

The University of Sydney

ETP Stage 1

Civil Design Report

SSDA Response to Submissions



Prepared for The University of Sydney

Report Amendment Register

Rev. No.	Page No.	Issue/Amendment	Author/Initials		Reviewer/Initials		Date
A	-	Issue for SSDA	Aleksandar Vasiloski	AV	Stephen Naughton	SN	1/12/17
B	-	30% Schematic Design	Aleksandar Vasiloski	AV	Stephen Naughton	SN	2/07/18
C	-	Updated flooding section	Jacky Hu	JH	Stephen Naughton	SN	3/09/18
D	-	Response to Submissions	Aleksandar Vasiloski	AV	Stephen Naughton	SN	14/09/18

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1. DESIGN, AUTHORITY & COMPLIANCE ISSUES

1.1. Summary

The civil design complies with authority requirements as it demonstrates that there are no adverse flooding impacts off site and that adequate protection to the 1% AEP flood level at proposed building entrances are provided.

1.2. Other Authority/Compliance/Departure Issues

We do not believe that there are any civil related departures from the Design Excellence requirements or CIS Standards or that there are any alternative civil solutions being proposed.

2. SITE DESCRIPTION

2.1. Location

2.1.1. Overview

The existing J03 Electrical Engineering Building is located within the Engineering Precinct of the University of Sydney Camperdown Campus, at the South-Eastern side of the campus. The existing Electrical Engineering Building is approximately 50x50m and is bordered by Maze crescent to the west, PNR Building to the South, Engineering Link Building and Aeronautical/Mechanical Engineering Building to the East and Blackwattle Creek Lane to the North.

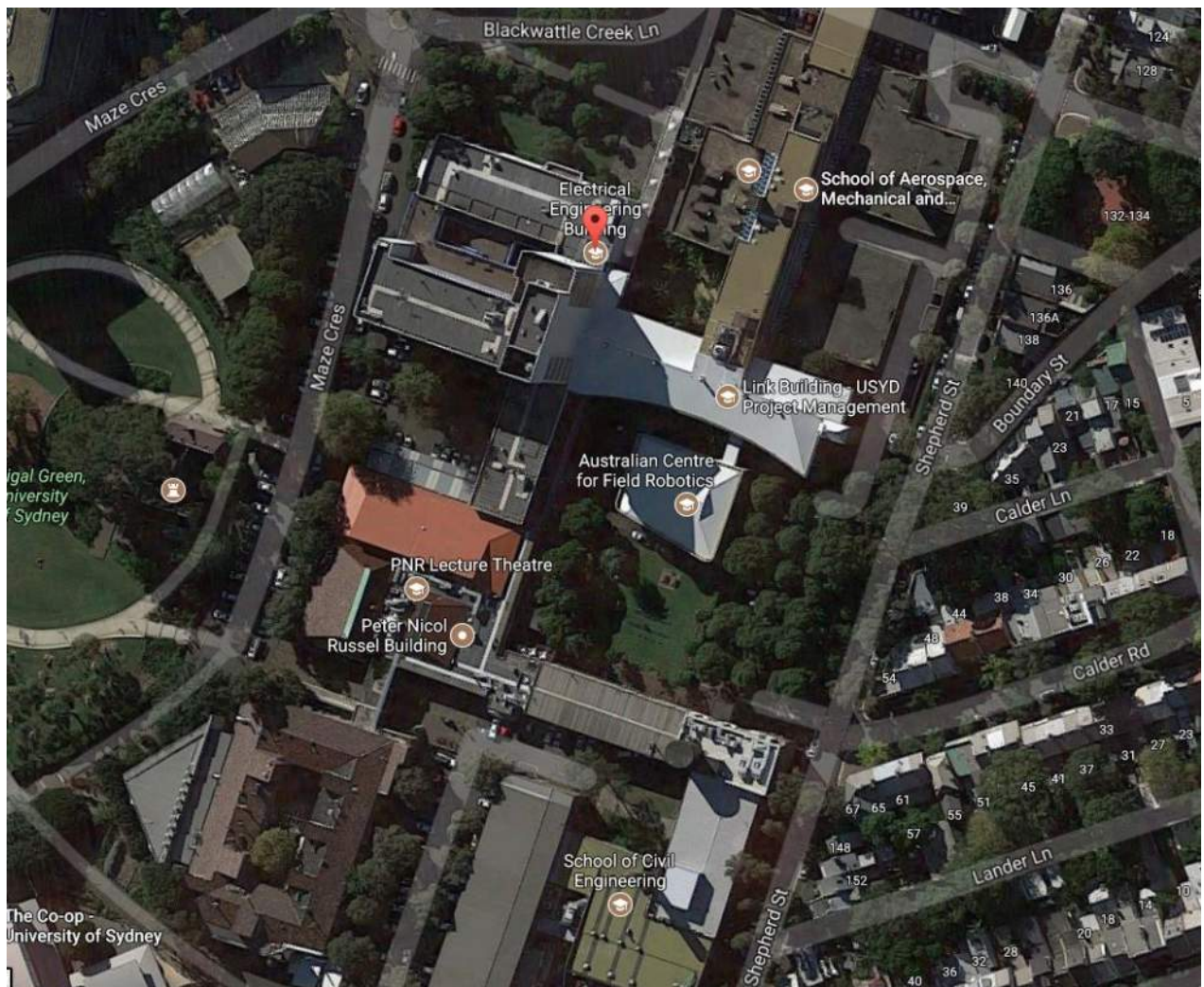


Figure 1 - University of Sydney Engineering Precinct

2.1.2. Topography

The Engineering Precinct generally slopes from Cadigal Green (west) to Shepherd Street (east). The existing buildings generally drain to the Campus stormwater network that ultimately discharges to Sydney Water and Council's stormwater pit and pipe network. In significant storm events, various locations within the precinct flood.

2.1.3. References

The report relies on the following reports (which have been reviewed and accepted as the basis of design in relation to flood assessment):

- WMA Water – University of Sydney Flood Risk Management Stage 1 – Campus Flood Study Review (September 2013),
- WMA Water – University of Sydney Engineering Precinct Flood Mitigation Plan (draft),
- TTW Civil / Flood Study, University of Sydney Engineering Precinct Civil / Flood Study (draft), December 2015, and
- The University of Sydney Engineering and Technology Precinct Redevelopment – Volume 7.23: Stormwater and Flooding Design Requirements (Revision B, 25 September 2017).

2.1.4. Basis of Design

The design of the civil works has been based on:

- Architectural Layout of the building and site prepared by COX,
- Landscape concept plans prepared by TCL,
- Survey by Monteith & Powys, and
- University of Sydney Campus Infrastructure & Services Standards.

2.1.5. Design Criteria and Standards

The design criteria and standards for the civil works include:

- Stormwater design in accordance with Australian Rainfall & Runoff,
- City of Sydney guidelines including;
 - City of Sydney DCP 2012,
 - Interim Floodplain Management Policy (2014)
- Australian Standards,
- Sydney Water policies and requirements,
- Landcom's Publication - Managing Urban Stormwater: Soils and Construction (the "Blue Book"), and
- University of Sydney Campus Infrastructure & Services Standards.

2.1.6. Existing Services

All existing services located adjacent to, or within the proposed location of the Stage 1 of the Engineering and Technology Precinct that may be affected by the development are to be:

- Capped, sealed and removed, if redundant, or
- Isolated and diverted if being retained.

All works associated with capping, diverting or connecting to Sydney University infrastructure shall be coordinated with Campus Infrastructure Services (CIS) prior to any works being carried out. These works are to be coordinated with any enabling works.

3. PROPOSED DEVELOPMENT

3.1. General Description

The proposed redevelopment involves demolition of the northern portion of the existing electrical engineering building, and construction of a new 10 storey building, demolition of the adjacent carpark to the south and constructing a flood mitigation storage basin, reconstruction of the public domain areas adjacent to Blackwattle Creek Lane to the north and demolition of the courtyard to the east and construction of new stores and loading dock. Stormwater from the new building and loading dock will drain to the existing precinct stormwater network, while the new flood mitigation basin will drain to the existing Sydney Water stormwater main traversing the site.

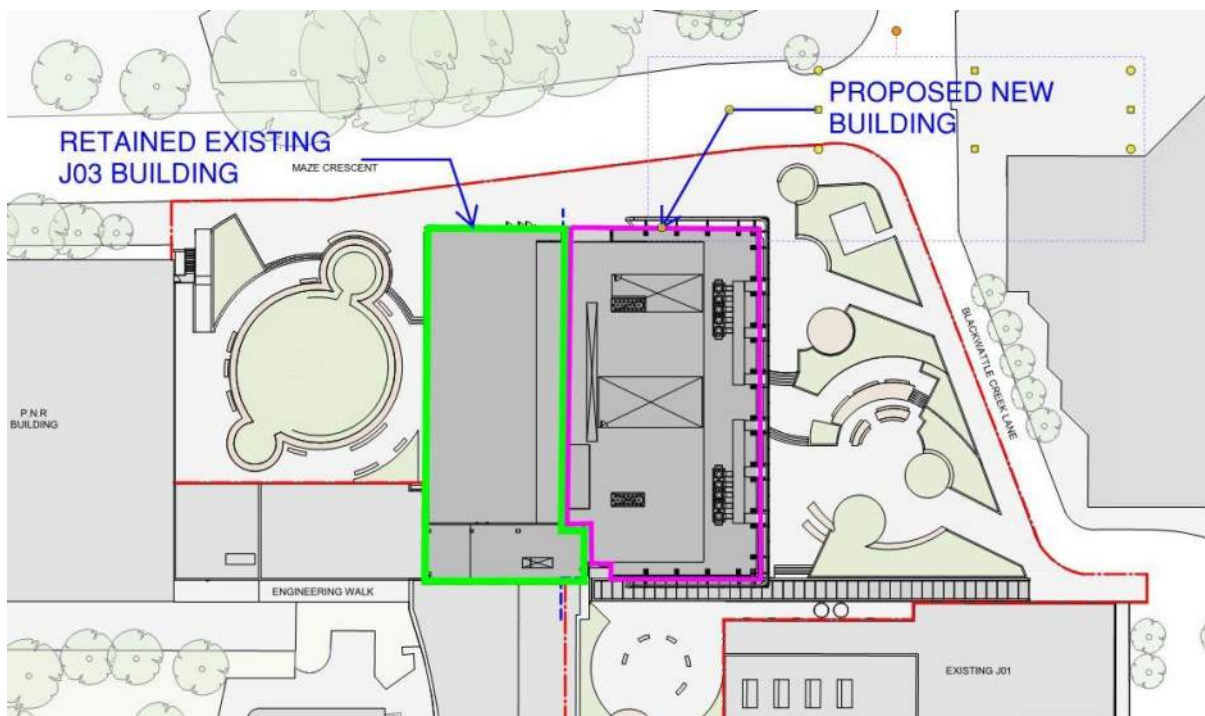


Figure 2 - Proposed Redevelopment of Existing Electrical Engineering Building

3.2. Flood Impact Assessment

A Campus wide flood study flood study “University of Sydney Engineering Precinct Civil / Flood Study” has been produced by TTW on behalf of on behalf of University of Sydney. The engineering precinct is flood affected as noted in Principal Project Requirements Volume 7.23: Stormwater & Flooding Design Requirements.

3.2.1. Flood Levels and Freeboard

The construction of basin D as part of Stage 1 Engineering Precinct complies with “City of Sydney Interim Floodplain Management Policy”, protection of commercial property on merit-based approach to a minimum of 1% AEP level. Flood protection to the entrances is achieved providing wall/landscaping to RL20.00 on the east edge of basin D and RL20.70 on the north east edge of the basin (refer to drawing 00031-33). To protect entrances further south, grated drain and pit to collect the 1% AEP event (approx. 150L/s) is proposed. Refer to drawing 00033.

The design produces no adverse impact off site. It is observed that there are areas of maximum flood increase of more than 10mm. However, given the coarseness of the flood model, the areas of increase being relatively small (few grid sizes), no coherence and direct causation of the affectation a long distance from the site, it is

determined to be acceptable to conclude that there is no adverse impact off site. There is no material increase in the maximum flood levels off site.

3.2.2. Basis for the Design

The TUFLOW modelling has been based on:

- TUFLOW model supplied by CIS (“existing” situation). This is assumed to be the WMA base TUFLOW model, updated to incorporate the latest works undertaken at the University
- Architectural Layout of the building and site prepared by COX
- Landscape concept plans prepared by TCL
- Survey by Monteith & Powys

3.2.3. Adjustments to “Existing” TUFLOW Model

Adjustments were made to the existing TUFLOW model to:

- Correct pipe sizes and locations as identified by survey,
- Digitize kerb to Maze Crescent,
- Check of 2016 Australian Rainfall and Runoff methodology (ensemble storms) and updated Bureau of Meteorology data

3.2.4. TUFLOW Results

Numerous runs of the proposed redevelopment were undertaken with various basin layouts. These included (note all volumes are calculated from proposed surface to RL19.35, which is 300mm below the J03 building floor level):

- “Box” layout of detention basin (Basin D in previous reports) to maximize volume. The volumes provided were approximately 930m³ (which would require the sewer to be adjusted) and also 1300m³ (which would also require demolition of Tyree building), and
- Revised basin layout following DERC review of Wingara Mura Design Principles. The flood storage volume provided is 530m³.

The Bonacci modelling results (shown in Figure 4 below), are consistent with previous modelling. With the current design, as shown in Figure 3 below, no adverse flood impact to offsite areas is achieved and adequate protection to building finish floor levels have been provided.

All options modelled resulted in overland flow through Engineering Walk. This results in the flood levels being approximately the same as existing – the implication is that if openings to the new building are provided adjacent to the basin, the flood water will enter the new building. However, landscaping will be provided to a reduced level necessary to provide protection to the entrances of the proposed building (as shown in drawing C031).

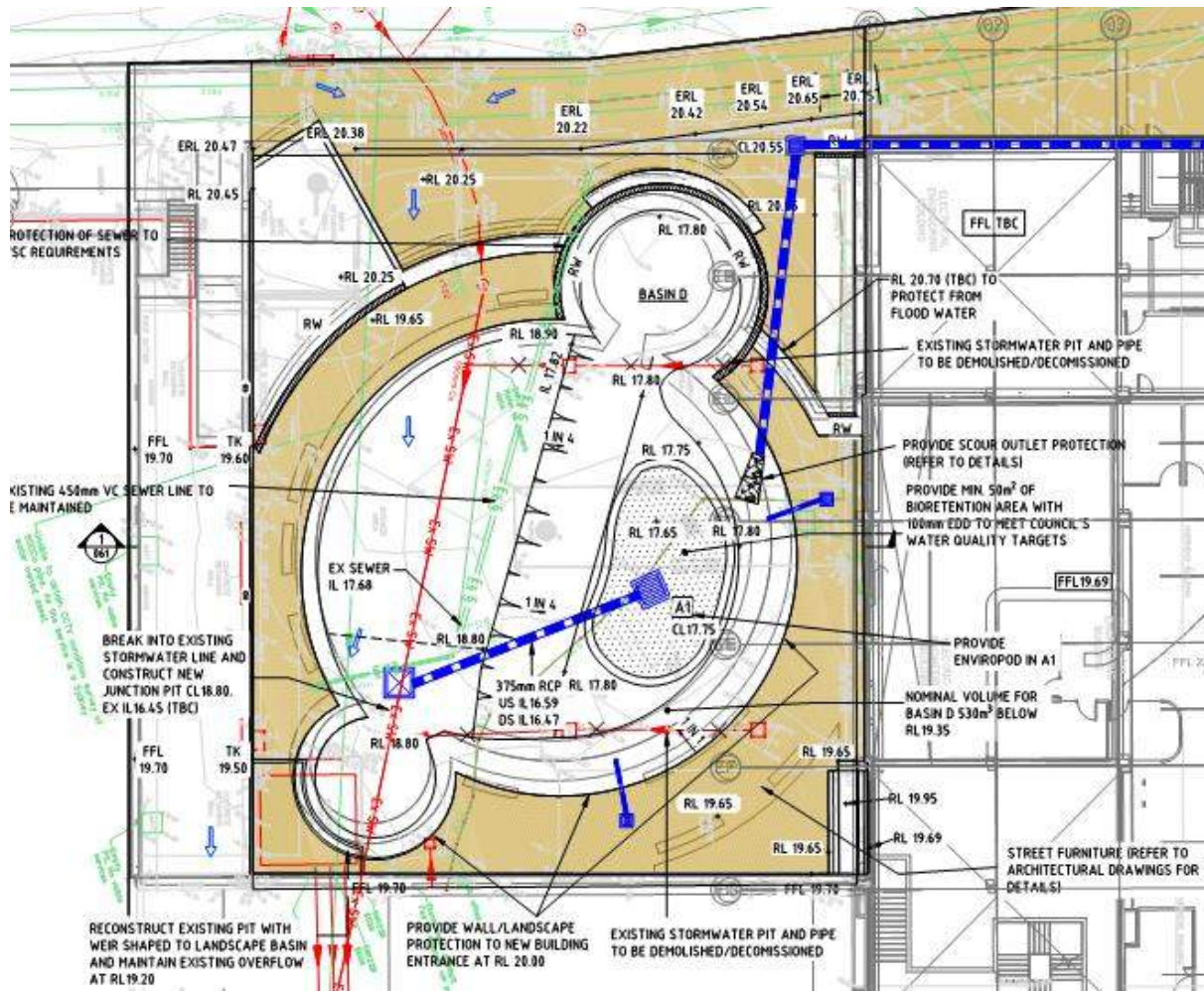


Figure 3 – Proposed Ramp to protect Building J03 for 100year ARI Flood Depth Afflux at the end of Stage 1 works



Figure 4 – Bonacci 100year ARI Flood Depth Afflux (Figure 19, Depth difference between BON025 and BON024)

3.3. Stormwater Drainage

3.3.1. Existing Drainage

The existing site generally falls from Maze Cres (north-west) to Shepherd St (south-east). There is existing stormwater infrastructure originating from multiple external catchments and multiple defined overland flow paths traversing the proposed works site. These drain Cadigal Green, Maze Cres, Electrical Engineering building (subject works site), PNR Lecture Theatre, and other sites further afield. The existing Electrical Engineering Carpark serves as an ill-defined minor flood storage basin.

There is an overland flow path that conveys stormwater through the existing Electrical Engineering Carpark from the north-west (Cadigal Green and Maze Cres). There exists a 900 diameter Sydney Water Stormwater Main that traverses the carpark site. Triple 600 diameter pipes convey the overland water flow from the existing carpark, under the existing Tyree Labs and Engineering Walk and towards Shepherd St.

