Western Sydney Engineering Design Manual

Prepared for: **Western Sydney Planning Partnership**

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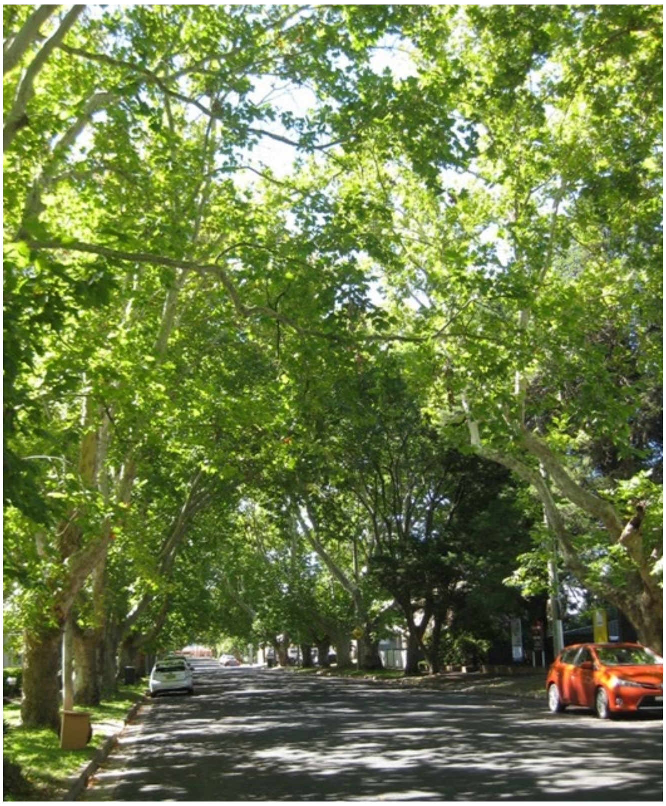

21 APRIL 2021

REVISIONS

Revision	Date	Purpose	Prepared By	Authorised By
PCG_01	6 Nov 20	For PCG	ACOR/C&R	Stuart Green Consultant Project Director
PCG_02	8 Dec 20	Post PCG comments added	ACOR/C&R	Stuart Green Consultant Project Director
PCG_03	21 Apr 21	WSPP edits and UDIA feedback added	ACOR/C&R	
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Acknowledgements

ACKNOWLEDGMENT OF COUNTRY

The Western Sydney Planning Partnership acknowledges the traditional owners of the lands that include the Western Parkland City and the living culture of the traditional custodians of these lands.

We recognise that the traditional owners have occupied and cared for this Country over countless generations and celebrates their continuing contribution to the life of Greater Sydney.

TEAM

The Western Sydney Engineering Design Manual was prepared by the Western Sydney Consultants Collaboration consisting of ACOR Consultants and Craig & Rhodes, for the Western Sydney Planning Partnership.

WESTERN SYDNEY PLANNING PARTNERSHIP

The Western Sydney Planning Partnership is a local government-led initiative that brings together the councils of Blacktown, Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly and key NSW government agencies to achieve more efficient and higher quality outcomes for Western Sydney through innovative and collaborative planning.

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1 Introduction

The Western Sydney Engineering Design Manual (the Manual), along with the Western Sydney Street Design Guidelines (Street Design Guidelines), have been developed as part of the Uniform Local Engineering and Design Standards project. This project is an initiative of the Western Sydney City Deal. Adoption of the Manual and Street Design Guidelines by councils is intended to simplify the development assessment process, deliver better outcomes for local residents and reduce costs to homebuyers.

The Manual and Street Design Guidelines are focused on service provision to new greenfield development areas in Western Sydney. They do however have the potential to be applied to existing areas that are undergoing significant change and are in an appropriate urban setting. The Manual also includes some information for the design of rural roads.

1.1 Using this Engineering Design Manual

The Manual has been prepared to enable designers, councils, and consultant teams to prepare compliant designs for civil infrastructure work, including landscaping of streets. It is intended to provide the necessary detail for preparing Development Applications, Subdivision Works Certificates, Construction Certificates, and applications for approvals under the *Roads Act 1993*.

The Manual is arranged to provide designers and certifiers with ready access to the information needed to create and review digital design models and associated drawing packages. Information is arranged as follows:

- Design data – information is presented in a table to easily find key parameters for design
- Design notes – give further information to assist in understanding qualitative issues of design
- Subsequent information - provided following design notes to give users further detail which cannot be expressed as data or in short form notes

1.1.1 Acceptable Solution

Use of the design data, design notes and subsequent information in the Manual will result in designs that are suitable in most urban contexts. The Manual refers to these as Acceptable Solutions. This is like the concept of “Normal Design Domain” (NDD) in *Austroads Guide to Road Design Part 2: Design Considerations (2019)*.

Acceptable Solutions give designers confidence that the same designs will be accepted across all Western Sydney councils that have adopted the Manual as a council policy. This will give greater consistency to the preparation, review, and certification of designs.

1.1.2 Varying the Acceptable Solution

There will be occasions where the Acceptable Solution will not be possible due to site conditions, too varied to list here. In such cases, designs will need to meet the submission requirements set out in ***Section 2.7*** of this Manual.

This variation to acceptable solutions should be limited in its application, and designers should always refine designs to work towards the Acceptable Solution. Generally, a variation would involve only one or two parameters not compounding them. “Varying the acceptable solution” can be likened to the concept of “Extended Design Domain” detailed in *Austroads Guide to Road Design Part 3: Geometric Design, Appendix A.*

In other cases, a designer may have a more innovative approach to achieving the objectives in the Manual. This is welcomed but must also address the submission requirements set out in ***Section 2.7.***

1.1.3 Local Variations

There will be circumstances where a council may need to accommodate local variations that are particular to that local government area. Where specific variations have been nominated by councils, they have been included in the design information.

1.1.4 Other Publications

There are a range of other guidelines, council polices, legislation and regulations that guide development in Western Sydney. This Manual:

1. Should be read in conjunction with the Street Design Guidelines, as applicable
2. Includes references to other publications that should be used for designs. There is a comprehensive list of these in **Appendix B**
3. Recognises the importance of Australian Standards and Austroads Guides to street, landform, and drainage design
4. Provides design parameters that fill in the detail where Australian Standards and Austroads Guides are either silent or defer to the authority of municipal or local government
5. Does not cover all design issues. Matters that are not covered in this Manual are well covered in Austroads Guides, Australian Standards and Australian Rainfall and Runoff
6. While not intended, may contain instances of uncertainty or conflicting advice. Where the designer, or other users of this Manual, are uncertain as to what document prevails, the council should be consulted for direction

2 Submissions

Submissions must provide engineering information to demonstrate that the proposed development will work while facilitating the consent authority to fulfil its duty under the Environmental Planning and Assessment Act 1979

2.1 Objectives

The objectives of submissions are to:

1. Provide enough information for councils to assess submissions efficiently and not have to require further information during the assessment period
2. Provide complete, accurate and professionally prepared documentation that gives confidence to assessing officers

2.2 General content

Engineering submissions for all matters should:

1. Contain information relevant to the type of development application being made
2. Provide all necessary information to clearly identify all necessary civil engineering works and infrastructure associated with the proposed development and how it will interface with existing and/or proposed civil infrastructure
3. Demonstrate full integration with any associated plans submitted with the application such as landscape and architectural drawings
4. Be prepared and endorsed by a suitably qualified and accredited professional as being in accordance with the Engineering Design Manual and other relevant standards and policies applicable to the proposed work
5. Be presented in a design report, with associated drawings and digital models, using the latest version of any code, guideline, computer modelling software, where appropriate, Australian Standard, or legislation. Detailed information on drawing requirements is contained in ***Appendix C*** and should be adhered to where possible

Certificates from Accredited Professionals may be required by councils for discrete design and/or construction elements. The certificates should not repeat other information but should state where other certificates have been relied upon by the professional certifying the design.

Requirements for the Accredited Professional are contained in ***Table 2*** on ***page 18***.

2.3 Development Application

Submissions for Development Consent (DA submissions) are to show information which demonstrates how the site fits into the existing and proposed context and how that site will function both at the time of the application and when all adjacent sites are fully developed.

DA submissions will contain but not be limited to:

1. Documents specified in the Environmental Planning and Assessment Act 1979 and or the Environmental Planning and Assessment Regulation 2000
2. Concept engineering drawings showing layout, drainage proposal, site cross-sections, cut and fill plan with sections, levels, contours, land features, trees, boundaries, and other information to fully describe and depict the existing site and its context
3. Concept stormwater management plan (SWMP) which is a report with drawings that depicts the process of capture, conveyance, and water quality treatment of stormwater. The SWMP shall provide enough detail for a council to determine at the Development Application stage that the proposal will function in accordance with any relevant development control plans, adopted council policies, and the engineering design parameters contained in this Manual
4. Detailed site survey by a Registered Surveyor including surrounds of the site to at least 20m beyond the boundary and the full road reserve fronting the site
5. Design reports (e.g. civil / stormwater / Safety in Design (SiD), CPTED) shall include methods, parameters, assumptions made for design purposes
6. Safety in Design reports should focus on critical infrastructure elements at the DA stage, such as basins/retaining structures. A more detailed SiD report may be required with SWC submissions
7. Traffic management report including modelling and a Road Safety Audit if required
8. Completed checklist
9. Computer model data in native digital format associated with any software used as a design tool such as the following and other software used but not listed below:
    a. 12d or Civil 3D
    b. DRAINS
    c. MUSIC and MUSIC-*link*
    d. XP-RAFTS
    e. HEC-RAS
    f. TUFLOW
    g. CIRCLY
    h. SIDRA
10. Layout and design of site frontage within the road reserve fronting the development site
11. Asset Management Report/Plan with details including life cycle costs for public assets
12. Coordinated Landscape Architecture / Public Domain Plans. Plans to show proposed landscape treatments and highlight all coordinated services

Councils offer pre-DA meetings where engineering design concepts can be discussed, to ensure the information required for DA assessment is prepared and lodged. Some Councils will require pre-DA meetings for certain development types and thresholds.

2.4 Subdivision Works Certificate

The *Environmental Planning and Assessment Act 1979* defines the kinds of certificates relating to construction of works as being:

- construction certificate—a certificate to the effect that building work completed in accordance with specified plans and specifications or standards will comply with the requirements of the regulations
- subdivision works certificate—a certificate to the effect that subdivision work completed in accordance with specified plans and specifications will comply with the requirements of the regulations.

Subdivision Works Certificate (SWC) submissions must demonstrate a level of detail that will allow the appointed contractor to construct the works.

SWC submissions will require sufficient information for the Certifier to be satisfied that the design conforms to the Development Consent and to the requirements of this Engineering Design Manual and all applicable Australian Standards.

A Design Report endorsed by an Accredited Professional is to accompany the SWC submission. The information within the Design Report is to update the information that was presented in the DA submission (***Section 2.3***) with the detail appropriate for a SWC submission.

There will be occasions where a project requires both building work and civil engineering work (~~which is~~ typical of the kinds of work covered by subdivision works) which will be approved under a construction certificate. On these occasions, all civil works will be designed in accordance with the requirements of this Engineering Design Manual.

2.5 Roads Act Approvals

Where an Approval is required under Section 138 of the Roads Act 1993, Councils, as the road authority, may require a separate application from the Subdivision Works application. Where this is required the SWC drawings are to be clearly marked to show which works are to be approved under the Roads Act and which works are to be approved under the SWC. There is no requirement to produce two distinct drawing packages unless practical reasons indicate, or a council requires separate packages for its own purposes. Designers should check with the council whether a separate package of drawings is required for a Roads Act Approval.

2.6 Subdivision Certificate

A Development Consent identifies the Subdivision Certificate conditions that need to be satisfied. In preparing and lodging a Subdivision Certificate the documents that evidence satisfaction of the requirements are to be lodged in a complete package in digital format in either native or PDF format. The submission in PDF is to be arranged and identified so that relevant evidence documents can be easily found in the PDF. Hard copy submissions may also be required depending on the council requirements.

Digital submissions including work-as-executed plans are to comply with ADAC requirements for asset management purposes with information conveyed in native file formats or DXF, or as required by the Councils for its GIS system requirements.

Clause 157 of the Environmental Planning and Assessment Regulation 2000 sets out the documents that must be lodged with an application for a Subdivision Certificate. Click on the hyperlink below for the documents required under the regulation.

Documents to accompany a Subdivision Certificate Application

Note that Clause 158 (1) of the Regulation provides that: "*A certifier may require the applicant for a subdivision certificate to give the certifier any additional information concerning the proposed subdivision or a planning agreement that is essential to the certifier's proper consideration of the application*."

2.7 Varying the Acceptable Solution

Where the Acceptable Solution design data, notes or subsequent information cannot be satisfied, or where an innovative approach is proposed, a submission to vary the Acceptable Solution will be required. This submission may form part of the Design Report lodged in the DA submission or be a separate submission. In either case it must be lodged with the DA submission. It is also recommended that such variation to the Acceptable Solution be discussed at any pre-lodgement meeting with the council.

A submission prepared to vary the Acceptable Solution must explain why the Acceptable Solution has not been adopted and how the varied solution satisfies the criteria set out in ***Table 1***, below.

Table 1 Criteria to vary the Acceptable Solution

ID	CRITERIA	DESCRIPTION	GUIDANCE
1.	Functional	Designs must be prepared so that the final construction work is functional	Functional designs meet the objectives of the Acceptable Solution. These objectives can be found at the start of each major section.
2.	Durable	The design must create durable infrastructure, fit for the intended design life	Durable infrastructure will withstand impacts from normal wear and tear for its design life. Adoption of Australian Standards will lead to industry accepted design life for infrastructure elements. Maintenance cost should be taken into account under this criterion.
3.	Sustainable	Alternatives must not adversely impact on the environment any more than the Acceptable Solution	Variations to the Acceptable Solution must demonstrate benefits over the Acceptable Solution as well as no adverse impact.
4.	Safe	Infrastructure must be designed so that it is safe to those constructing, maintaining, using and demolishing it	Safe infrastructure is created when the designer considers the life cycle of the infrastructure, its construction, use, maintenance, and demolition.
5.	Beautiful	Infrastructure must have aesthetic qualities so that it enhances the landscape and/or streetscape	While beauty in a civil infrastructure context may be difficult to appreciate, alternatives proposed should demonstrate enhanced aesthetic qualities and be endorsed by an appropriate design professional like a landscape architect or architect. Consideration needs to be given to the effects on the public domain when presenting an alternative to the Acceptable Solution.

The variation to the Acceptable Solution must demonstrate how the criteria listed are satisfied, so that the assessing officer is clear on what is proposed at the time of DA and that the Certifier is clear on the construction detailing contained in the submission. Varying the Acceptable Solution after development consent has been issued may require a modification to the development consent. The council will provide advice in this regard as not all modifications require a formal submission under Section 4.55 of the *Environmental Planning and Assessment Act 1979*.

The over-arching issue to be addressed by varying the acceptable solution is that there must be an improvement on the acceptable solution to enhance the public benefit and the council asset.

The overall life cycle of the infrastructure must be considered to optimise capital costs and ongoing maintenance costs.

Varying the Acceptable Solution would be required for items such as:

- Innovative pavement design
- Alternative WSUD approach
- Interallotment retaining walls exceeding the Acceptable Solution height

Varying the Acceptable Solution submissions are not required for minor, isolated variations, or departures to the design data, for example:

- distance between drainage pits is 62m not the specified 60m
- velocity in gutter flow is 2.1m/s not 2.0m/s
- gutter flow width is 2.6m not 2.5m

These isolated and minor departures from the standard are to be identified in the Design Report with reasons for the departure. At all times, the designer must ensure the safety of the user of the infrastructure that is being designed, as required by the *Work Health and Safety Act 2011*.

2.7.1 Risk assessment

Risk analysis and assessment should form the foundation of all engineering design proposals, including justification of any variation of the Acceptable Solution offered in the Engineering Design Manual.

Risk analysis and assessment guidance is given in Australian Standard (*AS ISO 31000:2018, AS/NZS IEC 62198:2015*) and should be used to assist engineers in demonstrating that all risks associated with the design, construction, operation/maintenance, and eventual demolition of the structure, have been considered at the design stage and have been mitigated as far as is reasonably practicable.

Any risk analysis should be comprehensive and consider the impact on all users of roads (and other infrastructure) be they pedestrians, cyclists or drivers and contemplate the impact on issues pertinent to Western Sydney including health and micro-climate.

2.8 Safety

Councils require all aspects of safety to be addressed within the Design Report for a SWC submission. This may also require consideration and reporting on any Crime Prevention Through Environmental Design (CPTED) concepts, measures, or initiatives.

The *Work Health and Safety Act 2011* requires a designer to prepare a written report for any structure where hazards to the health and safety of people may be present. This report is known as a Safety in Design report and has specific requirements under the *Work Health and Safety Act 2011* and *Regulations*.

2.9 Endorsement by an Accredited Professional

All submissions must be endorsed by an Accredited Professional as set out in ***Table 2***, below. There may be other matters that require an Accredited Professional endorsement which are not listed here. Where there is doubt, the council should be contacted for clarification.

Table 2 Accredited Professional Endorsements

ID	ENDORSEMENT	ACCREDITED PROFESSIONAL	AREA OF PRACTICE
1.	Plan of subdivision draft or final documenting existing, proposed, or future cadastral boundaries and associated instruments Levels for existing surface and features Work-as-executed levels and features Other spatial data Other submissions allowable under the registration requirements of the Board of Surveying and Spatial Information	Registered Surveyor under the authority of the NSW Board of Surveying and Spatial Information	Spatial data and land surveying
2.	Civil Engineering for DA, SWC, SC including a. Streets, drainage, OSD, WSUD, flooding, earthworks b. minor civil structures (for example: retaining walls <1.2m, special drainage pits) c. traffic engineering d. design compliance e. pavement design	Chartered Professional Engineer (see also 2.9.1 Note 3, below this Table)	NER Civil
3.	Structural Engineering including major civil structures and bridges	Chartered Professional Engineer	NER Structural
4.	Geotechnical Engineering, including landslip assessments, pavement design and land contamination	Chartered Professional Engineer	NER Subdivisional Geotechnics
5.	Road Safety Audits	Accredited Road Safety Auditor	Road Safety

ID	ENDORSEMENT	ACCREDITED PROFESSIONAL	AREA OF PRACTICE
6.	Landscaping	AILA Registered Landscape Architect	Landscape Architecture
7.	Arboricultural	Registered Professional Member of Arboriculture Australia or holder of Australian Qualifications Framework (AQF) Level 5	Arboriculture
8.	Bushfire	Bushfire Planning and Design (BPAD) Accredited Practitioners	Bushfire
9.	Ecology generally and associated with WSUD and watercourse rehabilitation	Certified Practicing Ecological Consultant	Ecology
10.	Biodiversity Assessments	Accredited BAM Assessor	Biodiversity Assessment
11.	Street / Public Lighting Compliance	Level 3 Service Providers for designing distribution works in NSW	Electrical
12.	Acoustics report	CPEng in acoustics or Member of Australian Acoustical Society, or Member Firm of The Association of Australasian Acoustical Consultants	Acoustics
13.	Contaminated Land	Site Auditor	Contaminated land

2.9.1 Endorsement notes

1. Any reference in Development Consents to a "suitably qualified person", an "experienced professional" or "competent professional" or similar terms means those people holding the certifications or registrations listed in Table 2
2. The Design and Building Practitioners Act 2020 was given assent on 10 June 2020. Regulations are being prepared which will enable the Act to commence fully from 1 July 2021. It is expected these Regulations which cover the registration of engineers and other design practitioners who will then be required to provide "compliance declarations" under the Act and its Regulations. These declarations may replace or add to some of the endorsements and accredited professionals noted in the table above
3. Registered Professional Engineer of Professionals Australia is also acceptable as an accredited professional
4. Endorsement requires:

a. A “wet signature” of the professional by pen, dated, scanned, and pasted into the signature field within the document, or a digital signature by an encrypted individual identity (typed initials without a signature are not acceptable).

b. Registration number of the person signing

c. Scanned documents to be enhanced to reduce file size to minimum available

5. Registered Surveyor means a person satisfying the registration requirements of the *Surveying and Spatial Information Act 2002*
6. NER means National Engineering Register maintained by Engineers Australia
7. AILA means Australian Institute of Landscape Architects
8. Endorsements must be completed by a person that meets the requirements of any legislation or is registered under any applicable legislation

2.10 Digital data submissions

The 3D design models associated with all engineering plan submissions are to be submitted in IFC file format. IFC stands for Industry Foundation Class which are files in open format similar to a PDF but for 3D models.

Developers shall organise Works as Executed (WAE) drawings in suitable electronic formats such as pdf, dwg, (AutoCAD) and 12d file formats after completion of construction. A pdf version shall be submitted for review by the council with a second version submitted in a format that is suitable for importing into the council's GIS system. The applicant is to contact the council to determine data requirements for importing to the GIS system. The WAE drawings shall be provided on the MGA2020 coordinate system and on Australian Height Datum (AHD), or other system as permitted by the NSW Board of Surveying and Spatial Information.

2.11 Submission checklists

To assist with preparation and lodgement of complete submissions, checklists have been prepared and are in the appendices listed in the table below. These checklists are to be completed and lodged with the submission. They are to be endorsed by the lead accredited professional in accordance with the ***Table 2***, above.

Table 3 Submission Checklists

ID	APPENDIX	CHECKLIST
1.	***Appendix D***	***Submission Checklist - Development Application***
2.	***Appendix E***	***Submission Checklist - Drawings***
3.	***Appendix F***	***Submission Checklist - Subdivision Works*** This checklist can also be used for Construction Certificate and Roads Act submissions

3 Landform

New landforms created by bulk earthworks or site regrading are to provide an engineered platform for development that has no impact, or limited adverse impact, on the development, the environment, or adjacent sites

3.1 Objectives

The objectives of landforms are to:

1. Create landforms that minimise cut and fill
2. Retain existing trees in the landscape and supplement these trees with new plantings
3. Create suitable surfaces upon which to build new dwellings, other buildings, roads, parks, and other infrastructure for the people of Western Sydney
4. Shape land to direct stormwater to appropriate systems without placing an undue burden on any future lot
5. Create landforms that are as naturalistic as possible

3.2 Bulk earthworks and site regrading

Designers should consider how to minimise cut and fill on a development site to reduce overall impacts on the environment. A better solution to extensive cut and fill may be for designs to respond to the natural topography where possible to retain natural land features, trees, vegetation, and biodiversity.

This is to be balanced with the need to create flat sites for dwellings, new industrial buildings, and other building sites.

3.2.1 Design data

Table 4 Design Data: Bulk Earthworks and Site Regrading

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Fill batters to merge with existing natural surface at the stated distance from the filled land to the adjoining boundary within the development site	1m
2.	Drawings required for any filling or cutting in excess of a depth of	300mm
3.	Drawings to indicate cut or fill depths in increments of a maximum of	500mm
4.	Drawings to indicate cut or fill depths in increments of a minimum of	100mm
5.	Finished earthworks on all areas apart from new lots are to be topsoiled to a minimum depth of	100mm
6.	Filled areas are to be graded at a desirable grade of	1.0%

<table>
<tr><th>ID</th><th>DESIGN DATA DESCRIPTION</th><th>VALUE</th></tr>
<tr><td>7.</td><td>Filled areas are to be graded at a minimum grade of</td><td>0.5%</td></tr>
<tr><td>8.</td><td>Regraded land in residential areas is to be the stated height above the 1% AEP mainstream water level</td><td>0.5m</td></tr>
<tr><td>9.</td><td>Regraded land in non-residential areas is to be the stated height above the 1% AEP mainstream water level</td><td>0.3m</td></tr>
<tr><td>10.</td><td>Land adjacent to overland flow paths created by design (not mainstream flooding) is to be set above the 1% AEP water depth in the overland flowpath by the stated multiplier (rounded up to the nearest 10mm) to a maximum of 500mm above the design water depth (for examples see table below)
<table>
<tr><th>ID</th><th>1% design water depth</th><th>Height above 1% AEP water depth</th></tr>
<tr><td>a.</td><td>100</td><td>150</td></tr>
<tr><td>b.</td><td>120</td><td>180</td></tr>
<tr><td>c.</td><td>200</td><td>300</td></tr>
<tr><td>d.</td><td>300</td><td>450</td></tr>
<tr><td>e.</td><td>400</td><td>500</td></tr>
</table>
</td><td>1.5</td></tr>
<tr><td>11.</td><td>Batters on filled land in private property shall be no steeper than the stated ratio unless supported otherwise by a geotechnical report</td><td>1V:4H (max)</td></tr>
<tr><td>12.</td><td>Regraded areas for public open space absolute maximum for safe mowing with push mowers. Such areas should be limited and integrated with overall open space design by an accredited Landscape Architect</td><td>1V:3H (max)</td></tr>
<tr><td>13.</td><td>Batters which extend into areas subject to inundation, or land dedicated to council, are to be no steeper than the stated ratio</td><td>1V:6H</td></tr>
<tr><td>14.</td><td>Batter in rock – maximum unless supported by a geotechnical report</td><td>1V:0.25H</td></tr>
</table>

3.2.2 Design notes

1. Where natural topography cannot be retained, retaining walls are to be designed and installed at Subdivision Works Stage
2. Cut and fill should not alter the boundaries of natural water catchments, that is, reshaping land does not move water from one catchment to another or have detrimental impacts on drainage patterns
3. In saline soils the soil horizons should be maintained
4. Where more than 1m cut or fill of land is proposed, a comprehensive report from an Accredited Professional geotechnical engineer is required, see below at ***Section 3.2.3***
5. Filling on land adjoining the development will require the adjoining landowners' written consent prior to approval of any DA or SWC
6. Finished surface of any filled area (apart from WSUD, ecological areas and the like) must not allow water ponding, but allow free flow of water across the filled area

7. Filled areas are not to create drainage patterns or flow volumes or discharge rates which adversely impact on downstream properties. Where this circumstance could occur, drainage swales, or other drainage techniques (e.g. kerb and gutter, pits and pipes, etc) are to be designed to prevent this adverse impact and intercept flows where necessary and convey to appropriate downstream systems or receiving waters
8. Stability of proposed batters are to be confirmed in the geotechnical engineering report
9. Batters are to be fully contained within the subject land unless written permission is obtained from affected adjacent landowners
10. Where batters cannot be constructed retaining walls may be constructed within the development site subject to consideration at the DA submission
11. Where road earth formations exceed one metre in height from surrounding natural or finished ground, consideration is to be given to safety considerations contained in to Austroads Part 6 Roadside Design, Safety and Barriers
12. Road earth formations should be designed to avoid the use of traffic barriers, guard fence or the like, wherever possible
13. Critical infrastructure, land use or facilities, such as hospitals and schools, etc may be subject to different design criteria than that provided in this EDM as defined by the State Government or Councils in DCPs
14. All earth cuttings and embankments should have soft, feathered transitions. Tops, bottoms, and ends of cuttings should be rounded off
15. Designers are to consult council’s flood policies for specific council requirements
16. Allow for decompaction and restoration of soil profiles of sufficient depth to any graded (cut as well as fill) areas to be vegetated/planted

3.2.3 Geotechnical engineering report

A geotechnical consultant, being an Accredited Professional, is to prepare a report to accompany a DA and a SWC submission, if required, which requires cutting or filling of land. The report must cover, but not be limited to:

1. Extent and stability of proposed embankments (particularly those acting as retarding basins)
2. Recommended geotechnical testing requirements
3. Compaction specification for all fill within subdivisions
4. The level of risk to existing adjacent buildings because of a construction contractor using vibratory rollers anywhere within the site the subject of the works. If vibratory rollers could affect adjacent buildings, high risk areas must be identified on the engineering drawings which are to indicate that no vibratory roller must be used within that zone
5. The impact of the installation of services on overall site stability and recommendations on short term drainage methods, shoring requirements and other remedial measures that may be appropriate during installation
6. The recommended treatment of any unstable areas within allotments that will be privately owned, which may include removal and replacement of soil, blending of soils, dynamic compaction, etc
7. Requirement for sub-surface drainage lines
8. Overall suitability of the engineering plans for the proposed development
9. Where the filling of existing dams or watercourses is proposed, the geotechnical report shall detail any necessary works. The certifying geotechnical engineer shall have a Level 1 responsibility, unless agreed otherwise by the council, in accordance with AS 3798 which is to be stated within the report

3.2.4 Tree preservation

Designing site regrading and site filling works must demonstrate retention of trees. At all times and wherever possible trees are to be retained to protect urban tree canopy. Consideration is to be given to the end use of the parcel of land when assessing retention of trees. The reasonableness of retention can be assessed with the assistance of an arboriculturalist. Where it is proposed to retain or remove trees as part of site earthworks, an arboricultural report should accompany the DA submission.

AS 4970 - 2009 "*Protection of trees on development sites*" is to be used to determine Tree Protection Zones which are to be shown on the tree management plan. Other matters in the AS are also to be considered with respect to trees.

3.2.5 Salinity

Salinity assessment is to be done at subdivision stage. Infrastructure is to be designed accordingly. Mapping of salinity hazard is available at DPIE's eSPADE web app. Those preparing development or subdivision applications are to identify the site using the mapping at the link. The mapping layers *"Hydrogeological landscapes / overall salinity hazard*" need to be checked. The site can then be located on the map and included in the DA submission.

Applications for developments must include a detailed assessment of the salinity potential of the site for all sites other than:

- Dwellings
- Additions or alterations to dwellings on existing lots
- Additional dwellings on existing lots

Any salinity requirements for lots in any subdivision are to be advised at subdivision stage. No homeowner should need to undertake their own salinity study.

