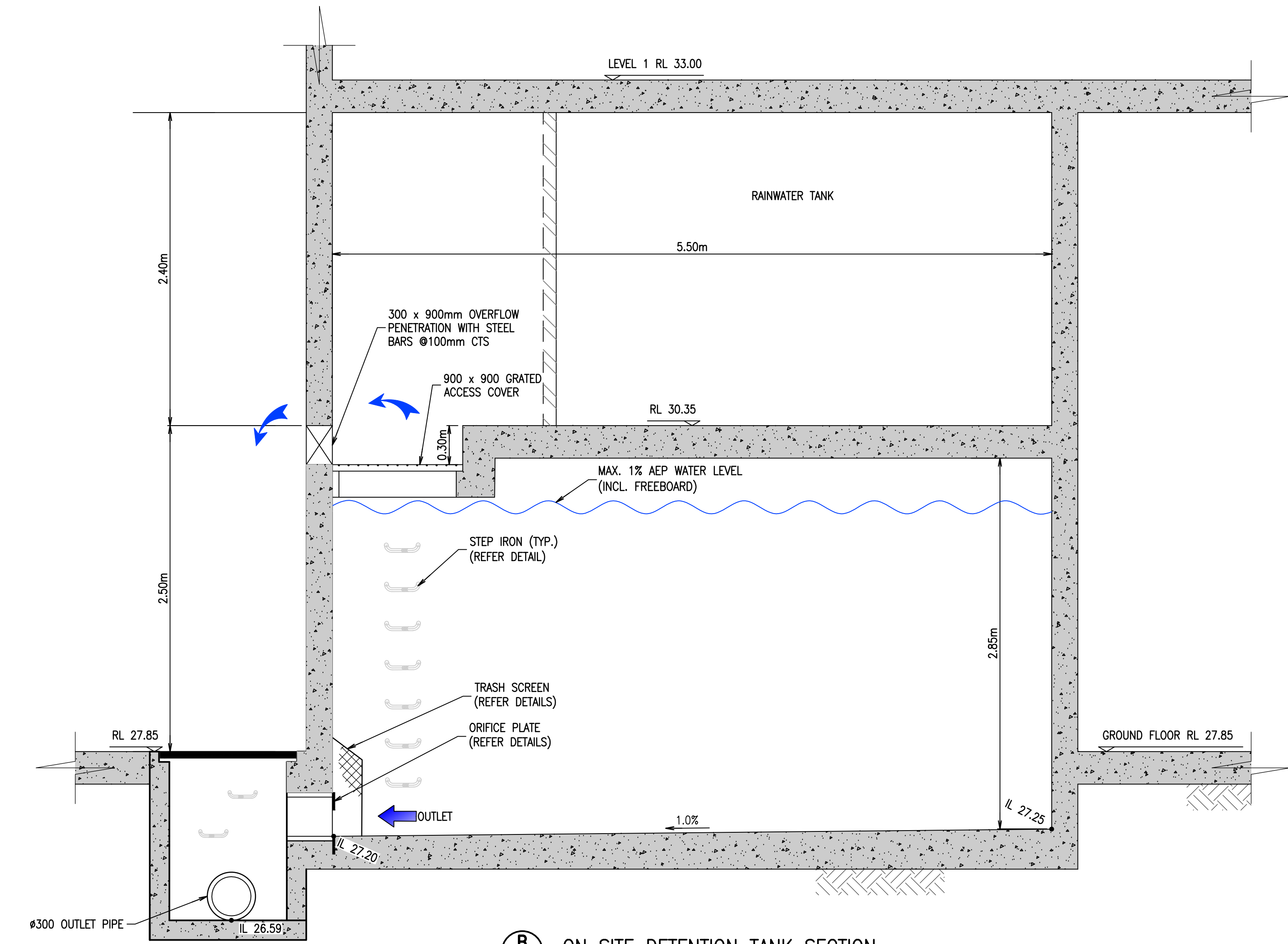
1. WHEN POSITIONED IN STRAIGHT ALIGNMENT, STEP TO BE 400 WIDE.
2. STAGGERED STEPS TO BE 200 WIDE, STEPS TO BE STAGGERED 200 CENTRE TO CENTRE FOR ALTERNATE STEPS.
3. SPACING OF STEPS TO BE UNIFORM TO WITHIN ± 8 mm IN EACH PIT.



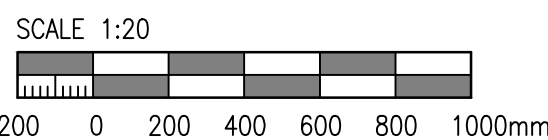
TRASH SCREEN DETAIL
SCALE 1:20



ORIFICE PLATE DETAIL
SCALE 1:20



ON SITE DETENTION TANK SECTION
SCALE 1:25



Rev	Revision Description	By	App	Date
1	ISSUED FOR PRELIMINARY COORDINATION	SM	CW	06.03.18
2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
3	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	MC	CR	21.02.20
8	ISSUED FOR APPROVAL	RC	CW	05.10.21

Rev	Revision Description	By	App	Date
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2	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
3	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
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8	ISSUED FOR APPROVAL	RC	CW	05.10.21

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ACN 010 580 248

TOGA

Title
**ON SITE DETENTION TANK TYPICAL
DETAILS**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
21.02.20