3.3.2. Concept Stormwater Design

The concept stormwater drainage design has been provided in accordance with the requirements of the City of Sydney, Sydney Water and Australian Standard 3500.3 Plumbing and Drainage. The key drainage criteria include:

- Minor drainage system capturing and conveying the 5% AEP,
- Minimum pipe grade of 1%,
- Minimum pipe diameter of 375mm,
- Minimum fall through a pit of 20mm, and
- Pipe material to be steel reinforced concrete pipe.

The stormwater strategy for the new building incorporates water quality train, water reuse provisions and a stormwater and floodwater detention strategy.

3.3.3. On-site Detention

The WMA Water – University of Sydney Engineering Precinct, Draft Flood Mitigation Plan has identified a methodology to facilitate the redevelopment of Sydney University land. This methodology has been accepted by Sydney Water and involves mitigating the effects of development via a campus-wide strategy.

A new flood storage basin (Basin D) was identified in the WMA report. The proposed basin location is the existing electrical engineering carpark, a current low point and overland flow path. As part of the current development, the newly constructed basin will provide approximately 530m³ of volume below RL19.35.

3.3.4. Subsoil Drainage

Sub-soil drainage will be provided to retaining walls, sub-floor space and podium planting/landscaping in accordance with structural engineer and landscape architect's requirements. The sub-soil drainage will discharge into the stormwater drainage system.

3.4. Water Quality

The proposed new building stormwater strategy incorporates Water Sensitive Urban Design principles by allowing for infiltration opportunities where possible (through the use of deep landscaping elements on podium) and building roof runoff being captured and reused via a 45kL rainwater tank. Water quality improvement device(s) will be specified and modelled using MUSIC (Version 6.2), demonstrating compliance with the water quality targets set in the Sydney City Council Development Control Plans (2012).

Currently the site does not have any stormwater quality treatment measures. The proposed development provides water quality measures specifically for the new building and associated infrastructure. The proposed water quality strategy for the site is described in detail below.

3.4.1. City of Sydney - Stormwater Quality Improvement Targets

Development of a site greater than 1000m² must undertake a stormwater quality assessment to demonstrate that the development will achieve the post development pollutant load standards as follows:

- 90% reduction in Gross Pollutants greater than 5mm,
- 85% reduction in Total Suspended Solids,
- 65% reduction in total phosphorous runoff, and
- 45% reduction in total nitrogen runoff.

3.4.2. Water Quality Strategy

The proposed water quality discharge measures for the site are provided to reduce existing pollutant loads. The water quality strategy for the new building incorporates a 45kL rainwater tank, Enviropods in all new pits and bioretention basins at Basin D and new landscaped area adjacent to Blackwattle Creek Lane.

Table 3-1: Summary of Sub-catchments and Water Quality Measures for overall Site

Sub-catchments	Area (ha)	Impervious Fraction (%)	WSUD Treatment Measures	Comments
Roof	0.088	100	Rainwater Tank, Enviropod	
Basin D	0.163	65	50m ² Bioretention Basin	
Roof (Bypass RWT)	0.062	100	Enviropod	
North Landscape (Bypass)	0.008	100	-	
North Landscape (Mixed)	0.175	75	Bioretention	
Building	0.06	80	Enviropod	
Road	0.048	100	Stormfilter	
Total	0.604			

3.4.3. Water Quality Model

The water quality strategy for the proposed site was established using *MUSIC* [Version 6.2] model. The *MUSIC* model is constructed using City of Sydney Council *MUSIC* Link. A screen shot of *MUSIC* [version 6.2] model representing the site is provided in the figure below.

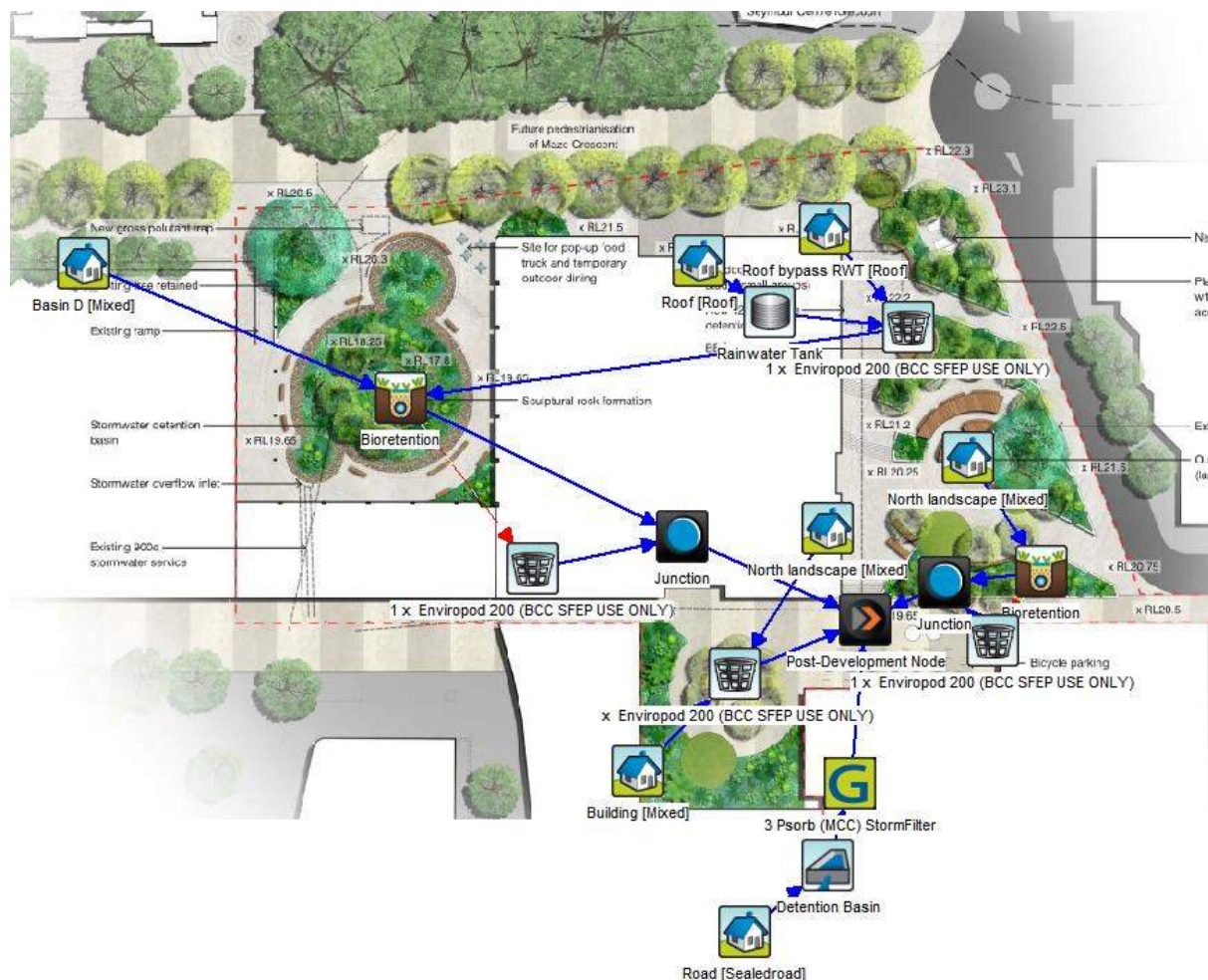
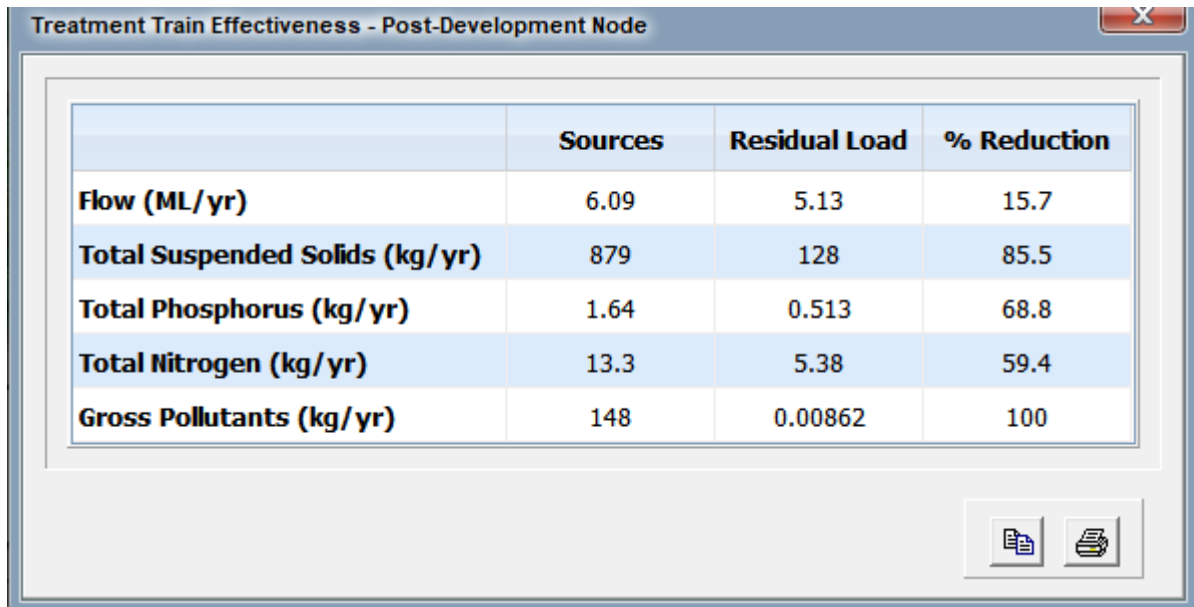


Figure 5 – Schematic Diagram of the Overall Music Model.

3.4.4. Water Quality Results

The results of *MUSIC* modelling show the pollutant reduction due to the overall proposed development. The comparison in actual pollutant loads is clearly shown in the Residual Load column. The results from the *MUSIC* model are shown as a screen shot below demonstrating that the City of Sydney pollution reduction criteria has been met.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	6.09	5.13	15.7
Total Suspended Solids (kg/yr)	879	128	85.5
Total Phosphorus (kg/yr)	1.64	0.513	68.8
Total Nitrogen (kg/yr)	13.3	5.38	59.4
Gross Pollutants (kg/yr)	148	0.00862	100

Figure 3-6: Overall Music model Results

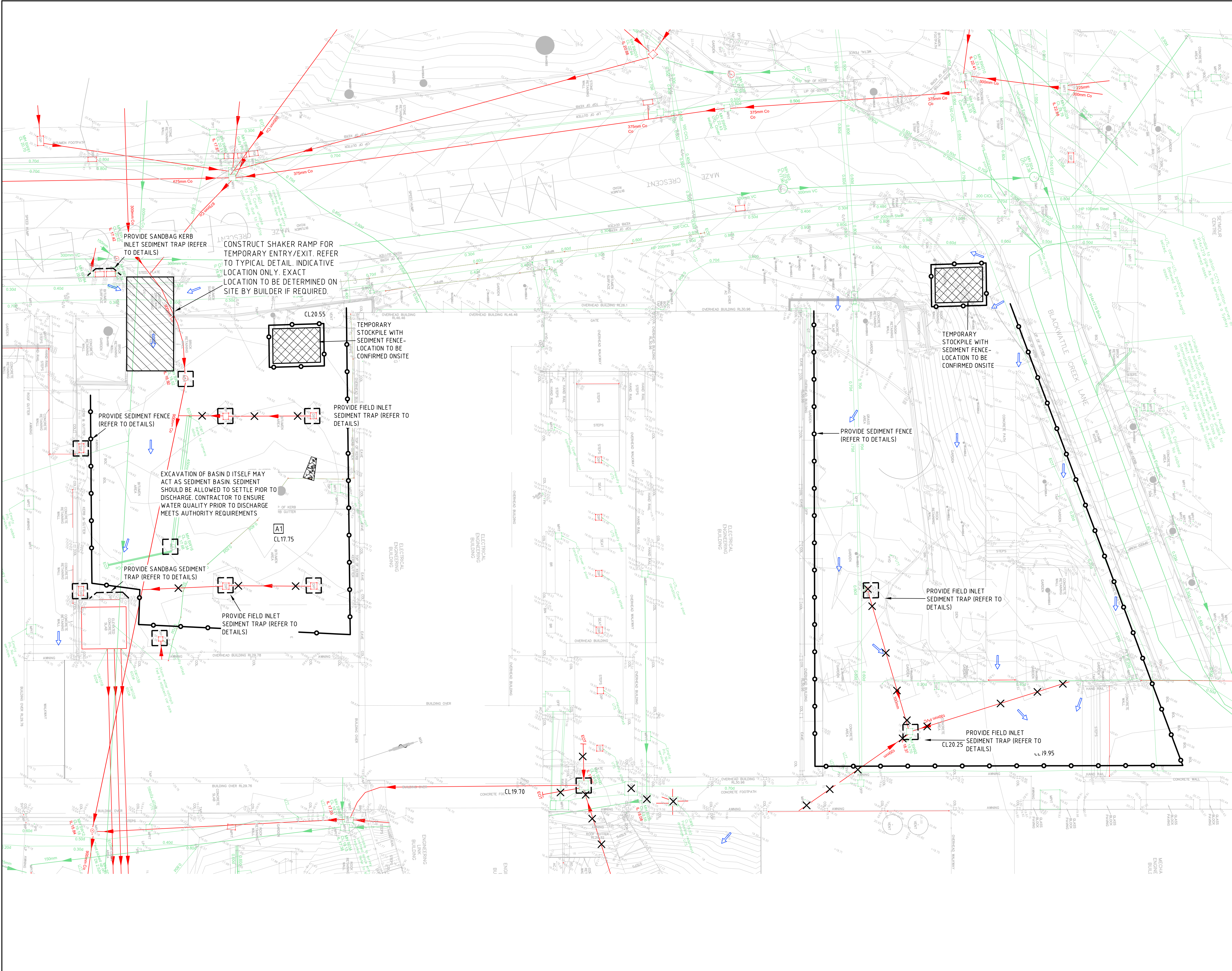
3.5. Erosion and Sediment Control

A sediment and erosion control plan has been prepared in accordance with Landcoms Managing Urban Stormwater: Soils and Construction Volume 1 (the “Blue Book”). The erosion and sediment control measures have been designed to meet the requirements of the Blue Book – the Contractor will be responsible for confirming the design and phasing the installation of the measures to suit the construction staging.

Refer to Appendix A Sediment and Erosion Control Plan (Drawings K33-BON-CIV-SKT-C005-P1 and K33-BON-CIV-SKT-C006-P1)

APPENDIX A – SEDIMENT AND EROSION CONTROL PLANS

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SOIL AND WATER MANAGEMENT LEGEND

- SEDIMENT FENCE
- TEMPORARY SHAKER RAMP FOR ENTRY/EXIT
- TEMPORARY STOCKPILE (LOCATION TBC ON-SITE)
- GEOTEXTILE PIT FILTER / FILTER SURROUND INSTALLED ON EXISTING PIT
- SANDBAGS INSTALLED ON EXISTING PIT

SOIL AND WATER MANAGEMENT NOTES

- IT HAS BEEN ASSUMED THAT SEDIMENT FENCING WILL BE PROVIDED TO THE STAGE BOUNDARY SUFFICIENT TO PREVENT SEDIMENT RUNOFF FROM LEAVING SITE (EXCEPT IN THE CASE OF ENTRY/EXIT LOCATIONS WHERE TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TRAP ARE PROVIDED). IF THIS IS NOT THE CASE, PROVIDE SEDIMENT FENCE TO STANDARD DETAIL BELOW AS REQUIRED TO PREVENT SEDIMENT FROM LEAVING SITE, DIRECT RUNOFF TO SEDIMENT BASIN.
- ALL SEDIMENT CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH LANDCOM MANAGING URBAN STORMWATER "BLUE BOOK".
- MINIMISE CLEARING OUTSIDE BASEMENT EXTENT.
- SEDIMENT CONTROL FOR LANDSCAPED WORKS DOWNSTREAM OF THE BUILDING TO INCLUDE A SILT/FENCE AND SANDBAGS AS REQUIRED. TO BE MANAGED AT A RATE OF 50L/S BY THE CONTRACTOR ON SITE. INSTALL CATCH DRAIN TO DIVERT UPSTREAM CATCHMENT AWAY FROM DISTURBED SOIL AREA.

SEDIMENT CONTROL CONDITIONS

- SEDIMENT FENCES WILL BE INSTALLED AS SHOWN AND ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER TO CONTAIN COARSER SEDIMENT FRACTIONS INCLUDING AGGREGATED FINES) AS NEAR AS POSSIBLE TO THEIR SOURCE.
- SEDIMENT REMOVED FROM ANY TRAPPING DEVICE WILL BE RELOCATED WHERE FURTHER POLLUTION TO DOWNSLOPE LANDS & WATERWAYS CANNOT OCCUR.
- STOCKPILES WILL BE PLACED WHERE SHOWN ON DRAWING OR ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER AND NOT WITHIN 5m OF HAZARD AREAS INCLUDING LIKELY AREAS OF HIGH VELOCITY FLOWS SUCH AS WATERWAYS, PAVED AREAS & DRIVEWAYS.
- WATER WILL BE PREVENTED FROM DIRECTLY ENTERING THE PERMANENT DRAINAGE SYSTEM WITH INLET FILTERS (SEE DETAILS) UNLESS IT IS SEDIMENT FREE.
- TEMPORARY SEDIMENT TRAPS WILL BE RETAINED UNTIL AFTER THE LANDS THEY ARE PROTECTING ARE COMPLETELY REHABILITATED.
- CONTRACTOR TO DESIGN/SIZE/CONSTRUCT TEMPORARY SEDIMENT BASIN. WATER SHOULD BE ALLOWED TO SETTLE BEFORE DISCHARGE. CONTRACTOR MUST VERIFY THAT WATER QUALITY MEETS AUTHORITIES REQUIREMENTS PRIOR TO DISCHARGE. ACCUMULATED SEDIMENT SHOULD THEN BE REMOVED & DISPOSED OF IN ACCORDANCE WITH ENVIRONMENTAL MANAGEMENT PROCEDURES.