Adverse salinity impacts are to be mitigated. This is to be considered at subdivision DA stage and a report from an accredited geotechnical consultant may need to be prepared and submitted with a DA. This will need to be confirmed at a pre-DA lodgement meeting with the council.

Reference is to be made by designers to DPIE's urban salinity resources linked below:

> https://www.environment.nsw.gov.au/topics/land-and-soil/soil-degradation/salinity/type-of-salinity-and-their-prevention

3.2.6 Contaminated land

Any land to be developed needs to be assessed in accordance with the *Contaminated Land Management Act 1997*. When this is required the investigation of the land must be prepared by an Accredited Professional experienced in contaminated land assessment and will need to cover:

1. Soil quality and classification for off-site disposal
2. Where soil is to be imported an Accredited Professional must indicate in an endorsed submission that:
    a. any fill proposed is appropriate for use and classified as either:
        i. virgin excavated natural material (VENM)
        ii. excavated natural material (ENM)
    b. free of any contaminants, including asbestos and other potential contaminants of concern
    c. and is suitable for use

3.3 Lots

Subdivision lots are to be configured in a way that facilitates the efficient construction of new buildings. The Design Data and Design Notes below provide the parameters to meet this aim.

Local Variation Blue Mountains: subdivisions are to be designed to respond to the existing topography. The regrading and retaining of lots is unlikely to be supported.

3.3.1 Design data

Table 5 Design Data: Lots

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Ponding on lots adjacent to boundary lines	Nil
2.	Provide the whole of all lots with drainage by one of the following means or in combination: ▪ natural runoff to streets, open space areas or the like, ▪ use of WSUD on lot connected to street drainage system ▪ pit and pipe interallotment drainage connected to street drainage system	All lots to be drained
3.	Minimum finished gradient along lot maximum dimension; fall to drainage outlet point, either front or rear of lot	0.7%
4.	Cross fall of lot - no minimum cross fall required, can be flat	0%
5.	For lots greater than the stated area, the gradients stated in ID 3 and 4 need only apply to the building envelope area	$500m^2$
6.	Minimum topsoil depth on new lots needed to support revegetation measures placed when Subdivision Works occur	50mm
7.	Revegetation required over the whole of the lot to provide soil stabilisation after final levels reached and maintained until new building construction starts	All

3.3.2 Design notes

1. To achieve the above gradings, retaining walls are to be constructed at subdivision stage
2. Where lot frontages are less than 10m retaining walls should be installed between lots at subdivision works stage unless batters are less than 600mm in height
3. Batters between lots are to be wholly contained in the low side property with the top of the batter on the property boundary of the higher lot and the toe of the batter on the lower lot
4. Revegetation of lots is to be as contained in the document Managing Urban Stormwater - Soils and Construction Edition 4, or in an approved vegetation management plan
5. Revegetation is to be installed as soon as practicable after final levels have been reached and prior to final inspection for the Subdivision Certificate
6. Siltation (erosion and sediment) controls to remain in place until revegetation is established over 80% of the area which has been revegetated

7. For industrial lots and other large lots greater in area than lots created for single dwellings, consideration will need to be given to interim surface drainage arrangements between the time of completion of the subdivision works and the commencement of building construction. Such surface drainage measures will need to address:
    a. Ponding of water
    b. Discharge of water off site
    c. Protection against transport of soils in runoff
    d. Protection against scour by lining or other techniques of any surface drains

3.4 Interallotment retaining walls

3.4.1 Design data

Table 6 Design Data: Interallotment Retaining Walls

ID	DESIGN DATA DESCRIPTION	VALUE
1.	For all permanent retaining walls, materials are to be of natural cut stone, masonry, concrete or galvanised structural steel individually or in combination	All
2.	Acceptable maximum height for residential interallotment retaining walls	1.2m
3.	Interallotment retaining walls are to be located in high side lot	All
4.	Distance of face of retaining wall to boundary between high side lot and low side lot, see ***Figure 2***	50mm
5.	Diameter of subsoil drainage required for all walls: slotted flexible pipe (known as ag pipe) within geofabric sock of stated diameter	100mm
6.	Free draining granular backfill or no-fines concrete to be as specified by the designer but at least the stated distance from the back of the retaining wall	300mm
7.	Structural endorsement is required for all retaining walls by an Accredited Professional at design (SWC Submission) and following construction for Subdivision Certificate	All heights
8.	Upon completion of construction of retaining walls, permanent fencing, which forms a continuous barrier, is to be installed at the top of retaining walls. The fencing must be in place prior to issue of a Subdivision Certificate. A suitable temporary safety barrier one metre in height must be provided during, and immediately after construction of retaining walls prior to installation of permanent fencing. Required for any retaining wall of stated height and greater	1 metre
9.	Clearance from outside of interallotment drainage pipe to backfill zone of retaining walls	300mm

Figure 1 Retaining walls for new lots

Figure 1 shows a typical retaining wall that has been constructed in Western Sydney. It shows that permanent fencing has been installed prior to the erection of new dwellings; see ***Design Note 9***, below.

3.4.2 Design notes

1. Retaining walls are to be designed under the provisions of AS4678 Earth-retaining structures
2. The retaining walls in this section are for single simple retaining walls - other wall arrangements are subject to detailed assessment at the Development Application stage, such as tiered walls, high walls, stepped walls, walls curved in plan view, etc
3. Subsoil drains, consisting of minimum 100mm diameter slotted flexible pipe (ag pipe) in geotechnical fabric, are to be installed along the bottom of all retaining walls
4. Subsoils are to be connected to drainage pits if the pit is located nearby the retaining wall subsoil outlet
5. Where there is no drainage pit nearby subsoils may be connected to the kerb using a kerb roof water outlet to Standard Drawing SD-R06
6. Subsoils may be connected to the granular material of drainage pipelines where practical
7. Walls are to be located within the high side lot with the face of the wall set back as shown in ***Figure 2***
8. Upon completion of retaining wall works, a temporary physical barrier consisting of one metre high para-webbing or other hi-visibility material is to be fixed in place using star pickets and fencing wire to prevent accidental falls over the retaining wall
9. Upon completion of works and prior to applying for a Subdivision Certificate permanent fences and, or permanent landscaping is to be installed to prevent falls over the retaining walls (refer to ***Figure 1***)
10. Structural engineering drawings for retaining walls are to be shown on all SWC plans and signed off by an Accredited Professional
11. Where land above retaining walls is sloped down towards the wall, a surface drainage system is to be incorporated into the retaining wall design
12. Retaining walls are to be designed so that wind loads on permanent fencing attached to the wall acts as with the retaining wall as an integrated structure. Fixing details of fencing to retaining walls are to be provided in the design drawings and endorsed by an accredited professional

13. Retaining wall design must consider the location of interallotment stormwater drainage and sewer reticulation pipelines in relation to retaining wall structural element
14. Retaining walls across multiple lots to be designed by an Accredited Professional to ensure integrity of design and construction

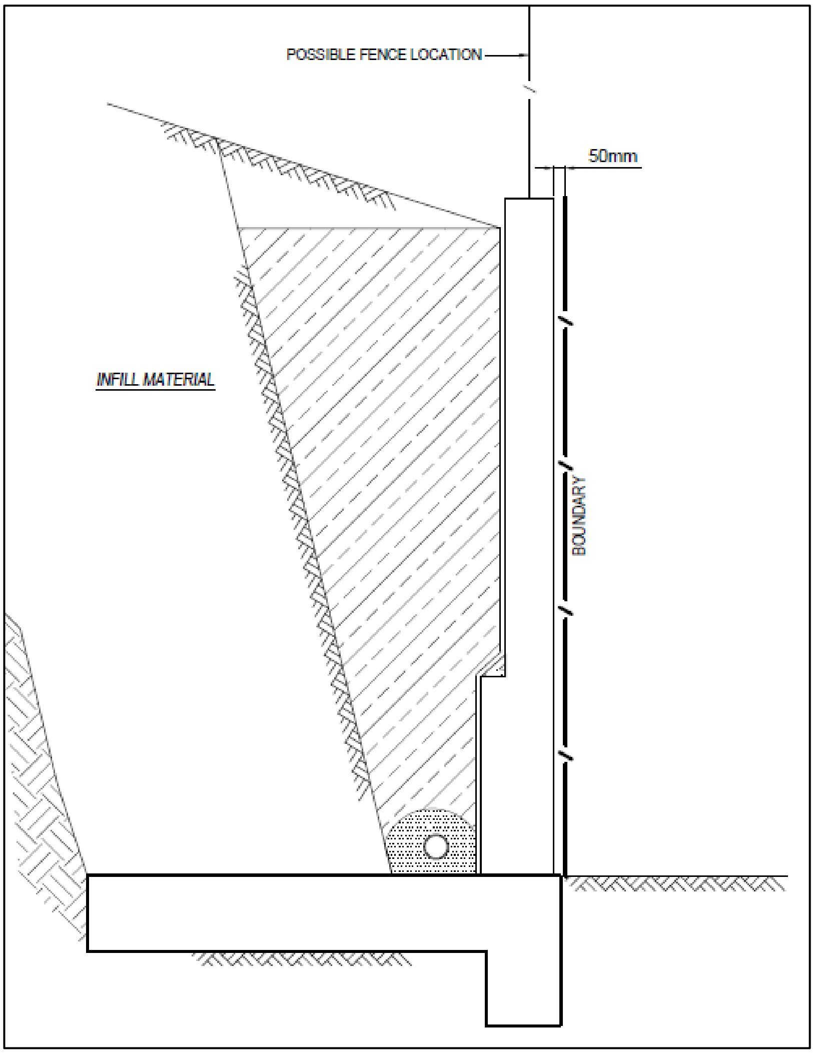


Figure 2 Interallotment retaining wall location

The purpose of ***Figure 2*** is to show the location of retaining walls with respect to property boundaries. Other details are incidental, as there are a variety of retaining wall designs that are acceptable. The location of interallotment drainage has been omitted for sake of clarity. Interallotment drainage is covered in the stormwater sections of this Engineering Design Manual.

4 Streets

Streets are not just for cars; they need to deliver a wider range of benefits and experiences that are balanced and valued by the broader community

Details of the streets for Western Sydney are contained in the Street Design Guidelines.

Detailed drawing requirements for engineering submissions are set out in ***Appendix C.2.5.***

4.1 Objectives

The objectives of streets are to:

1. Encourage social activation through their design
2. Be self–explaining slow environments that are safe and comfortable for all users
3. Be inclusive with footpaths on both sides
4. Be safe for cycling, with separated bicycle facilities on busy streets
5. Ensure that continuous tree canopy cover is achieved on both sides of every street
6. Ensure that water sensitive urban design is integrated into every street
7. Design carriageway widths to maximise space for alternate uses and users
8. Ensure future transport solutions maximise place outcomes for streets

These objectives are also articulated in the Street Design Guidelines.

4.2 Design considerations

Local government has a unique place in establishing design parameters, standards, and requirements. While Australian Standards and Austroads contain details for guiding design, in the context of engineering design standards for local streets both Australian Standards and Austroads defer to the authority of local government.

Streetside safety will need to be assessed with the guidance of Austroads "*Guide to Road Design Part 6: Roadside Design, Safety and Barriers*" Edition 3.0 published August 2020. This new edition changes the focus of safety and uses a risk-based assessment approach.

Design and check vehicles are as nominated in the Street Design Guidelines unless specified otherwise in a Development Control Plan or other planning instrument.

The Street Design Guidelines for Western Sydney provides design requirements for the permeable proportion per 1000m^2 of road reserve area. To achieve these design requirements designers will need to collaborate with landscape architects and urban designers to achieve optimal outcomes. See Table B.3 Street Types in the Street Design Guidelines.

4.3 Street geometric design

This Engineering Design Manual provides the tools to bring the guiding principles of the Street Design Guidelines to reality to enable detailed design, assessment, approval and construction of streets and associated infrastructure for the Parkland City of Western Sydney.

Good street design needs a multi-disciplinary, collaborative approach to optimise outcomes. Civil designers should work with landscape architects, urban designers, and other design professionals to ensure integrated design solutions are achieved.

Local Variation Blue Mountains: where the site is within a bushfire prone area, the road design requirements contained in ‘Planning for Bushfire Protect 2019’ (or subsequent version), will apply, see ***Section 4.20***

4.3.1 Design data

Table 7 Design Data: Street geometry

<table>
<tr><th>ID</th><th>DESIGN DATA DESCRIPTION</th><th>VALUE</th></tr>
<tr><td>1.</td><td>Longitudinal grade maximum - Local streets for short lengths up to 150m</td><td>20%</td></tr>
<tr><td>2.</td><td>Longitudinal grade maximum - Local streets</td><td>16%</td></tr>
<tr><td>3.</td><td>Longitudinal grade desired - Local collector</td><td>6.5%</td></tr>
<tr><td>4.</td><td>Longitudinal grade maximum - Local collector</td><td>10%</td></tr>
<tr><td>5.</td><td>Longitudinal grade maximum - Industrial street</td><td>6%</td></tr>
<tr><td>6.</td><td>Longitudinal grade minimum desirable</td><td>1.0%</td></tr>
<tr><td>7.</td><td>Longitudinal grade minimum absolute for short distances up to 50m, only and as agreed by the council</td><td>0.5%</td></tr>
<tr><td>8.</td><td>Half width road carriageway minimum width</td><td>5.5m</td></tr>
<tr><td>9.</td><td>Maximum distance between guideposts at dead ends and temporary turning heads</td><td>1.5m</td></tr>
<tr><td>10.</td><td>Minimum curve radii
<table>
<tr><th>Minimum Deflection Angle</th><th>Minimum Radius (metres)</th></tr>
<tr><td>75</td><td>20</td></tr>
<tr><td>60</td><td>33</td></tr>
<tr><td>40</td><td>65</td></tr>
<tr><td>30</td><td>75</td></tr>
<tr><td>20</td><td>100</td></tr>
</table></td><td></td></tr>
<tr><td>11.</td><td>Maximum cross fall at intersections
In Penrith</td><td>5%
4%</td></tr>
<tr><td>12.</td><td>Minimum cross fall at intersections</td><td>1%</td></tr>
</table>

ID	DESIGN DATA DESCRIPTION	VALUE
13.	Maximum longitudinal grade within culs-de-sac turning circles for residential streets	8%
	In Hawkesbury and Penrith	5%
14.	Maximum longitudinal grade within culs-de-sac turning circles for industrial streets	6%
15.	Minimum longitudinal grade within residential cul-de-sacs turning circles	2%
16.	Minimum longitudinal grade within industrial cul-de-sacs turning circles	3%
17.	Carriageway cross fall to WSUD facility or kerb line	3%
18.	Verge cross fall maximum falling to WSUD facility or kerb line	2.5%
19.	Verge reverse cross fall permitted to drain sag points or overland flow maximum	2.5%
20.	Offset in crown from street centreline for constrained design situations	2m
21.	Relative change in grade of kerb line and centreline in area of super elevation	0.5%
22.	Splay corners at boundary of intersections are to be provided as follows:	
a.	Laneway splay	3m x 3m
b.	Street splay	4m x 4m
c.	Industrial street splay	12m x 12m
d.	For roundabouts: constant offset from kerb lines to match verge widths of streets leading to and departing from the roundabout	Note
e.	Other splays to be as referenced in DCPs	Note
23.	Cul-de-sac nominal kerb line radii residential streets	8.5m
24.	Cul-de-sac nominal kerb line radii light industrial streets	13.5m
25.	Cul-de-sac nominal kerb line radii heavy industrial streets	16.5m
26.	Kerb return radii are to be as stated in the Street Design Guidelines	SDG
27.	Design speed for approach sight distance (ASD) using Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections Table 3.1 on page 17	50km/h
28.	Design speed for safe intersection sight distance (SISD) using Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections Table 3.2 on page 20	50km/h
29.	Reaction time for ASD and SISD	2 sec

4.3.2 Design notes

1. The geometric design of local urban streets shall generally be in accordance with the Austroads Guides, where not covered in this Manual
2. For roads with speed limits of 60km/h and above the Austroads Guides take precedence over this Engineering Design Manual
3. Roadside safety considerations are detailed in Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers Edition 3.0 published August 2020
4. Where possible vertical curves at all changes of grade are to coincide with horizontal curves
5. Vertical curves are to be designed to Austroads Guides
6. Stopping site distances are to be based on the street design speed
7. Where the deflection angle is 90 degrees and travel speed is not an issue, the size of the horizontal curve is to be related to the turning requirements of a 12.5 metre Heavy Rigid Truck
8. Traffic speeds on any street should be compatible with the functions of that street
9. The carriageways must provide a smooth, safe trafficable alignment and surface
10. Access is to be made available to building allotments across the street footpaths, unless rear loaded from laneways
11. Ponding of surface water run-off on the naturally high side of the road reserve is to be alleviated by site filling if practicable, the run-off being catered for in the street drainage system. Alternative drainage schemes shall be designed if ponding is unavoidable
12. Provision is to be made for bushfire protection with consideration given to siting, maintenance and emergency access and to Rural Fire Service guidelines (see ***Section 4.20***)
13. Unless there are specific site requirements to excavate material for site filling and improvement works or to provide a stockpile of surplus material for special purposes, excavation shall be kept to a minimum to balance the necessary filling of embankments, in the road reserves and associated batters
14. Where super elevation or one-way crossfall is considered necessary, the designer is to justify its use in the Design Report submitted with the DA Submission
15. At each road junction the major road shall be designed first, the crossfall of the through carriageway being maintained at the standard 3% from the crown to the gutter lip alignment. The minor road is to be graded to conform with the levels of the gutter line of the major road
16. “T” intersections shall be adopted in *preference* to four-way intersections and should take into account horizontal and vertical alignments at the proposed site and future roadway capacity requirements. The absolute minimum sight stopping distance for the design speed of roads shall be taken as the minimum distance allowable between “T” junctions
17. “T” intersections do not require give way or stop lines and signs as stated in NSW Road Rule 73 Giving way at a T-intersection. Give way and stop lines and signs may be necessary to address specific safety issues such as limited sight distance or road legibility concerns. Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management in Table 3.5 supports the concept of using give way signs to *reinforce road rules or assign priority*. In the same table under “type of control” it states that road rules only, are common practice at T-intersections
18. Where intersections are likely to cause traffic problems, traffic islands should be considered for traffic control and safety
19. So that drivers will see approaching traffic, there shall be an area of sight unobstructed by buildings or other objects across the corner of an intersection. Additional earthworks shall be considered at the splay corners to alleviate any restriction in sight distance

20. Designers must consider the road network of adjacent future Indicative Layout Plans (ILP) including future intersections for both line and level and how these may impact on their design
21. Deceleration and acceleration lanes may be necessary where a traffic generating development is proposed. This shall be considered and documented in a Traffic Report (or Road Safety Audit if required by a council) and / or the Design Report submitted at DA
22. Culs-de-sac should be avoided but where they are necessary, consideration is to be given to the design of kerb longitudinal profiles which drain to the head. In these cases, provision is to be made to take drainage from downhill culs-de-sac heads via pipelines through easements, pathways, or drainage reserves if no feasible alternative option is available (e.g. for in-fill development). It is essential that an overland flow path also be provided for events which exceed pipeline capacity or to allow for blockages of the downstream line. The location of overland flow path may not be flexible, and regrading may be necessary to ensure safe overland flow
23. Pathways to convey overland flow are to be avoided and will only be permitted where it can be demonstrated that there is no other solution. Culs-de-sac will only be permitted where very minor flow is anticipated
24. Design of pavement thickness is to consider, and document issues associated with the existing and anticipated route of localised heavy vehicles such as where bus stops are located, traffic growth and major construction access for future subdivision activities

4.4 Street planting

4.4.1 Design data

Table 8 Design Data: Street Planting

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Refer to the Street Design Guidelines Part B3 for required number of trees per 1000m^2 of road reserve area and associated canopy cover at 20 years	
2.	Minimum setback from back of kerb to centreline of street trees	600mm
3.	Refer to the Street Design Guidelines Part C2.1 and C2.2 for information regarding street trees and soil volumes	
4.	Minimum Maintenance Period (Maintenance includes but is not limited to: watering, weeding, pruning, mulching, insect and disease control, replacement of dead trees, re-shaping of ground around stem to ensure healthy growth and retention of moisture and generally maintenance as required)	12 months

4.4.2 Design notes

1. A statement is required from a Registered Landscape Architect that the street tree design and associated streetscape landscaping has addressed the Street Design Objectives of the Western Sydney Street Design Guidelines, and has considered in detail:
    a. Illumination of streets, based on the mature tree form
    b. Location of utilities

   c. Stable root systems in the available volume
   d. Drainage
   e. Soil profile and compaction
2. The statement referred to above is not required within Blue Mountains City Council
3. Refer Western Sydney Street Design Guidelines Section C2 The Green and Blue Grid
4. Street tree planting near intersections should take account of sight line requirements and tree guard design and location
5. A security deposit equivalent to the cost of the supply, planting, establishment of trees and associated council administration costs, shall be provided if, for some reason, planting cannot proceed prior to release of the subdivision plan. Alternatively, a cash payment of the same amount should be paid to council if agreed. (Refer to s6.15(2) of the *Environmental Planning and Assessment Act 1979*)
6. There are many limitations to the positioning of street trees on footways immediately behind the kerb. Distances from infrastructure elements such as intersections, light and electricity poles, stormwater inlets, WSUD elements, driveways, footpaths, underground service pits and bus stops, are important in determining final planting locations. Typically, individual site assessment will be required, and designs must show relationships in full cross-sections of the road reserve and demonstrate how level changes are dealt with between private property and the road reserve
7. Spacing of street trees must take into account clearance requirements from utility infrastructure and other features such as driveways, WSUD elements, footpaths, etc
8. Where councils have a DCP which addresses tree planting the DCP provisions shall prevail over this Manual

4.5 Kerbs and kerb returns

Kerbs are to be provided on all new streets to the details below, in ***Table 9***, and in the relevant Standard Drawing SD-R04, unless specifically not required by a council to suit existing conditions or other neighbourhood character criteria.

4.5.1 Design data

Table 9 Design Data: Kerbs

ID	KERB TYPE	ABBREVIATION	APPLICATION
1.	150mm Kerb and Gutter	KG	Default kerb type and adjacent to open space and other public areas where vehicular access is to be restricted
2.	Kerb with Toe	KT	As for KG but where carriageway falls away from kerb as in a one-way cross fall situation
3.	Edge Strip	ES	Where no barrier kerb is required but edging is required for pavement or surface delineation or containment

ID	KERB TYPE	ABBREVIATION	APPLICATION
4.	Dish Crossing	DC	At intersections where a sag is not efficient or reasonably feasible OR To delineate side streets from priority streets and as an edge to different pavement types
5.	Median Kerb	MK	For medians and other non-mountable elements such as roundabouts.
6.	Kerb Only	KO	For edging to pavement where no drainage function is required but a barrier is required
7.	Residential Layback	LB	For access to property when roll kerb not used and property access point is known at the time of construction
8.	Roll Kerb	RK	To provide flexible access to properties as agreed by the council
9.	Roll Kerb at VC	RK-VC	Where less pronounced access for vehicles across roll kerb is required for example at laneway entry points
10.	Mountable Kerb	MOK	Where allowance is to be made for kerb to be mounted but only in unusual circumstances e.g., the annulus for roundabouts
11.	Elsholz Kerb	EK	Where specifically required by council – note that the use of this type of kerb is currently under review by NSW RMS. It is difficult to install and its purpose as a re-directive solution is subject to review

4.5.2 Design notes

1. Kerb types are as shown on standard drawing SD R04
2. Where residential laybacks are to be installed after kerb has been installed, the whole of the concrete kerb and gutter is to be removed for the full width of the layback and the layback constructed in its place
3. Provision shall also be made for future roof and stormwater disposal from each allotment by providing one outlet at the lowest point in the kerb. A 150 mm by 50 mm hot dipped galvanised steel Rectangular Hollow Section (RHS) must be provided for all kerb types to accommodate stormwater disposal or a proprietary kerb adaptor if agreed by the council. Designers should check with the council before specifying the type of kerb outlet for roof and stormwater
4. Kerb ramps shall be provided at all intersections and on all legs in accordance with the standard drawings and *Disability Discrimination Act 1992 (Cth)*
5. Where kerb returns are specified due consideration must be given to the following:
    a. The provision of kerb levels (on the nominal kerb lines) at tangent points, quarter points and wherever necessary to ensure accurate construction of junctions and turning heads

b. Offsets to all crests and low points are to be shown on the kerb profile
c. The kerb return profile is to be generally designed by adopting the grades of the approach and exit kerbs to the return, by quartering the length of the return and by computing kerb levels adopting vertical curves as required
d. Low points within the kerb return are not permitted to eliminate the use of pits with curved lintels

6. Kerb return standard drawing is SD-R03

4.6 Kerb extensions

Kerb extensions, also known as blisters, are designed to:

- Constrain vehicle operating speeds
- Provide an environment for the safe movement of pedestrians
- Provide elements for WSUD
- Provide areas for landscape and tree planting in clusters, where appropriate and safe

Intersections need to address the considerations of Austroads for sight distance and other safety issues as required. Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management, suggests in Table 3.13 the use of:

> "*kerb extensions to reduce crossing distances and improve visibility*".

In Table 9.2 of that same Guide, it also suggests that:

> "*safety is improved with kerb extensions*".

In Table 9.5 of the Austroads Guide the use of kerb extensions in local streets is regarded as:

> "*most likely are to be an appropriate treatment*."

Austroads Table 9.5 is reproduced below at ***Table 10.***

Table 10 Extract from Austroads Guide to Traffic Management Part 6

Table 9.5: Guideline for selection of facilities according to road classification

Facility	Freeway/ motorway	Primary arterial urban/(rural)	Secondary arterial	Collector road	Local street
Refuge/traffic island, median	X	O	O	A	A
Kerb extension	X	X/(O)[3]	O	A	A
Road narrowing, indented parking	X	X	X	A	A
Pedestrian fencing[1]	X[2]	O	O	O	X
Speed control device	X	X	X	O	A
Pedestrian (Zebra) crossing	X	X	O	O	A
Children's crossing	X	X	X	O	A
Pedestrian traffic signals	X	A/(X)	A	O	X
Grade separated	A	O	O	X	X
Mall	X	X	X	O	O
Integrated	X	X	X	X	O

1 *Pedestrian fencing in the context of this table is an enhancement to a facility provided to guide pedestrians to away from an unsafe crossing location.*
2 *Pedestrian fence located within the road reservation is inappropriate on freeways or motorways because pedestrians are not generally present. However, boundary fences are normally erected along urban freeways or motorways to prevent access between interchanges, including pedestrian access.*
3 *Kerb extensions are not usually provided on urban primary arterial roads as road capacity and traffic efficiency are most important. However, a kerb extension at an appropriate set back from the edge of traffic lane may be appropriate on the approaches to a rural village as a form of 'gateway' treatment, the objective being to encourage drivers to reduce speed.*

Notes:
A = Most likely to be an appropriate treatment.
O = May be an appropriate treatment.
X = Usually an inappropriate treatment.
X/(O) = Represents urban/(rural).

Key points to note in the table above:

- Kerb extensions are most likely to be appropriate for Collector roads and Local streets
- Second part of Note 3 to the table; "*However, a kerb extension at an appropriate set back from the edge of traffic lane may be appropriate on the approaches to a rural village as a form of 'gateway' treatment, the objective being to encourage drivers to reduce speed.*" This same kerb extension concept could also be applied within primary arterial urban road context by substituting "*a rural village*" with "*a new urban precinct*"

4.6.1 Intersections

Kerb extensions at intersections and mid-block are recommended because they provide opportunities for WSUD, landscaping and creating a safe speed environment. An example of an existing kerb extension treatment is below at ***Figure 3***. A dish drain and an edge strip have been added to illustrate how these intersection types can be used as thresholds.

Kerb extensions are to be designed to suit the intersection. There are some instances that kerb extensions may not be suitable. The designer will need to consider the street use and traffic volumes when designing kerb extensions.

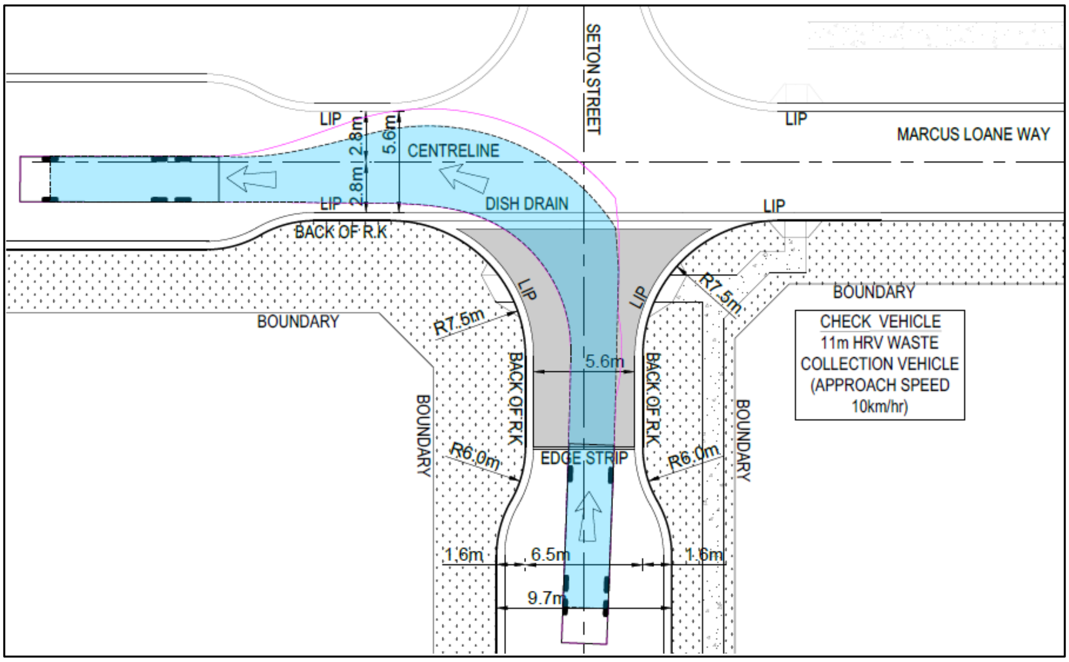


Figure 3 Example of existing intersection In Camden Council

Figure 3, above shows the details of an existing kerb extension at the intersection of Marcus Loane Way and Seton Street, Oran Park. It has been included in this Engineering Design Manual to demonstrate that the kerb extension concept works in practice. Note that the check vehicle, a 11m HRV, crosses the centreline of both streets as permitted under Road Rule 133, below:

133 Exceptions to keeping to the left of the centre of a road

(1) This rule applies to a driver on a two-way road without a dividing line or median strip.