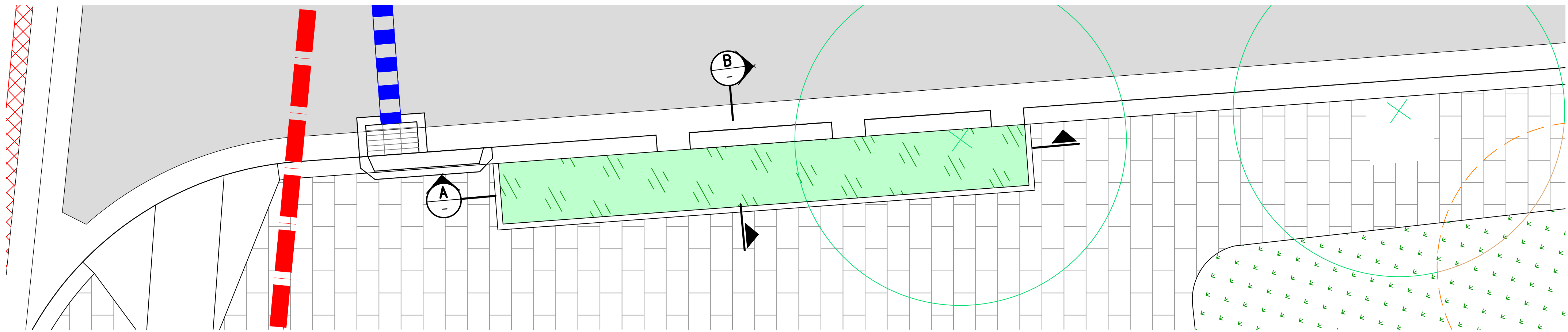
Drawn
M.CLAVEL
Designer
M.CLAVEL

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

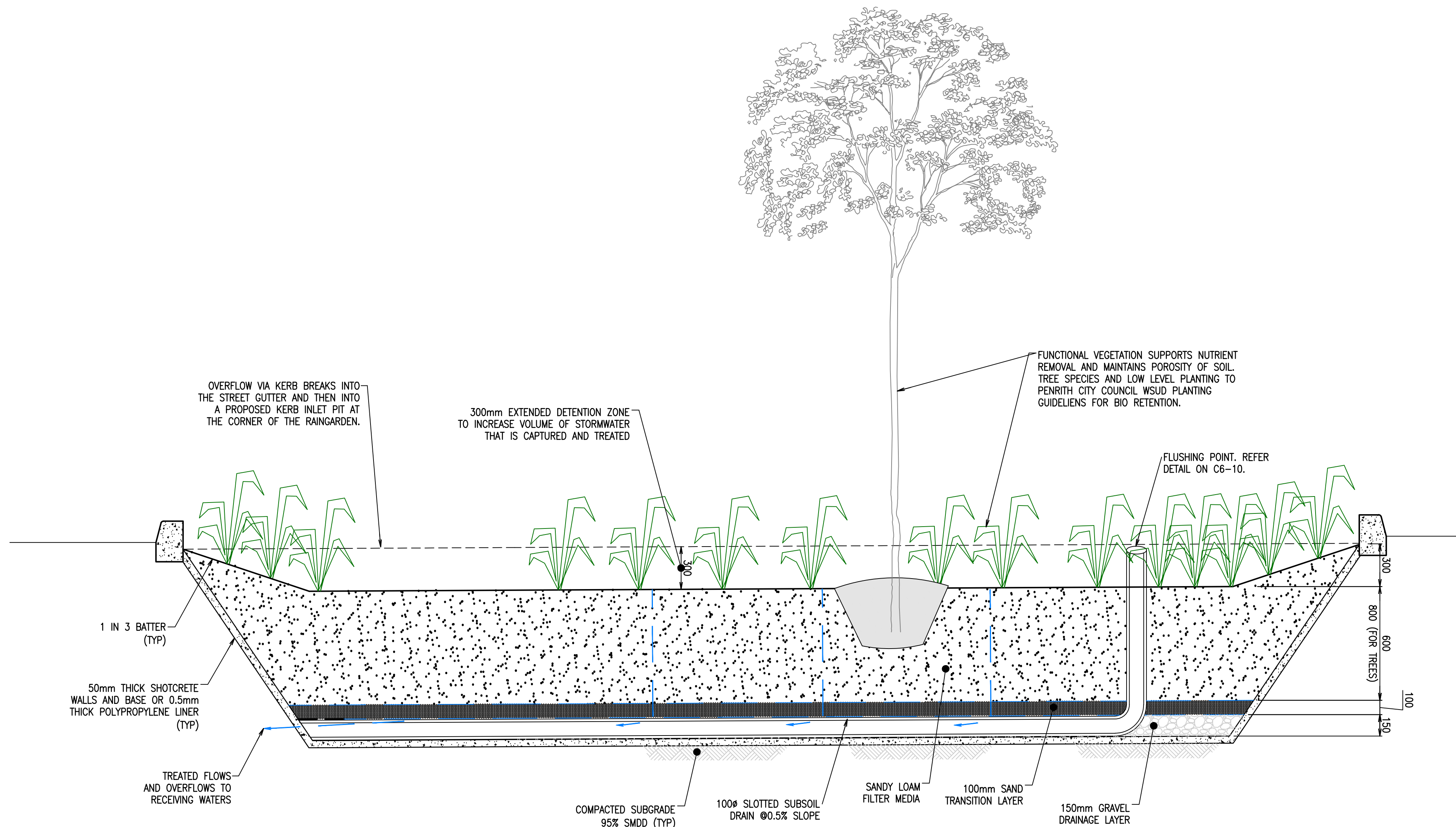
FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C6-26

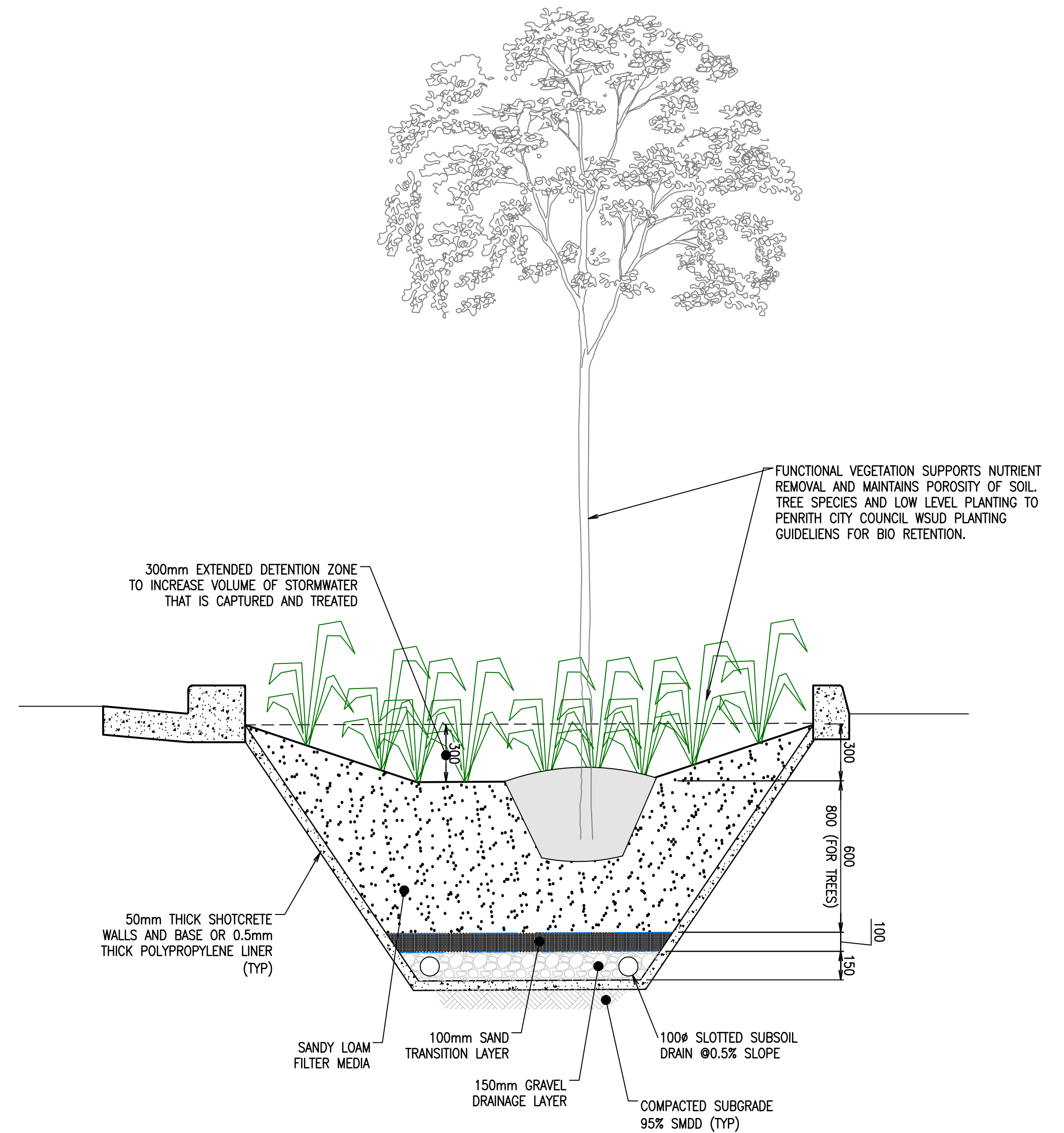
Revision
8



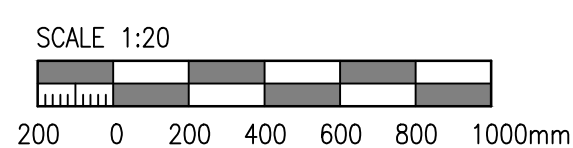
WSUD RAINGARDEN
PLAN VIEW
SCALE 1:50



BIORETENTION SYSTEM ARRANGEMENT
(WSUD TREATMENT DEVICE)
SCALE 1:20



BIORETENTION SYSTEM ARRANGEMENT
(WSUD TREATMENT DEVICE)
SCALE 1:20



Rev	Revision Description	By	App	Date
1	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	15.03.18
2	ISSUED FOR FINAL COORDINATION	SM	CW	23.05.18
3	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
6	ISSUED FOR DEVELOPMENT APPLICATION	RC	CR	21.02.20
7	ISSUED FOR APPROVAL	RC	CW	05.10.21