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A	ISSUED FOR 30% SCHEMATIC DESIGN	22.08.18	PA	-			
P2	ISSUED FOR DEVELOPMENT APPLICATION	21.08.18	PA	-			
P1	ISSUED FOR INFORMATION	15.11.17	JH	-			
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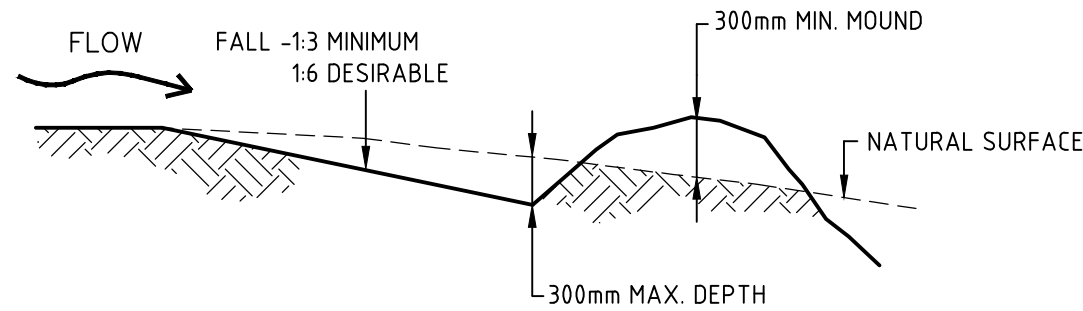
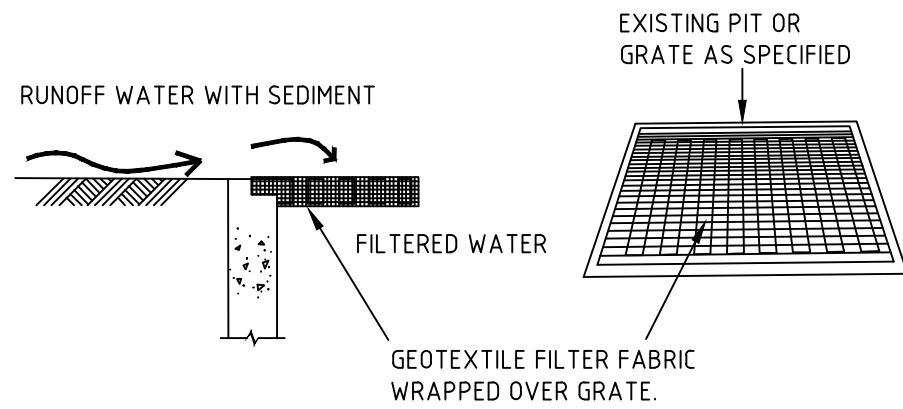
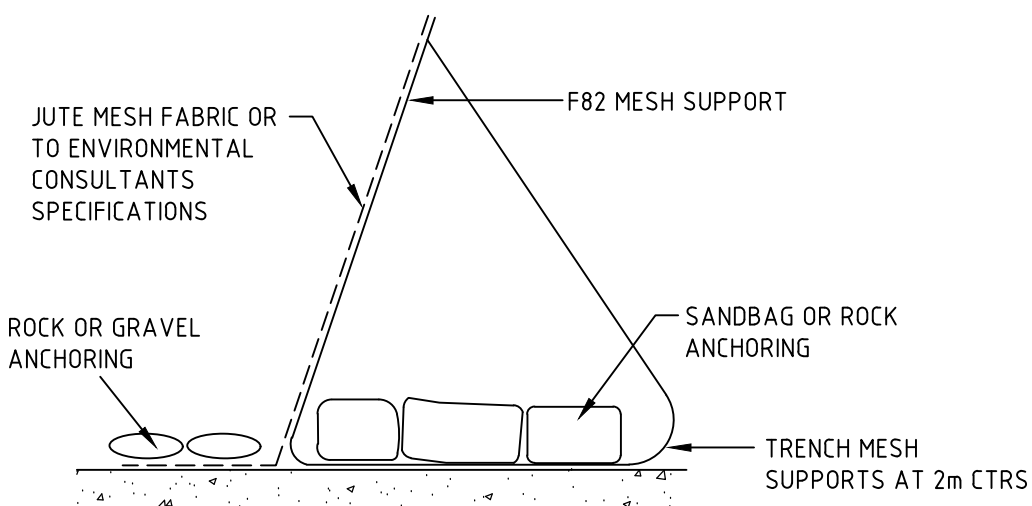
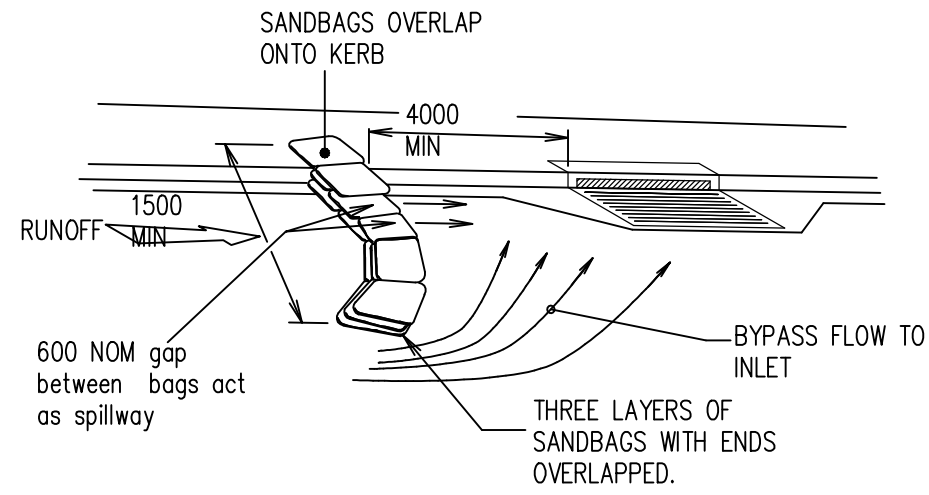
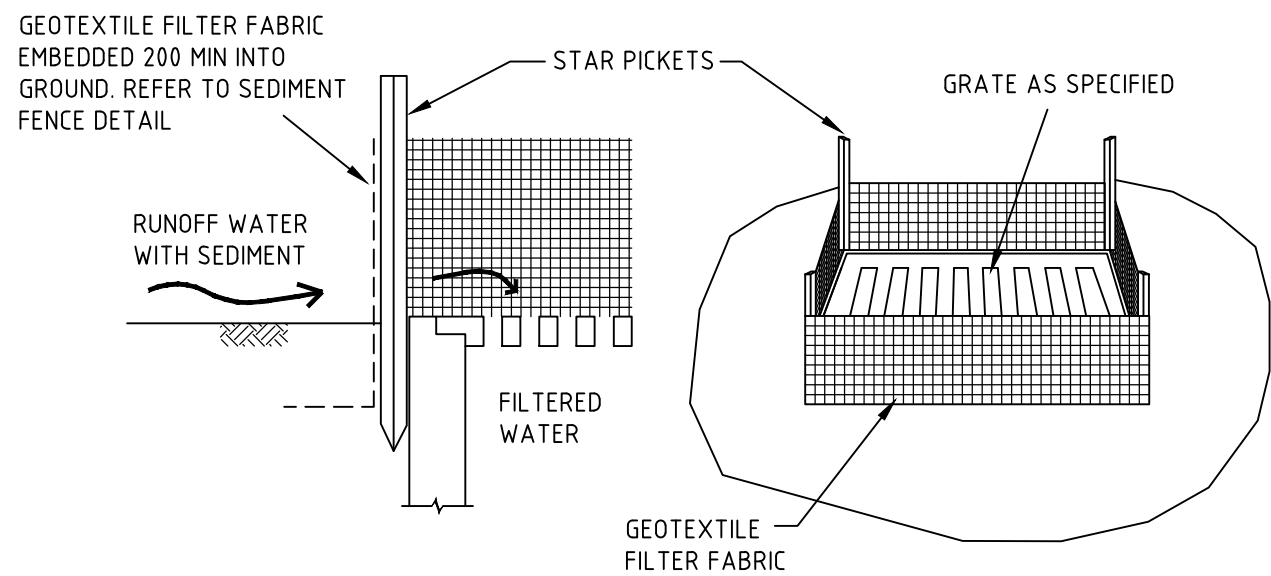
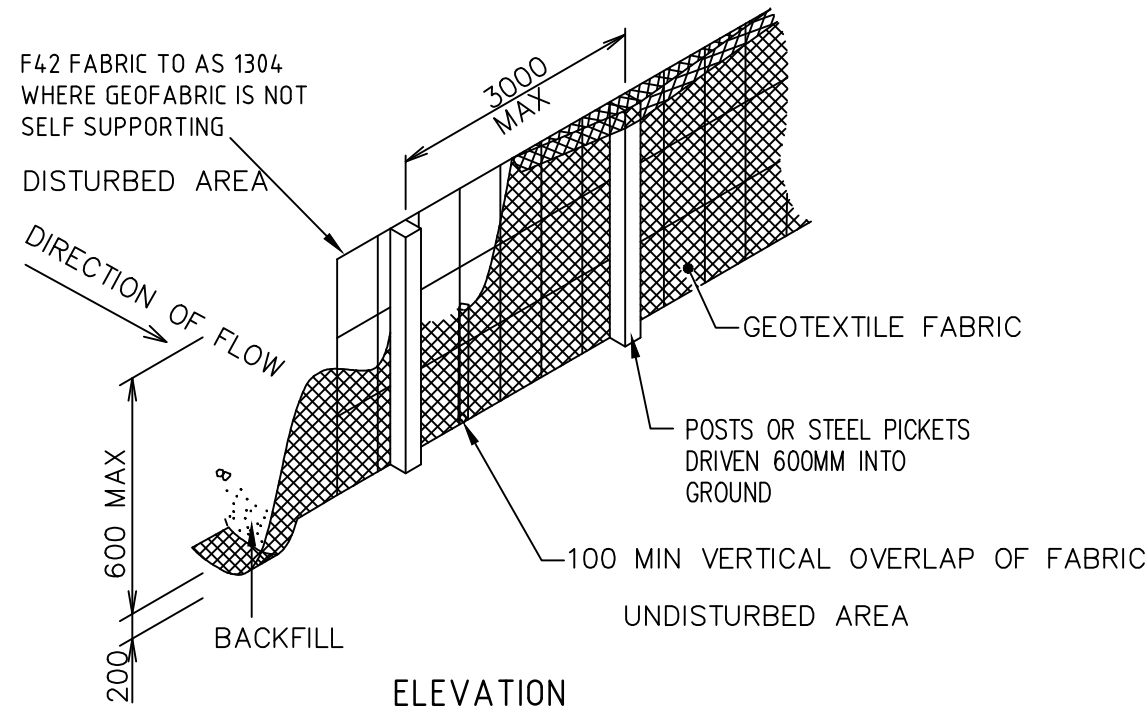
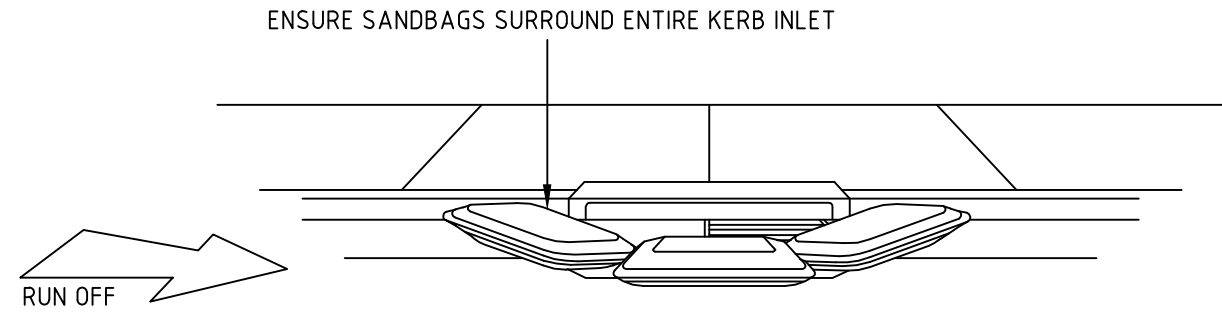
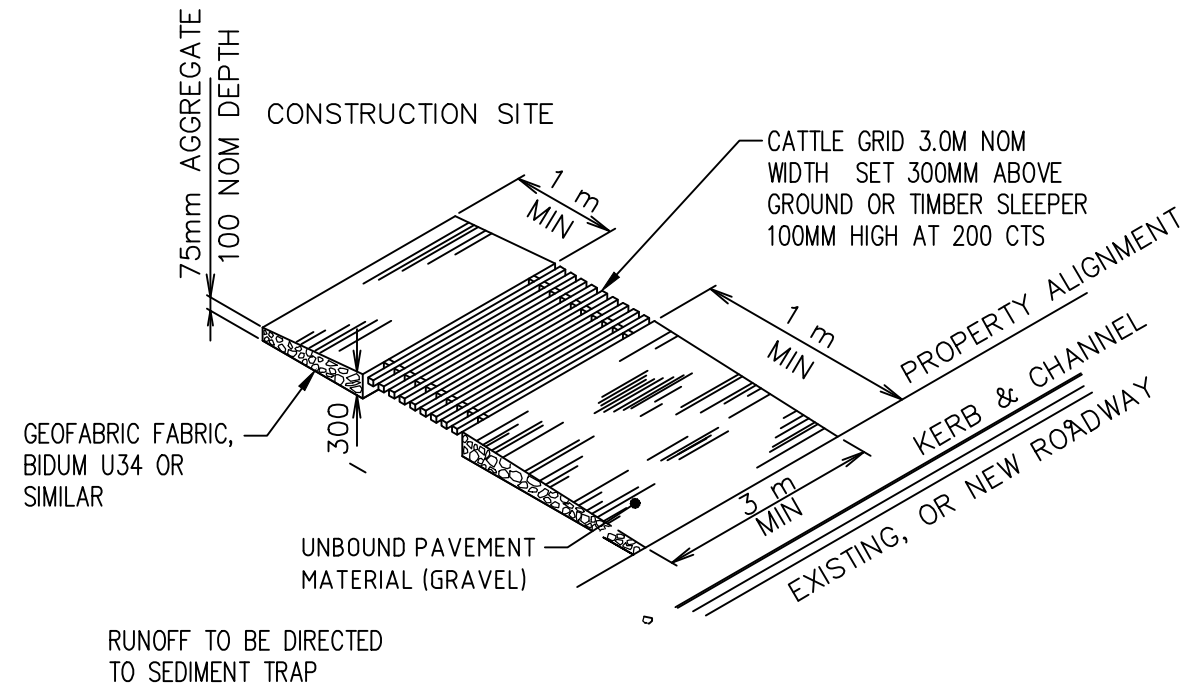
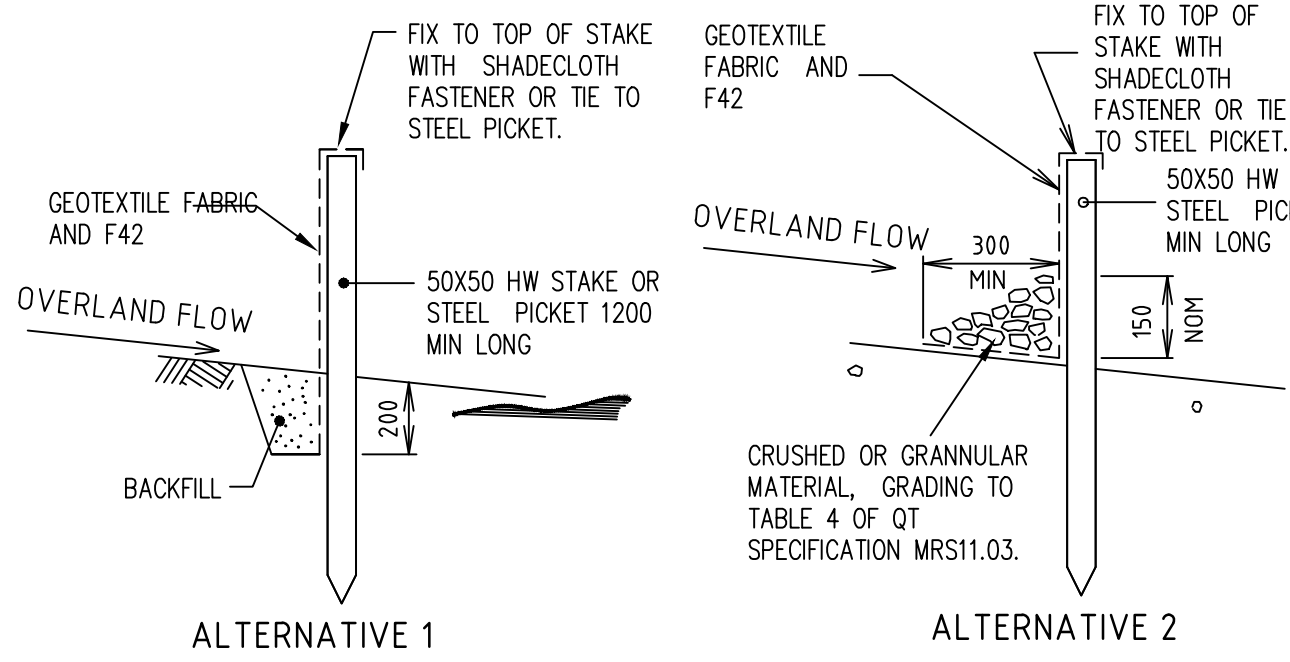
Project Name
**THE UNIVERSITY OF SYDNEY
ENGINEERING AND TECHNOLOGY
PRECINCT (ETP) - STAGE 1**

Drawing Title
**SOIL AND WATER MANAGEMENT
PLAN**

30% SCHEMATIC DESIGN

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Date	NOV 17			
Sheet	A1			

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ALTERNATIVE SEDIMENT FENCE NOTES

1. INSTALL THIS TYPE OF SEDIMENT FENCE WHEN USE OF SUPPORT POSTS IS NOT DESIRABLE OR NOT POSSIBLE. SUCH CONDITIONS MIGHT APPLY, FOR EXAMPLE, WHERE APPROVAL IS GRANTED FROM THE APPROPRIATE AUTHORITIES TO PLACE THESE FENCES IN HIGHLY SENSITIVE ESTUARINE AREAS.
2. USE BENT TRENCH MESH TO SUPPORT THE F82 WELDED MESH FACING AS SHOWN ON THE DRAWING ABOVE. ATTACH THE JUTE MESH TO THE WELDED MESH FACING USING UV-RESISTANT CABLE TIES.
3. STABILISE THE WHOLE STRUCTURE WITH SANDBAG OR ROCK ANCHORING OVER THE TRENCH MESH AND THE LEADING EDGE OF THE JUTE MESH. THE ANCHORING SHOULD BE SUFFICIENTLY LARGE TO ENSURE STABILITY OF THE STRUCTURE IN THE DESIGN STORM EVENT, USUALLY THE 10 YEAR EVENT.