Note—

Dividing line, ***median strip*** and ***two-way road*** are defined in the Dictionary.

(2) The driver may drive to the right of the centre of the road—

(a) to overtake another driver, or

(b) to enter or leave the road, or

(c) to enter a part of the road of one kind from a part of the road of another kind (for example, moving to or from a service road or emergency stopping lane).

Note—

Centre of the road, ***overtake*** and ***service road*** are defined in the Dictionary, and ***emergency stopping lane*** is defined in rule 95.

(3) The driver may also drive to the right of the centre of the road if—

(a) because of the width or condition of the road, it is not practicable to drive to the left of the centre of the road, and

(b) the driver can do so safely.

Figure 4 Seton Street intersection at Oran Park

It is intended to provide kerb radii at minimum of 7.5m as indicated in the Street Design Guidelines, except where the SDG provides alternative guidance. The intersection, as shown in ***Figure 3***, has kerb radii of 7.5m. ***Figure 4***, above, shows an image of the intersection from Google Street View.

Visibility of pedestrians and vehicles is to be considered to and from the pram ramp location. The preference is to have pedestrians crossing at the shortest point across the road. That is why the Street Design Guidelines presents a preference for the 7.5m radius on kerb returns.

Designers should note the guidance for visibility to pedestrians contained in Australian/New Zealand Standard 2890.1 Parking facilities Part 1: Off-streetcar parking. Figure 3.3 from this standard is presented below at ***Figure 5***.

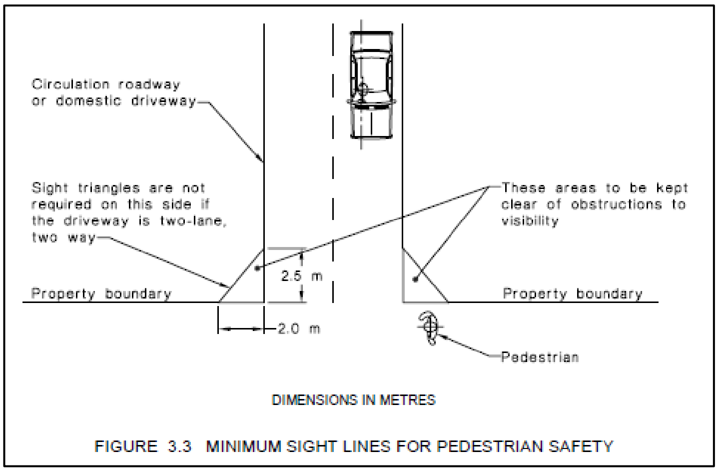


Figure 5 Minimum sight lines from AS2890.1 Figure 3.3

Intersections in shared environments with pedestrians and vehicles, should be designed in accordance with Technical Direction TTD 2020/03 as issued by Transport for NSW.

4.6.2 Mid-block

Kerb extensions are also to be considered at mid-block for the same reasons listed above. They should be used in local streets, not in higher order streets that are subject to higher traffic volumes and heavy vehicles. An example of a mid-block kerb extension is shown below in ***Figure 6***.

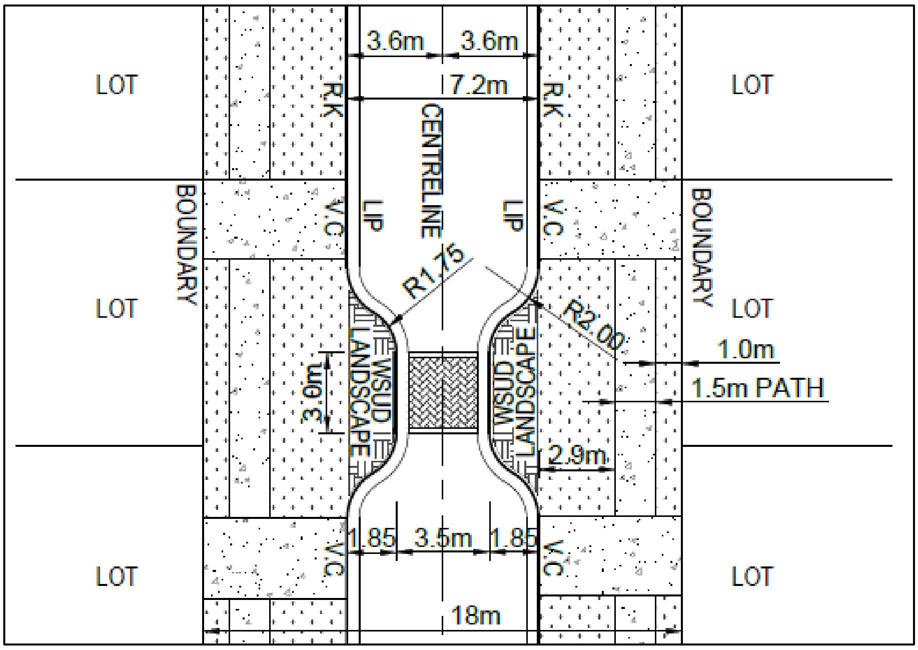


Figure 6 Mid-block kerb extension

The mid-block narrowing is set at 3.5m to cause drivers to slow while letting vehicles already in the narrowing to pass. In practice this works in low speed areas by drivers exercising road sense. Should there be concern that drivers will not be sensible, Councils may require the installation of “No Overtaking or Passing” signs as allowed under Road Rule 93, which can be seen below.

93 No overtaking or passing signs

(1) A driver must not—

(a) drive past a *no overtaking or **passing** sign* if any oncoming vehicle is on the bridge or length of road to which the sign applies, or

(b) overtake a vehicle on a bridge or length of road to which a *no overtaking or **passing** sign* applies.

Maximum penalty—20 penalty units.

Note.

Oncoming vehicle and ***overtake*** are defined in the Dictionary.

(2) A *no overtaking or **passing** sign* on a road applies to the length of road (including a length of road on a bridge) beginning at the sign and ending—

(a) if information on or with the sign indicates a distance—at that distance past the sign, or

(b) if the sign applies to a bridge—at the end of the bridge, or

(c) at an *end no overtaking or **passing** sign* on the road.

However, the installation of these signs should be limited so as not to clutter the streetscape with signs.

Mid-block narrowings can be wider than the 3.5m stated above, to allow passing of two design vehicles at the same time. The width should be set the same as the lane width for the street type, as nominated in the Street Design Guidelines. For example, Local Street Type 2 requires a travel lane width of between 2.8 and 3.0m. This would mean that the narrowing for this street would be set at between 5.6 and 6.0m, to match the combined lane width in the remainder of the street.

Designers should consider sight distance at mid-block kerb extensions in local urban streets as well as the location of driveways to residences. Speed in local urban streets may also be managed by limiting lengths of free flow by alternating priority at 4-way intersections. This can work well in rectilinear street patterns; however, kerb extensions would also be encouraged to provide opportunities for landscape, tree planting and WSUD.

It is inappropriate to use kerb extensions where:

- The kerbside lane is required for traffic
- Sight distance is limited
- The narrowing will pose a hazard to cyclists and other road users

An example of mid-block kerb extensions incorporating a chicane is shown in Figure 7, below. Note that a single lane is provided; approximately 3.25m wide. The street has a carriageway of approximately 12.6m. There are no signs to indicate no overtaking or passing; it is self-regulating. The chicane is shown in Nearmap images back to November 2009, which would appear to indicate its community acceptance.

Figure 7 Mid-block kerb extensions, Cabramatta Road, Mosman

4.6.3 Thresholds

Thresholds may be used to define a change in street type or to emphasis the priority street. An example of such a threshold is shown below in ***Figure 8***.

Figure 8 Glenrowan Drive and John McLennon Circuit, Harrington Park in Camden Council

A similar effect to thresholds may also be achieved using dish drains at intersections.

Figure 9 Hawthorne Circuit and Ellen Ridge, Harrington Park in Camden Council

Thresholds provide visual clues to drivers and variety in streetscape to reinforce the low speed objectives of local urban streets.

4.7 Half width streets

The provision of half width street constructions is significantly influenced by site specifics, development staging/layout and funding considerations. The combination of these influences with a single approach to dealing with half width street constructions is prohibitive. Due to the risk posed by these unknown variables, the construction of half width streets as part of subdivisional developments is not encouraged.

In situations where site specifics and development staging/layout necessitate that pavement construction be carried out, the applicant will cover all costs associated with the design of the full street width and construction of half the full width pavement. This includes the adequate transition to full width cross sections, plus a two-way traffic configuration ensuring operational effectiveness and safety to relevant Standards and approval.

Where half street construction is necessitated an AC pavement will be provided to a minimum distance of 1 metre past the street centreline, measured transversely, with a minimum width of 5.5 metres to allow for two-way traffic. A full-size temporary turning circle must be provided where there are no through streets, to cater for truck turning movements. All turning circles are to be constructed within the subject land unless agreement is provided by the adjoining landowner.

Provision is to be made for surface rainfall runoff so that adjacent undeveloped sites are not impacted.

Where retaining walls or earth embankments are installed along half roads, the wall, footings, guard fencing, drainage and subsoils associated with the wall/embankment are to be fully contained within the land subject of the development. Where not practical, an easement for infrastructure support may be required from the adjoining property.

No provision is to be made for on-street parking on both sides of a half road. The installation of temporary No Parking or No Stopping signs may be required to facilitate this arrangement. Approval of the Local Traffic Committee would be required for such signage.

4.8 Dead end staged construction

Where streets are constructed in stages of a subdivision, a temporary two coat flush seal (or 25mm of AC10 if required by a council) turning area suitable for heavy rigid vehicles and a permanent type barricade shall be constructed at the end of that stage to warn motorists of the dead-end and prevent their passage beyond. Such barricades are only to be removed upon connection of the adjoining stage.

A turning area must always be provided for garbage vehicles, regardless of the staging. The designer is to demonstrate that the proposed temporary turning head facilitates this turning manoeuvre by use of swept paths.

Generally, barricades shall be made of guideposts with eye reflectors. The distance between two (2) guideposts is shown in ***Table 7*** at ***ID 9***. However, a site assessment is required to determine the adequacy of such measures given the prevailing site conditions.

Other matters for consideration are:

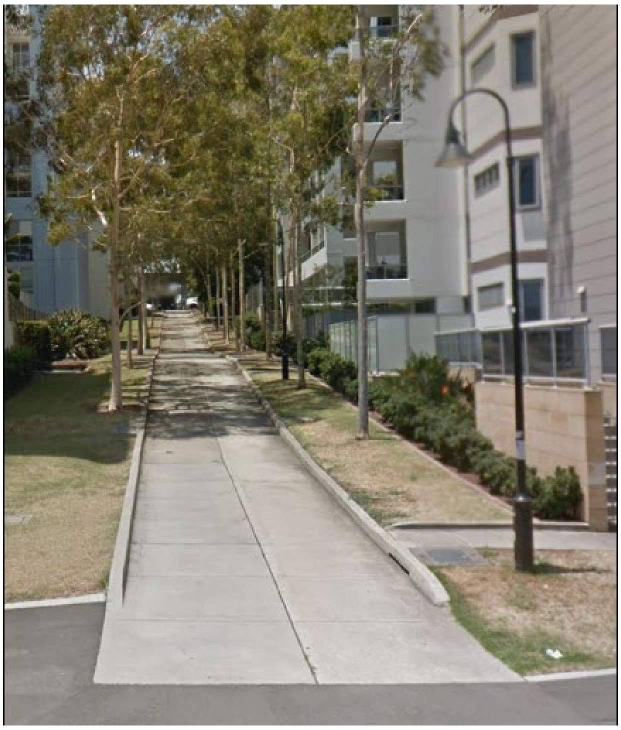
- Installation of appropriate parking restrictions to keep the turning head clear
- Where truck overhang passes over lots fronting the turning area, a right of way may need to be created
- Drainage structures should be located to not impede the turning manoeuvre of the checking vehicle

4.9 Footpaths

Pedestrians are to be provided with appropriate all-weather surfaces to permit universal access.

Footpaths also include pathways which link roads. For example, where a residential street links to a sub-arterial road bus-stop. Or, where a residential street links another residential street to provide an overland flow path. Examples of such paths are shown at ***Figure 10***, below.

Skye Court and Fenwick Close, Kellyville



Annie Leggett Promenade, Rhodes

Figure 10 Pathway linking streets

Note that both these examples provide good surveillance of the paths from streets and adjacent properties. Designers should aim for such surveillance where pathways are unavoidable designs.

4.9.1 Design data

Table 11 Design Data: Footpaths

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Minimum width of concrete footpath for both sides of Local Street Types 2, 3 and 4, Industrial Streets, Sub-Arterial Roads and other locations nominated by Councils or on Development Consents (see Street Design Guidelines), unless varied in a Development Control Plan or other planning instrument	1.2m
2.	Minimum width of concrete footpath for both sides of Local Collector unless varied in a Development Control Plan or other planning instrument	1.5m

ID	DESIGN DATA DESCRIPTION	VALUE
3.	Footpaths for High Streets subject to detailed design to create generous footpaths with multiple uses	NA
4.	Distance from boundary to edge of footpath closest to boundary	0.6m
5.	Minimum headroom	3m
6.	Minimum earthwork formation when not part of the street	2m
7.	Thickness of concrete footpath paths installed with subdivision works and reinforced with SL82 with 40mm top cover	100mm
8.	Cross fall on verge and footpath	2.5%
9.	Concrete strength (note may vary if salinity risk is identified)	25 MPa
10.	Metal key joints (equivalent to Connolly type) are to be installed at intervals not more than	9m

4.9.2 Design notes

Designers should refer to the Street Design Guidelines, Part B Street Types and Part C1.1 Footpaths, for further design information requirements

1. Footpaths are to be provided to the frontage of all residential properties and in other locations nominated by Councils
2. Councils require the installation of footpaths at the time of subdivision works prior to Subdivision Certificate. Councils may require variation to this based on local requirements. Designers should show footpaths on Subdivision Works Certificate drawings in all cases
3. Cross fall to match verge
4. Longitudinal grade to match street
5. Joints are to be placed in the concrete paving so that cracks are controlled and panels adjacent to street trees can articulate as the tree grows
6. Where footpaths are required to link streets with bus routes, schools, parks, etc they shall be provided with vehicle barriers at each end of the accessway
7. Footpaths may be installed by slip form machines to construction specifications prepared by the councils
8. Unless specified otherwise in a works construction specification, earthwork formations under concrete footpaths are to be adequately compacted, with a 25mm layer of course sand bedding installed under the concrete
9. Footpaths in parks, at stormwater maintenance locations and other discrete locations will need to be trafficable. Council will identify to which paths this applies and what vehicle they must be designed to accommodate. This may include provision for turning and manoeuvring.

4.10 Cycleways / shared paths

Cyclists are to be provided with appropriate all-weather surfaces to promote ease of cycling. These cycleways/shared paths must be consistent with the Street Design Guidelines at Section C1.7 Cycling.

4.10.1 Design data

Table 12 Design Data: Cycleways/shared paths

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Minimum width of concrete (or other material agreed with council) for off road cycleways/shared paths unless otherwise specified in a Development Control Plan or other planning instrument	2.5m
2.	Distance from property boundary to edge of cycleway or shared path closest to property boundary	600mm
3.	Thickness of concrete cycleway/shared path installed with civil works and reinforced with SL82 with 40mm top cover	125mm
4.	Crossfall of cycleway/shared path and verge	2.5%
5.	Concrete strength (note may vary if salinity risk is identified)	25MPa
6.	Maximum longitudinal grade for off road	1V : 14H (7.1%)
7.	Minimum longitudinal grade for off road	1V : 100H (1%)
8.	Minimum headroom	3.0m
9.	Minimum width of formation if not incorporated into street verge	3.0m

4.10.2 Design notes

1. On road and off-road cycleways and shared way designs shall be undertaken in accordance with the Austroads Guides Part 6A: Paths for Walking and Cycling and or AS 2156.2 Walking tracks Part 2: Infrastructure design
2. Cycleways are to be provided in locations nominated by councils and in accordance with the Street Design Guidelines at Section C1.7 Cycling
3. Cross fall to match verge
4. Longitudinal grade to match street always, unless specific grade separation of the cycle way and the street is able to be accommodated
5. Joints are to be placed in the concrete so that cracks are controlled and panels adjacent to street trees are able to articulate as the tree grows
6. Shared/accessways/pathways ways designated as catch drains or overland flow paths are to generally have a standard integral 150mm kerb and gutter on the low side and should have sufficient capacity to carry the flows with the required freeboard
7. Shared pathways are to incorporate jointing designed by an Accredited Professional

8. Shared paths in parks, at stormwater maintenance locations and other discrete locations will need to be trafficable. Council will identify to which paths this applies and what vehicle they must be designed to accommodate. This may include provision for turning and manoeuvring.

4.11 Driveways

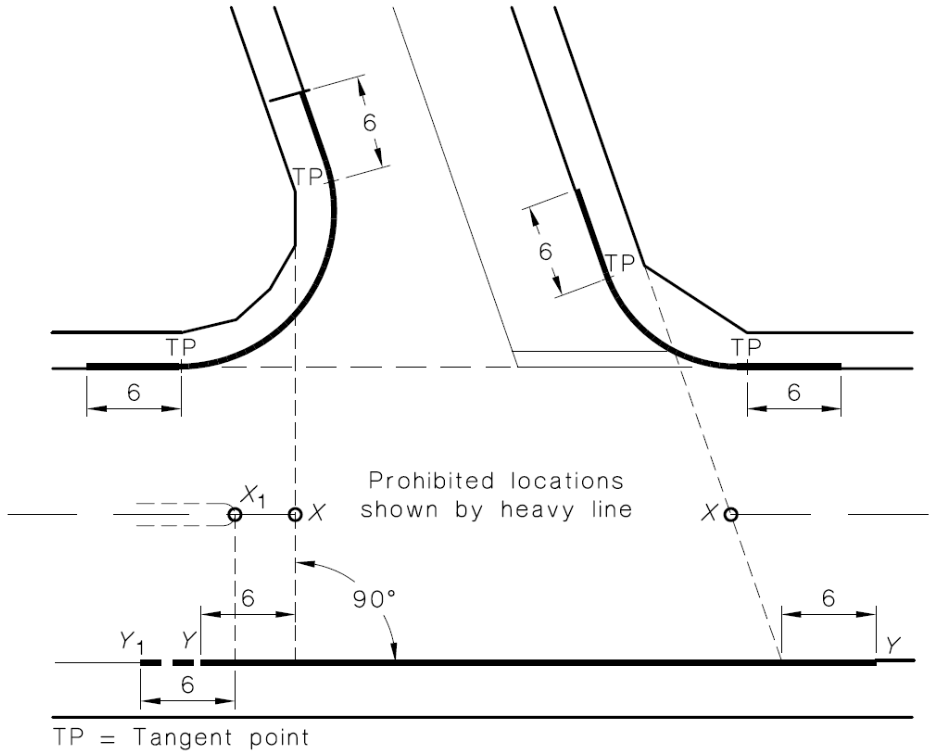
Driveways are to be provided from the kerb line to the property boundary. The indicative location of driveways is to be shown on the design drawings for SWC.

Driveways are to be to the Standard Drawing (SD-R08) showing single driveway 2.5m wide and a double driveway of a maximum of 4.5m wide, consistent with the design guidance in the Street Design Guidelines. These widths apply from the carriageway across the verge to the property boundary. The dimensions above are to be used unless stated otherwise in a Development Control Plan or other planning instrument.

It is preferred that driveways be constructed at the time of the Subdivision Works. There may be circumstances where the council varies this approach however, there remain occasions when driveways must be installed at Subdivision Works stage. Such as, when it serves a battle-axe handle, or multiple lots from a shared driveway. Other situations where construction is necessary at subdivision works stage would be, for example, where boundaries do not follow the kerb line around a cul-de-sac, or at sharp bends in roads.

Driveways should be constructed at each side of the footpath so that it is clear that the footpath has priority, see Street Design Guidelines Section C1.4 Driveway Crossovers. Installers of driveways are not to remove the footpath and replace it with concrete or another surface that matches the remainder of the driveway.

For corner lots the driveway should be located as shown in ***Figure 11,*** below.



NOTES:

1 Accesses to domestic driveways are excluded from the prohibition in respect of the kerb section marked Y-Y (see Clause 3.2.3(a)).

2 The points marked X_1 and X are respectively at the median end on a divided road and at the intersection of the main road centre-line and the extensions of the side road property lines shown as dotted lines, on an undivided road. On a divided road, dimension Y-Y extends to Point Y_1.

DIMENSIONS IN METRES

FIGURE 3.1 PROHIBITED LOCATIONS OF ACCESS DRIVEWAYS

Figure 11 Prohibited location of driveways (AS/NZS 2890.1 Parking facilities - Off street parking)

4.12 Private access handles

Access handles are to be installed during the construction of subdivision civil works to the Standard Drawing SD-R25.

In addition, conduits for utilities are to be provided at the civil works stage so that the access handles do not need to be excavated for the provision of house services. The configuration of the access handle utilities is shown at ***Figure 12***. Standard Drawing SD-R25 contains more detail.

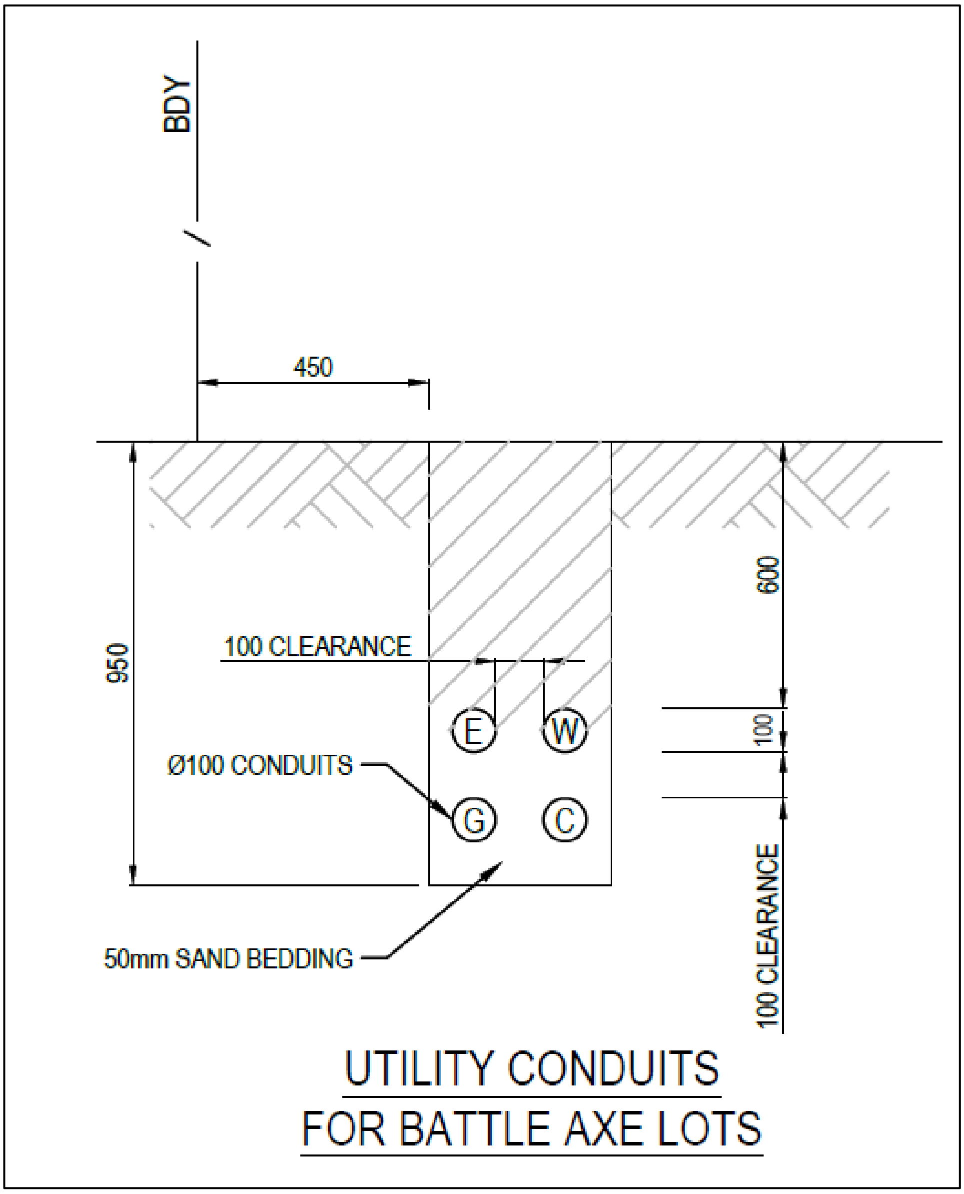


Figure 12 Conduits for access handles

4.13 Roundabouts

The design of roundabouts is to be in accordance with Austroads Guides and the RMS Supplements. In the case of work not within an existing road reserve approval is by the Certifier. In the case if an existing road reserve approval is by the Roads Authority. As part of the approval process the design may need to be considered and approved by the council's Local Traffic Committee. Councils are to be consulted to determine the approval requirements prior to lodging the designs for approval.

Roundabouts should be designed to be as small as possible, prioritising pedestrian continuity of movement adjacent an intersection. Roundabouts should be used sparingly, T-intersections are the preferred intersection type.

Mountable roundabouts are to be in accordance with Standard Drawing SD-R15 and are to be installed only where necessary for traffic management reasons. Such roundabouts on local streets are to be designed only for the design vehicle. The check vehicle is permitted to mount the roundabout island.

Consideration must be given to the WSUD/landscaping opportunity presented in a roundabout and included wherever reasonably practicable. Such landscaping should be low maintenance and drought tolerant. Plants should be low to the ground (less than 1m) to allow sight distance across the roundabout. Trees planted may be clear stemmed tall growing canopy trees to maintain sight lines while providing shade over handstand areas.

Figure 13 Recently installed landscaped roundabout in Camden

Concept designs for roundabouts should be contained in any DA submission and shall show:

1. Proposed landscaping concepts, planting species and mulching
2. Sub-soil drainage around the outer edge of the landscaped area and how this is connected to the street drainage stormwater piped system
3. Location of water supply conduit should this be required by the council

4.14 Traffic management measures

4.14.1 People movement

Traffic management measures can be incorporated into street designs where they will aid in managing the movement of people and traffic. Such measures include:

- Pedestrian refuges
- Raised thresholds
- Raised mid-block kerb extensions

All traffic facilities with signage and linemarking must be referred to Local Traffic Committees for approval.

Designs should avoid the use of fencing to prevent the misuse of pedestrians and others of thresholds, kerb extensions, etc. Streets designed for pedestrians should be easily recognised and understood by them.

Examples of traffic management measures are shown below. There are many examples of these facilities across Sydney and Western Sydney. The examples have been shown for conceptual recognition, not as a contemporary best practice example.

Figure 14 Example of raised pedestrian crossing

Note that kerb is protruding adjacent to the ramps. These look to have been struck by tyres of vehicles. This feature could have had an alternative treatment; however, the council would have had this designed and then approved by its Local Traffic Committee. Note the overhanging of the tree canopy further along the road, providing shade to all users of the street.

Figure 15 Pedestrian refuge Edgewater Drive, Bella Vista The Hills Shire

Refuge islands need to be a minimum of 2m wide to meet current guidance in Austroads. Pram ramps in this image do not give good visual contrast to surrounding pedestrian pavement. However, it appears that this refuge is effective as the chevron signage is intact and there are no tyre marks on the painted medians. Designers should ensure that current editions of Austroads and Transport for NSW documents are consulted for contemporary design guidance.

Figure 16 Pedestrian refuge, Wollondilly Shire

An example of a refuge that has a 2m wide refuge area. Note that there are black tyre marks on the kerb, just to the left of the Keep Left sign. Even facilities that are consistent with Austroads Part 4: Intersections and Crossings - General and AS1742.10 can represent a hazard to motorists.

4.14.2 Lines and signs

Designers are to refer to the standards of the Transport for NSW, Roads and Maritime for lines and signs and other traffic management standards. These can be accessed at this link: Transport for NSW Traffic Management Documents. [1]

[1] https://www.rms.nsw.gov.au/business-industry/partners-suppliers/traffic-management/documents/index.html

4.15 Pavements

Streets are to be provided with functional and sustainable pavements suited to the anticipated traffic loading as set out in ***Table 13***, below.