Rev	Revision Description	By	App	Date
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ACN 010 580 248



Client

Title
**BIORETENTION SYSTEM TYPICAL
ARRANGEMENT DETAILS**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
06.05.19

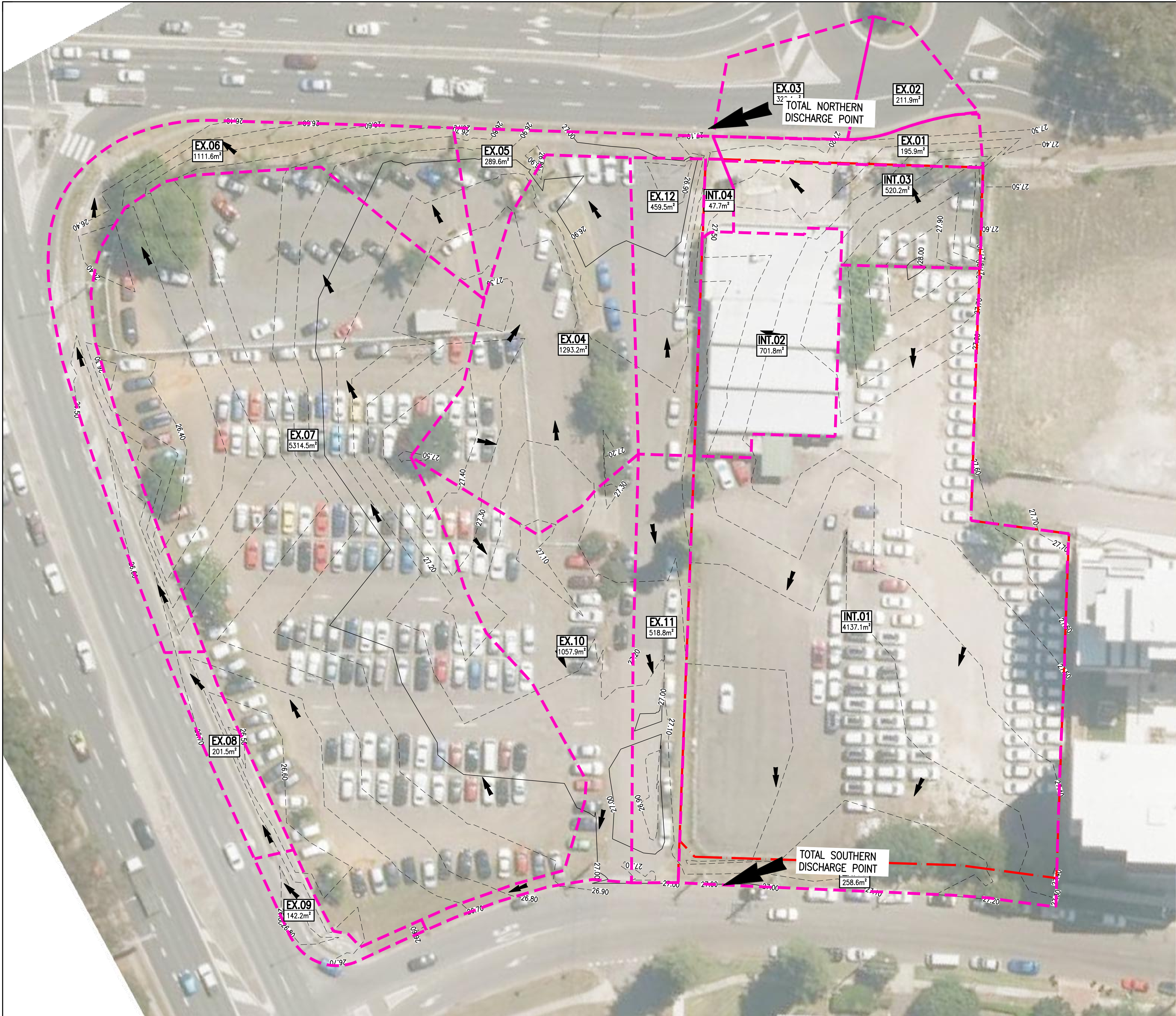
Drawn
S.MANANDHAR
Designer
Z.JONES

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

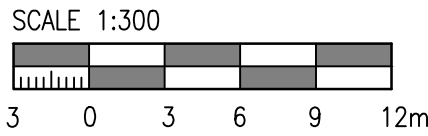
Drawing Number
C6-30

Revision
7



LEGEND	
	EXISTING SITE BOUNDARY
	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR
	EXISTING STORMWATER DRAINAGE PIT
	EXISTING CATCHMENT BOUNDARY
	EXISTING SURFACE FLOW RUNOFF
	CATCHMENT LABEL CATCHMENT AREA

PRE DEVELOPMENT CATCHMENT SUMMARY				
CATCHMENT	Area	% IMPERVIOUS	Discharge (l/s) 20% AEP	100% AEP
SOUTHERN DISCHARGE				
INT.01	4137.1	80	108.5	239.4
NORTHERN DISCHARGE				
INT.02	701.8	100	24.5	51.4
INT.03	47.7	80	1.3	2.8
INT.04	520.2	80	13.6	30.1
Total Northern Discharge			39.4	84.3



Rev	Revision Description	By	App	Date
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4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
8	ISSUED FOR APPROVAL	RG	CW	05.10.21

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5	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
7	ISSUED FOR DEVELOPMENT APPLICATION	RG	CR	21.02.20
8	ISSUED FOR APPROVAL	RG	CW	05.10.21

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ACN 010 580 248



Client

Title
**PRE-DEVELOPMENT CATCHMENT
PLAN**

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

Drawn
M.CLAVEL
Designer
R.ATHERTON

Design Checker
C.ROPE
Approved
C.WAITE
Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C6-51

Revision
8



LEGEND

EXISTING SITE BOUNDARY

DETAINED CATCHMENT AREA (AND DETAINED)

TREATED CATCHMENT AREA (NOT DETAINED)

BYPASS CATCHMENT AREA (EXTERNAL TO SITE)

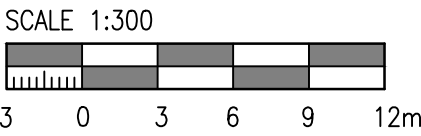
PROPOSED SURFACE FLOW RUNOFF

1/A

23m²

CATCHMENT LABEL

CATCHMENT AREA



Rev	Revision Description	By	App	Date
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2	ISSUED FOR PRELIMINARY COORDINATION	RA	CW	15.05.18
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4	ISSUED FOR DEVELOPMENT APPLICATION	SM	CW	28.05.18
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6	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	19.06.18
7	ISSUED FOR DEVELOPMENT APPLICATION	SM	CR	05.05.19
8	ISSUED FOR DEVELOPMENT APPLICATION	RC	CR	21.02.20
9	ISSUED FOR APPROVAL	RC	CW	05.10.21

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Client

POST-DEVELOPMENT CATCHMENT
PLAN

Project
HIGH STREET PENRITH

Scale at A1
AS SHOWN
Date
05.10.21

Drawn
S.MANADHAR
Date
Z.JONES

Design Checker
C.ROPE
Approved
C.WAITE

Job Number
17665C

FOR APPROVAL NOT FOR CONSTRUCTION

Drawing Number
C6-56

Revision
9

Appendix B

Stormwater Checklist



CHRIS NAITE
 28.05.18.