SEDIMENT AND EROSION CONTROL DETAILS

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A ISSUED FOR 30% SCHEMATIC DESIGN 22.08.18 PA -
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Project Name
THE UNIVERSITY OF SYDNEY
ENGINEERING AND TECHNOLOGY
PRECINCT (ETP) - STAGE 1

Drawing Title
SOIL AND WATER MANAGEMENT
PLAN DETAILS

30% SCHEMATIC DESIGN

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Date NOV 17
Sheet A1

Project Director Approved Date North

Project Ref Drawing No Rev

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APPENDIX B – 30 % SCHEMATIC DESIGN ISSUE CIVIL DRAWINGS

10518C - UNIVERSITY OF SYDNEY ENGINEERING AND TECHNOLOGY PRECINCT
DRAWING REGISTER AND CONSTRUCTION NOTES - CIVIL & STORMWATER

DRAWING No.	DESCRIPTION
DRG-00001	DRAWING REGISTER AND CONSTRUCTION NOTES
DRG-00005	SOIL AND WATER MANAGEMENT PLAN
DRG-00006	SOIL AND WATER MANAGEMENT PLAN DETAILS
DRG-00031	SITWORKS AND STORMWATER DRAINAGE PLAN-SHEET 1
DRG-00032	SITWORKS AND STORMWATER DRAINAGE PLAN-SHEET 2
DRG-00033	SITWORKS AND STORMWATER DRAINAGE PLAN-SHEET 3
DRG-00060	SITWORKS AND STORMWATER DRAINAGE DETAILS SHEET 1
DRG-00061	SITWORKS AND STORMWATER DRAINAGE DETAILS-SHEET 2
DRG-00062	SITWORKS AND STORMWATER DRAINAGE DETAILS-SHEET 3

GENERAL NOTES

- THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL AND OTHER CONSULTANT DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS OR SKETCHES AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH WORK.
- MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATION, CURRENT SAA CODES, BUILDING REGULATIONS AND THE REQUIREMENTS OF ANY OTHER RELEVANT STATUTORY AUTHORITIES.
- THESE DRAWINGS MUST NOT BE SCALED. ALL DIMENSIONS ARE IN METERS, ALL SET OUT DIMENSIONS AND LEVELS, INCLUDING THOSE SHOWN ON THESE DRAWINGS SHALL BE IN ACCORDANCE WITH THE ARCHITECT'S DRAWINGS AND VERIFIED ON SITE.
- ALL SETOUT AND DIMENSIONS OF THE STRUCTURE INCLUDING KERBS AND RETAINING WALLS, AND BULK EARTHWORKS MUST BE TAKEN FROM THE ARCHITECT'S DRAWINGS. SETOUT OF THE STORMWATER PITS BY OTHERS. CONTRACTOR TO CONFIRM SETOUT OF SERVICE TRENCHING INCLUDING SUBSOIL ON SITE.
- THE CONTRACTOR SHALL COMPLY WITH ALL REGULATIONS OF AUTHORITIES HAVING JURISDICTION OVER THE WORKS. REFER TO GEOTECHNICAL REPORT BY COFFEY SERVICES AUSTRALIA PTY LTD REFERENCE: GEOTLCOV234/15AA-AC.
- ALL DIMENSIONS AND REDUCED LEVELS MUST BE VERIFIED ON SITE BEFORE THE COMMENCEMENT OF ANY WORK.
- THE APPROVAL OF A SUBSTITUTION SHALL BE SOUGHT FROM THE SUPERINTENDENT BUT IS NOT AN AUTHORISATION OF A COST VARIATION. THE SUPERINTENDENT MUST APPROVE ANY COST VARIATION INVOLVED BEFORE ANY WORK STARTS.
- ALL LEVELS SHOWN ARE TO THE AUSTRALIAN HEIGHT DATUM.
- SERVICE INFORMATION SHOWN IS APPROXIMATE ONLY. PRIOR TO COMMENCEMENT OF ANY WORKS, THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND SERVICES AND COMPLY WITH ALL REQUIREMENTS OF THOSE AUTHORITIES.
- EXISTING SURFACE CONTOURS, WHERE SHOWN, ARE INTERPOLATED AND MAY NOT BE ACCURATE.
- UNLESS NOTED OTHERWISE, ALL VEGETATION SHALL BE STRIPPED TO A MINIMUM DEPTH OF 150mm UNDER ALL PROPOSED PAVEMENT AND BUILDING AREAS.
- MAKE SMOOTH CONNECTION WITH ALL EXISTING WORKS.

SITEWORKS NOTES

- PRIOR TO THE PLACEMENT OF ANY PAVEMENTS, BUILDINGS OR DRAINS THE EXPOSED SUBGRADE SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD COMPACTION IN ACCORDANCE WITH TEST 'C1' OF A.S. 1289 FOR THE TOP 300mm. ANY SOFT SPOTS SHALL BE REMOVED AND REPLACED WITH GRANULAR FILL TO THE ENGINEERS APPROVAL AND COMPACTED IN ACCORDANCE WITH THE COMPACTION REQUIREMENTS SET OUT BELOW. ON HIGHLY REACTIVE CLAY AREAS SITE EXCAVATED MATERIAL MAY BE USED WITH THE PRIOR AUTHORISATION OF THE ENGINEER.
- S2 ALL FILL AND PAVEMENT MATERIALS SHALL BE COMPACTED IN ACCORDANCE WITH GEOTECHNICAL REPORT BY COFFEY SERVICES AUSTRALIA PTY LTD. REFERENCE: GEOTLCGV23415AA-AC. MOISTURE CONTENT TO BE MAINTAINED AT +/ -2% OMC. MINIMUM COMPACTION REQUIREMENTS ARE DETAILED BELOW FOR ALL REQUIREMENTS ARE TO VERIFIED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER:
- LANDSCAPED AREAS 98% STD.
 - FILL UNDER ANY FOOTINGS AND FLOOR SLABS FOR ANY STRUCTURE TO SUBGRADE LEVEL;
 - FINE CRUSHED ROCK 98% STD.
 - SELECTED FILL WITHOUT CONSPICUOUS CLAY CONTENT 98% STD.
 - BUILDING BASECOURSE 98% MOD
 - FILL UNDER ROAD PAVEMENTS;
 - TO WITHIN 500mm OF FINISHED SUBGRADE LEVEL 98% STD.
 - UP TO FINISHED SUBGRADE LEVEL 98% STD.
 - ROAD PAVEMENT MATERIALS;
 - SUB BASE 98% MOD.
 - BASE COURSE 98% MOD.
- THE MAXIMUM COMPACTION IS TO BE NO GREAT THAN 4% ON TOP OF THE ABOVE MENIONED VALUES.
- S3 GRADE EVENLY BETWEEN FINISHED SURFACE SPOT LEVELS. FINISHED SURFACE CONTOURS ARE SHOWN FOR CLARITY. WHERE FINISHED SURFACE LEVELS ARE NOT SHOWN, THE SURFACE SHALL BE GRADED SMOOTHLY SO THAT IT WILL DRAIN AND MATCH ADJACENT SURFACES OR STRUCTURES.
- S4 ALL DIMENSIONS GIVEN ARE TO FACE OF KERB, CENTER OF PIPE OR EXTERIOR FACE OF BUILDING UNLESS NOTED OTHERWISE.
- S5 ANY STRUCTURES, PAVEMENTS OR SURFACES DAMAGED, DIRTIED OR MADE UNSERVICABLE DUE TO CONSTRUCTION WORK SHALL BE REINSTATED TO THE SATISFACTION OF THE ENGINEER.
- S6 ANY FILL REQUIRED SHALL BE APPROVED BY THE ENGINEER / GEOTECHNICAL CONSULTANT
- S7 CONTRACTOR IS TO ENSURE THAT ALL EXCAVATIONS ARE MAINTAINED IN A DRY CONDITION WITH NO WATER ALLOWED TO REMAIN IN THE EXCAVATIONS.
- S8 ALL FINISHES AND COLOURS TO BE IN ACCORDANCE WITH ARCHITECTURAL SPECIFICATIONS.
- S9 REFER TO STRUCTURAL DRAWINGS FOR CONCRETE, REINFORCEMENT AND RETAINING WALL DETAILS.
- S10 GENERALLY FOR TRENCHING WORKS THE CONTRACTOR MUST:
- A) COMPLY WITH THE GENERAL PROVISIONS OF PART 3.1 "MANAGING RISKS TO HEALTH AND SAFETY" OF NSW WORK HEALTH AND SAFETY REGULATION 2011
- B) COMPLY PART 6.3 DIVISION 3 "EXCAVATION WORK" OF NSW WORK HEALTH AND SAFETY REGULATION NSW 2011
- S11 PRIOR TO THE EXCAVATION OF ANY TRENCH DEEPER THAN 15 METRES THE CONTRACTOR MUST:
- A) NOTIFY THE OCCUPATIONAL HEALTH AND SAFETY AUTHORITY ON THE APPROPRIATE FORM.

STORMWATER DRAINAGE NOTES

- | | |
|------|--|
| SW1 | UNLESS NOTED OTHERWISE BY HYDRAULIC ENGINEERS DRAWINGS, ALL DOWNPIPES & GRATED INLETS SHALL BE CONNECTED TO PITS OR MAIN STORMWATER DRAINS WITH 150 DIA. UPVC PIPES LAID AT A MINIMUM GRADE OF 1 IN 100. FOR SYPHONIC ROOF DRAINAGE SYSTEMS ALL DOWNPIPES CONNECTION DRAIN SIZES TO BE CONNECTED INTO MAIN STORMWATER DRAINS SHALL BE IN ACCORDANCE WITH HYDRAULIC ENGINEERS DRAWINGS. |
| SW2 | ALL MAIN STORMWATER DRAINS SHALL BE CONSTRUCTED USING MATERIALS AS SPECIFIED ON THE DRAWINGS IN ACCORDANCE WITH THE APPROPRIATE A.S. IF NOT SPECIFIED THEN MINIMUM CLASS 4 R/R RCP SHALL BE USED FOR DIAMETERS > 225mm. SEWER CLASS SEH UPVC IN ACCORDANCE WITH AS1260 SHALL BE USED FOR Ø225mm OR SMALLER. |
| SW3 | ALL PIPEWORK TO BE INSTALLED IN ACCORDANCE WITH AS3725 FOR RCP AND AS2032 FOR PVC. ALL BEDDING TO BE TYPE H2 UNLESS NOTED OTHERWISE. |
| SW4 | FOR ALL PITS > 1.2m DEEP, STEP IRONS SHALL BE INSTALLED. |
| SW5 | PRECAST PITS MAY BE USED EXTERNAL TO THE BUILDING SUBJECT TO APPROVAL BY BONACCI GROUP. |
| SW6 | ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA. |
| SW7 | WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED UPVC SEWER GRADE PIPE IS TO BE USED. |
| SW8 | GRATES AND COVERS SHALL CONFORM WITH AS 3996 AND AS 1428.1 FOR ACCESS REQUIREMENTS. |
| SW9 | CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES ARE NOT TO BE REDUCED WITHOUT APPROVAL. |
| SW10 | AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS. |
| SW11 | ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE SUPERINTENDENT/ENGINEER FOR FURTHER DIRECTIONS. |

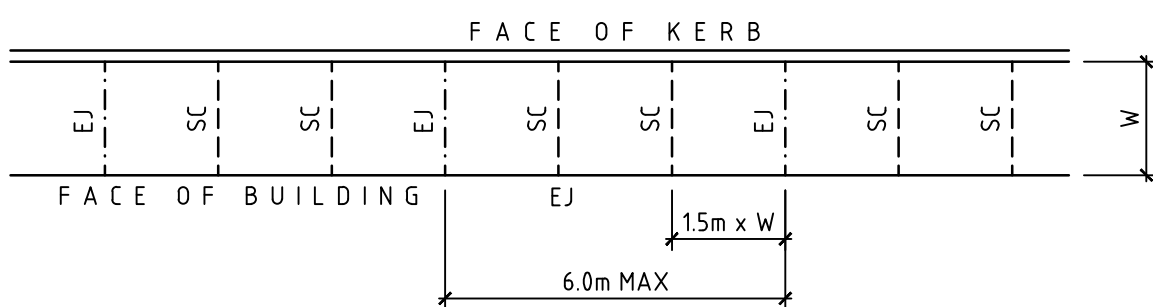
KERBING NOTES

- | | |
|----|--|
| K1 | ALL CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 32 MPa U.N.O. |
| K2 | ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 75mm GRANULAR BASECOURSE COMPACTED TO A MINIMUM 98% MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS1289 5.21. |
| K3 | EXPANSION JOINTS (EJ) TO BE FORMED FROM 10mm COMPRESSIBLE CORK FILLER BOARD FOR THE FULL DEPTH OF THE SECTION AND CUT TO PROFILE. EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PIT ON TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX 12m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE EXPANSION JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLAB. |
| K4 | WEAKENED PLANE JOINTS TO BE MIN 3mm WIDE AND LOCATED AT 3m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE WEAKENED PLANE JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLAB. |
| K5 | BROOMED FINISH TO ALL RAMPED AND VEHICULAR CROSSINGS. ALL OTHER KERBING OR DISH DRAINS TO BE STEEL FLOAT FINISHED. |
| K6 | IN THE REPLACEMENT OF KERBS:-
- EXISTING ROAD PAVEMENT IS TO BE SAWCUT 900mm U.N.O. FROM THE LIP OF GUTTER, UPON COMPLETION OF THE NEW KERB AND GUTTER, NEW BASECOURSE AND SURFACE TO BE LAID 600mm WIDE U.N.O.
- EXISTING KERBS ARE TO BE COMPLETELY REMOVED WHERE NEW KERBS ARE SHOWN. |

JOINTING NOTES

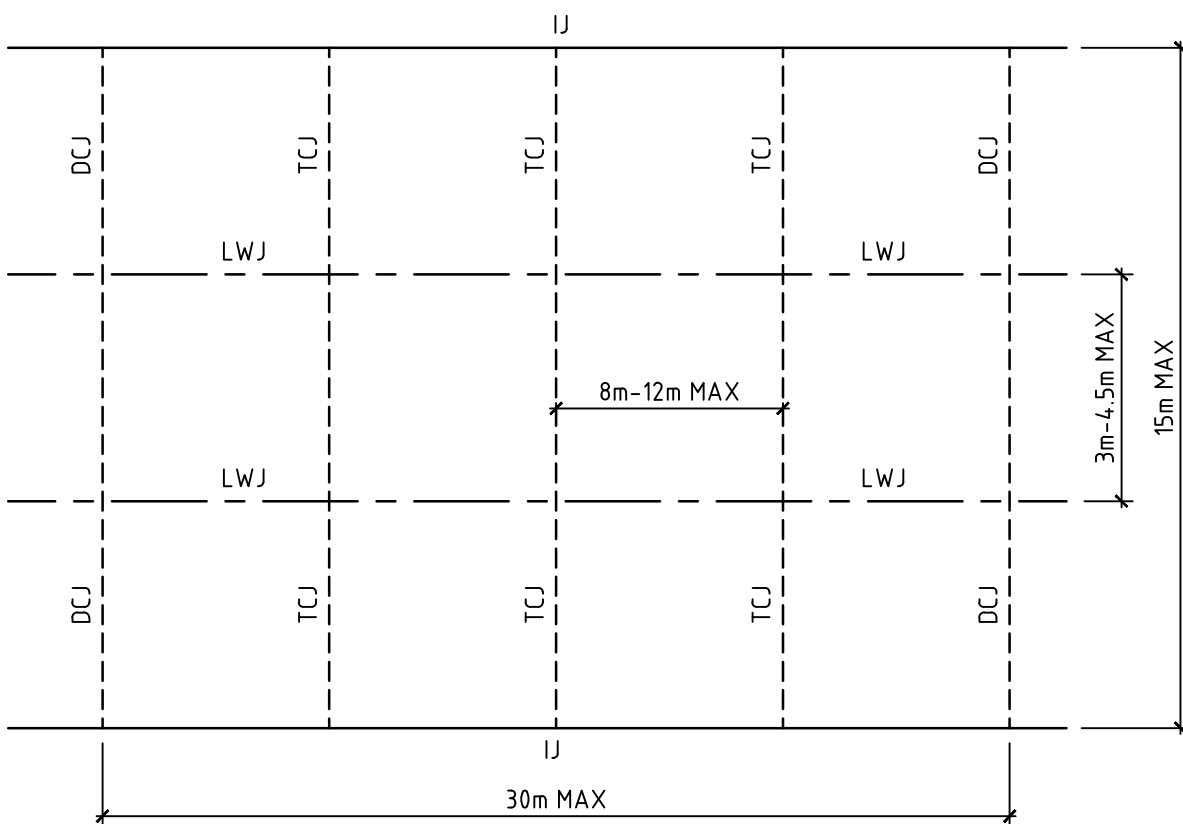
PEDESTRIAN FOOTPATH JOINTS

- | | |
|----|--|
| J1 | EXPANSION JOINTS (EJ) ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT 6m CENTRES. |
| J2 | SAW/CUT JOINTS (SC) ARE TO BE LOCATED AT A MAX 1.5m x WIDTH OF PAVEMENT. THE TIMING OF THE SAWCUT IS TO BE CONFIRMED BY THE CONTRACTOR ON SITE. SITE CONDITIONS WILL DETERMINE HOW MANY HOURS AFTER THE CONCRETE POUR BEFORE THE SAW CUTS ARE COMMENCED. |
| J3 | WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND / OR ADJACENT PAVEMENT JOINTS. |
| J4 | PROVIDE 10mm WIDE FULL DEPTH EXPANSION JOINTS (EJ) BETWEEN BUILDINGS AND ALL CONCRETE OR UNIT PAVERS |
| J5 | ALL PEDESTRIAN FOOTPATH JOINTINGS AS FOLLOWS (U.N.O.). |