Table 13 Street traffic loading

LOCAL	Local Street – Type 1 (no footpaths)	Local Street Type 2 (yield street)	Local Street – Type 3 (dual carriage and footpaths – low density)	Local Street – Type 4 (dual carriage and footpaths – med density)	Residential Laneway	Local Collector
N (ESA)	1×10^5	5×10^5	5×10^5	1×10^6	1×10^5	5×10^6
MIXED USE	High Street	Industrial Street	Retail Laneway	Sub-Arterial Road		
N (ESA)	5×10^6	1×10^7	2×10^6	1×10^7		

Notes:

1. For other details of streets refer to the Street Design Guidelines Street Types Matrix
2. ESAs in the table are for a 20-year design life
3. In Blue Mountains City Council ESAs should be adopted for streets of equivalent traffic loadings to those within the council area

4.15.1 Design data

Table 14 Design Data: Pavements

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Minimum sub-base thickness for either compacted crushed sandstone or DGS	200mm
2.	Minimum base course consists of compacted DGB20 thickness of	150mm
3.	Single coat flush seal with stated aggregate size stated are to be applied after base course is completed and before the AC layer or primer seal whichever is required by the council	10mm
4.	a) Minimum thickness of final single layer of asphaltic concrete wearing course designed using AC10 Residential Mix from AGPT04B/14 'Austroads Guide to Pavement Technology - Part 4B Asphalt', *Under no circumstances must the wearing course be assumed to have structural strength*. Final AC layer installed prior to Subdivision Certificate	40mm
	b) Where final AC is required by the council in two layers the thickness of each layer shall be	30mm
5.	Minimum AC14 asphaltic concrete pavement thickness for roundabouts and cul-de-sac heads is as stated consisting of SBS Polymer Modified AC surface layer to accommodate twisting and torsion effects if in local streets	80mm

ID	DESIGN DATA DESCRIPTION	VALUE
6.	If roundabout is in local collector or industrial street minimum thickness base layer of AC40 below AC14 layer is	160mm
7.	The minimum Design Traffic Loadings used to undertake pavement designs is dependent on the street classification as shown in: The figures provided are minimums only and may be increased depending on the circumstances with each development as stated in the relevant Development Consent condition	***Table 13***
8.	Subgrade investigations will include sample data recording of test boreholes excavated to a minimum depth as stated below the design subgrade levels (unless rock is encountered)	1 metre
9.	Asphalt mix size is to be selected as shown below:	
10.	**Size (mm)** / **Layer where used**	**Thickness range mm**
	10 / wearing	30 - 40
	14 / as above and intermediate	45 - 60
	20 / Base and intermediate	60 - 100
11.	Minimum CBR for pavement design Other CBRs may be used where site samples are taken and tested by a NATA registered soils facility to requirements of Austroads Guide to Pavement Technology Part 2: Pavement Structural Design or Pavement Design for Light Traffic and reported by the design geotechnical engineer or civil engineer	3%
12.	If CBR less than stated value, provide minimum capping layer or working platform of 150 - 300mm depending on CBR swell. (refer to Austroads Guide to Pavement Technology Part 2: Pavement Structural Design Table 5)	3%

4.15.2 Design notes

1. Pavement design is to be certified by an Accredited Professional and shown on the SWC plans, for each new development where pavements are required or where traffic loadings have been or will be increased on existing pavements
2. Pavement designs are to be submitted based on the minimum CBR for pavement design in Table 14, above or by sampling and testing of the subgrade materials taken from the site by a NATA registered facility. Two (2) copies of the details of the pavement design and results of the subgrade testing (including CBRs) are to be submitted to the Certifier for approval prior to commencement of pavement construction. Under no circumstances are any roadworks to commence prior to written approval of the Principal Certifier, or in the case of work within an existing public road and subject of an approval under the Roads Act 1993, the council
3. Pavement thickness calculations are subject to variation should changes in the subgrade become evident during construction or due to spatial variations in the subgrade. Confirmation by an Accredited Professional geotechnical engineer of preliminary subgrade conditions will be required following initial excavation. In deep cuttings, deep fills or other instances where testing of subgrade is possible only at the time of construction, a separate pavement design will be required during construction

4. Pavement design shall be based on the assessed subgrade strength and the design traffic loadings (equivalent standard axles ESA) shown in ***Table 13***. The structural design of the pavement must be in accordance with procedures stated in this Engineering Design Manual
5. Roundabout, culs-de-sac, and intersection pavements shall be designed to address the torsion loads applied to the pavement by moving vehicles. This is to be demonstrated on the design plans
6. The SWC engineering plans must indicate the extent of any pavement treatments and designs required. Reference can then be made to the pavement treatments and designs certified on the plans, by an Accredited Professional geotechnical engineer for specific details including depth and type of material to be used for each pavement layer
7. Traffic design loadings may vary due to the following circumstances, where further assessment of the design traffic loading may be required:
    a. Large volumes of construction traffic, particularly major land filling requirements
    b. Quarry traffic
    c. Industrial traffic route
    d. Potential for future expansion of the street
    e. Potential for future development adjoining the street and loads from associated construction traffic
8. Pavements must be analysed using the pavement design software, CIRCLY for industrial and sub-arterial roads
9. Use of recycled materials - Where it is proposed to use recycled materials instead of virgin quarried materials in road construction, the construction shall comprise polymer modified bitumen seal (PMB) or rubber seal on top of primer seal as second coat seal prior to asphalt overlay. The pavement materials are to be tested by a N.A.T.A registered technical consultant and designed by an Accredited Professional taking into account performance of the proposed recycled materials to reduce the potential for reflection cracking by limiting the active cement content of the material
10. For existing road upgrading conditioned in a consent, pavement design traffic (ESA) should be determined / considered based on existing traffic count analysis data with estimated post development traffic and projected future traffic growth rate applied.

4.15.2.1 N values equal to or less than 5×10^5 ESA

Pavements should be designed using the general principles of the current version of Austroads publication: Guide to Pavement Technology Part 2: Pavement Structural Design AGPT02-17

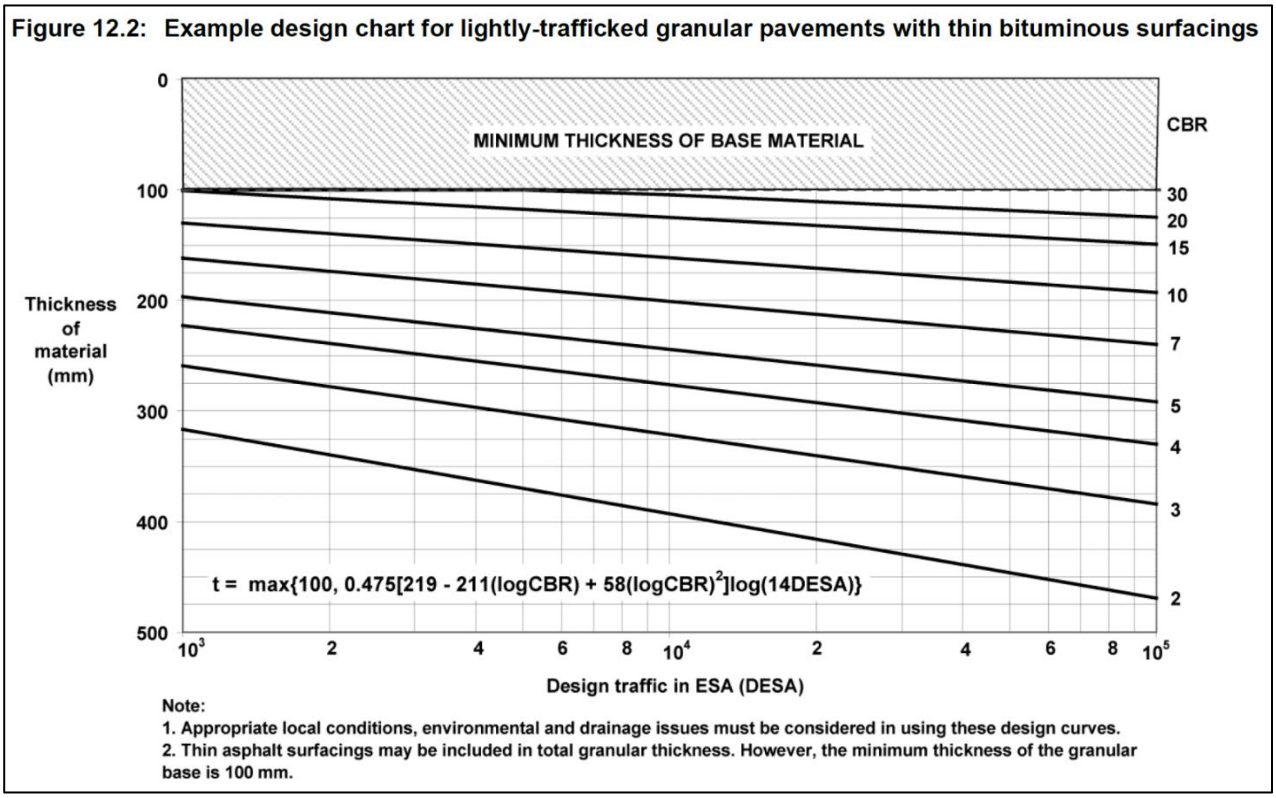


Figure 17 Austroads light traffic design chart ESA < 10^5

4.15.2.2 N Values greater than 5 x 10^5 ESA and Roundabouts

Pavements should be designed using the general principles of the of the current version of Austroads publication listed below:

- Austroads Guide to Pavement Technology - Part 2 Pavement Structural Design AGPT02/17

Figure 8.4: Design chart for granular pavements with thin bituminous surfacing

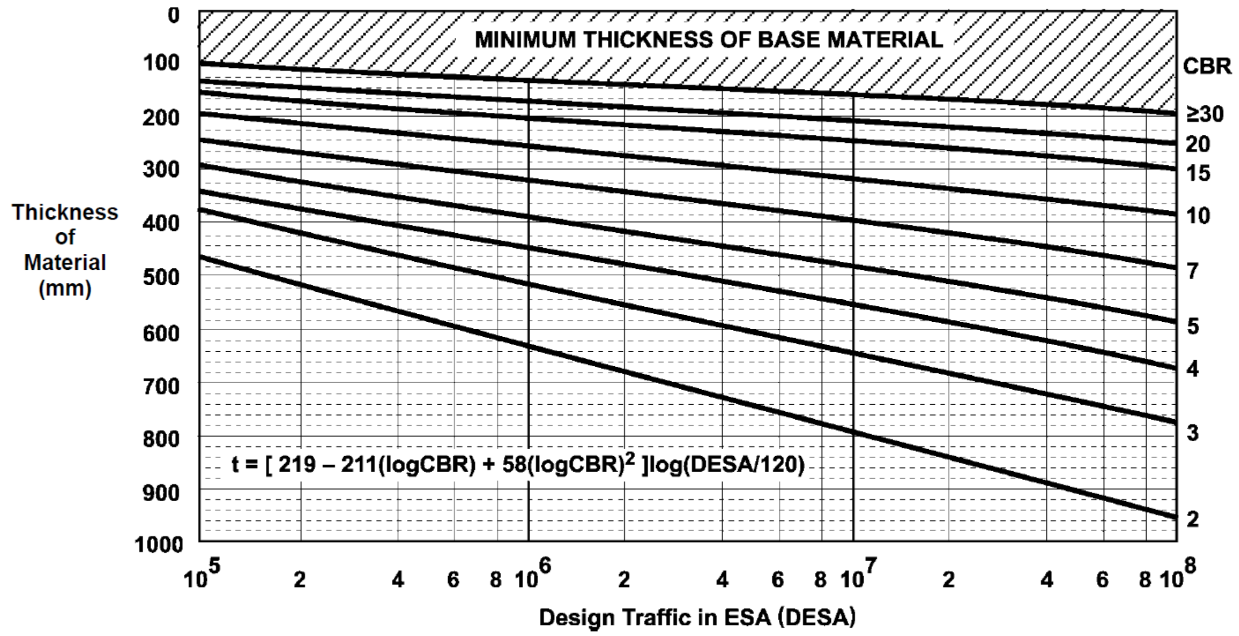


Figure 18 Austroads design chart for ESA > 10^5

4.15.2.3 Rigid pavements

Rigid pavements should be designed using the Cement Concrete and Aggregates Australia T51 'Guide to Residential Streets and Paths'. Reference may also be made to AGPT02/17 'Austroads Guide to Pavement Technology - Part 2 Pavement Structural Design', RMS Form 76 (supplement to the AUSTROADS guide) and the RMS 'Concrete Pavement Manual'.

Rigid pavements are extremely sensitive to individual heavy traffic loads as well as cumulative loading. If a rigid pavement is being considered, then a full traffic analysis is required in accordance with 'Austroads Guide to Pavement Technology - Part 2 Pavement Structural Design'.

4.15.2.4 Segmental paving

For segmental paving areas (high density concrete pavers) a concrete pavement should be designed underneath the pavers in accordance with the design method for rigid pavements and negating the thickness and any structural strength of the paver units.

4.15.2.5 Alternative designs

Alternative designs may be submitted accompanied by supporting evidence, certified by an Accredited Professional geotechnical engineer, as to the bearing capacity of the subgrade and the structural adequacy of the proposed pavement. Alternative designs may include mechanistic design methods in order to consider types of materials, analyse stresses, deformations, etc. Software such as CIRCLY may be appropriate for these situations.

4.15.3 Industrial streets

Subbase and base materials for industrial roads must comply with RMS Specification 3051.

4.15.4 Water sensitive urban design

If Water Sensitive Urban Design (WSUD) features (e.g. bio-retention swales) are proposed, consideration must be given to the pavement design in areas adjoining these measures. The aim is to avoid the potential impacts from frequent water logging and the subsequent impact on pavement materials. Selection of WSUD water treatment devices shall take into consideration the potential for traffic disruptions when carrying out maintenance or replacing these devices to minimise traffic disruption (i.e. minimum distance to live traffic in accordance with WorkCover requirements). Consideration shall also be given to the ease of using modular units for replacing plants.

Designers also need to consider isolation of WSUD from the pavement and cross service connections through WSUD areas.

More information on WSUD is contained in the Street Design Guidelines at Part C2.5 and in the stormwater sections of this Engineering Design Manual.

4.15.5 Evaluation of subgrade

Council will require investigation and testing by an Accredited Professional geotechnical engineer of the anticipated subgrade material in accordance with AS 1289.0. The geotechnical engineer shall have a Level 1 responsibility, unless agreed otherwise by the council, in accordance with AS 3798.

Design subgrade California Bearing Ratio (CBR) values shall be determined by a suitable site investigation, generally in accordance with 'Austroads Guide to Pavement Technology - Part 2 Pavement Structural Design', 'Pavement Design for Light Traffic – A Supplement to Austroads Pavement Design Guide' and AS 1289.0. The investigation will include sample data recording of test boreholes excavated to a minimum depth one metre below the design subgrade levels (unless rock is encountered). Soil samples shall be taken at the subgrade design depth and CBR tests undertaken after 4-days of soaking.

The testing authority responsible for the subgrade investigation must be fully satisfied that the location and depth of the test samples have been accurately surveyed to ensure that the sample represents a material which will remain in place when the subgrade is exposed. To this end, location, identification, and sampling of subgrade materials shall be carried out in accordance with AS 1726.

In general, the location and frequency of sampling and testing shall consider the following:

1. In similar subgrade conditions sampling shall be carried out at intervals not greater than 50 meters and testing at intervals not greater than 100 meters
2. In variable subgrade conditions the above intervals will need to be reduced accordingly
3. Sufficient soil sampling and testing must be undertaken to ensure that all soil types represented in the subgrade are properly identified and tested for pavement depth requirements; and
4. At least two (2) samples shall be taken from each road subgrade

4.15.6 Reconstruction of existing pavements

Where reconstruction of existing pavement is proposed the subgrade investigation is generally to be in accordance with AGPT02/17 'Austroads Guide to Pavement Technology - Part 2 Pavement Structural Design', AP-T36-06 'Pavement Design for Light Traffic – A Supplement to Austroads Pavement Design Guide'. Deflection testing of the existing pavement is to be carried out to provide a representative subgrade CBR. Where the CBR value is shown to be less than 4.0, the subgrade must be stabilised or replaced to provide a minimum CBR of 4.0.

Such analysis is to be based on existing traffic counts with estimated post development traffic and projected future growth included.

4.15.7 Street surfacing

The wearing course for all new streets and for the widening of existing streets shall be designed and certified on the plans by an Accredited Professional geotechnical engineer as part of the full pavement design. *The street wearing course must not be considered to provide structural strength*.

The placement of the AC10 wearing course shall not be undertaken until all utilities and services have been installed and permission obtained from the council. Works are to be completed prior to the final inspection by council. The values in ***Table 14*** are to be adopted when selecting asphalt mix size.

4.15.8 Pavement materials

All street pavement materials for unbound base and unbound subbase shall comply with the requirements of the council's Engineering Construction Specification.

4.16 Parking facilities

4.16.1 Off street

Off-street carparking shall be designed in accordance with the relevant DCPs adopted by Councils, any conditions of consent, AS/NZS 2890 and the relevant provisions of AS 1428.1. Designers should consider the movement of people in off street carparking and linkages to public pedestrian spaces. This consideration should minimise potential conflicts between people and cars and consider desire lines from one business to another to avoid informal paths being created through landscape areas.

Carparking should be surfaced with a layer of 30mm of AC10 over a one coat bitumen seal with 10mm stone. Minimum pavement thickness is to be in accordance with ***Table 14***.

Alternatively, a rigid pavement can be provided designed by an Accredited Professional, or a permeable surface designed to provide a WSUD solution.

4.16.2 On street

On-street carparking is to be designed in accordance with the provisions of the:

- Street Design Guidelines
- AS/NZS 2890.5 Parking facilities Part 5: On-street parking
- the relevant provisions of AS 1428.1 Design for access and mobility Part 1: General requirements for access—New building work
- and any relevant consent conditions

4.17 Utilities

Designers are to be aware of the need to consider the location of utility services within the street. As provided for in the Street Design Guidelines, utilities should be provided on one side of streets to increase tree planting opportunities.

See standard location drawings at ***Figure 19***, for details which are subject to detailed design to utility authority design requirements. For detail refer to standard drawing SD-29.

Design drawings shall include underground services and utilities related information on design (project) drawings i.e. plans, longitudinal sections, cross-sections etc. The depth and position of these services shall be presented at concept design stage through to the detailed design stage.

The depth and position of these services in concept design stage shall be based on Dial Before You Dig and engineering survey information. Though this information may not be accurate it will assist project managers to organise necessary liaison with the relevant services authorities.

This information can also be helpful in the discussion with the various stakeholders at Safety in Design, consultation meeting(s). It can be used for determining the accurate locations of potholing required at detailed design stage.

In the absence of the potholing information, the designer shall use the nominated standard depth from the relevant services authorities of the underground services, at the concept design stage. Position of these services can be plotted from Dial Before You Dig diagrams.

Designers are to specify an additional conduit in the electrical allocation for future communications and data requirements. This conduit will be owned by the council.

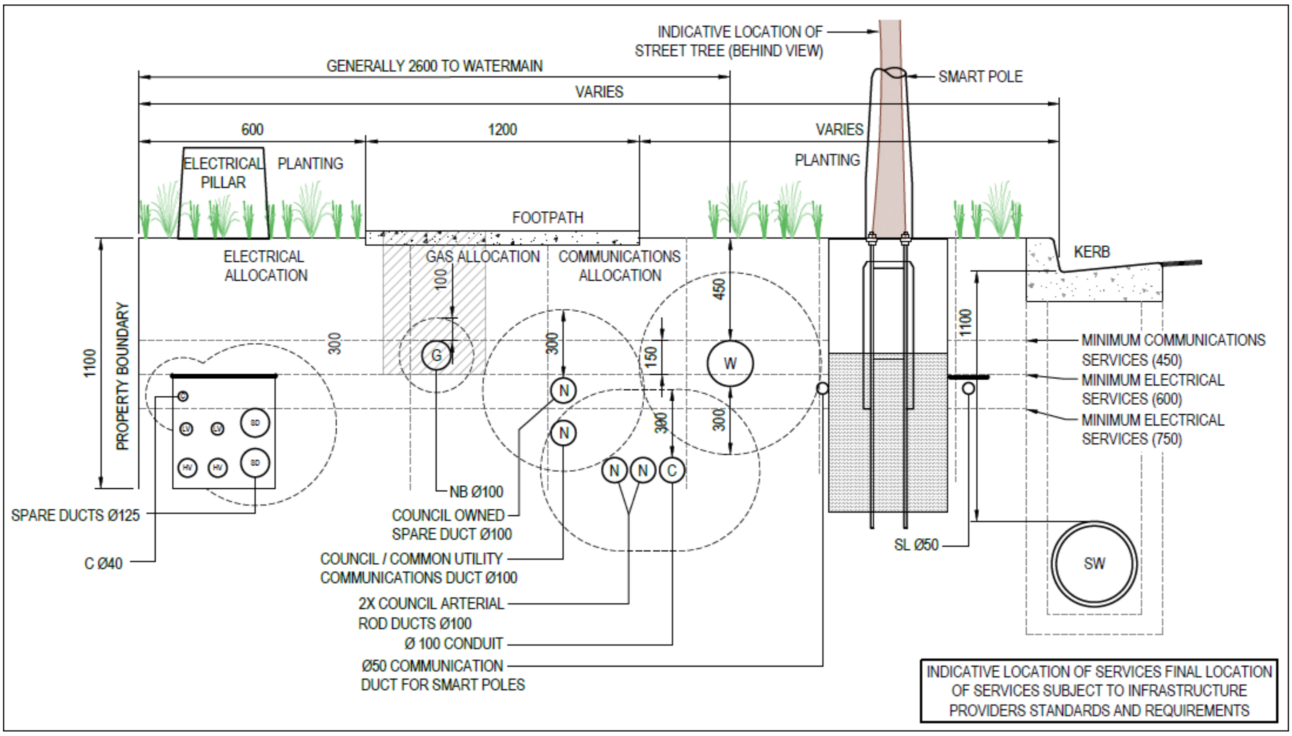


Figure 19 Indicative Trench Profiles (Adapted from Endeavour Energy)

4.17.1 Shared trenches

Shared trenches for the provision of electricity, communications, gas, and water services are to be provided where possible.

Shared trenching is to be undertaken generally in accordance with the ‘Guide to Codes and Practices for Streets Opening’.

Where new subdivisions or other developments depart from general practices or where the shared trenching arrangement shown in the ‘Guide to Codes and Practices for Streets Opening’ cannot be applied, details of alternative suitable shared trench configurations shall be obtained from the relevant Utility Authorities or from the NSW Streets Opening Coordination Council (SOCC).

4.17.2 Multi-function poles

With the provision of digital innovations designers should consider the use of multi-function poles. Note, agreement will be required from Endeavour Energy (or the current energy network provider) to this concept.

While it is recognised that these poles are designed to the requirements of Endeavour Energy, the engineering design of streets should consider the location of such poles when infrastructure of the street is designed. There needs to be coordination between the designer of the street, designer of electrical infrastructure, design section of council or section dealing with streetlights and landscape architect to coordinate trees, see Street Design Guidelines Part C5.2 for further information.

4.17.3 Street lighting

Electrical designers need to consult with Councils to ascertain the street lighting categories. Designers are to consider location of light poles with respect to lighting of paths, street trees, roadside and pedestrian safety, etc.

All lighting should be specified as LED.

Campbelltown City Council requires the following:

1. The street lighting and associated infrastructure in subdivisions is to be dedicated to council and will not be handed over to the energy supplier
2. All street lighting is to be LED “Smart” lighting to Australian Standard lighting levels
3. The design and installation of the street lighting is to be such that council can take ownership of the street lighting in subdivisions (i.e. separate circuit to residential supply)
4. Prior to any lighting design being undertaken, council’s City Delivery Section must be consulted
5. Padmount substations to be sited to improve public domain and visual amenity

4.18 Bridges and culverts

Bridges are to be designed to AS5100 Bridge Design Code by an Accredited Professional who shall provide the certification for the design as required in ***Table 2***. Designers should check with the council whether increased freight loads should be allowed for in the design.

Culverts should be designed using the guidance of Austroads Guide to Road Design Part 5B: Drainage - Open Channels, Culverts and Floodway.

Consideration should be given to:

1. 1% AEP flood level of any water course which the bridge crosses and associated freeboard to the underside of the bridge deck. Bridges may also need to take into account flood evacuation clearances on formal evacuation routes
2. The blockage factor for bridges and large culverts shall be undertaken in accordance with the blockage assessment criteria nominated in ARR 2019. The assessment shall take into account the proposed size of culverts, and the potential for debris to be collected in the catchment and the size of debris that may wash into the drainage system
3. Allowance for the passage of wildlife under the bridge with suitable provision of daylight and compliance with NSW Department of Primary Industries requirements for fish passage.
4. The aesthetics of the bridge design when viewed by the bridge user and surrounding viewers of the bridge
5. Adequate clearance for any road users should the bridge span an existing or future road, cycleway, or pedestrian path
6. Shared path on bridge
7. Footpath on bridge to be contiguous with approaching footpaths
8. Provision for utility services with spare capacity

9. Lighting in bridges
10. Landscaping and greening of bridges, including opportunities for tree planting
11. Provision of service conduits
12. Scour created by bridges is to be considered and mitigated to retain the geomorphology of streams being crossed by bridges
13. There should be no upstream afflux in urban areas in the design 1% AEP event
14. Bridges should be located on straight alignments and grades
15. Bridges designers should also consider Austroads Guide to Road Design Part 3: Geometric Design Section 10 Bridge considerations
16. Provision of safety barriers between road carriageway and footpath/cycleways and suitable clearance between railings and pedestrians and cyclists

   d. Abutments

      i. Spill-though abutments, aligned adjacent batters should be provide in preference to walled abutments
      ii. Spill-through abutments should adopt a maximum slop of 1:2 and be lined with an appropriate hard surfacing material that is consistent with the bridge setting
      iii. Where retaining wall abutments are utilised, they should return back to the bridge alignment to form buttresses
      iv. Abutments must consider maintenance requirements
      v. Shotcrete will not be used

   e. Safety screens

      i. Safety screens and throw prevention screens, if required, must be integrated with overall bridge design
      ii. Post spacing should provide a pleasing and ordered visual relationship both other bridge details
      iii. Terminate screens by tapering down towards bridge parapets and should match the extent of the bridge parapets
      iv. Tops of safety screens should be parallel to bridge alignment without stepping
      v. Screens and posts must not be attached and obscure the outer face of the bridge parapet

   f. Bridge and pier form

      i. Minimise the number of bridge piers by maximising span length
      ii. Minimise the thickness of bridge superstructure and bridge decks
      iii. Bridge design, including the parapets and other critical elements must address the slenderness ratio for the structure
      iv. Pile caps must be concealed below finished surface levels
      v. Reverse tapers are recommended on short elevation of piers
      vi. All bridge elements including piers, sill beams, abutments and leading edges must be fully integrated

   g. Bridge Barriers

      i. Parapets, bridge barriers/rails and throw screens must be design as integrated elements
      ii. Designs should maximise visual transparency to the landscape beyond

    iii. Barriers are to continue past the abutments in order to anchor the bridge to the surrounding landscape
    iv. Wherever possible there should be simple resolutions maintaining a constant height between bridge barriers and adjacent road barriers
    v. At creek and river crossings, two rail bridge barriers or similar bridge barriers that maximise views out to the landscape should be provided

17. Bridge designs must provide clearance between ground level and bridge soffit, and the toe of the bridge abutment and edge of the water course, to provide fauna connectivity, consistent with NSW Environmental Protection Authority's fauna crossing design principles
18. Bridge designs should allow penetration of light and moisture to encourage growth of vegetation under the structures
19. Anti-graffiti coating is to be specified for to elements of bridges accessible in public places

Figure 20 Stanhope Parkway, Second Ponds Creek, Blacktown City

4.19 Retaining walls (public assets and non-interallotment)

Retaining walls for streets, open space, drainage, industrial facilities and other non-residential interallotment purposes and are to be designed under the provisions of AS4678 Earth-retaining structures.

Councils should be consulted on their requirements so that aesthetic and functional objectives of the council are satisfied. There are many and varied forms of retaining walls, so early consultation is essential. SD-R28 Typical Rock Wall Geometry provides an example of a wall often used in developing areas of Western Sydney.

Guidance in Austroads Guide to Road Design on retaining walls is limited, which again suggests early consultation with councils to determine the approach required to retaining wall design.