7. APPENDICES

APPENDIX A

CHECKLIST FOR STORMWATER CONCEPT PLAN (SCP)

Survey Information	Yes	No	NA
1. Site boundaries	☒	☐	☐
2. North point	☒	☐	☐
3. Services within the public footway	☒	☐	☐
4. Site features, including tree, structures, depressions	☒	☐	☐
5. Contours at 0.1m for flat sites ranging to 0.5m for steep sites and extending 10m into adjoining properties	☐	☒	☐
6. Top of kerb levels	☒	☐	☐
7. Boundary levels	☒	☐	☐
8. Benchmarks	☒	☐	☐
9. Levels to AHD where site is affected by overland flow, flooding or where works on Council's drainage network are required	☒	☐	☐
General	Yes	No	NA
1. Plans to scale of 1:100 or 1:200	☒	☐	☐
2. Designer's name, qualifications, contact details provided	☒	☐	☐
3. Design report, including details of any variations provided	☒	☐	☐
4. Plan number and date of issue shown	☒	☐	☐
5. Consistency between stormwater, architectural and landscape plans	☒	☐	☐
6. 1% AEP overland flow extents shown	☒	☐	☐
7. Development layout, building envelope and proposed driveway locations shown	☒	☐	☐
8. Drainage calculations to support the proposed design submitted	☒	☐	☐
9. Proposed finished floor, garage and ground surface levels shown	☒	☐	☐

Olm Contours shown for design regions.

Refer report amendment register page.

Refer Sheet C6-56. Ultimate Condition shown.

Methodology noted in report. Stormwater long sections produced. Drains results attached. Software file can be provided if requested.

10. Compliance with freeboard requirements	☒	☐	☐
11. Location and level of proposed retaining walls indicated	☐	☐	☒
12. Appropriate tail water selected	☒	☐	☐
13. No adverse impact on other properties or the stormwater network	☒	☐	☐
14. Mainstream flood / local overland flow flood report (if any)	☒	☐	☐
Drainage Layout	Yes	No	NA
1. Pipe size, grade and invert level indicated	☒	☐	☐
2. Pit location, size, invert level and surface level indicated	☒	☐	☐
3. Proposed connection point to Council's stormwater system	☒	☐	☐
OSD	Yes	No	NA
1. A catchment plan showing areas draining to the OSD system.	☒	☐	☐
2. Location and size of OSD system and WSUD measures shown	☒	☐	☐
3. Location and level of OSD discharge points shown	☒	☐	☐
4. Compliance with detention volume required	☒	☐	☐
5. Compliance with less than 15% of site area bypassing OSD system	☐	☒	☐
6. Compliance with the Permissible Site Discharge (PSD) requirements	☒	☐	☐
7. Compliance with OSD storage depths	☒	☐	☐
8. Overland flows clear from the OSD system	☒	☐	☐
9. OSD storage located within common areas, clear of private courtyards and accessible from the street	☒	☐	☐
10. Overflow weir provided and shown	☒	☐	☐
11. Details of discharge control pit shown	☒	☐	☐
12. Orifice details and calculations shown	☒	☐	☐
13. Typical sections of OSD storage, including basin invert level, centreline level of outlet orifice, top water level, finished surface levels provided	☒	☐	☐
14. Provision of design certification of the OSD system in accordance with this policy	☒	☐	☐

Future Council Roadway bypasses OSD system.

900mm deep at outlet. 750mm deep at high end. Additional covers added for access.

Others	Yes	No	NA
1. Location of Council's drainage easements, private inter-allotment easements shown (if any)	☐	☐	☒
2. Location and details of basement pump-out system provided (if any)	☐	☐	☒
3. Location and details of overland flow path shown (if any)	☒	☐	☐

APPROVED

I hereby confirm that I have viewed all drawings in this set and they are approved for issue.

I also confirm that any design check and review processes required for this issue by the Design Check and Review Work Practice have been completed

Approved by: Chris.Waite

Date: 10/06/2021

Appendix C

DRAINS Output Results



DRAINS results prepared from Version 2017.12

PIT / NODE DETAILS		Version 8					Constraint
Name	Max HGL	Max Pond HGL	Max Surface Flow Arrivals (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	
Pit Ex 3	26.56	26.99	0.015	6.1	0.39	0	Inlet Capacity
Ex Pie 3/B	26.33		0.014		0.61	0	None
Ex Pit 5/B	26.05		0.041		0.44	0.002	Inlet Capacity
North Outl	26		0.002				
Pit 1/A	27.04		0.012		0.11	0	None
Pit 2/A	27.02		0.014		0.13	0	None
Pit 3/A	26.98		0		0.22		None
Pit 4/A	26.94		0.088		0	0.283	Outlet System
Pit 5/A	26.87	26.91	0.307	8.6	0	0.281	Outlet System
Ex Pit 3/SV	26.36		0.05		0.36	0.016	Inlet Capacity
Outlet 2	25.62		0.016				
N20781	26.45		0				
Future Pit :	26.55		0.037				
Pit 2/B	26.53		0.03		0.77	0.004	Inlet Capacity
Pit 3/B	26.43		0.015		0.68	0	None
Ex Pit 2	26.42		0.041		0.23	0.029	Inlet Capacity
Ex Pit 1/CR	27.99		0.174		0.01	0.117	Inlet Capacity
Ex Pit 2/CR	27.98		0.111		0.02	0.053	Inlet Capacity
Ex Pit 3/CR	27.68		0.248		0.02	0.142	Inlet Capacity
Ex Pit 4/CR	27.17		0.158		0.33	0.084	Inlet Capacity
Ex Pit 3/CR	27.69		0.174		0.01	0.123	Inlet Capacity
Ex Pit 1/SV	26.93		0.253		0.01		None
Ex Pit 1/SV	26.51		0.037		0		Outlet System
Ex Pit 2/SV	26.48		0.316		0.01		None
Pit 1/C	26.97		0		1.13		None
Pit 2/C	26.94		0		0.26		None

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat Ex 3B/I	0.015	0.015	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Cat Ex 3/B	0.014	0.014	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Cat Ex 5	0.012	0.012	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Cat 1/A	0.012	0.01	0.002	5	5	5	5 AR&R 5 year, 30 minutes storm, average 56.8 mm/h, Zone 1
Cat 2/A	0.014	0.012	0.002	5	5	5	5 AR&R 5 year, 30 minutes storm, average 56.8 mm/h, Zone 1
Cat 4/A	0.005	0.005	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 2/S\	0.025	0.025	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 3/S\	0.05	0.05	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Cat 2A/B	0.037	0.031	0.006	5	5	5	5 AR&R 5 year, 30 minutes storm, average 56.8 mm/h, Zone 1
Cat 2/B	0.03	0.03	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Cat 1/B	0.011	0.011	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 5B/I	0.041	0.039	0.003	5	5	5	0 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 1/Cf	0.174	0.166	0.012	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 2/Cf	0.111	0.105	0.008	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 3/Cf	0.127	0.121	0.009	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 4/Cf	0.158	0.151	0.011	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 1/Cf	0.174	0.166	0.012	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 1/S\	0.253	0.241	0.018	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 1/S\	0.037	0.037	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Cat 2/S\	0.037	0.037	0	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Cat 1/C	0.113	0.108	0.008	5	5	5	5 AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1