VEHICULAR PAVEMENT JOINTS

- | | |
|-----|--|
| J6 | ALL VEHICULAR PAVEMENTS TO BE JOINTED AS SHOWN ON DRAWINGS. |
| J7 | LONGITUDINAL WARPING JOINTS (LWJ) SHOULD GENERALLY BE LOCATED AT A MAXIMUM OF 3m TO 4.5m MAX CENTERS. ALL LWJ'S SHOULD BE TIED UP TO A MAXIMUM TOTAL WIDTH OF 30m. |
| J8 | TRANSVERSE CONTRACTION JOINTS (TCJ) SHOULD GENERALLY BE LOCATED AT A MAXIMUM OF 8m TO 12m MAX CENTERS. TCJ'S CAN BE SPACED AT SUITABLE INTERVALS UP TO A RECOMMENDED MAXIMUM LENGTH OF 15m. |
| J9 | TRANSVERSE DOWELLED CONSTRUCTION JOINTS (DCJ) TO BE PROVIDED FOR PLANNED INTERRUPTIONS SUCH AS AT THE END OF EACH DAY'S OPERATIONS (POUR BREAK), AT BLOCK OUTS FOR BRIDGES AND INTERSECTIONS OR FOR UNEXPECTED DELAYS WHEN THE SUSPENSION OF OPERATIONS IS LIKELY TO CREATE A JOINT. |
| J10 | ISOLATION JOINTS WITH SUB-GRADE BEAM (IJ) TO BE PROVIDED AT INTERSECTIONS OR AT THE JUNCTION OF A POUR BREAK. |
| J11 | ALL VEHICULAR PAVEMENTS TO BE JOINTED IN ACCORDANCE WITH AUSTRORoads AGPT02-12 GUIDE TO PAVEMENT TECHNOLOGY PART 2 STRUCTURAL PAVEMENT DESIGN AND SUPPLEMENT AP-T36-06 PAVEMENT DESIGN FOR LIGHT TRAFFIC |
| J12 | VEHICULAR PAVEMENT JOINTING AS FOLLOWS (U.N.O.) |



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A	ISSUED FOR 30% SCHEMATIC DESIGN	23.08.18	PA	
Rev	Description	Date	By	App

Rev	Description	Date	By	App
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~~BONACCI~~

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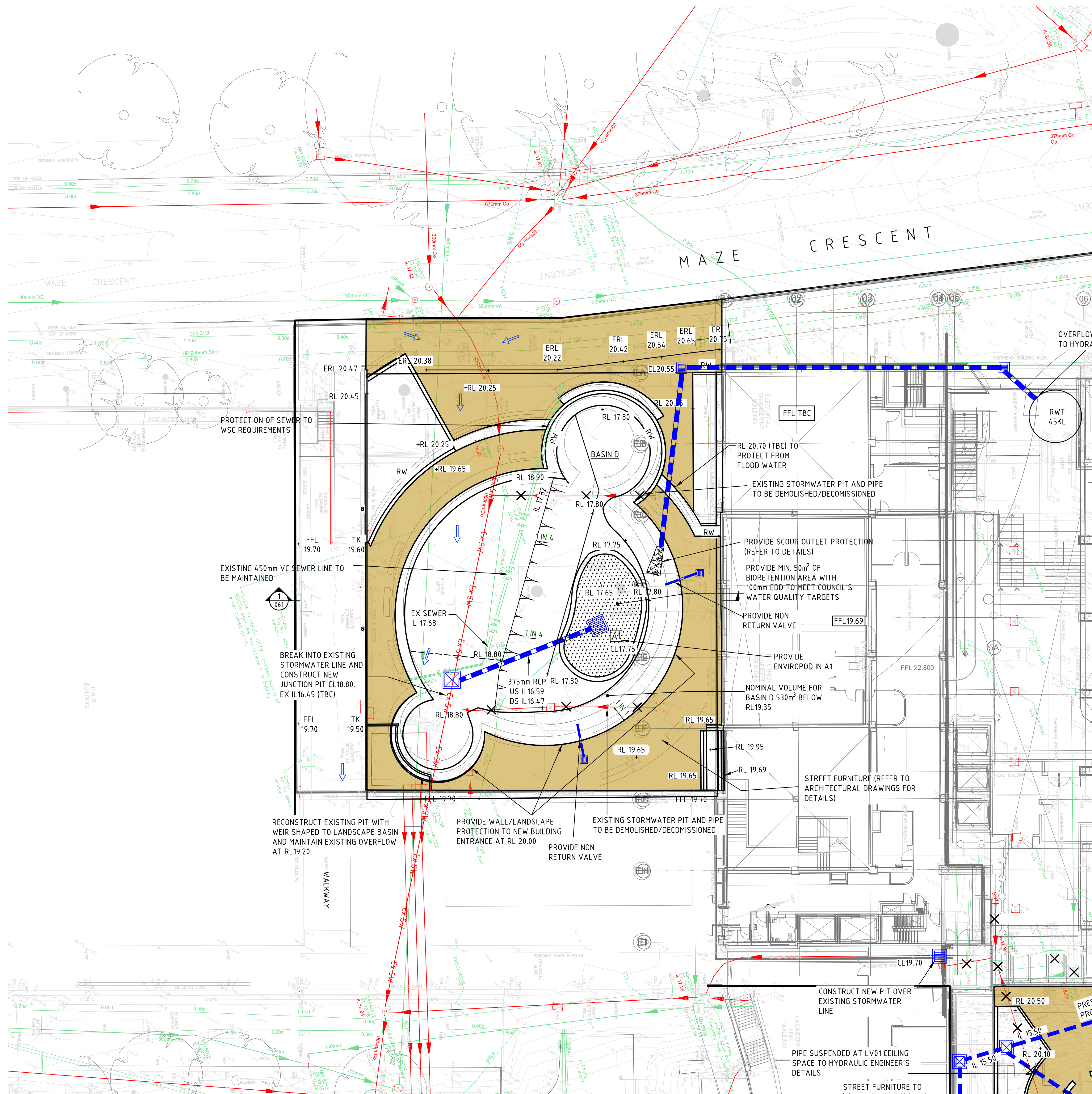
Project Name UNIVERSITY OF SYDNEY
SUSAN WAKIL HEALTH BUILDING

DRAWING REGISTER AND CONSTRUCTION NOTES

30% SCHEMATIC DESIGN

Designed	JH	Project Director Approved	Date	North
Drawn	PA			
Scale		Project Ref	Drawing No	Rev
Date	APRIL 2018			
Sheet	A1	K33-BON-CIV-DRG-00001		A

File: G:\Job\1051801\Civil\Issued\DWG\K33-BON-CIV-DRG-00031-CA01.dwg Plotted: 07.09.18 at 7:30 PM By: Praveen Adhikari



SITEWORKS LEGEND

IK 7.25	INVERT OF KERB LEVEL	ERL 7.25	EXISTING SURFACE LEVEL
TK 7.25	TOP OF KERB LEVEL	RL 7.25	FINISHED SURFACE LEVEL
RW	RETAINING WALL	K0	KERB ONLY
	EMERGENCY OVERLAND FLOW		STORMWATER LINE
	BIO RETENTION BASIN		STORMWATER GRATED PIT
	PAVEMENT FINISH TO LANDSCAPE ARCHITECTS DETAILS		JUNCTION PIT
	EXISTING STORMWATER TO BE MADE REDUNDANT	IL 1.75	PIPE INVERT LEVEL
		G6 SL 49.15	PIT NO. SURFACE LEVEL

- NOTES:
- 1% AEP FLOOD LEVEL 20.7 WESTERN (TOWARDS MAZE CRESCENT) AND R.L. 19.80 EASTERN FROM TUFLOW MODELLING (ASSUMING TENNIS COURT MITIGATION MEASURES CONSTRUCTED).
 - FLOOD PROTECTION TO J03 FLOOR LEVELS ARE PROVIDED BY A STEP OR RAMP. FREEBOARD HAS BEEN SELECTED ON MERITS BASED APPROACH, WITH MINIMUM LEVEL OF THE 1% AEP FLOOD LEVEL EXCEEDED IN ACCORDANCE WITH CITY OF SYDNEY INTERIM FLOODPLAIN MANAGEMENT POLICY.

REFER TO DRAWING C032 FOR CONTINUATION

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P5	ISSUE FOR 30% DD	02.07.18	PA	-
P4	ISSUE FOR INFORMATION	07.06.18	JH	-
P3	ISSUE FOR INFORMATION	26.04.18	JH	-
P2	ISSUE FOR SSDA	01.12.17	JH	-
P1	ISSUE FOR INFORMATION	15.11.17	JH	-

C	ISSUED FOR 30% SCHEMATIC DESIGN	07.19.18	PA	-
B	ISSUED FOR 30% SCHEMATIC DESIGN	03.09.18	JH	-
A	ISSUED FOR 30% SCHEMATIC DESIGN	22.08.18	PA	-
P6	ISSUE FOR DEVELOPMENT APPLICATION	21.08.18	PA	-

Rev	Description	Date	By	App	Rev	Description	Date	By	App
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Project Name
THE UNIVERSITY OF SYDNEY
ENGINEERING AND TECHNOLOGY
PRECINCT (ETP) - STAGE 1

Drawing Title
SITEWORKS AND STORMWATER
DRAINAGE PLAN - SHEET 1

30% SCHEMATIC DESIGN

Designed AV
Drawn JH
Scale 1:200
Date NOV 17
Sheet A1

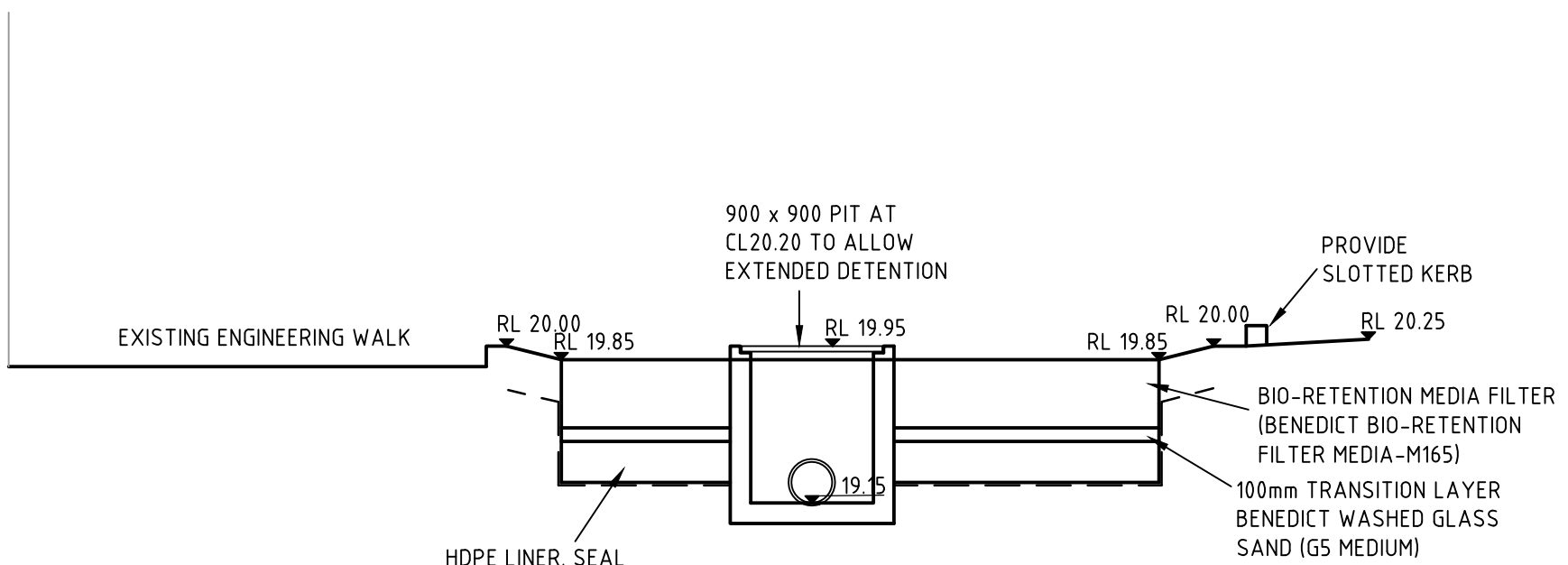
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Date
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Drawing No
Rev

North
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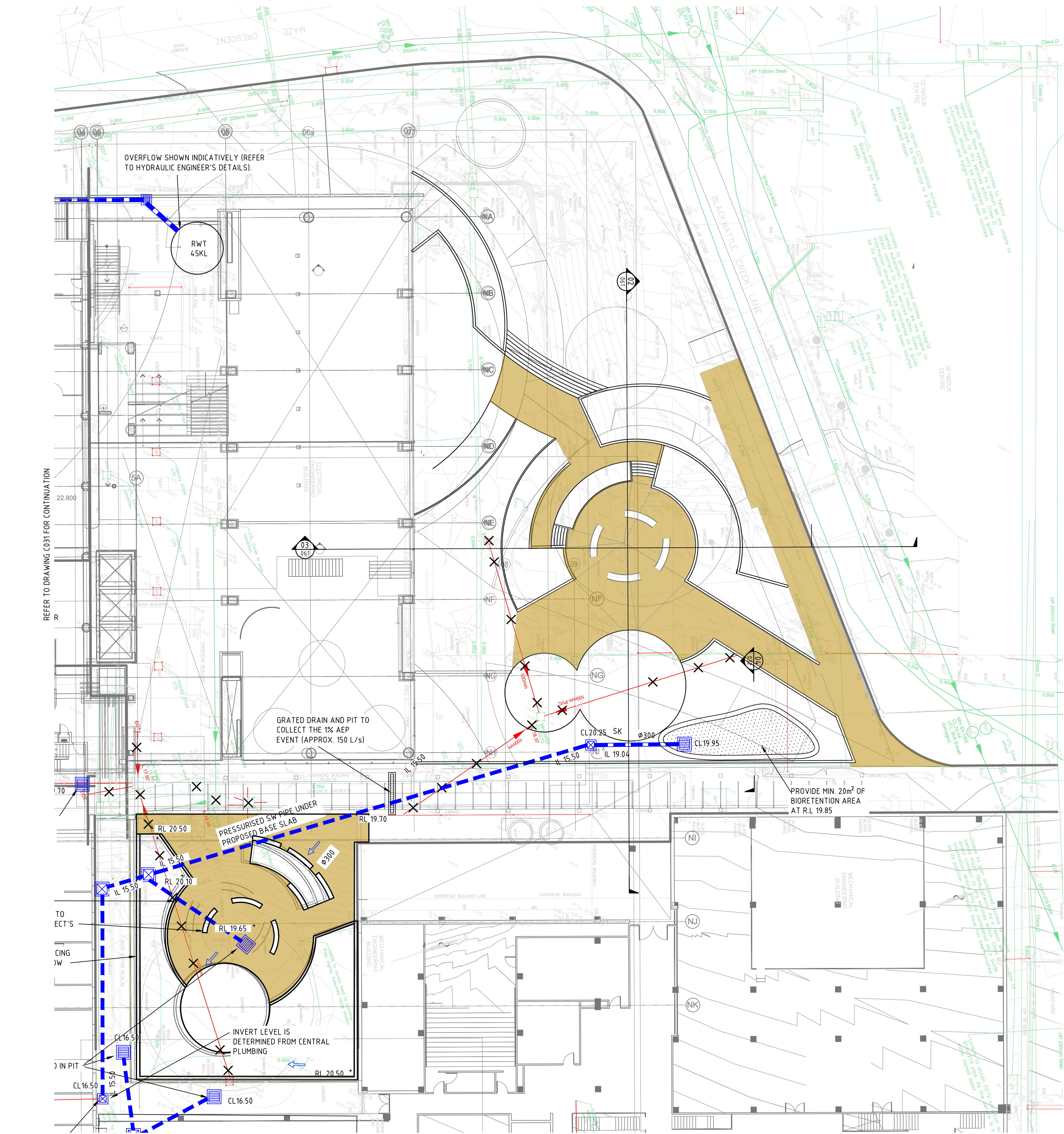
SITEWORKS LEGEND

IK 7.25	INVERT OF KERB LEVEL	ERL 7.25	EXISTING SURFACE LEVEL
TK 7.25	TOP OF KERB LEVEL	RL 7.25	FINISHED SURFACE LEVEL
		K0	KERB ONLY
RW	RETAINING WALL		STORMWATER LINE
	EMERGENCY OVERLAND FLOW		STORMWATER GRATED PIT
	BIO RETENTION BASIN		JUNCTION PIT
		IL 7.25	PIPE INVERT LEVEL
K0	KERB ONLY	G6	PIT NO. SURFACE LEVEL
FK	FLUSH KERB		TOP OF WALL
RW	RETAINING WALL	TW 7.25	BOTTOM OF WALL
SK	SLOTTED KERB	BW 7.25	
	EXISTING STORMWATER TO BE MADE REDUNDANT		
	PAVEMENT FINISH TO LANDSCAPE ARCHITECTS DETAILS		