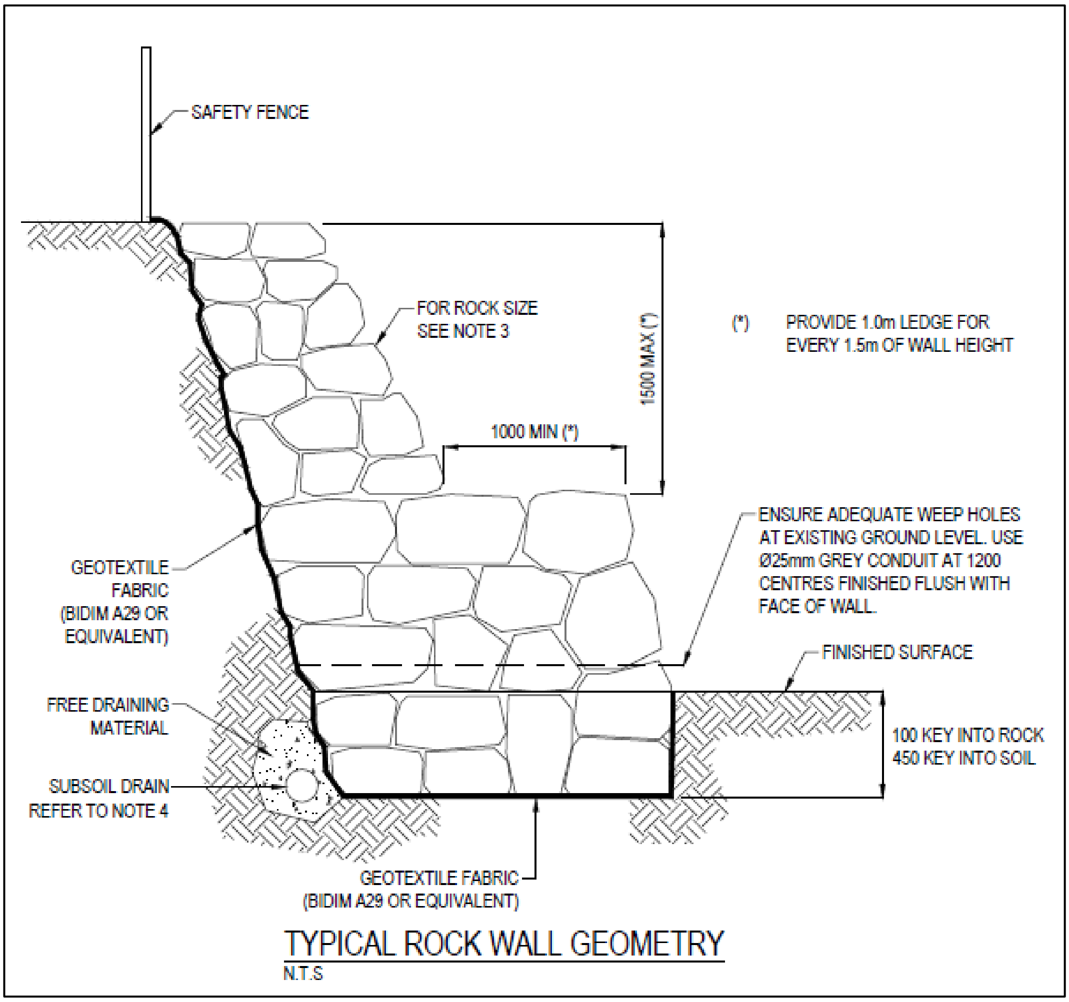


Figure 21 Standard drawing SD-R28

4.19.1 Design notes

1. Retaining wall subsoils should be connected to a stormwater pit where possible
2. Designers are to provide a Safety in Design written report for these types of retaining walls
3. Anti-graffiti coating is to be specified for to all retaining walls in public places
4. Designers should consider aesthetic outcomes when designing retaining walls. Landscape architects should be commissioned to work with retaining wall designers to achieve optimal aesthetic outcomes

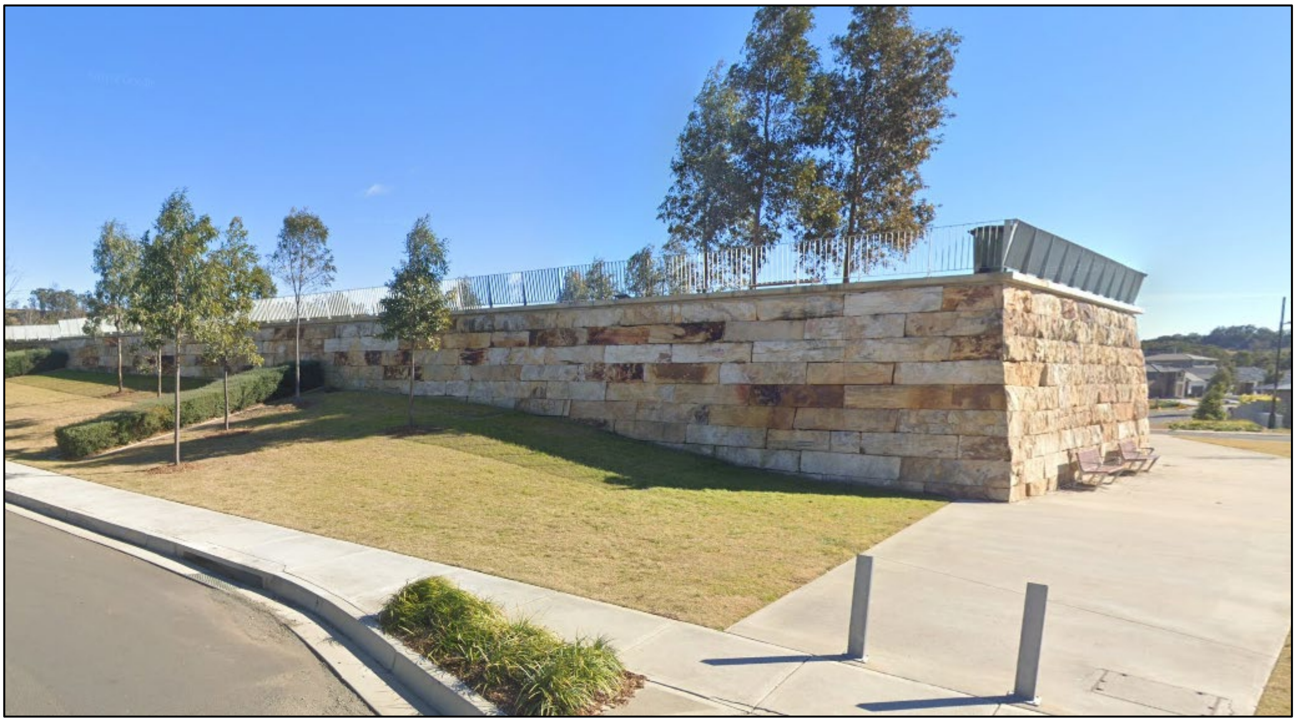


Figure 22 Retaining wall Main Ridge Park, Macarthur Heights, City of Campbelltown

The wall in ***Figure 22***, was designed by a landscape architect as part of the overall design of the park.

Figure 23 Roadside retaining wall Glenhaven Road, The Hills Shire

The Retaining wall in ***Figure 23***,was designed as a functional solution to support the pathway at existing ground level and achieve geometric requirements for nearby intersection.

Figure 24 Industrial Retaining Wall, Horsley Park, Fairfield City

Retaining walls in industrial areas, as shown above in ***Figure 24***, can be imposing and need to be designed in association with landscape architects or other design specialists. The challenge with industrial areas is the tension between the requirement for the creation of large flat pads for large footprint industrial buildings with level floors and the rolling hill terrain of some of the employment lands of Western Sydney.

Outcomes, like the one shown in ***Figure 24***, could be improved by considering the inter-relationship of existing parcels of land at re-zoning and the timing of development of adjacent parcels. Cooperation of adjoining owners is essential to achieve high quality aesthetics, in this challenging terrain.

Other design measures that could improve this outcome include:

- Tiering of the retaining wall to provide level areas for landscaping
- Planting of advanced trees and shrubs along the base of the wall
- Retaining wall units which allow planting for the full height

An example of landscaping used with a high retaining wall is shown at ***Figure 25***, below.

Figure 25 Planting in front of high retaining wall, Stanhope Shopping Village, Blacktown City

4.20 Bushfire protection

Requirements for bushfire planning can be found in the NSW Rural Fire Service publication see ***Figure 26***, below. It can be accessed from the link here: Planning for Bush Fire Protection[2]

Figure 26 NSW RFS Planning for Bushfire Protection November 2019

Designers should consult the publication to ensure initial applications consider all the bushfire issues in land prone to bushfires.

[2] https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0005/130667/Planning-for-Bush-Fire-Protection-2019.pdf

5 Rural Roads

Roads in rural areas should provide tree canopy shade as well as practical access to rural properties

5.1 Objectives

The objectives of rural roads are to:

1. Encourage social activation through their design
2. Be self–explaining slow environments that are safe and comfortable for all users
3. Provide grassed verges on both sides of the sealed carriageway giving opportunities for pedestrians and other transport options consistent with the rural context
4. Be safe for cycling, with safe bicycle facilities on busy roads
5. Ensure that continuous tree canopy cover is achieved on both sides of every road
6. Ensure that water sensitive urban design is integrated into every road
7. Design carriageway widths to optimise space for alternate uses and users

These objectives are to be reflected, wherever possible, into rural road design.

An example of an existing rural road is shown below.

Figure 27 Belmont Grove, North Richmond

5.2 Design Information

Geometric design of rural roads shall generally be in accordance with the Austroads Guides, where not covered by this Engineering Design Manual.

Austroads "*Guide to Road Design Part 6: Roadside Design, Safety and Barriers*" Edition 3.0 published August 2020 is to be used to assess roadside safety.

5.2.1 Design data

Table 15 Design Data Rural Roads

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Longitudinal grade maximum - local rural roads for short lengths up to 150m	20%
2.	Longitudinal grade maximum - local rural roads generally	16%
3.	Longitudinal grade minimum desirable	1.0%
4.	Longitudinal grade minimum absolute for short distances up to 50m, only and as agreed by the council	0.5%
5.	Rural road cross falls for unsealed shoulders	4% ± 1%
6.	Rural road table drains minimum longitudinal grade	1%
7.	Rural maximum cross falls for table drains	1v:3h
8.	Cul-de-sac radii rural roads	8.5m
	In Campbelltown	9.0m
	In bushfire prone areas stated value or other suitable turning arrangement provided in current version of *Planning for Bushfire Protection*	12.0m
9.	Maximum velocity of design storm event in table drain Where velocity is higher specific scour protection will need to be designed	1.8m/s
10.	Table drains are to be turf lined from invert to top of drain	ALL
11.	Minimum sealed carriageway width using bitumen two coat 10/20	6m
12.	Sealed shoulder width	1.2m
13.	Thickness of compacted base (either DGB20 or crushed sandstone) for shoulders	150mm
14.	Verge width from edge of sealed shoulder to property boundary - minimum	3.5m
15.	Rural road splay of boundaries at intersections	12m x 12m
16.	Batter slopes maximum	1v:4h
17.	Table drains maximum slope	1v:3h

ID	DESIGN DATA DESCRIPTION	VALUE
18.	Tree canopy coverage of rural road reserves for mature trees	70%

5.2.2 Design notes

1. Refer to SD-R60 for rural road cross section
2. Concrete kerbs are not required for rural roads, unless specifically required as agreed with the council
3. Vehicular crossings to rural properties are to be in accordance with the standard drawing SD-R61
4. Shoulders of rural roads are to be sealed, and line marked
5. To prevent scour table drains are to be lined or provided with kerb and gutter or other permanent solution such as dish drains
6. Designs should respect landform and vegetation of the local area and site. In bushland areas of the Blue Mountains careful attention will need to be given to the selection of revegetation species
7. Landscape character of local, district and region to be integrated into the design
8. Designs to take advantage of existing views/vistas to landscape features and attractive characteristics eg rolling hills, mountain, forest, watercourse and lake views

6 Erosion and sediment control

Well-designed soil and water management measures installed during construction will maintain healthy waterways

6.1 Objectives

The objectives of erosion and sediment control are to:

1. Eliminate wherever possible the deposition of sediment and sediment laden water into downstream drainage systems and receiving waters
2. Keep public roads and other public spaces free of sediment deposits
3. Retain the health of waterways during the construction phase of development

6.2 Preparation of details for subdivision works

Soil and Water Management Plans (SWMPs), incorporating Erosion and Sediment Control Plans (ESCPs) are to be prepared based on the publication Managing Urban Stormwater - Soils and Construction Volume 1 4th Edition, March 2004 published by Landcom (the Blue Book).

As stated in the Blue Book Glossary, page N-16:

> *Soil and Water Management Plans describe the measures are to be undertaken at development sites that, if carried out, will mitigate soil erosion and control pollution of sediment and nutrients to downslope lands and receiving waters both during and after development. They also include all the information contained in Erosion and Sediment Control Plans*

Drawings prepared using the Blue Book are for guidance purposes only, the soil and erosion controls are indicative and remain subject to construction methodology. The contractor always remains responsible for *compliance with all laws and regulations pertaining to safety and protection of the environment refer to the Protection of the Environment Operations Act 1997.*

Standard drawing notes found in ***Appendix C.3.5*** Soil and water management notes are to be used or referred to on all engineering design drawing SWC submissions.

Subdivision Works designs are to indicate that the Subdivision Works contractor is to ensure that sediment or sediment laden water is not allowed to enter adjacent lots, adjacent existing public roads or downstream stormwater systems. Where this does occur, the Subdivision Works contractor is responsible for immediate clean up and restoration of any damage caused by escaping sediment laden water from the work site.

7 Biodiversity

Biodiversity in the landscape should be preserved and enhanced

Consideration should be given to the principles set out in this section, when designing developments in new urban areas where biodiversity has been identified as an important feature. Such biodiverse land could include:

- Riparian corridors
- Remnant bushland
- Virgin bushland
- Fauna habitat corridors and locations

The *Biodiversity Conservation Act 2016* applies to such land. The Act states its purpose

> *"is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. . ."*

Designers should consult biodiversity specialists in the design of landscapes and urban precincts impacted by biodiversity. Note that biodiversity offsets may be required under the *Biodiversity Conservation Regulation 2017.*

7.1 Objectives

The objectives of biodiversity are to:

1. Preserve and maintain biodiverse landscapes
2. Enhance new urban precincts by integrating biodiverse land into landscape and urban design
3. Provide health micro-climate and safety benefits to all road users by providing a continuous tree canopy

7.2 Landscape design

7.2.1 Habitat area

1. Optimise landscaped area outside of development footprint
2. Include a buffer zone between embellished areas and remnant native vegetation - providing a transition between vegetation types
3. Metrics include % area preserved, area within development, % remnant native vegetation present, buffer width, % protected/priority areas avoided

7.2.2 Habitat variety

1. Optimise retention of original/remnant habitat
2. Metrics include number of priority species per habitat, species richness

7.2.3 Habitat quality

1. Optimise structural diversity
2. Where structural complexity of vegetation needs to be balanced with other consideration such as visibility for people safety, consider low plantings than provide pollination habitat (this could be further enhanced with interpretive displays about pollination and engagement of community in citizen science events such as pollinator week)
3. Use local native plants rather than hybrids such as hybrid grevilleas as these large flowering plants may encourage large and aggressive honeyeaters that can deter smaller birds and reduce bird diversity
4. Include habitat enhancement actions such as nest boxes, placement of logs
5. Minimise disturbance in native vegetation zones
6. Include weed and pathogen management actions in works management plan
7. Metrics include % structural layers present, # target plant species within structural layers

7.2.4 Habitat patch size and shape

1. Optimise patch size (minimise edge to area ratio)
2. Metrics include patch area

7.2.5 Habitat corridor size and shape

1. Optimise width of corridors
2. Metrics include distance gap between patch or corridor, corridor width

7.2.6 Habitat connectivity

1. Optimise connectivity between patches and corridors
2. Optimise connectivity among vegetation sections - including between embellished and original vegetation
3. Minimise fragmentation effects of pathways and vegetation zones to minimise creation of patches
4. Metrics include network consistency, % area as connectivity matrix

7.3 Urban design

7.3.1 Protect remaining ecological assets and habitats

1. Prioritise protection of areas of high ecological value where unable to protect all areas
2. Avoid or minimise development immediately adjacent to ecological assets and habitat
3. Create buffers (transitional vegetation zone) adjacent to ecological assets and habitat to reduce weed and pathogen invasion
4. Create buffers outside of protected area rather than within
5. Slope roads and sidewalks away from ecological assets and habitat to prevent entry of stormwater carrying weeds and nutrient pollution
6. Preserve natural drainage lines
7. Mitigate light and noise impacts on flora and fauna

Metrics include: % area preserved, area within development, % remnant native vegetation present, patch area, buffer width, % protected/priority areas avoided

7.3.2 Connect biological populations and habitats

1. Optimise connectivity between habitat corridors and patches
2. Consider private and public land connectivity between corridors and patches
3. Consider opportunities to recreate corridor linkages where not present

Metrics include distance gap between patch or corridor, network consistency, corridor width, % area as connectivity matrix

7.3.3 Construct diverse and complex habitats to attract and/or retain biodiversity

1. Construct ecological features that provide habitat for a range of plant and animal species
2. Incorporate structural complexity (vertical and horizontal features across space and time) in habitat design
3. Retain understorey, provide habitat walls
4. Create bird friendly habitat
5. Create pollinator friendly habitat
6. Use temporary or neglected spaces to increase habitat e.g. roofs, walls

Metrics include: % structural layers present, # target plant species within structural layers, number of priority species per habitat, species richness

7.3.4 Create cycles that mimic natural flows

1. Manage water, nutrient, and energy cycles at a local scale
2. Retain and use stormwater to enhance biodiversity

7.3.5 Encourage interactions within and between ecosystem elements

Encourage nature-nature interactions (e.g. pollinator) and human-nature interactions (e.g. local stewardship sites)

Figure 28 Cumberland Plain Woodland

8 Integrated Stormwater Management

Holistic approach to water management consistent with the principles of Australian Rainfall and Runoff 2019 and Water by Design

> ***Aerotropolis***
>
> *All development and public infrastructure within the Western Sydney Aerotropolis must comply with and contribute to the waterway health objectives and meet the waterway health planning and targets within the precinct planning using the Risk Based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions. The stormwater management objectives, waterway stability requirements and water quality targets in this Manual were not developed using Risk Based Framework and in some cases are not consistent with the objectives and targets developed for the Western Sydney Aerotropolis.*

8.1 Objectives

The objectives of integrated stormwater management are to:

1. Ensure a holistic approach to water management with a focus on volume management rather than just flow management and water quality management separately
2. Provide protection of riparian corridors
3. Reduce pollutant loadings and reduce physical degradation of urban waterways

8.2 What is integrated stormwater management

The Manual focuses on Integrated Stormwater Management, which gives due consideration to stormwater volumes, peak flow management, water quantity and quality management and drainage. This holistic approach recognises that development in catchments has a direct impact on receiving waters or urban streams. The value of waterways is being recognised by communities and how that relates to liveability today and for future generations. This holistic approach to water management is consistent with the principles of Australian Rainfall and Runoff (2019) with a focus on volume management rather than peak flow management.

All drainage design and construction work shall comply with these requirements unless otherwise approved by the council.

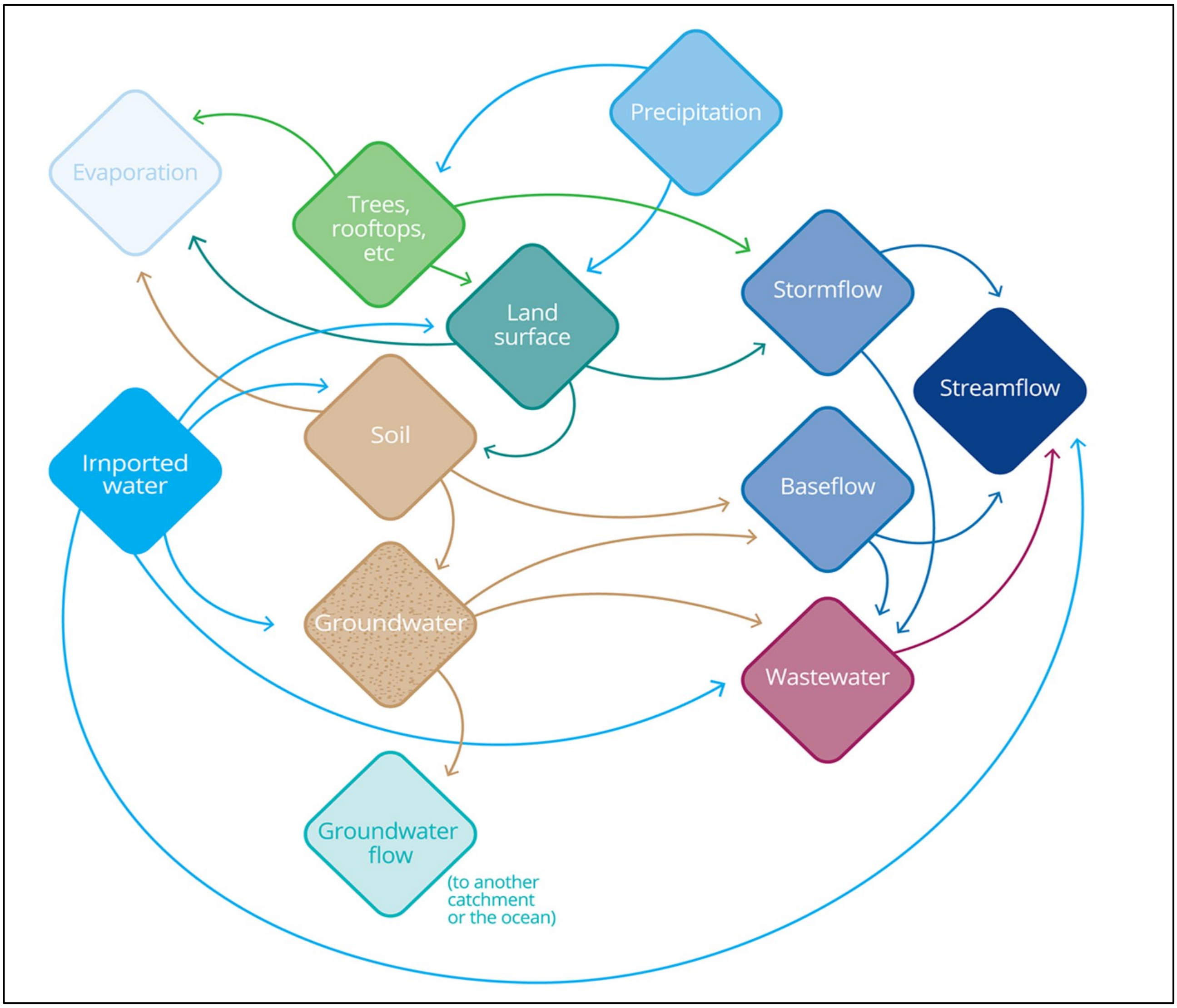


Figure 29 Simple Model of Water Inputs, Storage and Flows in an Urban Catchment
(source: ARR 2019 Book 9 Chapter 2)

Readers should refer to the latest version of Australian Rainfall and Runoff (ARR 2019) for guidance on:

- The hydrologic assessment of urban catchments larger than 500 hectares
- Determination of design flood levels along vegetated waterways
- Hydrologic assessment of gauged and ungauged rural catchments

All drainage designs shall be prepared in accordance with the relevant council's Flood Policy, Flood Risk Management Plans and/or DCPs. Council's Flood Policy, Flood Risk Management Plans and DCPs take precedence over this Manual.

The following should be reflected in Integrated Stormwater Drainage design:

1. A high level of safety for all users
2. Acceptable levels of amenity and protection from the impact of flooding
3. Retention of the natural stormwater system where possible and as required by other statutory authorities

4. Efficient conveyance of stormwater and surface runoff from public and private property to ensure public safety and property protection
5. Controlled rate of stormwater discharge to reduce downstream flooding impacts by maximising use of open spaces and other available areas to detain drainage
6. Ensure that the capacity of downstream drainage systems is not exceeded
7. Ensure that the stormwater drainage design has considered infrequent floods greater than the design flood
8. Minimise construction and maintenance costs and avoid the need for future property acquisition
9. Protection of the environment from adverse impacts of development by stabilising the landform, controlling erosion and maintaining/ enhancing regional water quality
10. Protection of aquatic biota and riparian vegetation
11. Meet water quality objectives and incorporate the principles of Water Sensitive Urban Design in all phases of the stormwater treatment train
12. Ensure low maintenance and economically sustainable in the long term in relation to operational, maintenance and replacement costs

To address public safety from a criminal standpoint all drainage design structures, and drainage system elements must be assessed using the NSW Police 'Safer by Design' or Crime Prevention through Environmental Design (CPTED) principles and protocols. The applicant must demonstrate how public safety and risk will be managed. The following will be considered in the assessment of proposals (this list is not exhaustive, and requirements will vary from site to site):

a. System elements which provide concealment opportunities will not be permitted
b. Vegetation which provides opportunities for concealment adjoining pedestrian areas will not be permitted
c. Underground pipe and pit systems which are large enough for children to get into must be screened (with due consideration given to flooding implications)

8.3 Climate change

Climate change and its impacts, such as increasing intensity of storms and cyclones, changed rainfall patterns and rising sea levels has potentially broad impacts on urban stormwater planning. Consequently, management of urban stormwater needs to consider likely impacts of climate change.

The periodic Assessment Reports produced by the United Nation's Inter-governmental Panel on Climate Change (IPCC) are the lead source of informaion about the impact of climate change.

Councils within the WSPP (especially councils within the same watershed catchment) should:

- Determine a uniform criteria to be adopted in achieving appropriate responses to the potential impacts of climate change (e.g. adoption of increased rainfall depths/intensities) on urban stormwater infrastructure
- Ensure uniform criteria are available to stormwater designers so they can incorporate them in their design where relevant

Designers shall ensure they are familiar with the latest design/research information and consult with the applicable council officers on climate change criteria to be adopted.

8.4 Design Models

All Stormwater drainage submissions are be be accompanyed by suppporting design models.

A list of the acceptable models are listed as below.

If applicants choose to utilise different stormwater models, applicants are required to make satisfactory arrangements with Council for the payment of all expenses incurred by Council in its assessment of the drainage submission.

- DRAINS: Hydrologic and Hydraulic Urban Catchment model derived from ILSAX
- XP-STORM: Hydrologic and hydraulic urban catchment model
- MIKE-11: One dimensional unsteady flow calculation for river/floodplain modelling
- RAFTS: Runoff routing model for trunk drainage and retention basin design. Flow rates should be checked against those calculated by other methods
- TUFLOW: Two dimensional hydrodynamic flood model
- HEC-RAS: 1-D Steady/unsteady flow calculations. To be used in open channel design and floodplain modelling
- MUSIC: Water quality conceptualisation model

Below is the table of modellng parameters to be used:

Table 16 Model design parameters

ID	PARAMETER	DESCRIPTION	VALUE	UNIT
		ILSAX or DRAINS MODELS		
1.		Model for Design and Analysis run	Rational Method	no unit
2.		Rational Method Procedure	ARR19	no unit
3.		Soil Type - Normal	3.0	no unit
4.		Paved (Impervious) Area Depression Storage	1	mm
5.		Supplementary Area Depression Storage	1	mm
6.		Grassed (Pervious) Area Depression Storage	5	mm
7.	AMC	Antecedent Moisture Condition (ARI= 1-5years)	2.5	no unit
8.	AMC	Antecedent Moisture Condition (ARI = I0-20 years)	3.0	no unit
9.	AMC	Antecedent Moisture Condition (ARI = 50-100 years)	3.5	no unit
10.		Sag Pit Blocking Factor (Minor systems)	0	0 = no blockage
11.		On Grade Pit Blocking Factor (Minor Systems)	0	

ID	PARAMETER	DESCRIPTION	VALUE	UNIT
12.		Sag Pit Blocking Factor (Major systems)	0.5	no unit
13.		On Grade Pit Blocking Factor (Major Systems)	0.2	no unit
14.		Inlet Pit Capacity	See ***Figure 51*** to ***Figure 55***	
		RAFTS XP Models		
15.	CAPIMP	Capacity of impervious area storage	1.5	mm
16.	ISC	Interception Storage Capacity	1.5	mm
17.	DSC	Depression Storage Capacity	5	mm
18.	USC	Capacity - Upper Soil Zone Storage	25	mm
19.	LSC	Capacity- Lower Soil Zone Storage	100	mm
20.	UH	Maximum Potential Evapotranspiration from Upper Soil Zone	10	mm/day
21.	LH	Maximum Potential Evapotranspiration from Lower Soil Zone	10	mm/day
22.	ER	Proportion of Evapotranspiration from USC	0.7	no unit
23.	IDS	Initial Impervious Area Storage	0.5	mm
24.	IS	Initial Interception Storage	0.5	mm
25.	DS	Initial Depression Storage (pervious)	0	mm
26.	US	Initial Upper Soil Zone Storage	20	mm
27.	LS	Initial Lower Soil Zone Storage	80	mm
28.	GS	Initial Groundwater Storage	0	mm
29.	GN	Groundwater Recession Factor	1	mm
30.	SO	Sorptivity of Dry Soil	3.0	mm/min - 0.5
31.	Ko	Saturated Hydraulic Conductivity	0.33	mm/min
32.	LDF	Lower Soil Drainage Factor	0.05	no unit
33.	KG	Constant Rate Groundwater Recession Factor	0.94	no unit
34.	ECOR	Rate of Potential Evaporation from " A" Class Pan	0.7	no unit
35.	IAR	Proportion of Rainfall intercepted by Vegetation	0.7	no unit

9 Flow Management

Management of stormwater runoff flows within the urban environment to provide a sustainable stormwater quantity and quality outcomes

Aerotropolis

All development and public infrastructure within the Western Sydney Aerotropolis must comply with and contribute to the waterway health objectives and meet the waterway health planning and targets within the precinct planning using the Risk Based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions. The stormwater management objectives, waterway stability requirements and water quality targets in this Manual were not developed using Risk Based Framework and in some cases are not consistent with the objectives and targets developed for the Western Sydney Aerotropolis.

9.1 Objectives

The objectives of flow management are to:

1. Provide safe conveyance of post development flows generated from development sites
2. Ensure sustainable reuse urban stormwater drainage
3. Provide integrated catchment management across climatic, ecological, social, and land use issues
4. Protect the environment of the downstream receiving waterway
5. Integrate Water Sensitive Urban Design principles wherever reasonably practicable

9.2 Major / minor drainage concept

The major / minor drainage concept, as discussed in *Australian Rainfall and Runoff (2019),* shall be adopted for all urban stormwater drainage design.