Outflow Volumes for Total Catchment (4.15 impervious + 0.41 pervious = 4.56 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m	Impervious Runoff cu.m	Pervious Runoff cu.m	Runoff %
AR&R 5 ye:	478.65	402.39	(84 394.45	(90 7.95	(18.6%)
AR&R 5 ye:	733.93	649.09	(88 626.96	(93 22.13	(33.8%)
AR&R 5 ye:	1065.19	967.56	(90 928.68	(95 38.88	(40.9%)
AR&R 5 ye:	1294.64	1184.44	(9 1137.66	(9 46.78	(40.5%)
AR&R 5 ye:	1755.06	1622.00	(9 1557.03	(9 64.97	(41.5%)

AR&R 5 ye: 2334.04 2170.50 (9 2084.37 (9 86.12 (41.4%)
 AR&R 5 ye: 2748.84 2564.07 (9 2462.15 (9 101.92 (41.6%)
 AR&R 5 ye: 3610.41 3372.44 (9 3246.90 (9 125.55 (39.0%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Ex RCBC 2	0.007	1	26.524	26.424	AR&R 5 year, 2 hours storm, average 25.6 mm/h, Zone 1
Pipe 4/B	0.095	2.3	26.232	26.099	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Pipe	0.144	0.71	26.012	26	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Pipe 1/A	0.016	0.24	27.043	27.022	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Pipe 2/A	0.027	0.39	27.019	26.983	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Pipe 3/A	0.027	0.4	26.975	26.94	AR&R 5 year, 30 minutes storm, average 56.8 mm/h, Zone 1
Ex Pipe 4/A	0.271	1.28	26.908	26.868	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Ex Pipe 2/S	0.407	1.92	26.628	26.362	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Ex Pipe 3/S	0.449	2.31	26.177	25.625	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Pipe 1/B	0.037	0.78	26.549	26.532	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Pipe 2/B	0.064	1.46	26.458	26.433	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Pipe 3/B	0.078	1.5	26.385	26.326	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex RCBC 3	0.012	1.34	26.382	26.05	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Pipe 1/C	0.069	0.65	27.967	27.976	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Ex Pipe 2/C	0.118	1.1	27.882	27.683	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Ex Pipe 3/C	0.268	1.26	27.531	27.17	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Pipe 4/C	0.342	1.62	27.069	26.94	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1
Ex Pipe 1/C	0.071	0.66	27.671	27.683	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
EX Pipe 1/S	0.103	0.96	26.876	26.868	AR&R 5 year, 10 minutes storm, average 96.6 mm/h, Zone 1
Ex Pipe 1/S	0.032	0.3	26.51	26.482	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Ex Pipe 2/S	0.091	0.85	26.463	26.362	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
Pipe WSUC	0.01	1.73	27.401	27.385	AR&R 5 year, 5 minutes storm, average 126 mm/h, Zone 1
1A/C	0.081	2.09	27.09	27.08	AR&R 5 year, 30 minutes storm, average 56.8 mm/h, Zone 1
Pipe 1/C	0.081	0.52	26.964	26.944	AR&R 5 year, 30 minutes storm, average 56.8 mm/h, Zone 1
Pipe 2/C	0.081	0.6	26.938	26.868	AR&R 5 year, 30 minutes storm, average 56.8 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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OVERFLOW ROUTE DETAILS

Name	Max Q	U/S	Max Q	D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF Ex 3	0	0	6.77E+22	0	0	0	0	0	0	
EX OF 4/B	0	0	0	0	0	0	0	0	0	
OF11791	0.002	0.002	26.95	0.008	0	2.54	0.19	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF 4/A	0	0	26.959	0	0	0	0			
OF 3/A	0	0	0	0	0	0	0			
OF 1/A	0.283	0.283	0	0.172	0.13	5.1	0.76	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF Ex 11	0.281	0.281	0	0.12	0.14	4	1.16	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF15031	0.016	0.016	26.95	0.064	0.04	2.39	0.64	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF 2/B	0.004	0.004	27.045	0.046	0.02	0.38	0.41	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF 3/B	0	0	0	0	0	0	0			
OF11787	0.029	0.029	0	0.022	0.01	7.33	0.36	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF13827	0.117	0.117	26.95	0.131	0.08	4	0.6	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF13821	0.053	0.053	26.95	0.106	0.05	3.05	0.51	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF13816	0.142	0.142	0	0.137	0.09	4	0.65	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF13809	0.084	0.084	0	0.12	0.07	3.76	0.55	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF14603	0.123	0.123	0.115	0.133	0.08	4	0.62	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OF29828	0.105	0.105	0	0.029	0.02	5	0.73	AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1		
OSD Overfl	0	0	0	0	0	0	0			

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
WSUD	27.98	10.4	0.115	0.01	0.105
OSD/C	27.39	18.3	0.081	0.081	0

CONTINUITY CHECK for AR&R 5 year, 20 minutes storm, average 70.1 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch Difference (cu.m) %
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Pit Ex 3	10.11	10.18	0.89	-9.5
Ex Pie 3/B	71.2	71.59	0	-0.6
Ex Pit 5/B	107.04	107.02	0	0
North Outl	107.02	107.02	0	0
Pit 1/A	8.28	8.24	0	0.5
Pit 2/A	17.51	17.57	0	-0.3
Pit 3/A	17.57	17.68	0	-0.6
Pit 4/A	357	357.82	0	-0.2
Pit 5/A	516.67	518.04	0.02	-0.3
Ex Pit 3/SV	494.34	495.08	0	-0.1
Outlet 2	495.08	495.08	0	0
N20781	0	0	0	0
Future Pit :	24.76	24.7	0	0.2
Pit 2/B	44.94	44.79	0	0.3
Pit 3/B	52.42	51.62	0	1.5
Ex Pit 2	27.41	27.39	0	0.1
Ex Pit 1/CR	115.97	115.92	0	0
Ex Pit 2/CR	131.91	131.44	0	0.4
Ex Pit 3/CR	303.31	302.65	0	0.2
Ex Pit 4/CR	335.67	336.2	0	-0.2
Ex Pit 3/CR	115.97	115.81	0	0.1
Ex Pit 1/SV	168.69	67.5	0	60
Ex Pit 1/SV	24.6	19.53	0	20.6
Ex Pit 2/SV	167.43	66.06	0	60.5
Outlet We:	158.51	158.51	0	0
WSUD	75.53	74.26	1.27	0
OSD/C	74.26	74.11	0.15	0
Pit 1/C	74.11	74.25	0	-0.2
Pit 2/C	74.25	74.58	0	-0.4

Run Log for 17665_High Street_DA Final Model2 run at 15:12:05 on 28/5/2018

Water was lost from the system at: Ex Pit 1/SV2, Ex Pit 2/SV2, Ex Pit 1/SV. If this water re-enters the system further downstream you should draw an overflow route from these locations.