EXISTING MECHANICAL ENGINEERING BUILDING



SECTION 04
SCALE 1:50
C032



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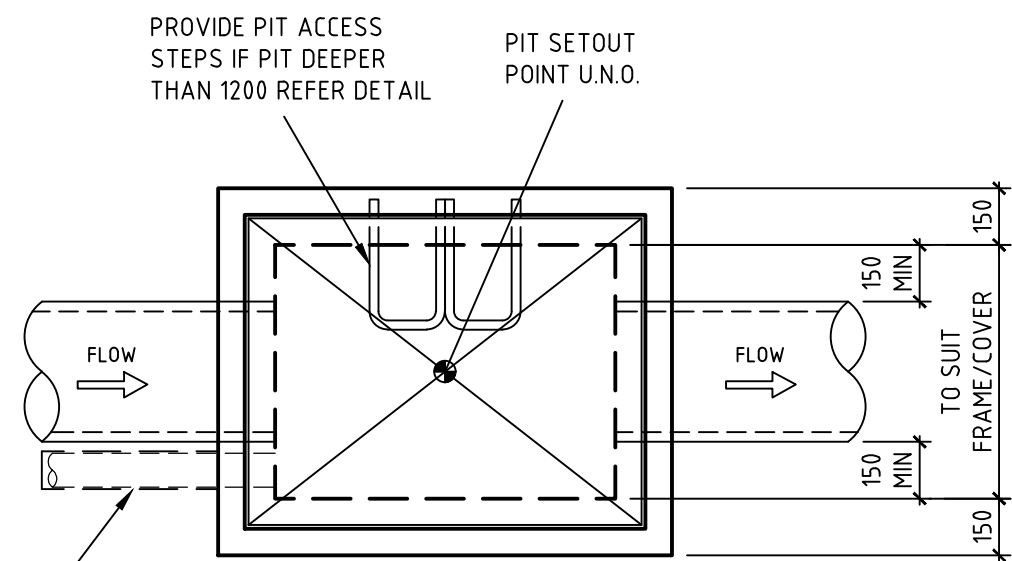
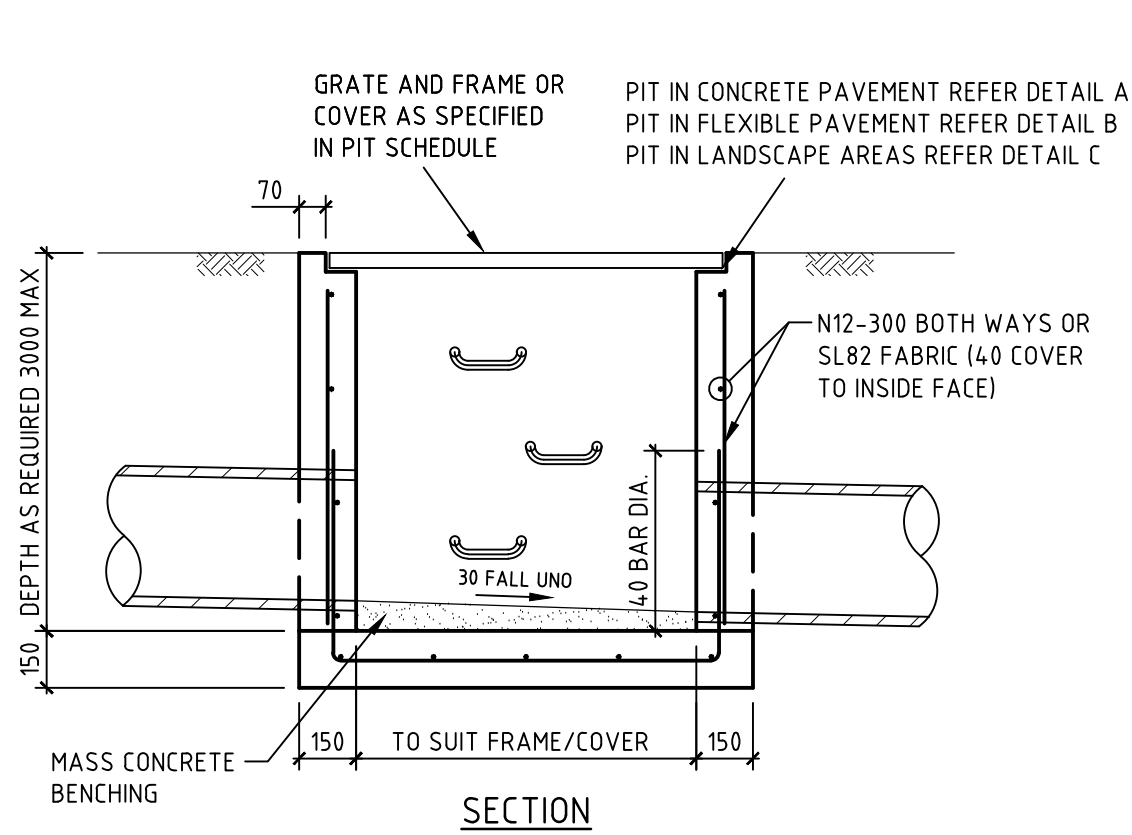
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Project Name
**THE UNIVERSITY OF SYDNEY
ENGINEERING AND TECHNOLOGY
PRECINCT (ETP) - STAGE 1**

Drawing Title
**SITEWORKS AND STORMWATER
DRAINAGE PLAN - SHEET 2**

30% SCHEMATIC DESIGN			
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Sheet	A1	K33-BON-CIV-DRG-00032 C	



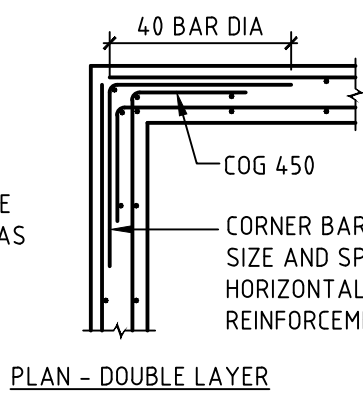
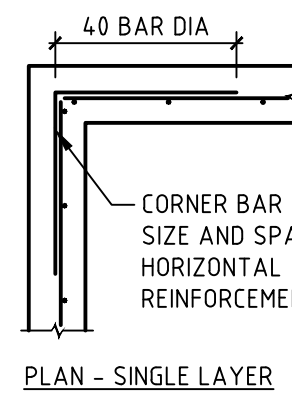
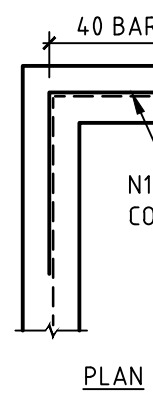
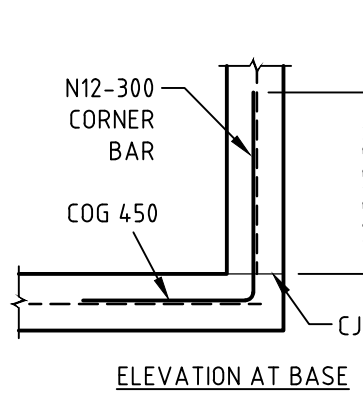
100 DIA x 3000 LONG SUBSOIL DRAINAGE STUB SURROUNDED WITH 100mm OF NOM 20mm COARSE FILTER MATERIAL WRAPPED IN GEOTEXTILE FILTER FABRIC (BIDM A24 OR SIMILAR) TO EACH INLET PIPE

SURFACE INLET/JUNCTION PIT DETAIL

SCALE 1:20

STORMWATER PIT NOTES

1. CONCRETE TO HAVE A MIN. COMPRESSIVE STRENGTH (F_c) OF 25 MPa AT 28 DAYS.
2. REINFORCEMENT NOT REQUIRED IF DEPTH OF PIT IS LESS THAN 1000mm. PITS GREATER THAN 3000mm DEEP TO HAVE WALL AND BASE 200mm THICK REINFORCED WITH N12-250 EACH WAY EACH FACE WITH CONCRETE STRENGTH F_c = 40 MPa.
3. PROVIDE STEP IRONS AT MAX 350mm CTRS IF DEPTH OF PIT EXCEEDS 1200mm.
4. IF REINFORCING FABRIC IS TO BE USED REFER TO WALL AND CORNER DETAILS.
5. PRECAST PITS ARE TO GENERALLY COMPLY WITH THESE DETAILS.
6. PRECAST PIT MAY BE USED SUBJECT TO ENGINEERS APPROVAL.
7. ALL PITS TO BE LOCKABLE.
8. FINAL INTERNAL PIT DIMENSIONS ARE TO COMPLY WITH AS 3500.



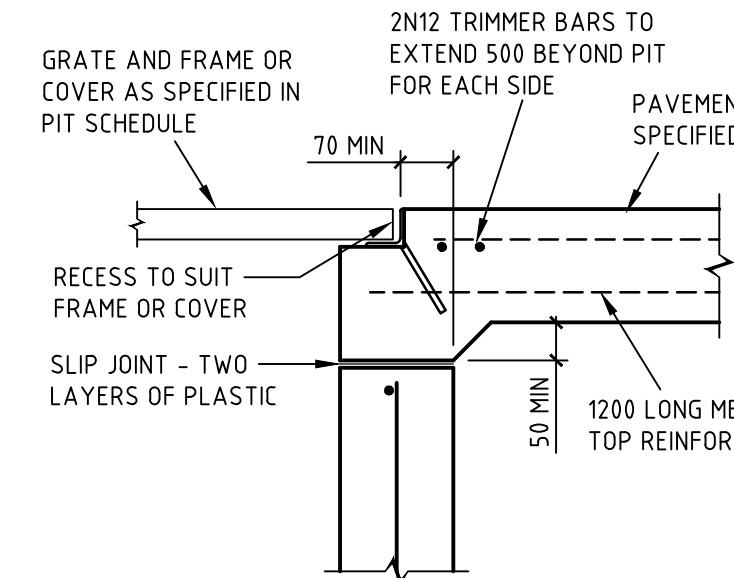
FABRIC

REINFORCEMENT

PIT CORNER DETAILS

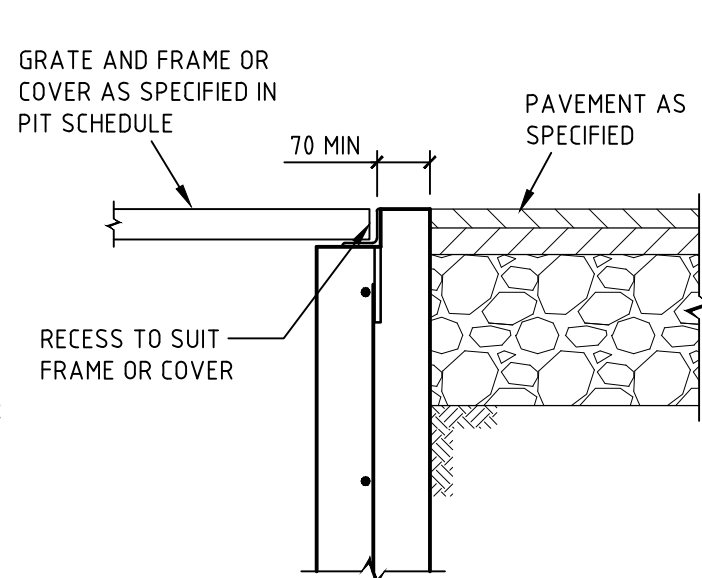
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NOTE: DESIGNER TO VERIFY EXTENT OF DETAILING



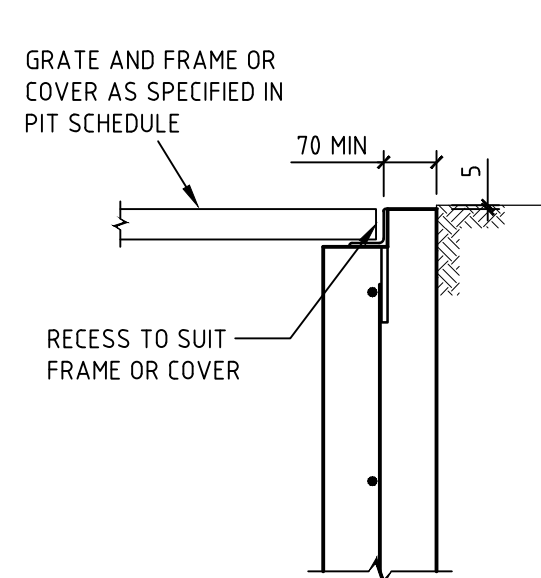
DETAIL A

SCALE 1:10



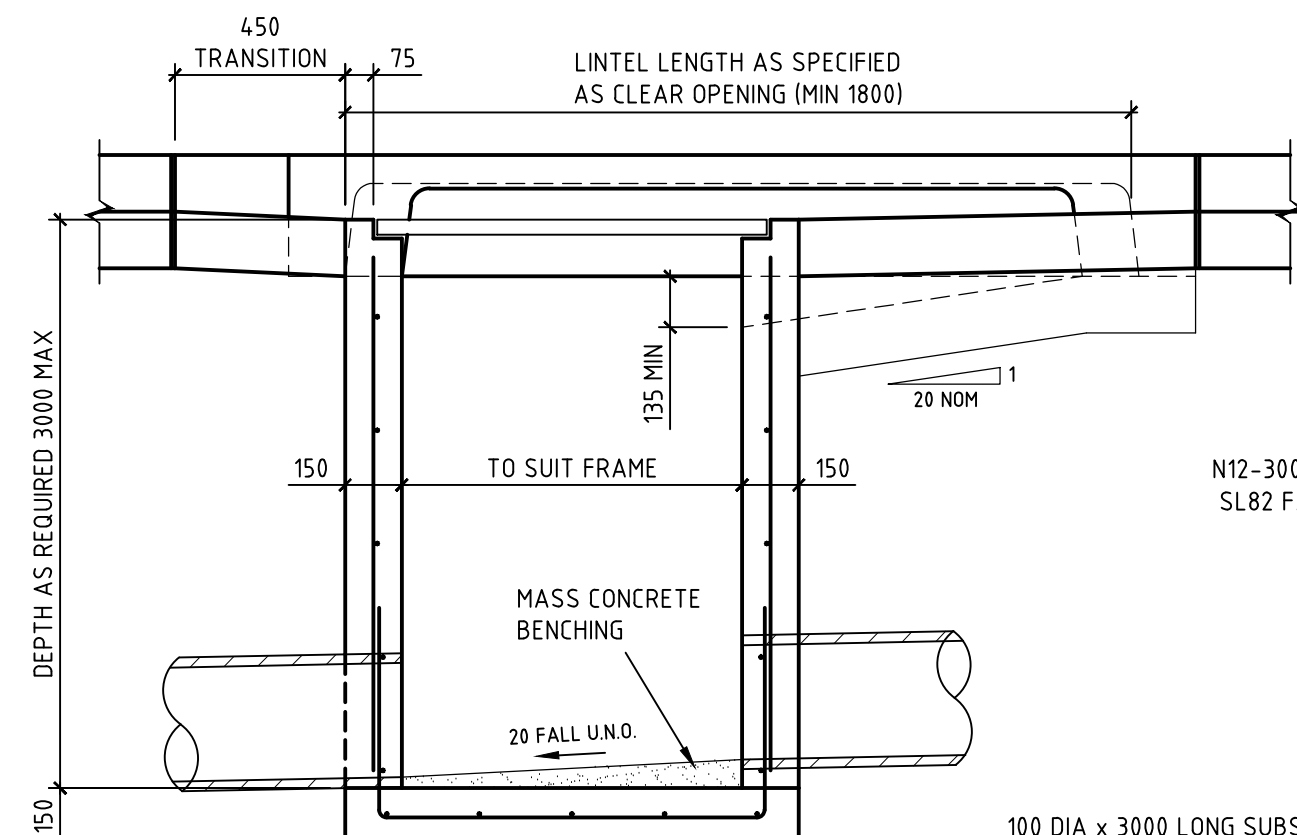
DETAIL B

SCALE 1:10



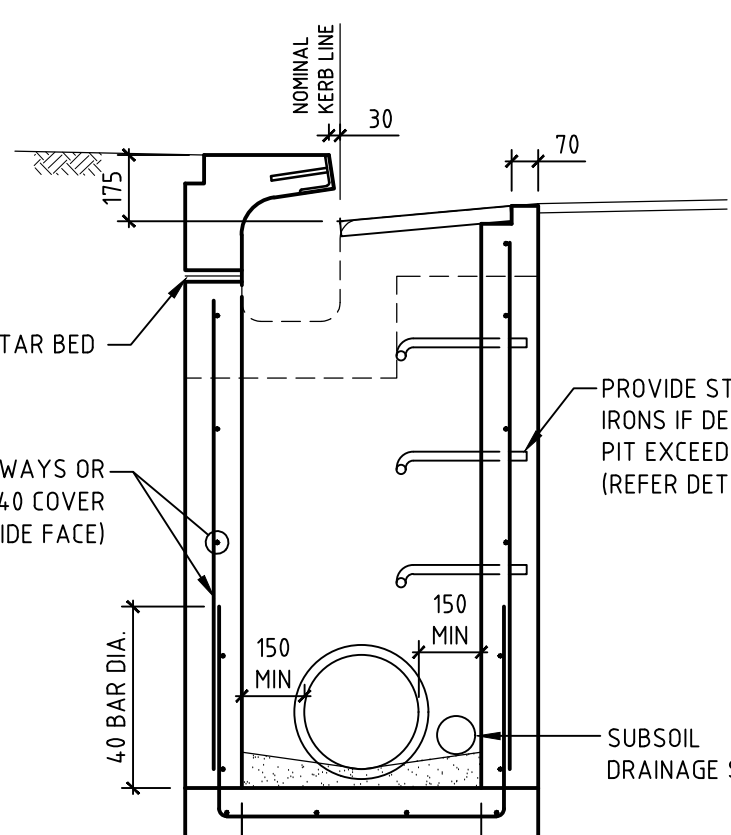
DETAIL C

SCALE 1:10



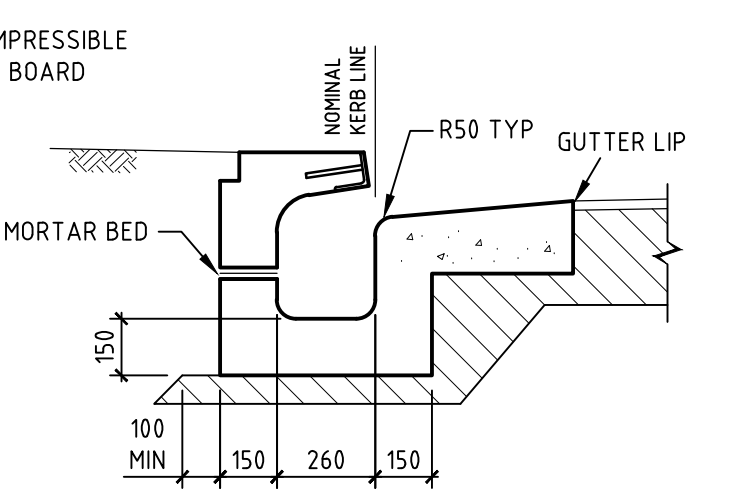
SECTION A - A

SCALE 1:20



SECTION B - B

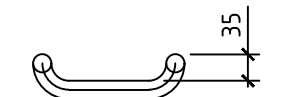
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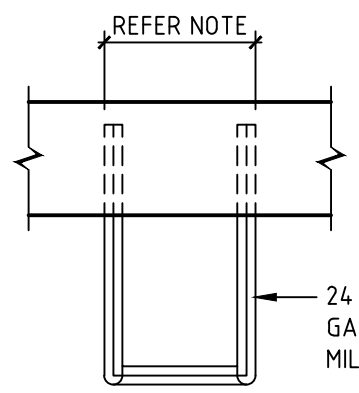
SECTION C - C

SCALE 1:20

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



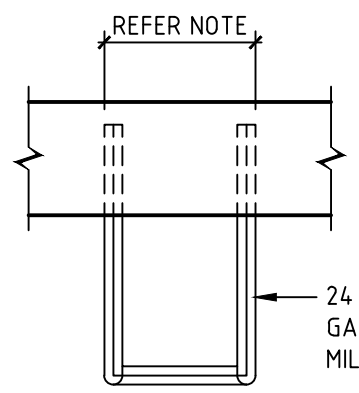
FRONT ELEVATION



SIDE ELEVATION

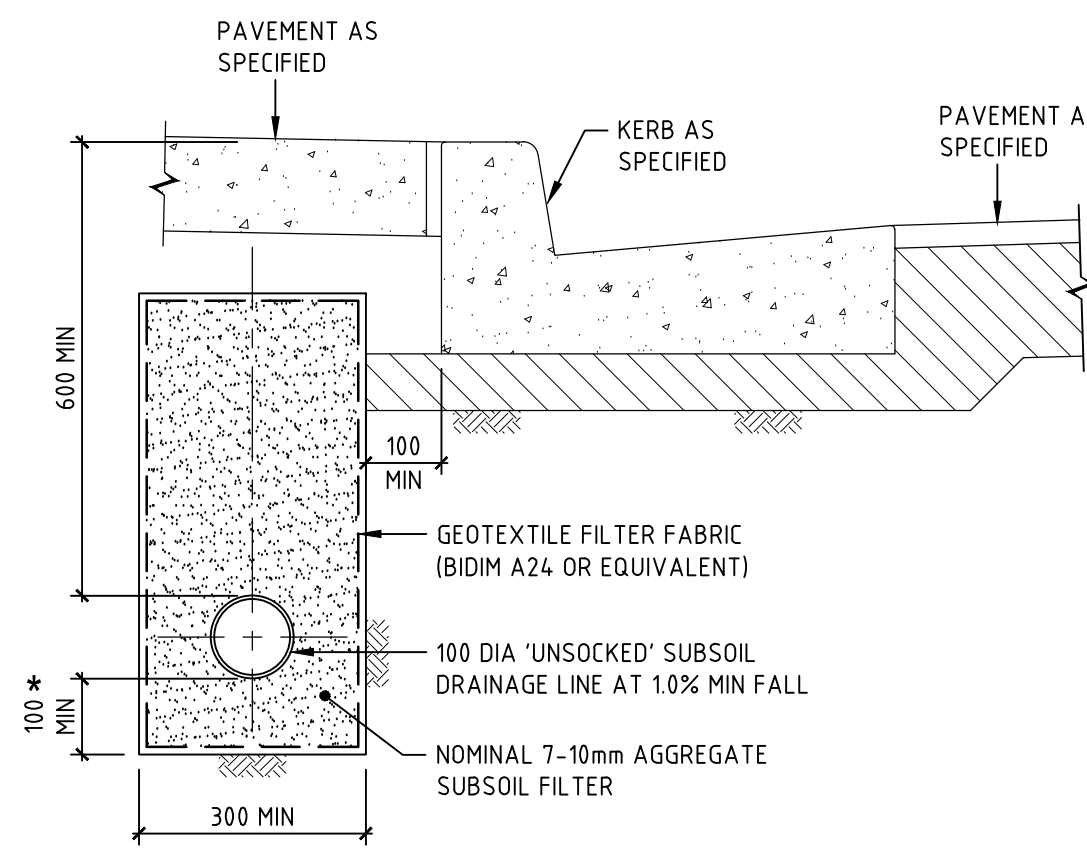
- NOTES
1. WHEN POSITIONED IN STRAIGHT ALIGNMENT, STEP TO BE 400 WIDE.
 2. STAGGERED STEPS TO BE 200 WIDE, STEPS TO BE STAGGERED 200 CENTRE TO CENTRE FOR ALTERNATIVE STEPS.
 3. SPACING OF STEPS TO BE UNIFORM TO WITHIN ±8mm IN EACH PIT.