The 'Minor' system refers to the underground piped system and gutters capable of carrying runoff from minor storms. The 'Minor' urban drainage systems are to be designed to cater for an Annual Exceedance Probability (AEP) as defined in ***Table 17***, below.

The 'Major' system refers to the overland flow paths which are to be designed to convey major storm flows when the capacity of the minor system is exceeded. The 'Major' urban drainage systems are to be of an "open-style" and designed to safely convey storm flows generated by the 1% AEP critical storm event. In instances where the 1%AEP flows minus the minor system flows cannot be safety conveyed, the minor system will need to be upsized.

Flows more than the 1% AEP event must be considered in terms of safety and impacts but are not required to be fully contained within the major system. Major system flows to be conveyed in road reserves must allow for the safe movement of vehicles and pedestrians.

9.2.1 Design data

Table 17 Design Data: Flow Management

ID	STORMWATER INFRASTRUCTURE	COMMENT	TARGET	EVENT RECURRENCE (or Events per Year)
1	GPT (3 month) Bioretention/ vegetated swale (3 month) Raingarden (6 month) Filter cartridges (3 month)	This is a typical recurrence interval for runoff generated from a developed catchment. Preventing runoff from rainfall events with a more frequent recurrence will focus on protection of the downstream waterway.	Capturing pollutant loads in the more frequent stormwater runoff events.	6EY – 4EY Note: Natural catchment flows shall range from 4EY -2EY
2	Creek bed and bank stabilisation. Design capacity of waterways.	This is the typical recurrence interval for stream forming flows. Maintaining the natural hydrograph (volume and peak flow) for this recurrence post development ensure the existing structural integrity of the waterways.	Reduce stormwater runoff volumes from proposed development up to this recurrence interval using WSUD.	50% AEP
3	Design capacity of the minor drainage system for residential development.	There should be no nuisance or overland flows occurring at this recurrence	Conveyance without nuisance flooding in residential areas	20% AEP
4	Design capacity of minor drainage system for commercial and industrial areas.	Drainage through other property within an overland flow path is permitted.	Conveyance without nuisance flooding.	5% AEP
5	Design capacity of minor drainage system for sub-arterial streets.		Conveyance without nuisance flooding.	5% AEP

ID	STORMWATER INFRASTRUCTURE	COMMENT	TARGET	EVENT RECURRENCE (or Events per Year)
6	Design overland flowpaths to convey flood flows safely with adequate freeboard. Define appropriate riparian corridor widths to convey these flood flows with adequate freeboard. Define arterial streets.		Convey floods safely with adequate freeboard to floor levels. Arterial streets are not subject to flooding in this recurrence.	1% AEP
7	Emergency facilities		Flood free (including access) for schools, hospitals, fire station, ambulance station, etc	0.2% AEP Extreme events
8	Major infrastructure		Flood free for large critical infrastructure (e.g. bridges, dams) and spillway designs of major basins and dams	0.05% AEP Extreme events
9	Useful for identifying to define flood-prone lands and flood evacuation procedures. Also used for sensitivity checking.		Flood evacuation routes	PMF

Figure 30 Multi-cell box culvert under construction

9.3 On-site Detention

Where private On-Site Detention (OSD) is required to reduce the impacts of the development on the downstream drainage system or property, the following design data shall apply, in accordance with the relevant council Development Control Plan or adopted council policy.

9.3.1 Design data

Table 18 Design Data: Onsite Detention

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Maximum site discharge from the post-development site shall not exceed the pre-development flows for all storms events from those stated	50%AEP up to and including the 1% AEP
2.	Site storage volume if the time of concentration for the catchment is: ▪ A non-time translation hydrograph method (e.g. Wollongong method or Swinburne method) ▪ ensure no increase in flows ▪ time translation hydrograph method (e.g. runoff routing method) can also be used for less than 30 minutes	less than 30 minutes

ID	DESIGN DATA DESCRIPTION	VALUE
3.	Site storage volume if the time of concentration for the catchment is ▪ time translation hydrograph method (e.g. runoff routing method) shall be used. ▪ ensure no increase in flows	greater than 30 minutes
4.	Location of OSD basins shall be located clear of any overland flow paths.	For all OSD facilities
5.	The runoff from the whole development site shall be directed to OSD	100 % of the site. In sites which this is not practicable, a maximum of 20% catchment bypass is permitted.
6.	Freeboard to habitable floors from OSD above the 1% AEP ponding water level, unless otherwise approved by the council	500mm
7.	Slope of turf storage areas (not batters)	3% with an absolute maximum of 5%
8.	Slope of paved areas	0.5% with an absolute maximum of 1%
9.	Minimum orifice diameter in below ground OSD tanks for commercial and industrial developments only	50 mm
10.	Discharge from aboveground OSD basins for storms in excess of the adopted pipe system design AEP, shall be via a weir designed to have a maximum depth of flow in a 100-year AEP storm of	150 mm
11.	Car parking spaces and open spaces can be incorporated as an OSD component. When car parking spaces or open spaces are to be utilised as OSD, the maximum permissible ponding depth in the 1% AEP	150mm

9.3.2 Design notes

1. All aboveground OSD basin outlets and below ground OSD tank orifices shall be protected by a screening device to minimise blockage. Such blockage protection must present a significantly greater area than the outlet pipe (10x)
2. An emergency overland flow path shall be provided for all OSD in case of extremely large flows or improper operation of OSD outlet, the overflow shall not be directed towards adjoining properties
3. All stormwater must fall by gravity to an approved drainage system. Discharge by use of mechanical pump system or charged lines is not allowed
4. Upon completion of construction a 'work as executed' plan shall be submitted to council prior to final inspection
5. At completion of construction of the onsite detention system and prior to the issue of the Occupation/Subdivision certificate the applicant shall submit a detailed 'work as executed' plan, certified by a Chartered Professional Engineer, in accordance with the ***Table 2*** Accredited Professional Endorsement, confirming the volume of storage provided and that the as constructed OSD shall perform as designed.

Construction tolerances of onsite detention systems shall be in accordance with the following:

Table 19 OSD construction tolerances

ID	ELEMENT OF OSD SYSTEM	CONSTRUCTION TOLERANCE
1.	Percentage of area not detailed	+/- 5%
2.	Storage volume	+/- 5% design
3.	Site discharge	+/- 5% design
4.	Freeboard	+/- 10% required
5.	Storage depth	+/- 10% or 50mm whichever is lesser
6.	Storage depth parking areas	+/- 5% design depth
7.	Pipe grades	+/- 10% design grade
8.	Tank height	+/- 5%
9.	Screen fit	+ 5mm gap between wall and floor

6. Consideration must be given to the likelihood of access by children in rainfall events and the subsequent need for fencing or other controls
7. A risk assessment, in accordance with the parameters in the following table shall be provided by the applicant to council. The risk assessment shall include consideration of wall height / drops, standing water, escape routes, likelihood of children entering, etc

Table 20 OSD risk assessment parameters

ID	STORAGE AREA	SUGGESTED DEPTH	FREQUENCY OF DURATION
1.	Pedestrian areas	Beginning to pond	Once in 5 years
2.		50mm (max depth)	Once in 100 years
3.	Parking and driveways	Beginning to pond	Numerous times per year
4.		100mm	Once in 5 years
5.		150mm (max depth)	One in 100 years
6.	Garden areas	Beginning to pond	Once a year
7.		200mm	Once in 5 years
8.		500mm (maximum depth without fence)	Once in 100 years

ID	STORAGE AREA	SUGGESTED DEPTH	FREQUENCY OF DURATION
9.		1200mm (fenced minimum)	Once in 100 years

8. Recommendations of the risk assessment shall be incorporated into the design
9. A ‘positive covenant’ shall be created pursuant to Section 88E of the Conveyancing Act 1919 and submitted to council indicating that the on-site stormwater detention area shall be maintained at all times to comply with the following:

‘The proprietor of the land hereby burdened (herein called ‘the proprietor’) shall be at all times in respect of the land hereby burdened identified on the above-mentioned plan as ‘on-site stormwater detention (OSD) (herein called ‘the basin’)responsible to;

(a) *Construct, clean maintain and repair all pits, tanks pipelines, orifice plates, trench barriers, walls, earth banks and other structures*

(b) *Maintain the approved surface levels*

(c) *Regularly mow and remove grass clippings and debris as necessary to ensure the efficient operation at all times of the basin* ***PROVIDED HOWEVER*** *that “Nominated Council” (herein called ‘the Council’) shall have the right enter upon the burdened lot with all necessary materials and equipment at all reasonable time and on reasonable times and on reasonable notice but at any time and without notice in the case of an emergency*

(i) *To view the state of repair of the basin*

(ii) *To ascertain whether or not there has been any breach of the terms of this covenant*

and

(iii) *To execute any work required to remedy a breach of the terms of this covenant if the proprietor has not within 14 days of the date receipt by the proprietor of written notice from the Council requiring remedy of a breach of the terms of this covenant taken steps to remedy the breach and without prejudice to the Council’s other remedies the Council may recover as a liquidated debt the cost of such remedial work from the proprietor forthwith up demand*

9.3.3 Upper Parramatta River Catchment Trust

If the development site is within the Upper Parramatta River Catchment Trust (UPRCT) catchment area, refer to ***Figure 31*** for location, then the requirements of the UPRCT On-site Stormwater Detention Handbook for Site Storage Volume and Permissible Site Discharge shall apply.

The UPRCT catchment extends for 110km^2 of the upper Parramatta River catchment. The only council within the WSPP that applies the UPRCT policies is Blacktown Council.

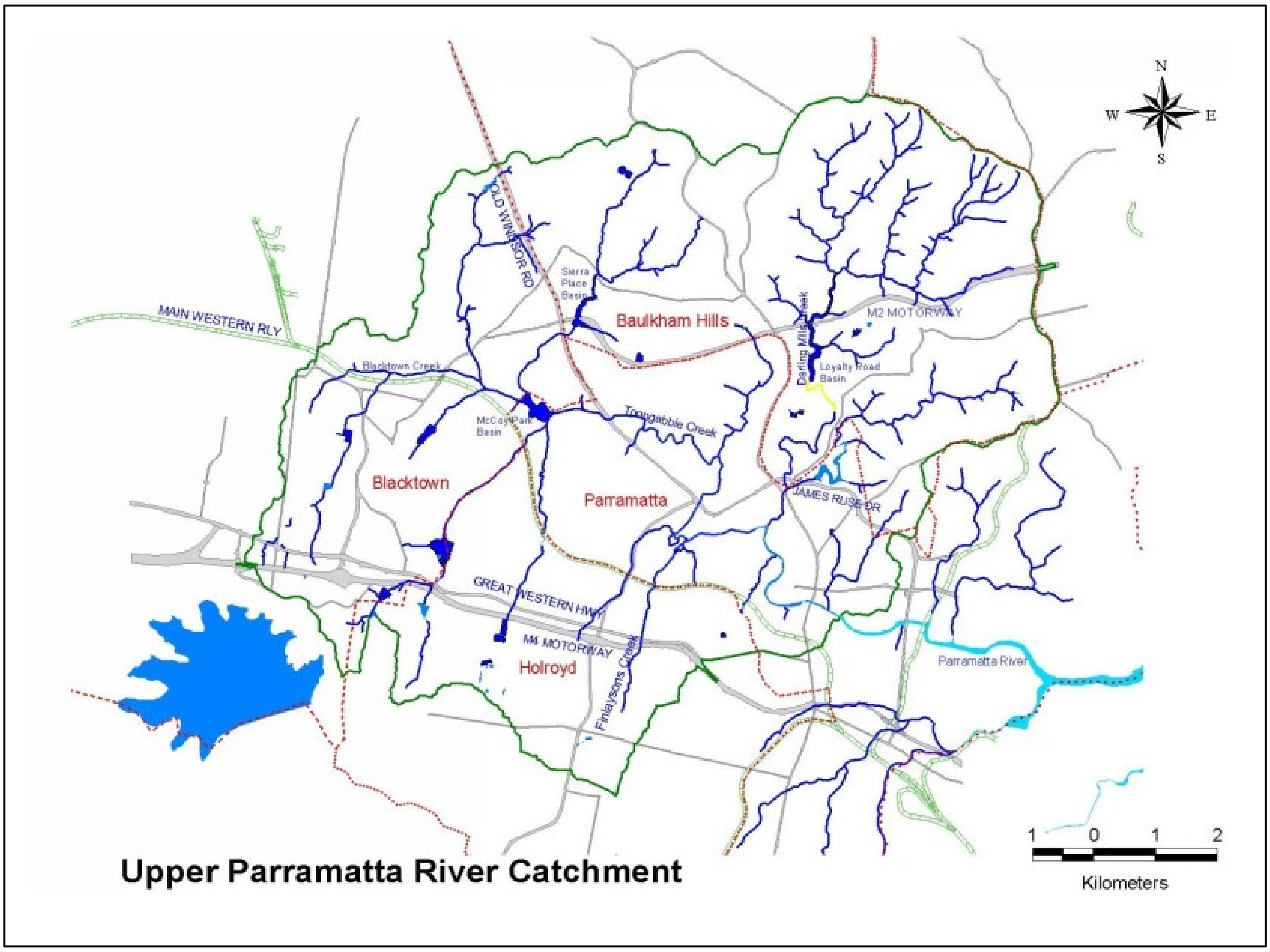


Figure 31 Upper Parramatta River Catchment Area

9.3.4 Fairfield permissible site discharge (PSD)

If the development site is within the Fairfield City Local Government Area, then the Permissible Site Discharge (PSD) rate is the lesser of Pre-development Flows for the full range of storms or the PSD, in accordance with the following table:

Table 21 Fairfield LGA PSD Rates

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Urban area maximum PSD of for the 9 hour 1% AEP for the total site area	140 L/s/ha
2.	Rural area Maximum PSD of for the full range of storm durations for the 20% AEP and 1% AEP for the developed site	78 L/s/ha
3.	Wetherill Park Industrial Area - no OSD requirement	Nil

Refer to ***Figure 32*** for location of stormwater management zones within Fairfield LGA - check with the council to confirm boundaries.

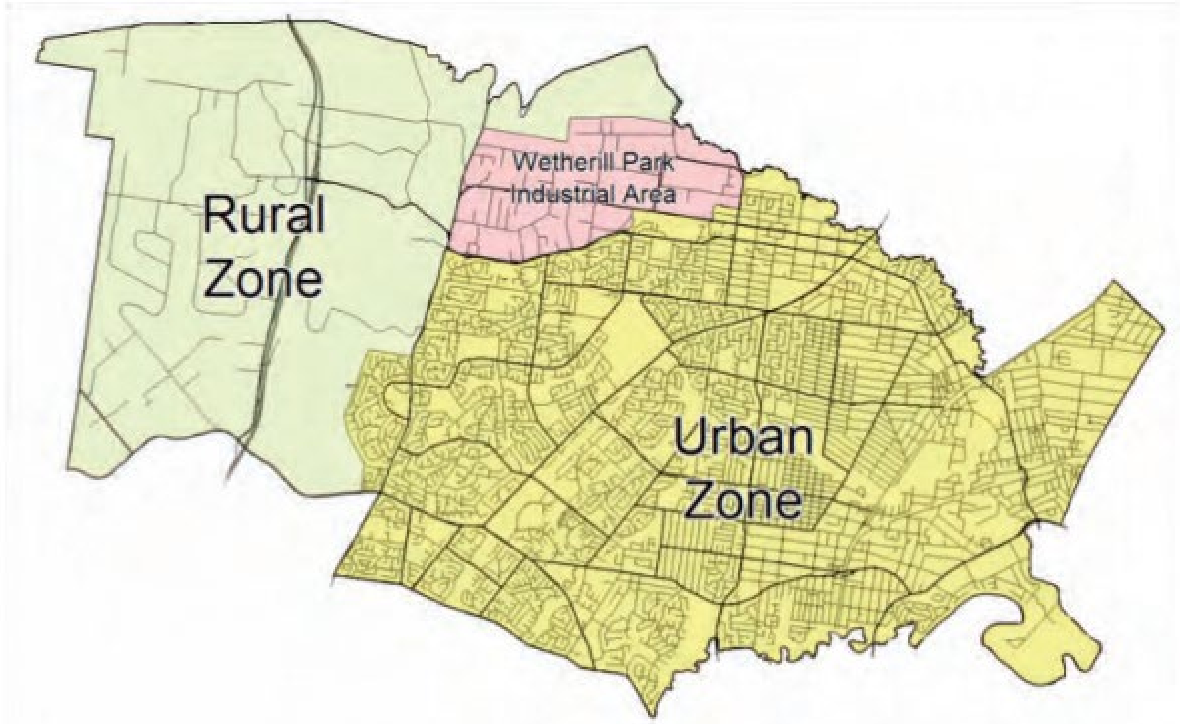


Figure 32 Fairfield LGA Stormwater Management zones

9.3.5 Waterway stability requirements

All developments shall ensure that the post development duration of stream forming flows shall be no greater than **2.0** times the pre-developed duration of stream forming flows, with a stream target of **1** to be applied to areas which drain to environmentally sensitive downstream waterway communities. . Designers are to defer to councils for location of areas which drain to environmentally sensitive downstream waterway communities.

In instances where the requirement of 2.0 cannot be satisfied, a submission to vary the Acceptable Solution (up to a maximum SEI of 3.5) will be required.

The comparison of post development and pre-development stream forming flows is commonly referred to as the Stream Erosion Index (SEI). Provision of a detention system designed and constructed in accordance with the UPRCT Stormwater Detention Handbook is deemed to satisfy the waterway stability requirements.

Development sites which are exempt from providing on-site stormwater detention are deemed to satisfy the waterway stability requirements.

Any changes in flow rate and flow duration within the receiving watercourse because of the development shall be limited as far as practicable. Natural flow paths, discharge points and runoff volumes from the site should also be retained and maintained as far as practicable.

9.4 Quality management

All development is to incorporate Water Sensitive Urban Design (WSUD) throughout to ensure sustainable and integrated management of land and water resources incorporating best practice stormwater management, water conservation and environmental protection.

WSUD treatment is best undertaken at source which can be broken down into the three main treatment areas:

- Lot
- Street
- Neighbourhood / precinct

Table 22 below, outlines the benefits of implementing WSUD as source control at varying scales.

Table 22 WSUD Benefits at Varying Scales

SCALE	CHARACTERISTICS
Lot	Focuses on reducing stormwater runoff and frequency of runoff Better distributes infiltrated stormwater into the landscape (note consideration to be given to salinity and soil properties) Reduces pollutants to street and receiving waters Reduces potable water use through rainwater tanks and passive irrigation Maintenance to be undertaken by lot owner / tenant See Figure 33 below, for an example
Street	Focuses on greening the streets and gardens through passive watering Reduces use of potable water Healthier streetscape environment e.g. mitigate heat island effect through creation of tree canopy cover, creates amenity Reduces stormwater volume downstream Reduces pollutant loads downstream Creates a sense of 'place' in the streetscape Reduces the size of downstream WSUD elements as well as the lifecycle costs for maintaining them. See Figure 34, below for an example
Neighbourhood / Precinct	Last line of defence to protect urban waterways Benefits from upstream WSUD Creates amenity Creates potential multiple purpose zones Enhances biodiversity and enhances corridors Reduces the reliance on larger downstream (neighbourhood) treatments

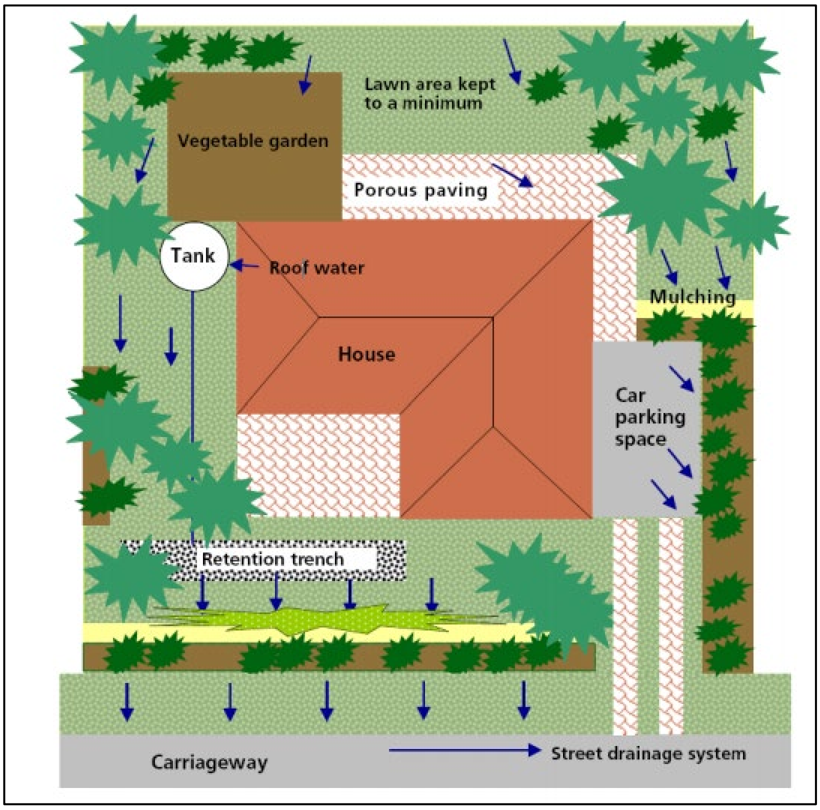


Figure 33 Example WSUD strategy for lot drainage
(source: LHC CREMS (2002)

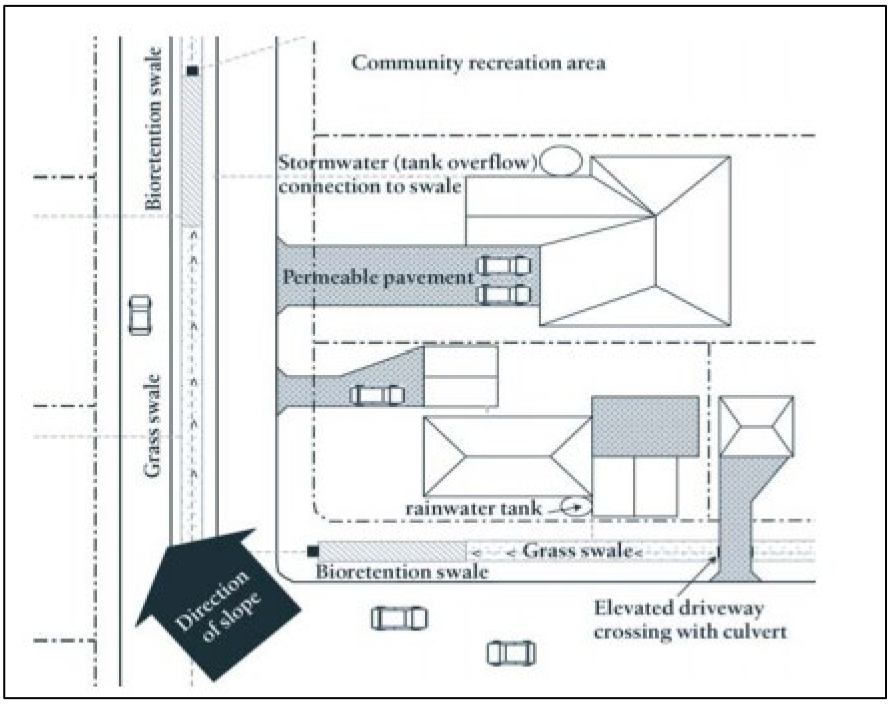


Figure 34 Example WSUD strategy for street drainage
(source: Hobart City Council 2006)

9.4.1 Design data

Table 23 Design Data: Water Quality Targets

ID	POLLUTANT	% POST DEVELOPMENT AVERAGE ANNUAL LOAD REDUCTION	% STRETCH TARGET (see Notes below)
1.	Gross Pollutants	90	
2.	Total Suspended Solids	85	90
3.	Total Nitrogen	65	85
4.	Total Phosphorus	45	65
5	Total Hydrocarbons	90	

9.4.2 Design notes

1. The size of the WSUD elements for street and neighbourhood/precinct scale must be determined by computer modelling with approved software packages and demonstrated performance criteria
2. Lot based treatments are encouraged as part of the overall integrated stormwater management solution for street and neighbourhood scale developments, were practicable.
3. Single lot developments including alteration or additions are exempt from specific water quality targets.
4. All developments which drain to Environmentally Sensitive downstream waterway communities are to also satisfy the Stretch targets nominated in ***Table 23***.
5. In preparation of pollution reduction targets, the predevelopment assessment shall be made on development sites at the "*state of nature*", ie prior to any development.
6. All developments within the Water NSW Drinking water catchments and Blue Mountains LGA are subject to Water NSW (Sydney Catchment Authority) rules and assessment where Neutral or Beneficial Effect (NORBE) applies.

9.4.3 Water quality modelling

A list of approved industry models is provided below, preference is given to the use of MUSIC modelling package for water quality design.

- Aqualm
- HSPF
- Mike
- MUSIC – Model for Urban Stormwater Improvement Conceptualisation
- Small Scale Stormwater Quality Model (S3QM) (from Water NSW catchment assessments website) may be acceptable for simple small-scale developments as an alternate to MUSIC modelling

MUSIC

MUSIC is a model that provides the ability to simulate both runoff quantity and quality from various catchments, and the effect of a wide range of treatment facilities on the quantity and quality of runoff downstream. It helps predict the performance of stormwater quality management systems and facilitates the planning and design of appropriate urban stormwater management systems for catchments, usually at the conceptual level.

MUSIC-link

MUSIC-link streamlines the process for assessing the compliance of Water Sensitive Urban Designs (WSUD) submitted by the development sector against guidelines from a specific council or other Local Government Authority. It provides specific modelling parameters to designers.

MUSIC-link ensures compliance with council's water quality target requirements as well as allowable performance parameters for stormwater infrastructure. Reports may be automatically generated about the performance of proposed stormwater designs.

It is the responsibility of the applicant to confirm council's adoption of MUSIC-link prior to submission for approval.

9.5 Farm Dams

Farm dams provide essential water for stock, irrigation, and gardens. They also provide a habitat for wildlife, water for fire protection and may be used for recreation.

The design of farm dams on rural properties is to be based in the following considerations:

1. Type of dam
2. Size and storage ratio
3. Catchment or source of water
4. Soils for foundation and bank materials
5. Proximity of dams should be as close as possible to where water will be used
6. Spillway or by-pass site
7. Protection of sensitive environments
8. Farm dams with intensive agriculture upstream are to be designed to incorporate sediment forebays to protect downstream receiving waters

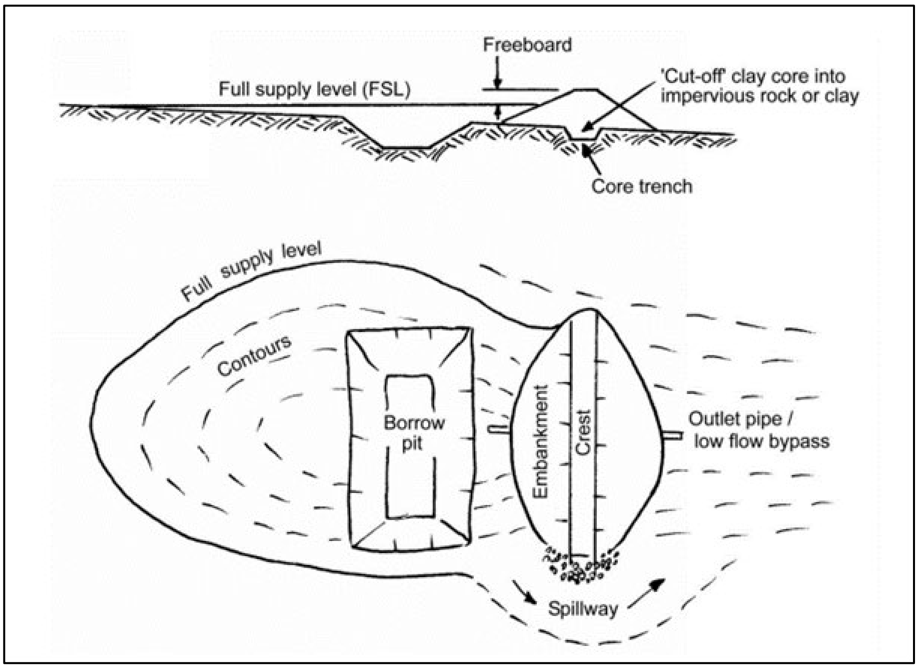


Figure 35 Rural farm dam concept

9.5.1 Dam embankment

A clay core is required if there is not enough suitable material at the excavation area to build a homogeneous clay embankment.

Refer to the Department of Primary Industries - Prime Fact sheet for Building a Farm dam dated October 2009, refer to link below for details on how to build Embankments to Farm Dams.

http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/311790/Building-a-Farm-Dam.pdf

9.5.2 Spillway

All farm dams need to have a spillway. This is to be designed to pass the 1% AEP critical storm through the dam safely and without damage to the dam and downstream land and property. Where the velocity of water in the spillway exceeds 2m/s scour protection must be designed. If the velocity is below this value, lining of the spillway with dense healthy grass is acceptable.