Upwelling occurred at: Pit 4/A

Freeboard was less than 0.3m at Ex Pit 1/SV2, Ex Pit 2/SV2, Ex Pit 1/SV, Ex Pit 3/CR2, Ex Pit 2/CR1, Ex Pit 1/CR1, Ex Pit 3/CR1, Ex Pit 2, Pit 1/A, Pit 2/A, Pit 5/A

The maximum flow in these overflow routes is unsafe: OF 1/A

These overflow routes carried water uphill (adding energy): OF11791. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at these locations. You may need to reformulate the model.

DRAINS results prepared from Version 2017.12

PIT / NODE DETAILS		Version 8					Constraint
Name	Max HGL	Max Pond HGL	Max Surface Flow Arrivals (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	
Pit Ex 3	26.58	27	0.02	8.3	0.37	0	Inlet Capacity
Ex Pie 3/B	26.37		0.019		0.57	0	None
Ex Pit 5/B	26.08		0.057		0.41	0.009	Inlet Capacity
North Outl	26		0.009				
Pit 1/A	27.12		0.017		0.03	0	Inlet Capacity
Pit 2/A	27.05		0.019		0.1	0	Inlet Capacity
Pit 3/A	26.97		0		0.23	None	
Pit 4/A	26.94		0.129		0	0.357	Outlet System
Pit 5/A	26.9	26.91	0.389	8.6	0	0.369	Outlet System
Ex Pit 3/SV	26.49		0.066		0.23	0.025	Inlet Capacity
Outlet 2	25.63		0.025				
N20781	26.45		0				
Future Pit :	26.59		0.052				
Pit 2/B	26.58		0.04		0.72	0.006	Inlet Capacity
Pit 3/B	26.48		0.021		0.63	0.001	Inlet Capacity
Ex Pit 2	26.42		0.055		0.23	0.041	Inlet Capacity
Ex Pit 1/CR	27.99		0.235		0.01	0.191	Inlet Capacity
Ex Pit 2/CR	27.99		0.149		0.01	0.078	Inlet Capacity
Ex Pit 3/CR	27.69		0.367		0.01	0.249	Inlet Capacity
Ex Pit 4/CR	27.22		0.213		0.28	0.123	Inlet Capacity
Ex Pit 3/CR	27.7		0.235		0	0.196	Inlet Capacity
Ex Pit 1/SV	26.94		0.341		0		Outlet System
Ex Pit 1/SV	26.51		0.048		0		Outlet System
Ex Pit 2/SV	26.49		0.415		0		Outlet System
Pit 1/C	27.01		0		1.09	None	
Pit 2/C	26.97		0		0.23	None	

SUB-CATCHMENT DETAILS							
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat Ex 3B/i	0.02	0.02	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat Ex 3/B	0.019	0.019	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat Ex 5	0.016	0.016	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat 1/A	0.017	0.015	0.003	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat 2/A	0.019	0.016	0.003	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat 4/A	0.006	0.006	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 2/S\	0.033	0.033	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 3/S\	0.066	0.066	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat 2A/B	0.052	0.044	0.009	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat 2/B	0.04	0.04	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat 1/B	0.015	0.015	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 5B/i	0.055	0.052	0.004	5	5	5	0 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 1/Cf	0.235	0.218	0.019	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 2/Cf	0.149	0.139	0.012	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 3/Cf	0.171	0.159	0.014	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 4/Cf	0.213	0.198	0.017	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 1/Cf	0.235	0.218	0.019	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 1/S\	0.341	0.317	0.027	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 1/S\	0.048	0.048	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Cat 2/S\	0.048	0.048	0	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Cat 1/C	0.153	0.142	0.012	5	5	5	5 AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1

Outflow Volumes for Total Catchment (4.15 impervious + 0.41 pervious = 4.56 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m	Impervious Runoff cu.m	Pervious Runoff cu.m	Runoff %
AR&R 20 yr	634.41	557.88	87.536	31.92	21.57 (38.1%)
AR&R 20 yr	964.9	879.75	91.837	33.95	42.42 (49.3%)
AR&R 20 yr	1400.97	1302.53	9.123	4.51	68.02 (54.4%)
AR&R 20 yr	1704.92	1594.17	9.151	1.35	82.82 (54.5%)
AR&R 20 yr	2315.73	2181.38	9.206	7.68	113.70 (55.1%)

AR&R 20 yr 3072.42 2907.04 (9 2756.90 (9 150.15 (54.8%)
 AR&R 20 yr 3610.41 3423.08 (9 3246.85 (9 176.23 (54.7%)
 AR&R 20 yr 4731.83 4485.96 (9 4268.35 (9 217.61 (51.6%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Ex RCBC 2	0.009	1.1	26.528	26.429	AR&R 20 year, 2 hours storm, average 33.7 mm/h, Zone 1
Pipe 4/B	0.127	2.48	26.254	26.137	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Pipe	0.187	0.9	26.046	26	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Pipe 1/A	0.018	0.26	27.12	27.051	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Pipe 2/A	0.036	0.54	27.048	26.969	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Pipe 3/A	0.037	0.55	26.965	26.94	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Ex Pipe 4/A	0.302	1.43	26.912	26.9	AR&R 20 year, 10 minutes storm, average 127 mm/h, Zone 1
Ex Pipe 2/S	0.427	2.02	26.659	26.494	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Ex Pipe 3/S	0.452	2.33	26.341	25.626	AR&R 20 year, 30 minutes storm, average 74.8 mm/h, Zone 1
Pipe 1/B	0.052	0.76	26.593	26.581	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Pipe 2/B	0.085	1.36	26.5	26.479	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Pipe 3/B	0.104	1.48	26.427	26.374	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex RCBC 3	0.014	1.42	26.386	26.083	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Pipe 1/C	0.074	0.7	27.978	27.986	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Ex Pipe 2/C	0.128	1.19	27.902	27.687	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Ex Pipe 3/C	0.269	1.27	27.554	27.216	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Ex Pipe 4/C	0.357	1.69	27.13	26.94	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
Ex Pipe 1/C	0.077	0.72	27.683	27.687	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
EX Pipe 1/S	0.107	1	26.924	26.9	AR&R 20 year, 10 minutes storm, average 127 mm/h, Zone 1
Ex Pipe 1/S	0.037	0.35	26.51	26.49	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Ex Pipe 2/S	0.092	0.86	26.47	26.494	AR&R 20 year, 5 minutes storm, average 167 mm/h, Zone 1
Pipe WSUC	0.01	1.75	27.596	27.59	AR&R 20 year, 10 minutes storm, average 127 mm/h, Zone 1
1A/C	0.103	2.2	27.116	27.106	AR&R 20 year, 30 minutes storm, average 74.8 mm/h, Zone 1
Pipe 1/C	0.103	0.66	26.998	26.971	AR&R 20 year, 30 minutes storm, average 74.8 mm/h, Zone 1
Pipe 2/C	0.103	0.76	26.961	26.9	AR&R 20 year, 30 minutes storm, average 74.8 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF Ex 3	0	0	6.77E+22	0	0	0	0	0
EX OF 4/B	0	0	0	0	0	0	0	0
OF11791	0.009	0.009	26.95	0.015	0	4.94	0.25	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF 4/A	0	0	26.959	0	0	0	0	0
OF 3/A	0	0	0	0	0	0	0	0
OF 1/A	0.357	0.357	0	0.184	0.15	5.72	0.82	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF Ex 11	0.369	0.369	0	0.131	0.17	4	1.28	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF15031	0.025	0.025	26.95	0.07	0.04	3.61	0.57	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF 2/B	0.006	0.006	27.045	0.055	0.02	0.48	0.45	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF 3/B	0.001	0.001	0	0.026	0.01	0.22	0.27	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF11787	0.041	0.041	0	0.026	0.01	8.53	0.38	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF13827	0.191	0.191	26.95	0.15	0.11	4	0.71	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF13821	0.078	0.078	26.95	0.118	0.06	3.63	0.55	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF13816	0.249	0.249	0	0.165	0.12	4.76	0.74	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF13809	0.123	0.123	0	0.133	0.08	4	0.61	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF14603	0.196	0.196	0.115	0.151	0.11	4.05	0.72	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OF29828	0.145	0.145	0	0.036	0.03	5	0.82	AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1
OSD Overfl	0	0	0	0	0	0	0	0