PLAN



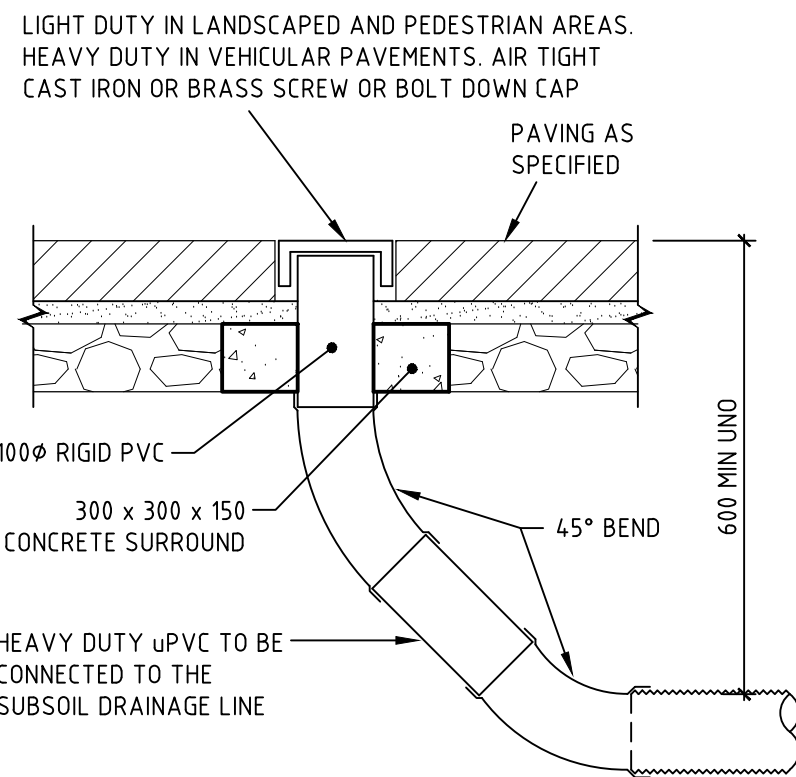
PIT ACCESS STEP DETAIL

SCALE 1:10



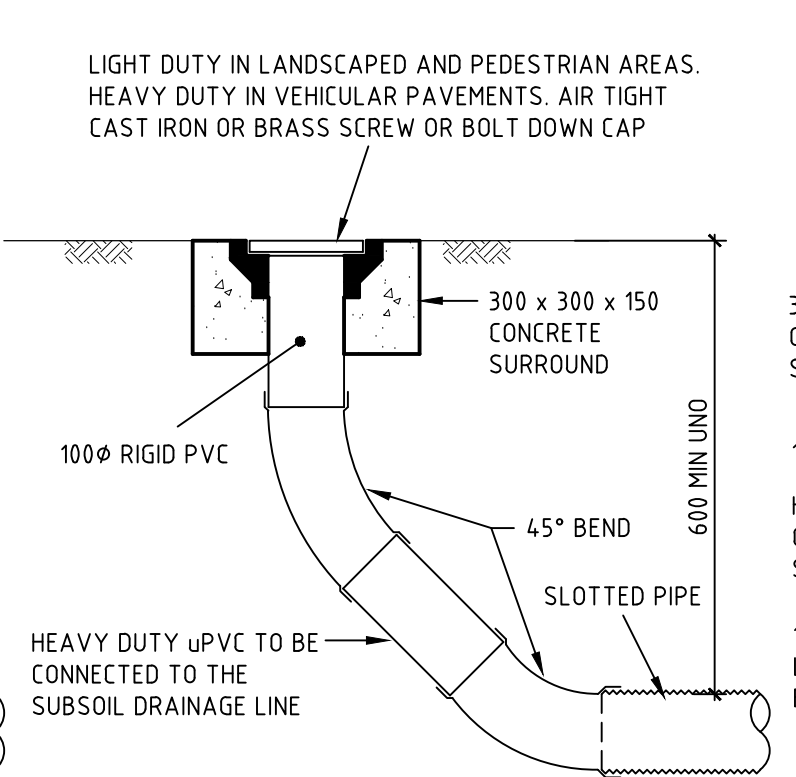
SUBSOIL BEHIND KERB

SCALE 1:10



FLUSHOUT RISER (FOR) IN PAVING BRICKS

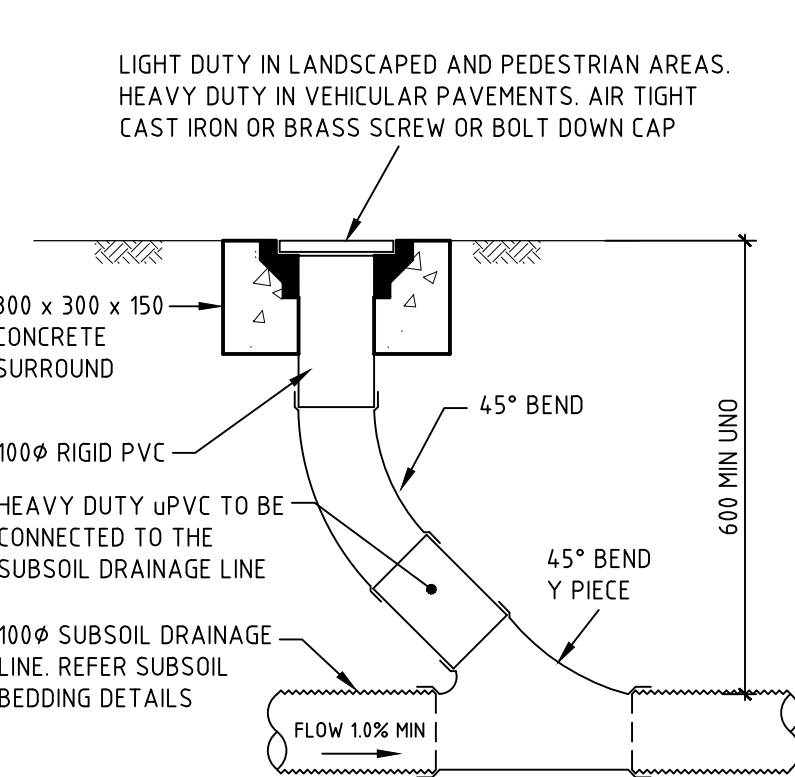
SCALE 1:10



FLUSHOUT RISER (FOR)

SCALE 1:10

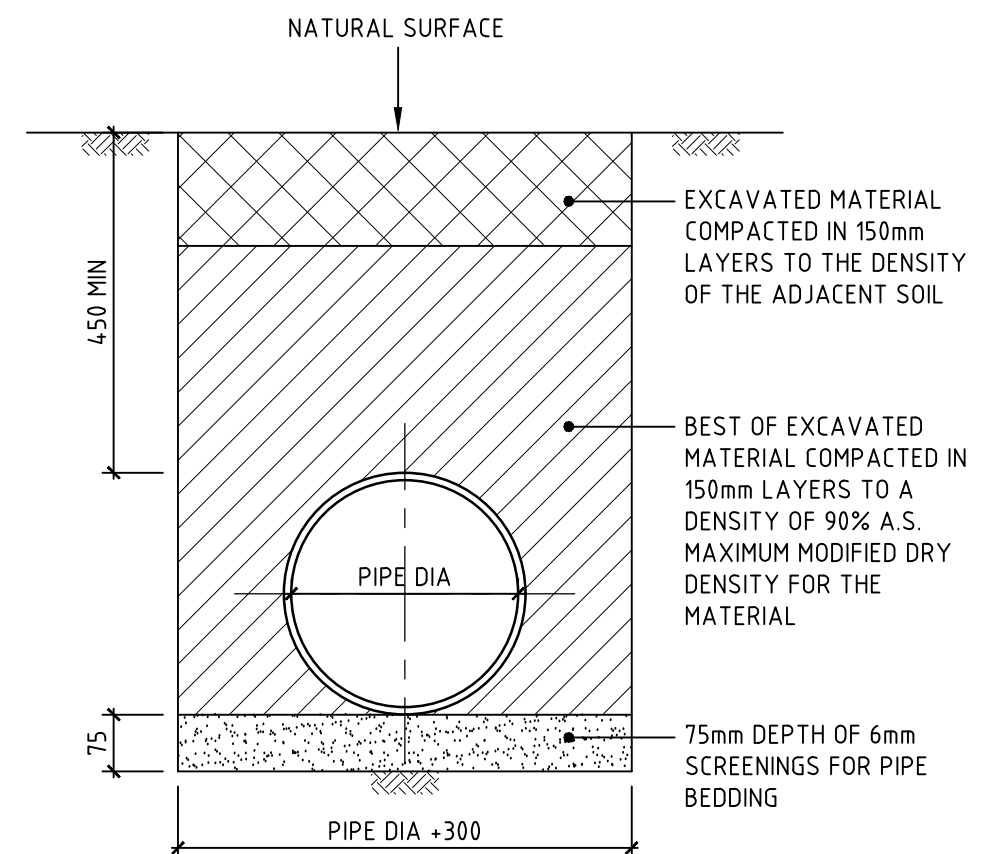
NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS WITHIN DRAINAGE LAYER ONLY



INTERMEDIATE RISER

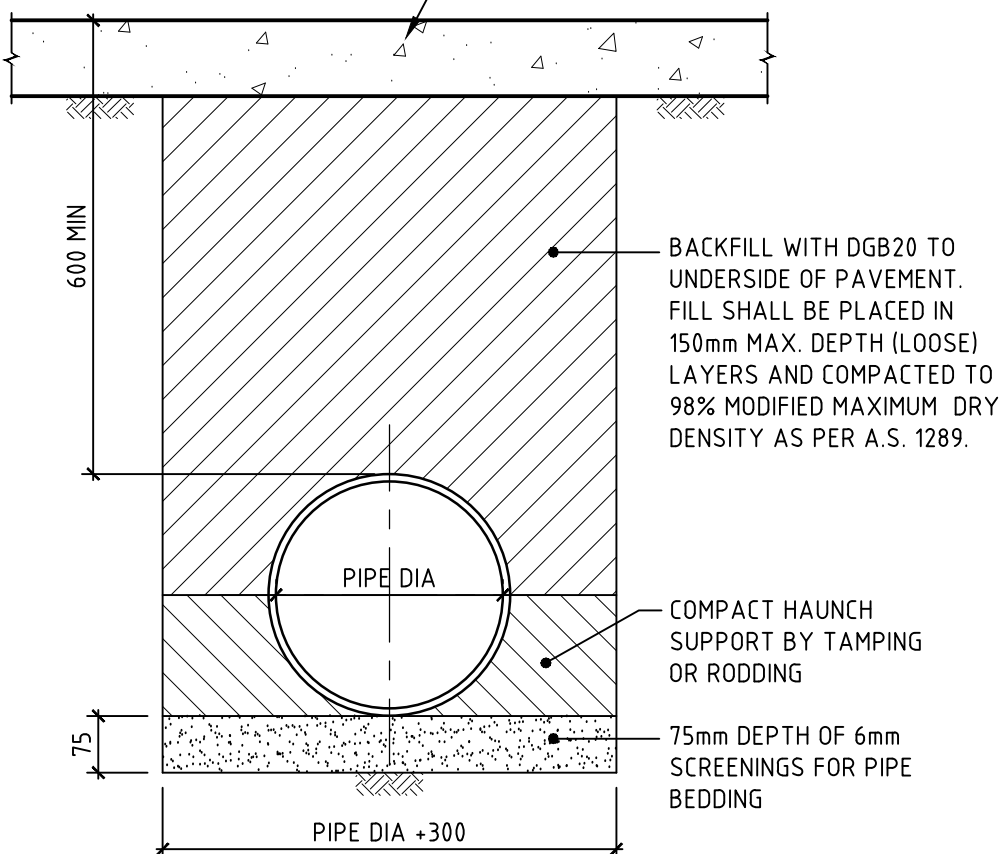
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NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED



PIPE LAYING DETAIL (ALL PIPES) UNDER LANDSCAPED AREAS

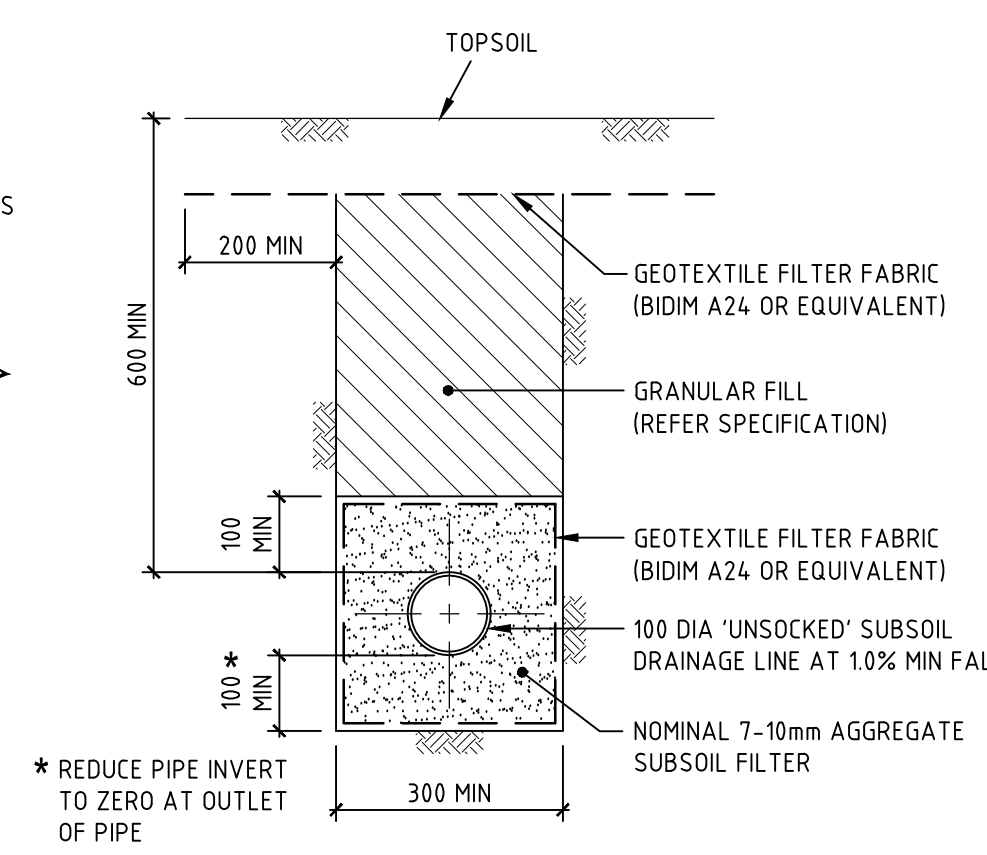
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PIPE LAYING DETAILS UNDER ALL PAVEMENTS

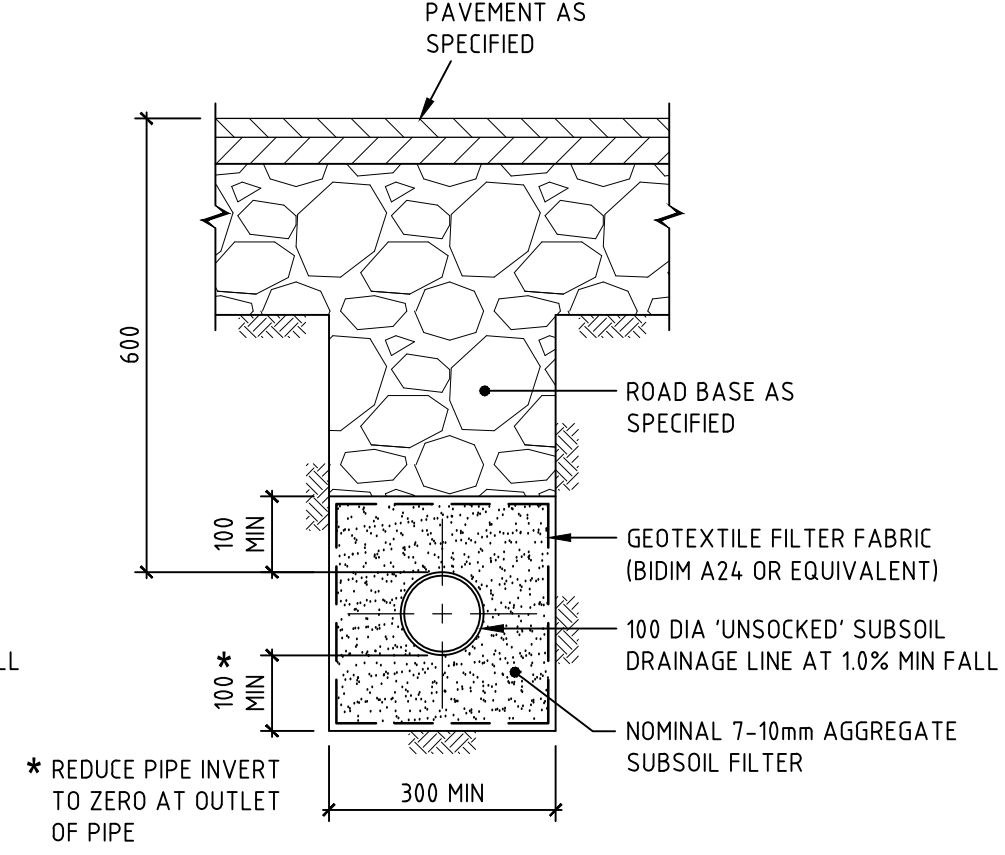
SCALE 1:10

NOTE: AVOID RUNNING CONSTRUCTION EQUIPMENT OVER THE PIPES UNTIL BACKFILL MATERIAL IS 300mm MIN. ABOVE CROWN OF PIPE.