9.5.3 Dam Removal

The removal of farm dams will be considered on satisfactorily meeting the following conditions:

- Low impact on the existing flow regime (including flood storage and groundwater conditions)
- Nil downstream earthwork and landscape impacts
- Details of how flood storage is being kept within the development
- Details on any water quality impacts arising from the removal of the farm dam

9.5.4 Dams Safety NSW

Dams may need to be referred to Dams Safety NSW if any person would be at risk in the event of the dam failing. Dams Safety NSW has a fact sheet titled "*Should your dam be declared?*". It is available at the link:

https://www.damsafety.nsw.gov.au/wp-content/uploads/FACT-SHEET-Should-your-dam-be-declared-August-2020-FINAL.pdf

Figure 36 Farm dam adapted for re-use Belmont Grove, North Richmond NSW

10 Water Sensitive Urban Design

Water sensitive urban design (WSUD) uses better urban planning and design to reuse stormwater by mimicking the natural water cycle as closely as possible

Aerotropolis

All development and public infrastructure within the Western Sydney Aerotropolis must comply with and contribute to the waterway health objectives and meet the waterway health planning and targets within the precinct planning using the Risk Based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions. The stormwater management objectives, waterway stability requirements and water quality targets in this Manual were not developed using Risk Based Framework and in some cases are not consistent with the objectives and targets developed for the Western Sydney Aerotropolis.

10.1 Objectives

The objectives of Water Sensitive Urban Designs are to:

1. Reduce the quantity of stormwater runoff
2. Improve the quality of stormwater runoff
3. Protect and restore water quality in creeks and rivers
4. Increase habitat areas in the urban environment
5. Increase the “green” within roads and open spaces
6. Cool local environments by retaining and reusing water

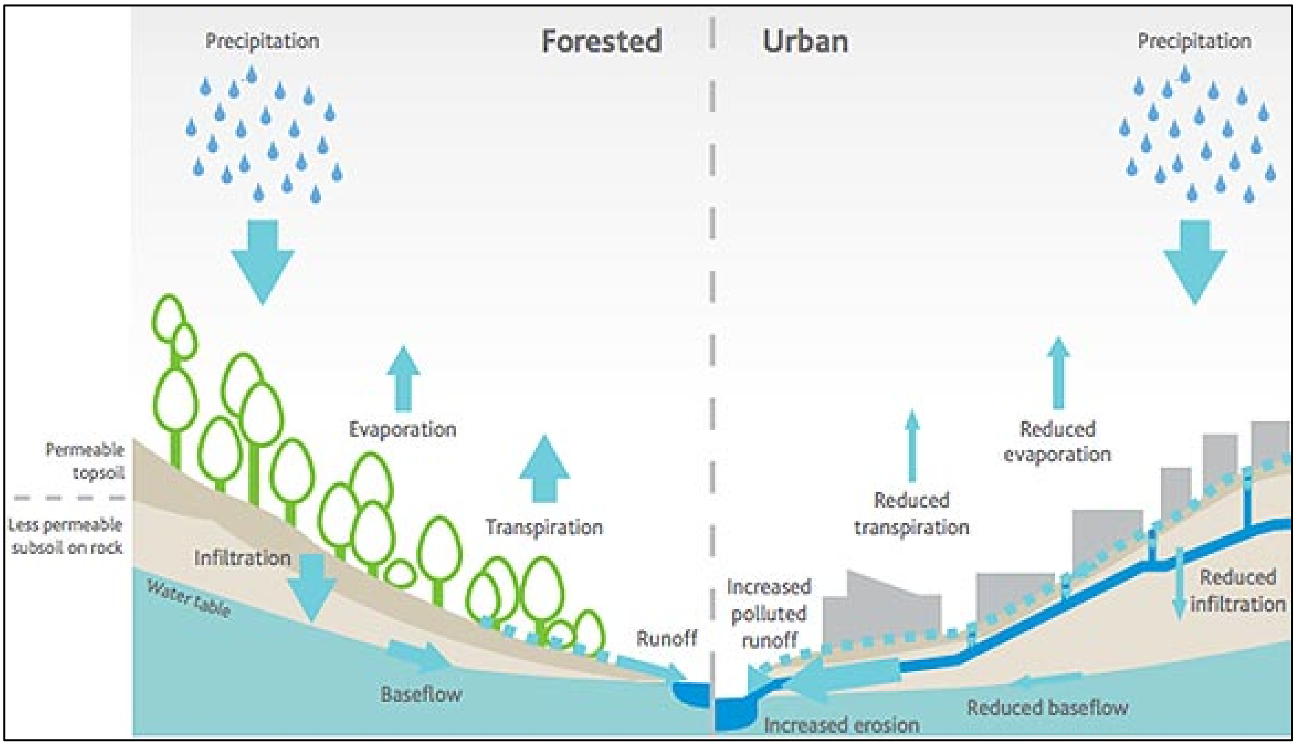


Figure 37 Water cycle comparison between urban and natural catchments
(Source: Melbourne Water)

10.2 Water sensitive urban design elements

A range of WSUD elements are outlined for the various scales. This is not meant to be an exhaustive list but covers the typical elements preferred. Innovative solutions are encouraged however it must be clearly demonstrated by applicants that the solution is effective over the life cycle of the element.

Table 24 WSUD elements and application scale

ID	WSUD ELEMENT	APPLICATION SCALE		
		LOT	STREET	NEIGHBOURHOOD / PRECINCT
1.	Infiltration Trench*		X*	X
2.	Raingarden		X	
3.	Permeable Paving	X	X	
4.	Rainwater Tank	X		
5.	Tree Pits		X	X
6.	Vegetated swale		X	X
7.	Bioretention Basins			X
8.	Retention / Detention Basins			X
9.	Constructed Wetlands			X

ID	WSUD ELEMENT	APPLICATION SCALE		
		LOT	STREET	NEIGHBOURHOOD / PRECINCT
10.	Filtering and Screening Devices / GPTs			X
11.	Stormwater Harvesting and Reuse			X

* Infiltration generally not permitted under road pavement

It is noted that there are many proprietary products that can also be used to achieve water quality outcomes. Applicants are to make contact with the relevant council to confirm if council has a preference for a particular product prior to making a submission to council.

If development is within Blue Mountains LGA infiltration trenches and raingardens are also permitted within Lots.

10.3 Infiltration trenches

Infiltration systems temporarily hold stormwater runoff within a surface or sub-surface system prior to infiltrating into the surrounding soils. Runoff generated from the site is reduced and provision of water quality treatment occurs through pollutant retention on-site. Infiltration systems are required to have sufficient set-back distances from structures to avoid any structural damage. These distances depend on local soil conditions.

Infiltration systems can also be vegetated and provide landscape amenity.

The appropriate rate of infiltration needs to be determined. A guide is provided in ***Table 26*** according to the soil type to prepare preliminary designs of infiltration systems. On-site permeability testing by an appropriately qualified and experienced person is required to confirm the hydraulic conductivity. An additional safety reduction factor for hydraulic conductivity should be applied to surface storage systems to compensate for compaction in accordance with ***Table 26***.

10.3.1 Design data

Table 25 Design Data: Infiltration Trenches

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Volume of infiltration system to capture The maximum emptying time is:	▪ 72 hours for sub-surface systems for 6EY – 4EY ▪ 24 hours for surface storage 6EY – 4EY
2.	Depth of system calculated by	Design rate of infiltration (mm/hr) multiplied by 72 hours
3.	Minimum conductivity of non-woven geotextile (for wrapping trench)	3600mm/hour

ID	DESIGN DATA DESCRIPTION	VALUE
4.	Gravel is typically used to fill the trench and is to be clean, washed prior to use, be inert, have high compressive strength and free of fines. Basalt (blue metal) and scoria are discouraged. Alternatively, trench may be a geo-cellular structure. Use of alternative products are to be considered at application	10-40mm diameter poorly graded gravel
5.	Cover below the surface but can be deeper if required	200mm
6.	Gravel porosity	0.33 (33%)

Table 26 Design Data: Infiltration trench location from footings

ID	SOIL TYPE	HYDRAULIC CONDUCTIVITY (mm / hr)	MINIMUM DISTANCE FROM FOOTINGS and PROPERTY BOUNDARY (metres)	REDUCTION FACTOR FOR SURFACE STORAGE SYSTEMS
1.	Sandstone	Assumed to be negligible	Do not infiltrate on these soils	NA
2.	Sand	>180	1	50%
3.	Sandy Clay	180-36	2	35%
4.	Medium Clay	36-3.6	4	20%
5.	Reactive Clay	3.6-0.036	5	10%

Reference: The Institution of Engineers Australia, Australian Runoff Quality Guidelines.

Note there are on-line resources available to gauge the soil types.

10.3.2 Design notes

1. Surface storage is limited to 300mm depth unless fencing is installed to prevent access
2. Geocellular structures are permitted
3. Outlet must be provided as shown in ***Figure 38, Figure 39, Figure 40*** and ***Figure 41***. The outlet must be connected to the back of kerb or to the downstream drainage network. No overland is permitted over the verge. It may be necessary for an appropriately designed level spreader to be used if there is no downstream drainage network
4. Sediment and debris are to be removed from stormwater before it is allowed to enter the infiltration system unless it can be demonstrated that the proposed system enables easy removal of accumulated sediment. This is very important to ensure that the system continues to function as needed and that to ensure that it does not clog and fail. A covenant or restriction as to user notice shall be placed on title to ensure that the infiltration system remains in place and maintained appropriately
5. An assessment of salinity and groundwater is required to accompany the proposal. It is noted that these assessments can be very brief in locations of no known salinity or groundwater interface
6. Where groundwater (or in Blue Mountains LGA rock) is within 500mm of the base of the infiltration trench, the trench shall not be permitted

7. Gravel or geocellular structures can be placed beneath driveways provided they are structurally sound. Appropriate manufacturer test certificates will need to be submitted with the application
8. In areas of known high salinity WSUD elements that encourage infiltration shall not be permitted

10.3.3 Typical details

Typical details and guidance for construction of infiltration systems.

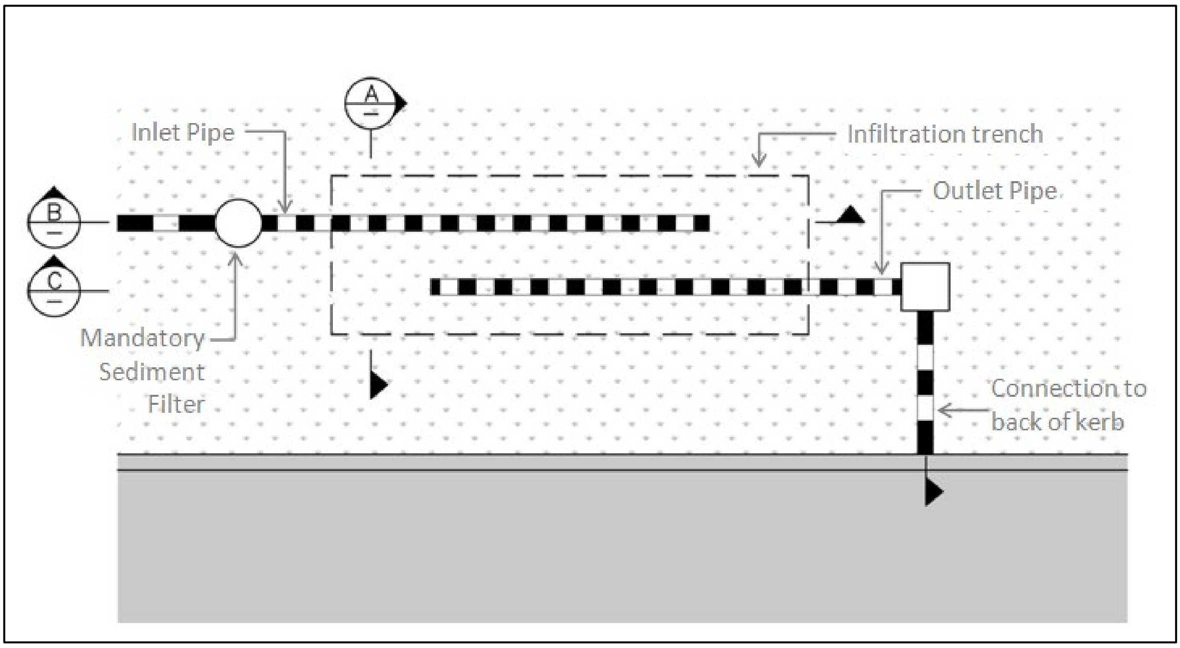


Figure 38 Infiltration trench plan

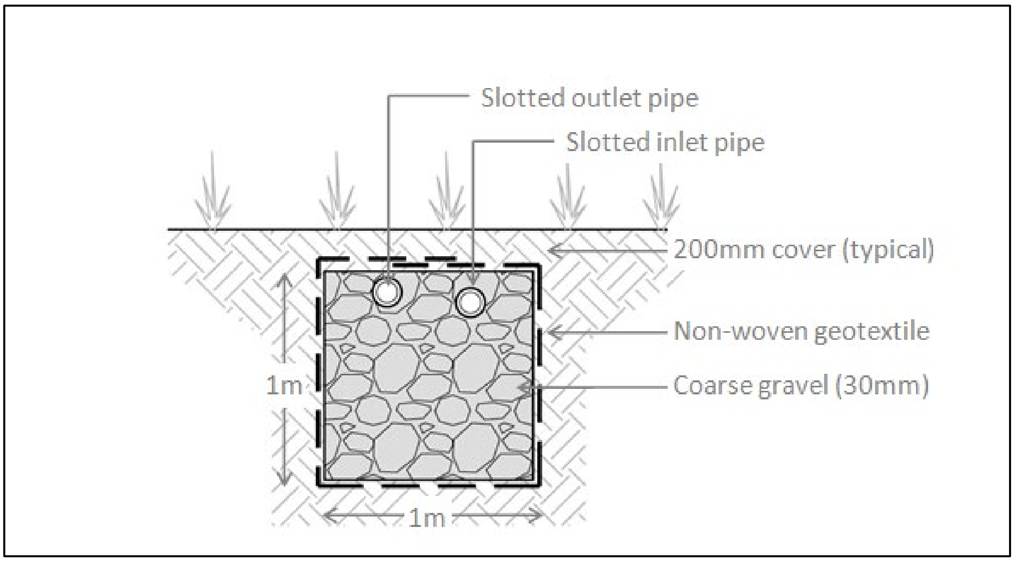


Figure 39 Infiltration trench cross section

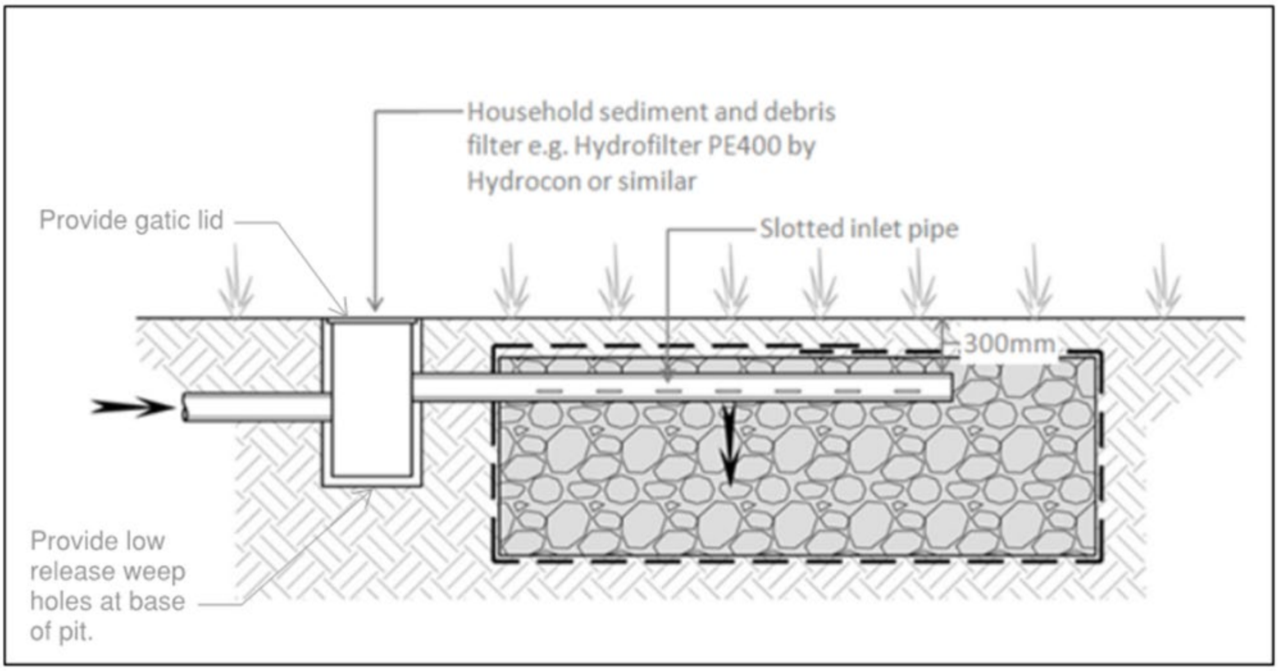


Figure 40 Infiltration system inlet

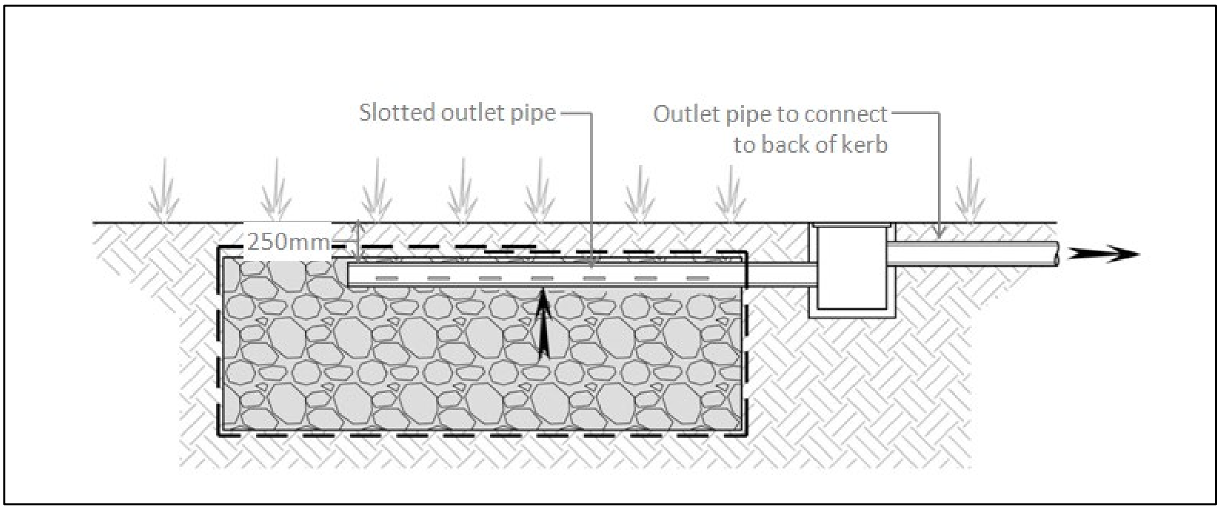


Figure 41 Infiltration system outlet

10.3.4 WSUD standard drawings

Refer to standard drawings in ***Appendix G*** .

10.4 Raingardens

Raingardens take in excess rainwater runoff from impervious surfaces and then filter the runoff through a media. The filtered water can infiltrate into the underlying soil and recharge groundwater, or alternatively be directed to the drainage network.

Raingardens provide treatment of stormwater through various mechanisms depending on the type of media used as the filter.

For the purposes of this Manual, raingardens are defined as locations where the filtration area is less than 30m^2 with a contributing catchment area of up to 2000m^2. They are to be designed within roadways in locations as nominated in the Street Design Guidelines.

Figure 42 Typical raingardens (Top images courtesy Melbourne Water)

10.4.1 Design data

In order to work out the required size of a rain garden the following must be taken into consideration:

- The amount of storage in the filter media
- The amount of storage on the surface of the raingarden (extended detention)

Table 27 Design Data: Raingardens

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Depth of extended detention	200mm
2.	Planting density	Minimum density of 10 plants / m^2
3.	Depth of filter media	400-600mm (typical) 300mm minimum (if no other options)
4.	Filter media - see note A, below	Organic media (preferred) Mineral based media (sandy loam)
5.	Side slopes of raingarden	Vertical up to 300mm for retained structure Up to 300mm height 1(V):2(H) minimum Up to 600mm height 1(V):3(H) minimum
6.	Minimum safe distances to footings	If system in unlined then refer to ***Table 26***
7.	Porosity	0.33 (33%) (note: typically, higher for organic media)

Note A*:* All filter media in Biofiltration systems shall comply with Facility for Advancing Water Biofiltration (FAWB) guidelines Version 3.0, dated June 2009.

The fundamental difference between media systems (e.g. FAWB/ CRCWSC and CORE Organic Media) is the higher organic matter and material nutrient content characteristics of organic media. The table below lists the raw materials within a Filter media and whether they are defined as Organic of Mineral:

Table 28 Filter media raw materials

ID	PRINCIPAL MATERIAL	FILTER TYPE
1.	Recycled Organics (RO-fine)	Organic
2.	Recycled Organics (RO-medium)	Organic
3.	Biochar	Organic
4.	Calcium Carbonate ($CaCO_3$)	Mineral
5.	Washed Sand	Mineral
6.	FAWB Specification (Sandy loam – M16)	Mineral (<%% organic matter)

The filter media may comprise organic reactive filter media or mineral based media. The organic media is strongly preferred as it has excellent treatment performance, can adopt a higher hydraulic conductivity, better supports vegetation and is made of waste and recycled products. An organic media may not require a transition layer where it is instead placed directly on the drainage layer depending on the particle size distribution in relation to the drainage layer. The typical saturated hydraulic conductivity for the reactive filter media is 300m/hr. More details on organic media can be sourced from the Centre for Organic Research & Education (CORE) https://core.asn.au/

Link to CORE Filter Media for Vegetated applications - https://www.core.asn.au/wp-content/uploads/2012/06/CORE-accreditation-+-specification-LGE01_A4-leaflet.pdf.

10.4.2 Design notes

1. Runoff from roadway hardstand areas may be directed to the raingarden via:
   a. an inlet pit which has a 500mm deep base below the incoming pipe and which allows sediment to settle out before discharging into the raingarden; or
   b. direct discharge onto the raingarden surface
2. An overflow pit is to be provided which directs overflows to the street drainage system. No overland is permitted over the verge
3. Raingardens in areas of know High Salinity must be lined

10.4.3 Typical details

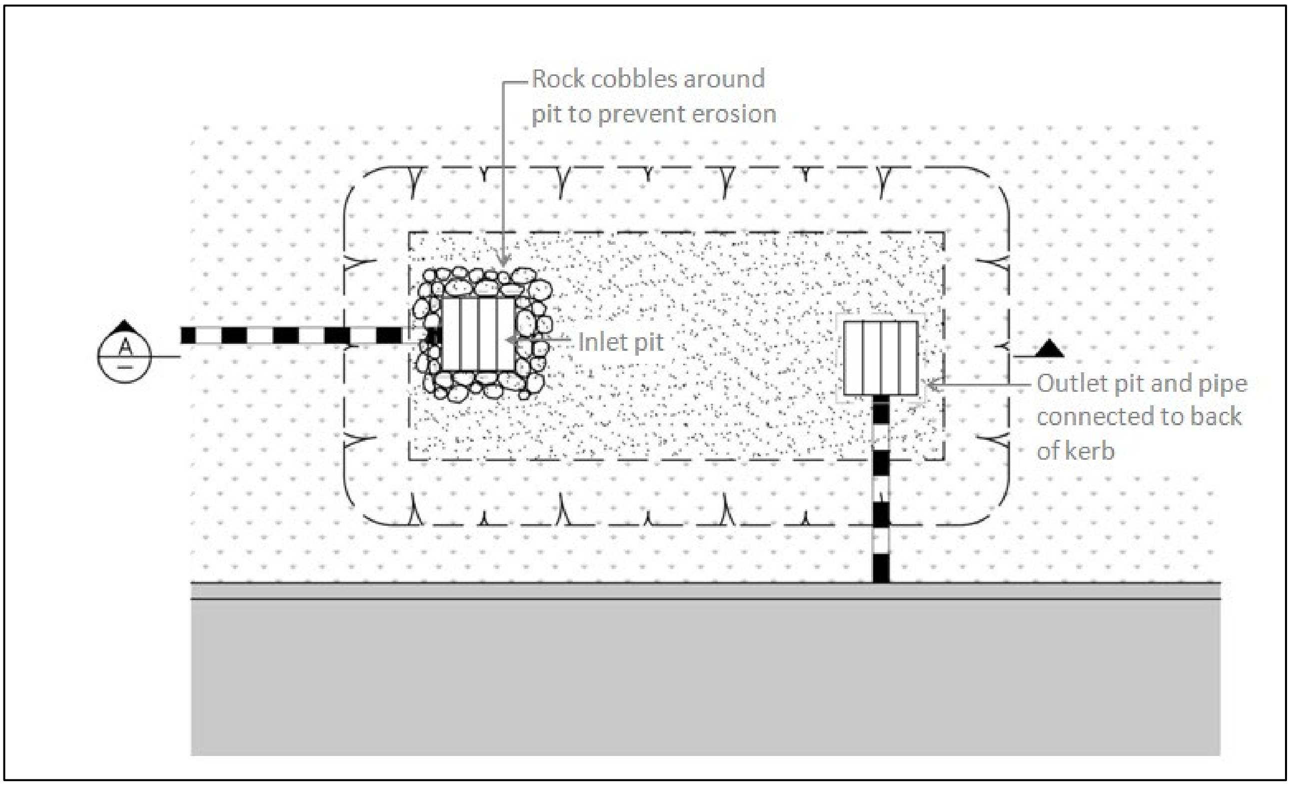


Figure 43 Raingarden Plan

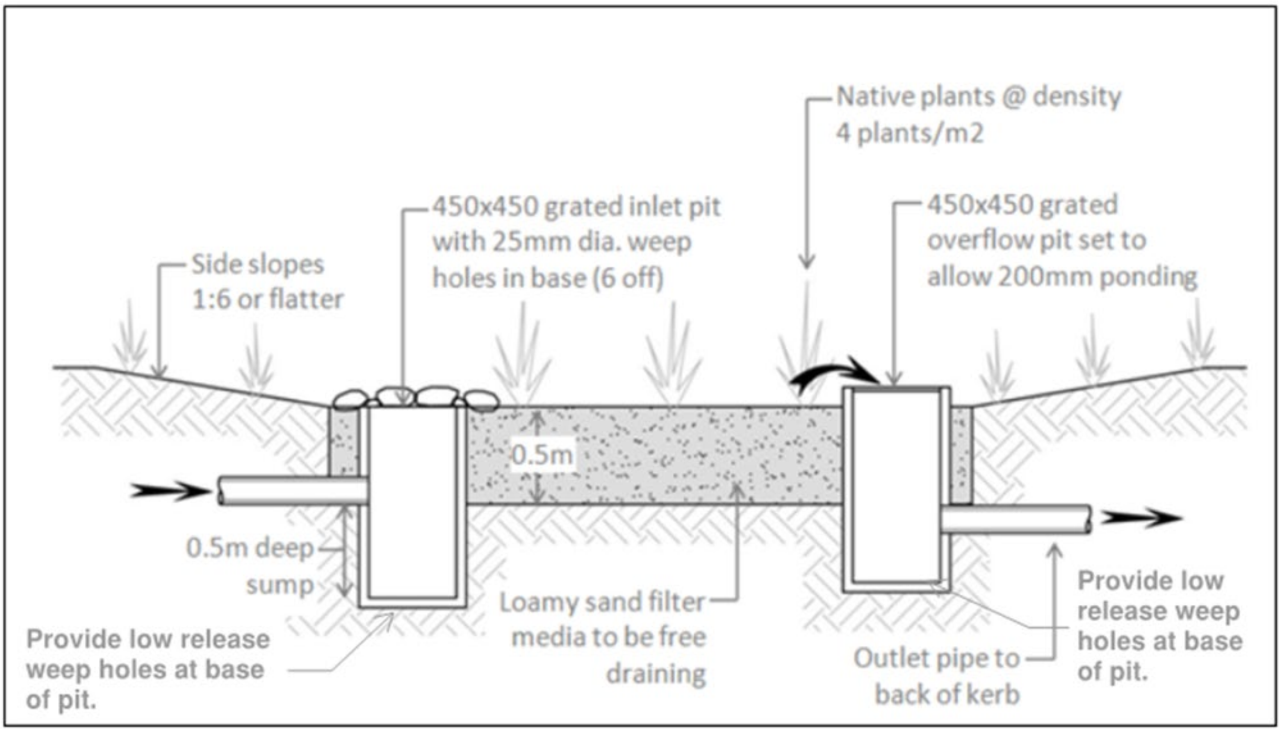


Figure 44 Section A raingarden

Refer to Standard Drawing WSUD 11 for details.

10.5 Permeable paving

Permeable paving is an alternative to typical impermeable paving.

It allows runoff to percolate through to an underlying reservoir for temporary storage until the water is either re-used, infiltrates into the ground or discharges to the stormwater system. The benefits of permeable paving include:

- Removal of sediments and attached pollutants by infiltration through an underlying sand/gravel layer
- Reducing runoff volumes through sub-soil infiltration
- Delaying runoff peaks by providing retention/detention storage capacity and reducing flow velocities.

Permeable paving can be used to reduce the impervious area on the proposed development. For example, a driveway which is constructed from permeable paving will not contribute to the total impervious area on a site.

In Blue Mountains LGA, permeable paving will not count as pervious area for calculations in cl 4.4A or cl 8.1LEP 2015. It is considered a hard stand area. Permeable paving is not generally an acceptable solution for driveways adjacent to trees where a compacted base is required

10.5.1 Design notes

1. Permeable paving is considered appropriate in areas of high groundwater salinity if configured appropriately to ensure there is no increased volumes of water being infiltrated. In areas where there is high ground salinity, no additional runoff may be directed to the pavers
2. Pavers must be "Exposure Grade" as defined in the National Construction Code
3. All pavers are to be laid in accordance with manufacturers recommendations

4. Pavers should be laid with grade of between 0% to 3%, with isolated sections of up to 5%. Ensure that surface is designed to allow stormwater to spread evenly across the pavers to maximise infiltration.