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
WSUD	27.93	10.4	0.156	0.01	0.145
OSD/C	27.59	28.1	0.103	0.103	0

CONTINUITY CHECK for AR&R 20 year, 20 minutes storm, average 92.2 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch (cu.m)	Difference %
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Pit Ex 3	13.44	13.59	1.2	-10
Ex Pie 3/B	96.16	96.49	0	-0.3
Ex Pit 5/B	144.14	144.07	0	0
North Outl	144.07	144.07	0	0
Pit 1/A	11.34	11.42	0	-0.7
Pit 2/A	24.11	24.11	0	0
Pit 3/A	24.04	24.02	0	0.1
Pit 4/A	453.04	452.82	0	0
Pit 5/A	647.91	648.63	0.01	-0.1
Ex Pit 3/SV	569.28	569.28	0	0
Outlet 2	569.28	569.28	0	0
N20781	0	0	0	0
Future Pit :	33.92	33.87	0	0.1
Pit 2/B	60.78	60.52	0	0.4
Pit 3/B	70.66	70.08	0	0.8
Ex Pit 2	36.96	36.94	0	0.1
Ex Pit 1/CR	156.38	156.3	0	0.1
Ex Pit 2/CR	158.12	157.96	0	0.1
Ex Pit 3/CR	413.75	411.82	0	0.5
Ex Pit 4/CR	425.9	424.78	0	0.3
Ex Pit 3/CR	156.38	185.21	0	-18.4
Ex Pit 1/SV	227.46	71.9	0	68.4
Ex Pit 1/SV	32.71	23.19	0	29.1
Ex Pit 2/SV	256.53	76.69	0	70.1
Outlet We:	268.92	268.92	0	0
WSUD	101.84	100.56	1.29	0
OSD/C	100.56	100.4	0.16	0
Pit 1/C	100.4	100.6	0	-0.2
Pit 2/C	100.6	100.87	0	-0.3

Run Log for 17665_High Street_DA Final Model2 run at 15:14:43 on 28/5/2018

Water was lost from the system at: Ex Pit 1/SV2, Ex Pit 2/SV2, Ex Pit 1/SV. If this water re-enters the system further downstream you should draw an overflow route from these locations.

Upwelling occurred at: Ex Pit 3/CR2, Pit 4/A

Freeboard was less than 0.3m at Ex Pit 1/SV2, Ex Pit 2/SV2, Ex Pit 3/SV, Ex Pit 1/SV, Ex Pit 2/CR1, Ex Pit 1/CR1, Ex Pit 3/CR1, Ex Pit 4/CR1, Ex Pit 2, Pit 1/A, Pit 2/A, Pit 5/A

The maximum flow in these overflow routes is unsafe: OF14603, OF13816, OF 1/A

These overflow routes carried water uphill (adding energy): OF11791. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at these locations. You may need to reformulate the model.

DRAINS results prepared from Version 2017.12

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit Ex 3	26.58	27	0.026	8.6	0.37	0.012	Inlet Capacity
Ex Pie 3/B	26.42		0.028		0.52	0	None
Ex Pit 5/B	26.12		0.076		0.37	0.019	Inlet Capacity
North Outlet	26		0.019				
Pit 1/A	27.14		0.022		0.01	0.005	Inlet Capacity
Pit 2/A	27.07		0.025		0.08	0.002	Inlet Capacity
Pit 3/A	27		0		0.2		None
Pit 4/A	26.94		0.176		0	0.425	Outlet System
Pit 5/A	26.89	26.91	0.465	8.6	0	0.45	Outlet System
Ex Pit 3/SV	26.59		0.087		0.13	0.038	Inlet Capacity
Outlet 2	25.63		0.038				
N20781	26.45		0				
Future Pit 1/f	26.64		0.067				
Pit 2/B	26.63		0.052		0.67	0.01	Inlet Capacity
Pit 3/B	26.53		0.03		0.58	0.003	Inlet Capacity
Ex Pit 2	26.43		0.075		0.22	0.057	Inlet Capacity
Ex Pit 1/CR1	28		0.306		0	0.266	Outlet System
Ex Pit 2/CR1	27.98		0.194		0.02	0.119	Inlet Capacity
Ex Pit 3/CR1	27.69		0.497		0.01	0.38	Inlet Capacity
Ex Pit 4/CR1	27.23		0.278		0.27	0.165	Inlet Capacity
Ex Pit 3/CR2	27.7		0.306		0	0.28	Outlet System
Ex Pit 1/SV	26.94		0.445		0		Outlet System
Ex Pit 1/SV2	26.51		0.064		0		Outlet System
Ex Pit 2/SV2	26.49		0.507		0		Outlet System
Pit 1/C	27.08		0		1.02		None
Pit 2/C	26.98		0		0.22		None

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat Ex 3B/B	0.026	0.026	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat Ex 3/B	0.024	0.024	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat Ex 5	0.021	0.021	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat 1/A	0.022	0.019	0.003	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat 2/A	0.025	0.022	0.003	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat 4/A	0.008	0.008	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 2/SV	0.043	0.043	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 3/SV	0.087	0.087	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat 2A/B	0.067	0.058	0.009	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat 2/B	0.052	0.052	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat 1/B	0.02	0.02	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 5B/B	0.072	0.068	0.005	5	5	5	0 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 1/CR1	0.306	0.286	0.02	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 2/CR1	0.194	0.182	0.012	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 3/CR1	0.222	0.208	0.014	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 4/CR1	0.278	0.26	0.018	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 1/CR2	0.306	0.286	0.02	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 1/SV	0.445	0.416	0.029	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 1/SV2	0.064	0.064	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Cat 2/SV2	0.064	0.064	0	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Cat 1/C	0.199	0.186	0.013	5	5	5	5 AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1

Outflow Volumes for Total Catchment (4.15 impervious + 0.41 pervious = 4.56 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 ye	835.74	759.03 (90.71%)	719.69 (94.39%)	39.34 (52.8%)
AR&R 100 ye	1276.41	1190.97 (93.31%)	1121.05 (96.91%)	69.91 (61.4%)
AR&R 100 ye	1853.83	1754.45 (94.65%)	1646.99 (97.10%)	107.46 (65.0%)
AR&R 100 ye	2249.67	2138.21 (94.99%)	2007.52 (97.10%)	130.69 (65.1%)
AR&R 100 ye	3058.82	2923.05 (95.55%)	2744.51 (97.10%)	178.54 (65.5%)
AR&R 100 ye	4047.96	3881.75 (95.87%)	3645.39 (97.10%)	236.36 (65.5%)
AR&R 100 ye	4745.62	4555.17 (96.00%)	4280.88 (97.10%)	274.30 (64.8%)