SUBSOIL IN LANDSCAPED AREAS

SCALE 1:10



SUBSOIL IN PAVED AREAS

SCALE 1:10

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A ISSUED FOR 30% SCHEMATIC DESIGN			
P1 ISSUED FOR DEVELOPMENT APPLICATION			
Rev	Description	Date	By App

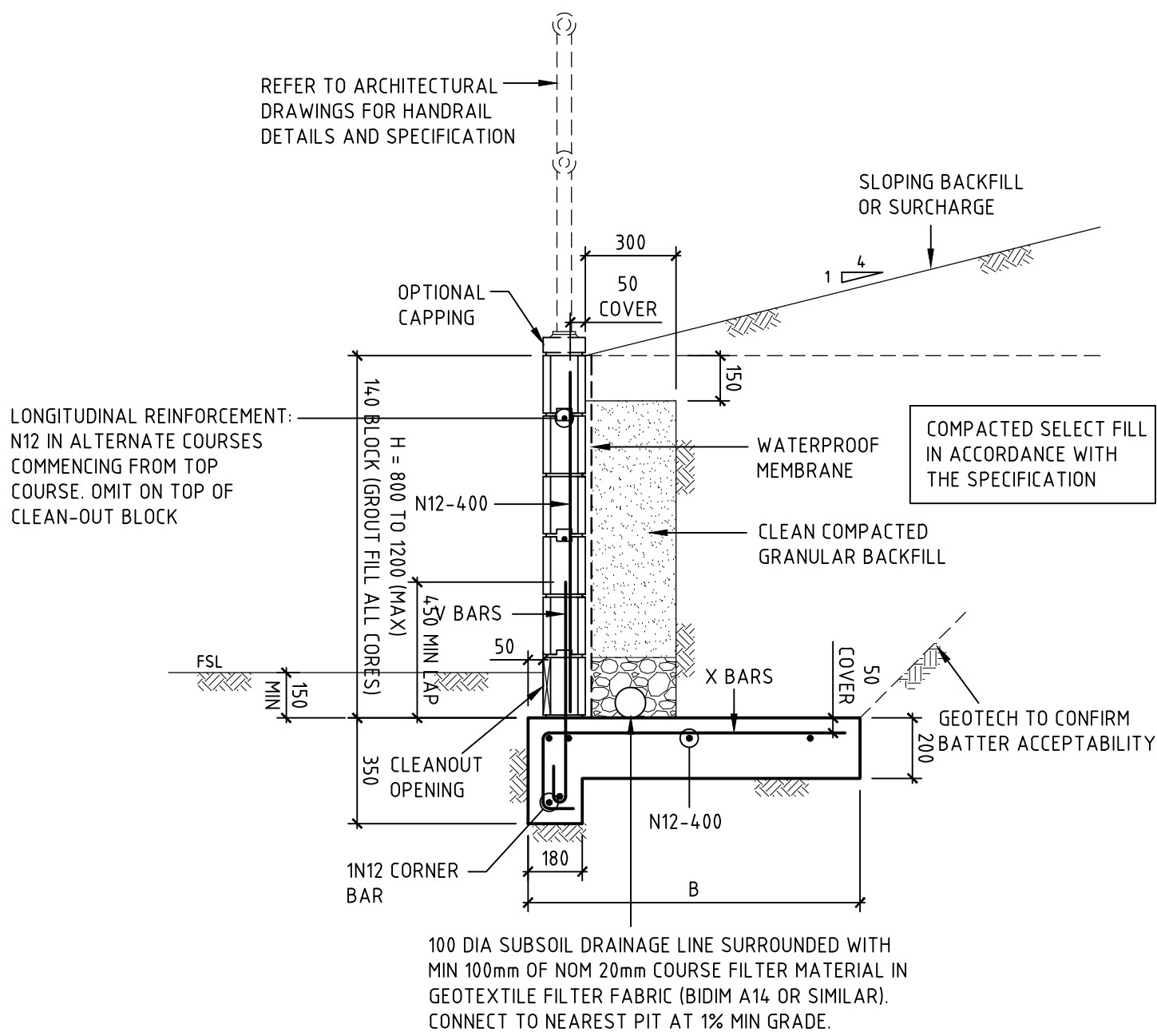
A ISSUED FOR 30% SCHEMATIC DESIGN			
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Rev	Description	Date	By App

BONACCI	
BONACCI GROUP Pty Ltd	
ABN 42 060 332 345	
Consulting Engineers, Structural - Civil - Infrastructure	
Level 6, 37 York Street, Sydney, NSW 2000 Australia	
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sydney@bonaccigroup.com	
www.bonaccigroup.com	

Project Name	THE UNIVERSITY OF SYDNEY ENGINEERING AND TECHNOLOGY PRECINCT (ETP) - STAGE 1		
Drawing Title	SITEWORKS AND STORMWATER DRAINAGE DETAILS SHEET 1		

30% SCHEMATIC DESIGN			
Designed	PA	Project Director Approved	Date
Drawn	PA		
Scale	1:20, 10	Project Ref	Drawing No
Date	17.08.18		Rev
Sheet	A1	K33-BON-CIV-DRG-00060 A	

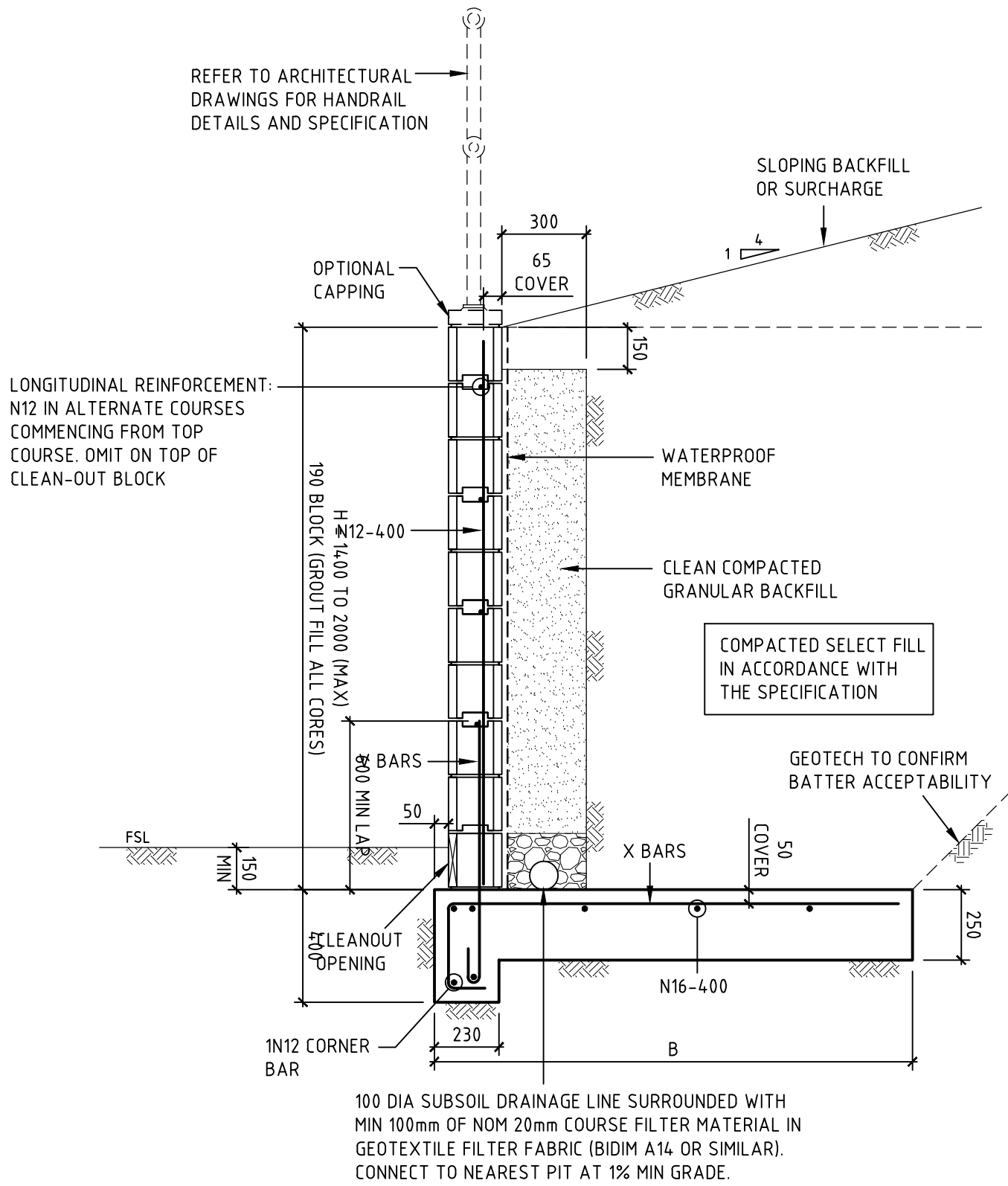
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BLOCK RETAINING WALL (MAX 1200 HIGH)

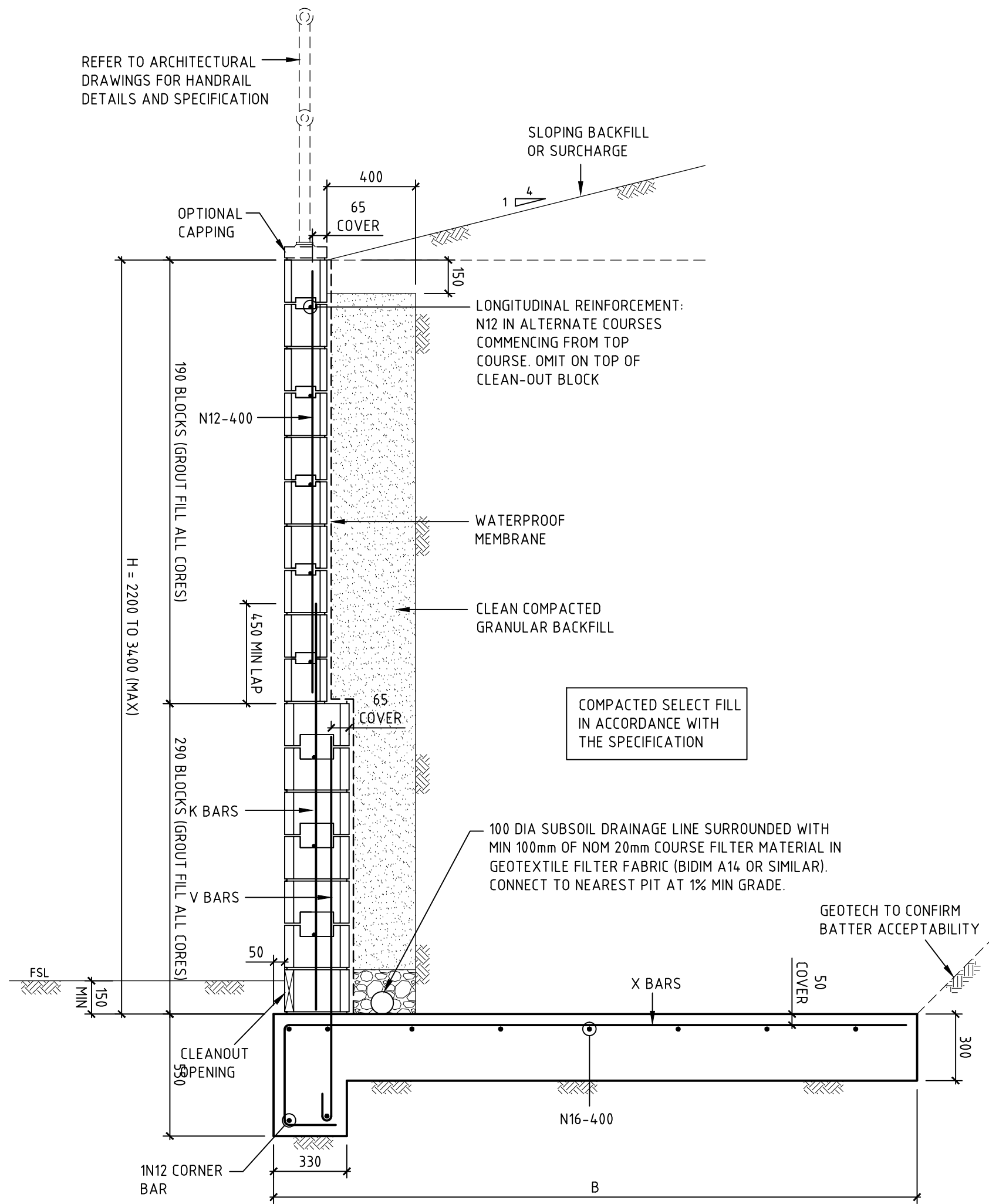
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NOTE: DESIGNER TO CHECK THE NEED FOR SHEAR KEY



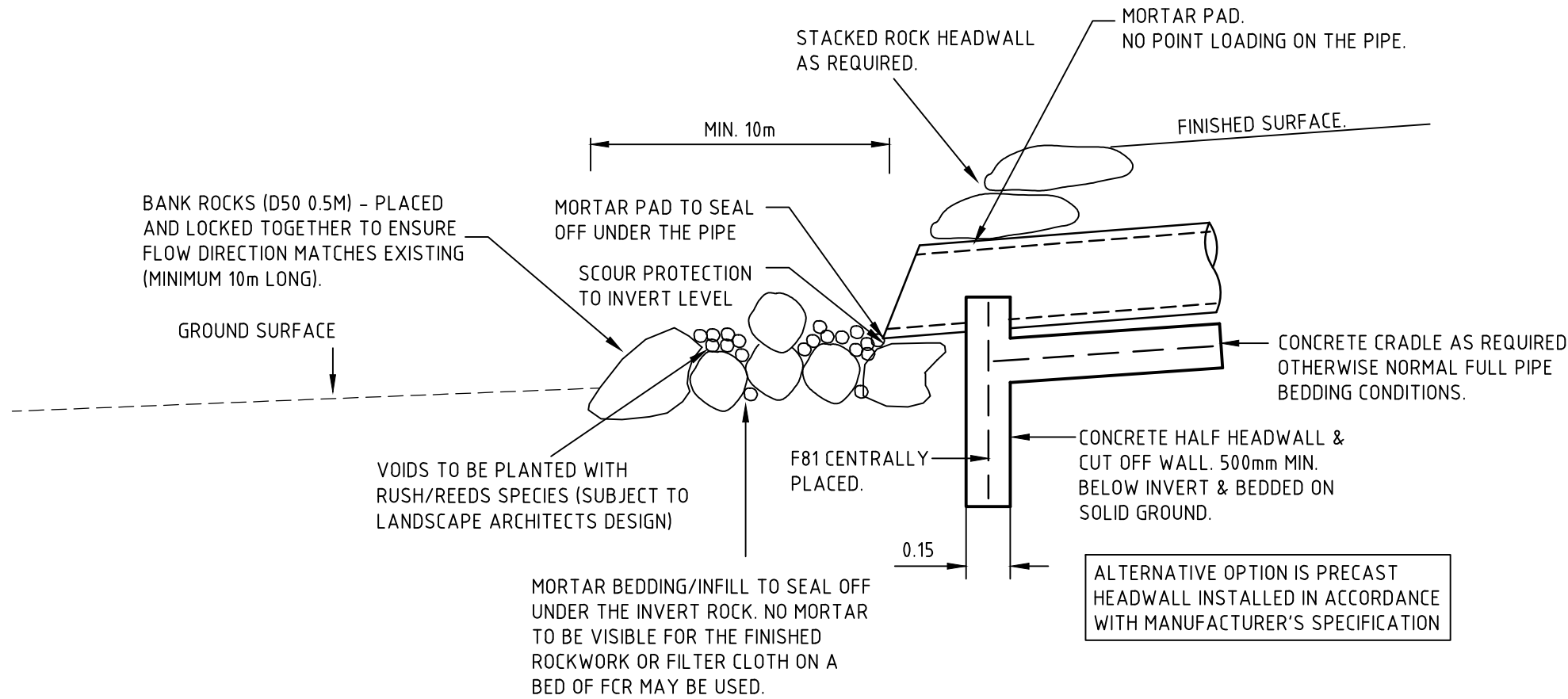
BLOCK RETAINING WALL (MAX 2000 HIGH)

SCALE 1:20



BLOCK RETAINING WALL (MAX 3400 HIGH)

SCALE 1:20



SECTION AT HEADWALL OUTLET

NTS

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Project Name
**THE UNIVERSITY OF SYDNEY
ENGINEERING AND TECHNOLOGY
PRECINCT (ETP) - STAGE 1**

Drawing Title
**SITEWORKS AND STORMWATER
DRAINAGE DETAILS
SHEET 3**

30% SCHEMATIC DESIGN

Designed PA
Drawn PA
Scale 1:20, 10
Date 17.08.18
Sheet A1
Project Director Approved Date North
Project Ref Drawing No Rev
K33-BON-CIV-DRG-00062 B

APPENDIX C – DRAFT DESIGN CERTIFICATE