AR&R 100 ye: 6236.16 5980.82 (9 5638.63 (9 342.19 (61.5%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Ex RCBC 2	0.01	1.11	26.529	26.429	AR&R 100 year, 30 minutes storm, average 98.7 mm/h, Zone 1
Pipe 4/B	0.16	2.23	26.299	26.174	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe	0.229	1.1	26.053	26	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
Pipe 1/A	0.021	0.32	27.131	27.072	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe 2/A	0.045	0.66	27.063	27.002	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe 3/A	0.045	0.66	26.998	26.94	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 4/A	0.352	1.66	26.916	26.891	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 2/SV	0.404	1.91	26.744	26.59	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 3/SV	0.455	2.34	26.465	25.627	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe 1/B	0.066	0.75	26.639	26.63	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe 2/B	0.107	1.41	26.53	26.526	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe 3/B	0.133	1.53	26.462	26.421	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex RCBC 3	0.017	1.51	26.39	26.124	AR&R 100 year, 1 hour storm, average 67.1 mm/h, Zone 1
Ex Pipe 1/CR1	0.079	0.74	27.985	27.984	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 2/CR1	0.134	1.26	27.893	27.691	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 3/CR1	0.276	1.3	27.545	27.235	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 4/CR1	0.373	1.76	27.154	26.94	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 1/CR2	0.078	0.73	27.688	27.691	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 1/SV	0.109	1.02	26.894	26.891	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 1/SV2	0.039	0.36	26.51	26.49	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Ex Pipe 2/SV2	0.094	0.88	26.458	26.59	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1
Pipe WSUD	0.01	1.74	27.821	27.824	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
1A/C	0.123	2.28	27.142	27.134	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
Pipe 1/C	0.123	0.79	26.985	26.979	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1
Pipe 2/C	0.123	0.91	26.949	26.891	AR&R 100 year, 20 minutes storm, average 122 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF Ex 3	0.012	0.012	1.13E+24	0.025	0.01	2.53	0.39	AR&R 100 year, 1 hour storm, average 67.1 mm/h, Zone 1
EX OF 4/B	0	0	0	0	0	0	0	
OF11791	0.019	0.019	26.949	0.019	0.01	6.44	0.31	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF 4/A	0.005	0.005	26.959	0.014	0	4.64	0.15	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF 3/A	0.002	0.002	9.71E+24	0.036	0.01	0.3	0.35	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF 1/A	0.425	0.425	0	0.195	0.17	6.23	0.85	AR&R 100 year, 20 minutes storm, average 122 mm/h, Z
OF Ex 11	0.45	0.45	9.94E+27	0.141	0.19	4	1.37	AR&R 100 year, 20 minutes storm, average 122 mm/h, Z
OF15031	0.038	0.038	26.95	0.075	0.04	4	0.6	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF 2/B	0.01	0.01	27.044	0.066	0.03	0.92	0.5	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF 3/B	0.003	0.003	0	0.046	0.02	0.38	0.39	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF11787	0.057	0.057	0	0.028	0.01	9.43	0.43	AR&R 100 year, 1 hour storm, average 67.1 mm/h, Zone 1
OF13827	0.266	0.266	26.95	0.169	0.13	4.93	0.75	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF13821	0.119	0.119	26.95	0.131	0.08	4	0.61	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF13816	0.38	0.38	0	0.188	0.16	5.89	0.83	AR&R 100 year, 20 minutes storm, average 122 mm/h, Z
OF13809	0.165	0.165	0	0.143	0.1	4	0.68	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OF14603	0.28	0.28	0.113	0.171	0.13	5.07	0.76	AR&R 100 year, 20 minutes storm, average 122 mm/h, Z
OF29828	0.191	0.191	0	0.042	0.04	5	0.92	AR&R 100 year, 5 minutes storm, average 220 mm/h, Zc
OSD Overflow	0	0	0	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
WSUD	27.95	10.4	0.201	0.01	0.191
OSD/C	27.82	41.1	0.123	0.123	0

CONTINUITY CHECK for AR&R 100 year, 5 minutes storm, average 220 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch (cu.m)	Difference %
Pit Ex 3	7.83	8.75	0.53	-18.5
Ex Pie 3/B	56.46	57.51	0	-1.9
Ex Pit 5/B	85.27	85.08	0	0.2
North Outlet	85.08	85.08	0	0

Pit 1/A	6.61	6.68	0	-1.1
Pit 2/A	13.94	14.11	0	-1.2
Pit 3/A	13.91	13.95	0	-0.3
Pit 4/A	269.81	270.14	0	-0.1
Pit 5/A	377.5	381.08	0.02	-1
Ex Pit 3/SV	342.06	343.33	0	-0.4
Outlet 2	343.33	343.33	0	0
N20781	0	0	0	0
Future Pit 1/f	19.75	19.69	0	0.3
Pit 2/B	35.38	35.01	0	1
Pit 3/B	40.92	40.43	0	1.2
Ex Pit 2	21.54	21.52	0	0.1
Ex Pit 1/CR1	91.12	144.53	0	-58.6
Ex Pit 2/CR1	84.73	85.04	0	-0.4
Ex Pit 3/CR1	260.6	260.28	0	0.1
Ex Pit 4/CR1	252.06	253.09	0	-0.4
Ex Pit 3/CR2	91.12	138.15	0	-51.6
Ex Pit 1/SV	132.54	35.46	0	73.2
Ex Pit 1/SV2	19.07	11.96	0	37.3
Ex Pit 2/SV2	135.03	38.99	0	71.1
Outlet West	237.7	237.7	0	0
WSUD	59.35	58.28	1.06	0
OSD/C	58.28	58.25	0.03	0
Pit 1/C	58.25	58.42	0	-0.3
Pit 2/C	58.42	58.9	0	-0.8

Run Log for 17665_High Street_DA Final Model2 run at 15:16:31 on 28/5/2018

Water was lost from the system at: Ex Pit 1/SV2, Ex Pit 2/SV2, Ex Pit 1/SV. If this water re-enters the system further downstream you should draw an overflow route from these locations.

Upwelling occurred at: Ex Pit 3/CR2, Ex Pit 1/CR1, Pit 4/A

Freeboard was less than 0.3m at Ex Pit 1/SV2, Ex Pit 2/SV2, Ex Pit 3/SV, Ex Pit 1/SV, Ex Pit 2/CR1, Ex Pit 3/CR1, Ex Pit 4/CR1, Ex Pit 2, Pit 1/A, Pit 2/A, Pit 5/A

Flows were safe in all overflow routes.

These overflow routes carried water uphill (adding energy): OF29828, OF11791. These results may be invalid. You should check for water flowing round in circles (e.g. negative flow in adjacent pipes) at these locations. You may need to reformulate the model.

Appendix D

Drainage Certification



SYDNEY OFFICE

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Reference: CW:DS LTR/C 17665C

5th October 2021

Toga
Level 5,
45 Jones Street
ULTIMO, NSW 2007

Attention: Bernardo Reiter

Dear Bernardo

RE: TOGA PENRITH –DEVELOPMENT APPLICATION

STORMWATER DRAINAGE CERTIFICATION

This letter is to certify that Robert Bird Group Pty Ltd (RBG) have undertaken the stormwater drainage and On Site Detention design of the Toga High Street Penrith project and confirm that the works proposed are in compliance with Penrith City Council's guidelines and standards.

Yours faithfully

ROBERT BIRD GROUP PTY LTD



COLIN ROPE
Senior Associate
B.Eng. (Hons), CPEng, MIEAust, NPER, CEng, MICE



Robert
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