10.5.2 Typical detail

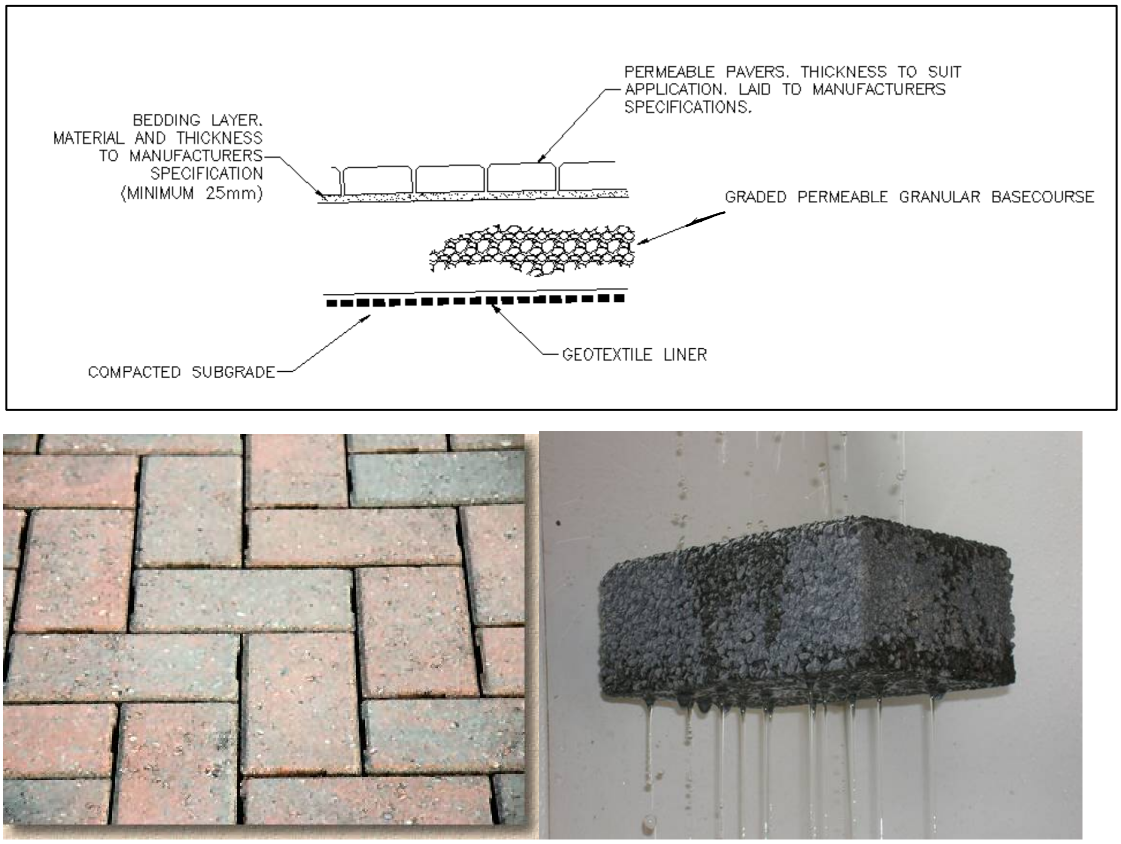


Figure 45 Typical permeable paving detail

10.6 Rainwater tanks

Rainwater tanks collect runoff from roof areas for potential reuse. This reduces the demand on potable mains supplies and reduces polluted stormwater discharges.

Rainwater tanks shall be fitted with 'first flush diverters' that divert the first portion of runoff volume away from the tank. The collected roof water is suitable for direct use for garden irrigation or toilet flushing with no additional treatment.

It is recommended that rainwater tanks have a connection to mains water to ensure a high degree of reliability and provide a secondary source of supply. Potable water top up volume allowance, shall be no more than 20% of tank capacity.

Figure 46 Typical rainwater tanks

The tank must be plumbed to deliver rainwater for the nominated end uses. Possible uses may include:

- Toilet flushing water
- Laundry washing water
- Outdoor water uses such as garden watering and car washing
- Topping up and/or filling up pools and spas

Where a particular development must comply with BASIX, the minimum use of the rainwater shall be in accordance with that required for compliance under BASIX. However, the proponent may decide that they wish to voluntarily exceed the requirements under BASIX.

10.6.1 Residential

Where a rainwater tank is to be installed, the tank is to be plumbed using a pump and a suitable 3-way flow diversion device or tank top-up system where mains water is available

Modelling requirements:

1. Where irrigation is proposed, it is to be scaled using potential evapotranspiration (PET) minus rainfall
2. Allow for a loss up to 10% of the volume of each rainwater tank from the base to allow for sediment storage space, low level top up and overflow
3. Residential development is subject to BASIX and has no minimum reuse target
4. A minimum of 50% of run off from the roof area is to be directed to the rainwater tank unless the BASIX certificate notes otherwise

10.6.2 Commercial and Industrial

Commercial and Industrial developments must supply 80% of their non-potable water demand using non potable sources. Rainwater collected in tanks shall be the primary source and only supplements by recycled water when rainwater cannot meet 80% of the demand. When the 80% demand threshold cannot be met, the use of non-potable sources shall be maximised and be considered on a merit basis by the council.

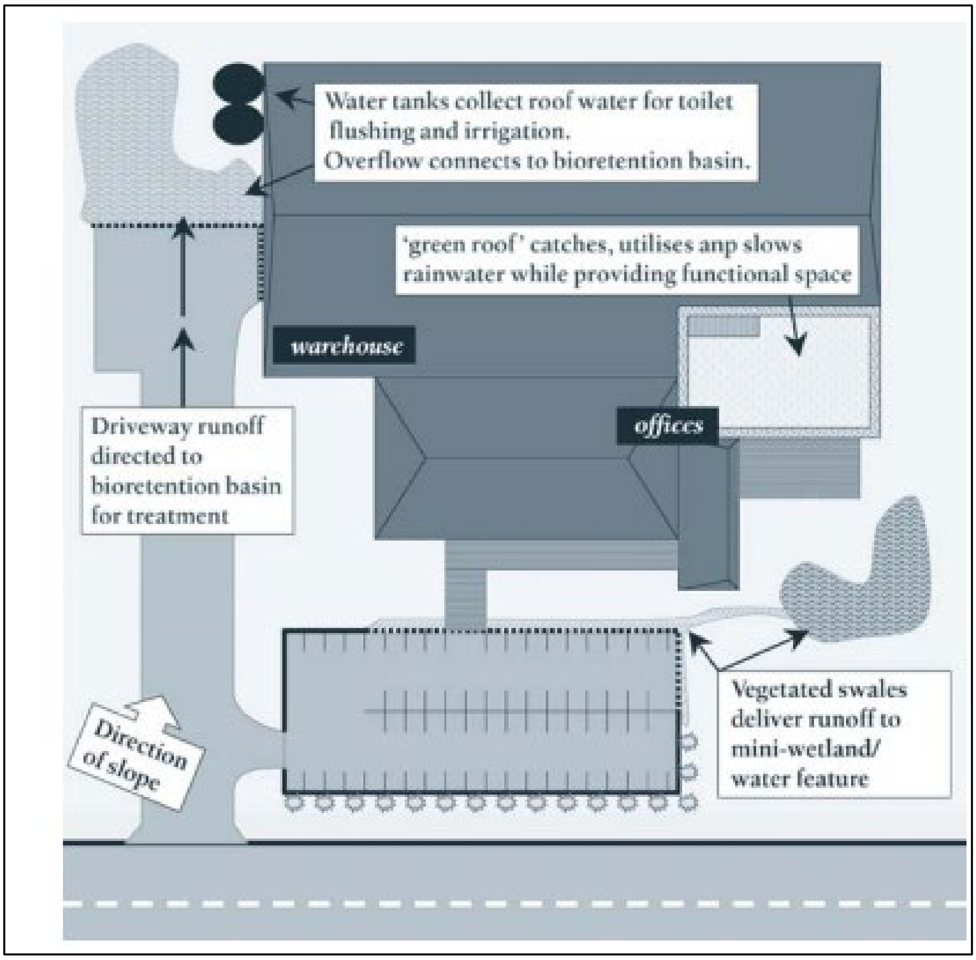


Figure 47 Industrial or commercial site layout incorporating WSUD measures
(source: Hobart City Council 2006)

10.7 Tree pits

An innovative way to deliver an alternate source of water to maintain street trees is via Water Smart Street Trees (WSST). Stormwater from the kerb is diverted to the root zone of street trees planted in adjacent garden beds. The WSSTs help to direct stormwater flows and nutrients to the trees to improve tree growth and survival, reduced maintenance costs and reduced potable water use.

WSSTs also aims to reduce sediment and nutrients flowing into downstream waterways. ***Figure 48***, below shows an example of how street trees can work.

Designers are to refer to the Western Sydney Street Design Guidelines, Table C2.2 on page 114 for specific details.

For MUSIC modelling parameters, designers need to consult the supplier or manufacturer of the particular tree pit.

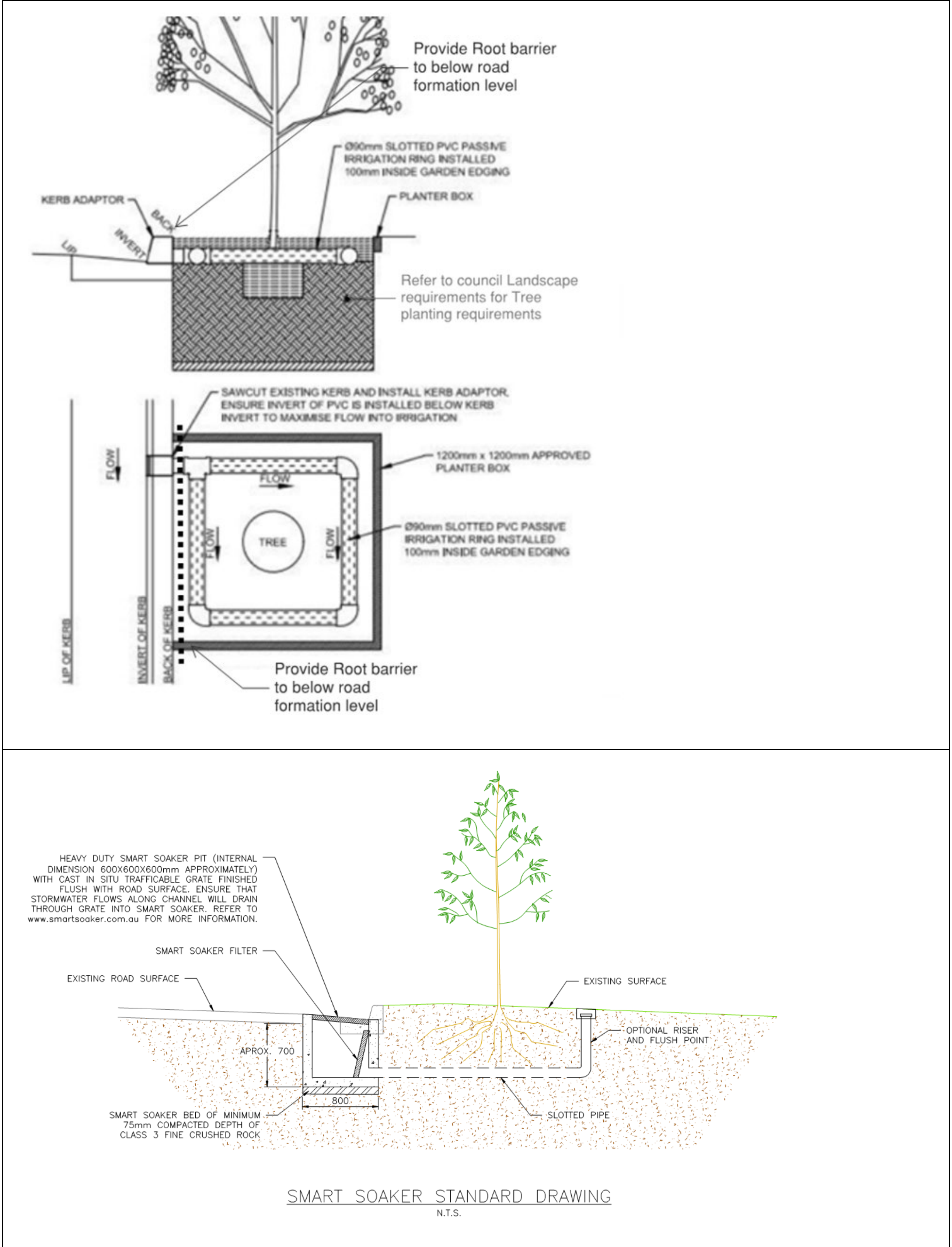


Figure 48 Water smart street tree pit detail
(source: WaterbyDesign, Smart Soaker)

10.8 Bioretention basins

The key function of bioretention systems is to remove pollutants from stormwater. This is achieved by filtering the stormwater through a densely vegetated and biologically active filter media. As the water percolates through the filter media, pollutants are captured by fine filtration, adsorption and biological processing by both soil microbes and plants. Treated water discharges to groundwater or is conveyed to downstream drainage systems such as waterways, channels or pipes.

Bioretention basins may be applicable at a range of scales and shapes and can therefore have flexibility for locations within a development. They can be located along streets at regular intervals and treat runoff prior to entry into an underground drainage system. Refer to WSUD Standard Drawings and notes for details.

Local Variation Blue Mountains: Unlined basins are generally preferred where site conditions permit.

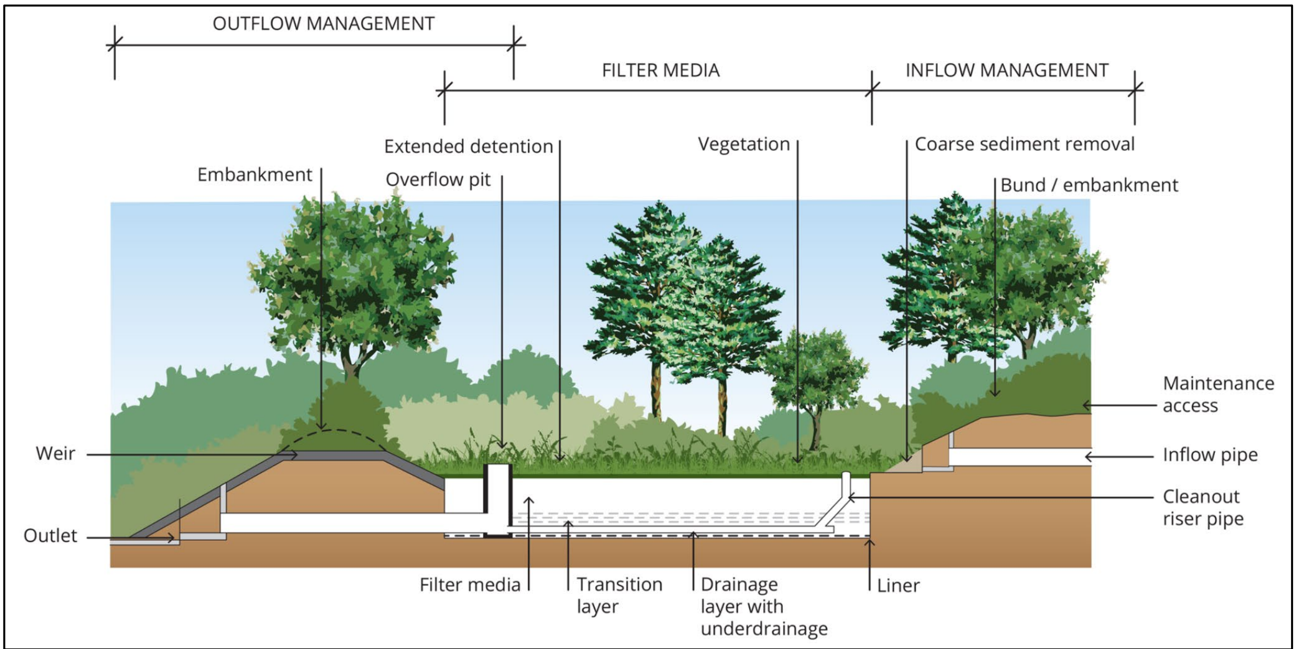


Figure 49: Bioretention basin cross section
(source: Healthy Waters by Design 2014 as cited in ARR2019 Book 9 Chapter 4)

10.8.1 Design data

Table 29 Design Data: Bioretention General Requirements

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Depth of surface ponding Limited only by other basin objectives however after rainfall the system must preferably drain in	300mm 24 hours - maximum of 48 hours
2.	Minimum planting density	10 plants / m^2
3.	Depth of filter media	300mm minimum (if no other options) 400-600mm (typical)

ID	DESIGN DATA DESCRIPTION	VALUE
4.	Filter Media – see notes A under ***Table 27***	Organic media (preferred) Mineral based media (sandy loam)
5.	Side slopes of raingarden	Refer to basin specifications in ***Section 10.9***
6.	Inlet must be managed to prevent scour typically limited to peak of (Flows must be evenly disturbed around or across the Bioretention basin)	4EY
7.	Outlet	Refer to basin specifications
8.	Saturated Zone, provided improved water treatment through better plant survival	400mm saturation depth is required In regional systems the top of the saturated zone should be 200mm below the bottom of the filter media layer, within the transition layer.

10.8.2 Design notes

10.8.2.1 Filter media

The filter media may comprise organic reactive filter media or mineral based media. The organic media is strongly preferred as it has excellent treatment performance, can adopt a higher hydraulic conductivity, better supports vegetation and is made of waste and recycled products. An organic media may not require a transition layer where it is instead placed directly on the drainage layer depending on the particle size distribution in relation to the drainage layer. The preferred saturated hydraulic conductivity for the reactive filter media is 300m/hr. More details on organic media can be sourced from the Centre for Organic Research & Education (CORE) https://core.asn.au/

Mineral based filter media must be according to specification by Facility of Advanced Water Biofiltration (FAWB) guidelines https://www3.monash.edu.au/fawb/

Use of organic media is preferred however there are no nodes for the MUSIC model. The current practice is to adopt the parameters for mineral media to sizing and assume 150mm/hour hydraulic conductivity.

Refer to Bioretention Technical Design Guidelines Version 11, October 2014 (waterbydesign https://hlw.org.au/download/bioretention-technical-design-guidelines/).

10.8.2.2 Staging of Bioretention Facilities

1. Bioretention Facilities shall be designed and constructed in two stages
   a. The first stage will involve the facility being designed and constructed to its final form, except for the planting and filter media and associated pits and pipes to enable use as a sediment basin
   b. The second stage involves the final planting and installation of biofiltration media and associated pits and pipes. The bioretention facility shall be delayed until Occupation Certificates for dwellings associated with 80% of the lots for the catchment have been issued; or when directed in writing by council.
2. A bond to ensure the second stage of works are completed shall be lodged in accordance with the relevant council's bond policy, which shall also cover the Defect Liability Period prior to release of the bond/retention monies.
3. Developer / Applicant to maintain the facilities (interim phase after first stage) until such time the final stage of facilities has been satisfactorily completed).

4. Mineral based filter media must be according to specification by Facility of Advanced Water Biofiltration (FAWB) guidelines https://www3.monash.edu.au/fawb/
5. Use of organic media is preferred however there are no nodes for the MUSIC model. The current practice is to adopt the parameters for mineral media to sizing and assume 150mm/hour hydraulic conductivity.

10.9 Retention / detention basins

Detention or retention basins are required to attenuate flows where the peak flows due to the development are in excess of natural flows, or where required by council. The basins improve visual amenity through appropriate landscaping measures. The basin shall be designed to perform in the full range of flood events up to 1% AEP. New retention/detention basins and other water quality control structures should be created as off-line to natural watercourses and open channels, unless otherwise required by council.

All retention or detention basins are to be integrated into the overall open space strategy for the area and consider usage for community facilities as well as flood management.

10.9.1 Design data

Table 30 Design Data: Retention / Detention Basins

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Top of embankment level minimum distance above 1% AEP in basin	500mm nominal (300mm minimum with approval)
2.	Vertical drop at edge of permanent water where unfenced (excludes boardwalks)	Maximum drop to normal water surface is 300mm Maximum drop to batter under normal water level is 600mm
3.	Submerged batter at edge must not exceed value stated until a depth of water of 500mm is achieved at permanent water level	1(V):8(H)
4.	Internal (submerged) batters	The maximum submerged batter is 1(V):3(H) for cohesive soils.
5.	Landscaped batters	Preferred mowing grade is 1(V):6(H) Up to 300mm height 1(V):2(H) minimum Up to 600mm height 1(V):3(H) minimum Up to 900mm height 1(V):4(H) minimum >900mm 1(V):6(H) Batters equal or flatter than 1(V):6(H) can be grassed
6.	Benching may be used on batters. The maximum bench crossfall is:	1(V):8(H) 2%
7.	Where the overall height of batter is > 3m then the average batter slope including benches must not exceed:	1(V):6(H)
8.	Minimum slope of basin floor	1%
9.	Minimum grade for other basin areas active in the 1% AEP event	2%

ID	DESIGN DATA DESCRIPTION	VALUE
10.	Incorporate safety measures to prevent accidental entry with a maximum depth in the 1% AEP event of greater than	350mm or a ponding time in excess of 2 hours
11.	Spillway to convey	50% PMF

10.9.2 Design notes

1. Maximum depth indicator to be installed in basins
2. Safety hazard warning signs to be installed as shown in the standard drawings
3. Access to the retention / detention basin MUST be designed to allow machinery to remove sediment and litter that is expected to accumulate. Truck access should be as close as possible to the basin to minimise spillage of material
4. Inlet and outlet structures must have debris and scour control where the maximum velocity is greater than 2.0m/s. Safety fencing will also be required
5. Emergency spillways shall be designed to discharge the 50% Probable Maximum Flood without catastrophic failure of the embankment. A suitable emergency spillway may be a broad crested overflow weir with its horizontal top at an elevation 0.5 metre above maximum storage elevation for 1% AEP. Special consideration shall be given to erosion protection on the spillways
6. Retention / detention basin shall not present water / drowning hazards
7. Where basins are integrated into open space areas such as playing fields, a low flow pipeline shall be provided and due consideration should be made to ensure this form of basin will have minimum disruption during wet weather and return to service as soon as possible. The low flow pipe must convey a minimum of the 4EY flow
8. All exposed areas are to be vegetated
9. Submission of design plans to the Dam Safety NSW Committee for comment as required by the Committee guidelines
10. Any information / details related to Dam Safety must be reviewed / revised in alignment with Dam Safety reform via Dam Safety Act 2015 (Sept 2019) by Dam Safety NSW
11. A geotechnical assessment of all basin aspects including embankments, keying into existing ground conditions, etc is required to accompany the proposal
12. Filling is to be carried out in accordance with AS 3798 and shall be supervised by a suitable qualified Geotechnical engineer with a Level 1 responsibility. Testing of the fill for suitability is required and all records must be kept with a copy submitted to council
13. A copy of all geotechnical testing and certification undertaken during construction is to be submitted with the Work as Executed plans
14. Designers should consult the publication Guidelines for Water Safety in Urban Water Developments by The Royal Life Saving Society Australia for details of treatments for access and egress to water areas and crossings over water areas
15. Depths and detailed design considerations may be varied using the risk assessment approach contained in Guidelines for Water Safety in Urban Water Developments

10.10 Constructed wetlands

Constructed wetlands are to be designed to retain nutrients, heavy metals, bacteria and other pollutants. Constructed wetlands should be implemented as a component of WSUD in conjunction with other WSUD measures upstream.

Wetlands generally consist of an inlet zone (primary treatment in the form of a sediment basin to remove coarse sediments), a macrophyte zone (typically characterised by a shallow heavily vegetated area to remove fine particulates and uptake of soluble pollutants) and a high flow bypass channel (to protect the macrophyte zone).

Wetlands can be scaled, to fit an individual block, or to be a large regional scale system. Wetlands provide stormwater treatment and can have significant community benefits including recreational focal point with paths and pocket parks, a landscape feature for a development. They also provide habitat for wildlife.

In general, constructed wetlands are to be designed in accordance with the following design guidelines:

- Water Sensitive Urban Design - '*Technical Guidelines for Western Sydney*' (2004)
- Australian Rainfall and Runoff (2019)
- Australian Runoff Quality (2006)

10.10.1 Design notes

1. Access to constructed wetlands are to be designed to allow machinery to remove sediment, litter and to allow replacement of macrophytes. Truck access should be as close as possible to the device to minimise spillage of material.
2. Landscaping of constructed wetlands should be consistent with the composition and structure of the indigenous freshwater wetland ecological community and fit with the Greater Sydney Green Grid concept
3. Factors for design life and renewal costs to functional stage should be taken into account
4. A Maintenance Plan must be prepared to accompany the design
5. Wetland design shall give consideration to allow water level control and dewatering for maintenance purposes
6. Constructed wetlands are to be designed to minimise the creation of mosquito habitat
7. See schematic layout of constructed wetland below at ***Figure 50***.
8. Designers should consult the publication Guidelines for Water Safety in Urban Water Developments by The Royal Life Saving Society Australia for details of treatments for access and egress to water areas and crossings over water areas

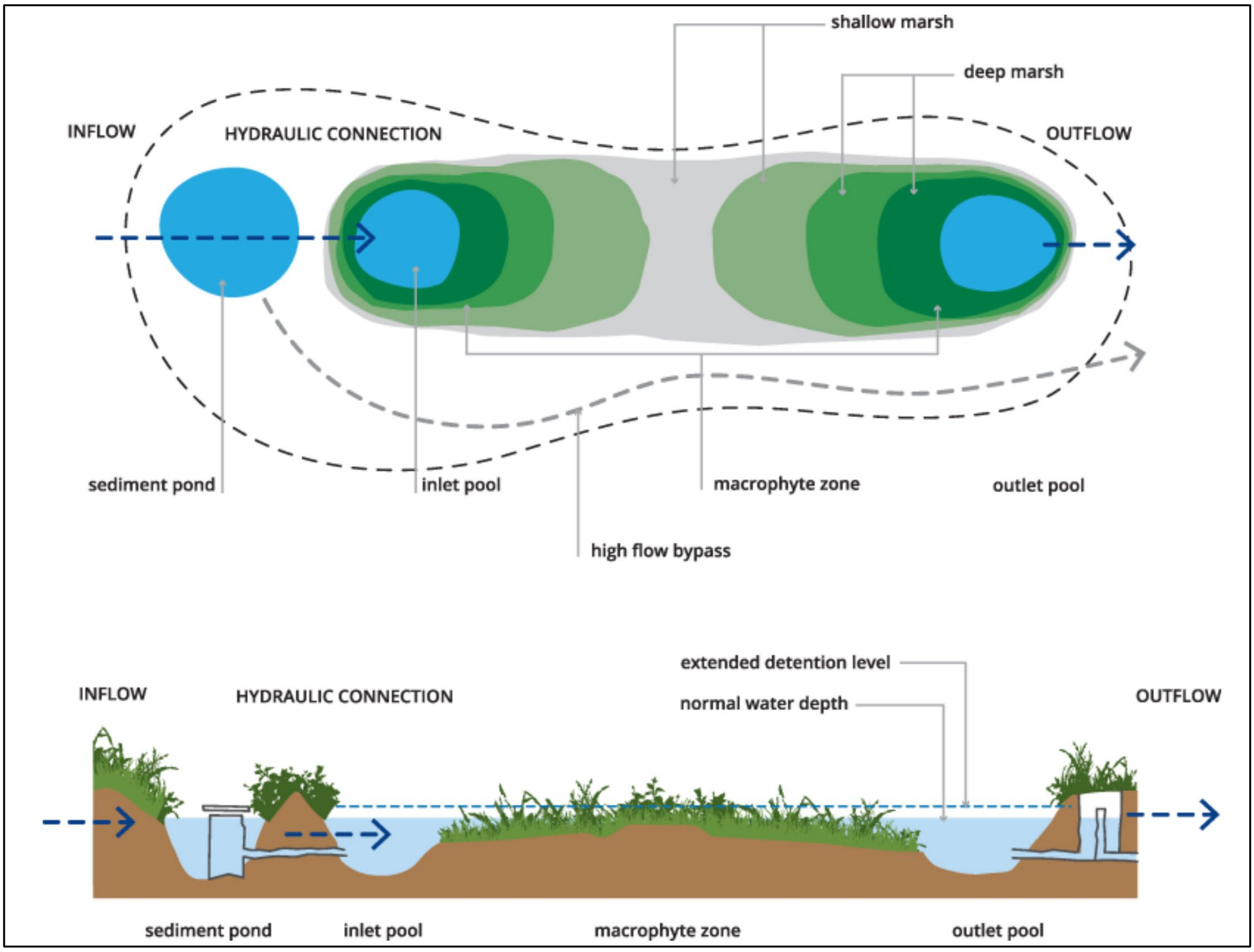


Figure 50 Schematic layout of constructed wetland
(source: ARR2019 Book 9 Chapter 4)

10.11 Filtering and screening devices / GPTs

10.11.1 Design data

Table 31 Design Data: Filtering and screening devices / GPTs

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Minimum width of reinforced concrete access with a turning facility for each filtering and screening device	3.5m wide
2.	Heavy machinery load	30 tonnes
3.	Minimum depositional volume provision in trap	6 months
4.	Expected life	50 years
5.	Metal components	304 or 316 stainless steel Or Hot dipped galvanized steel
6.	Maximum distance of device from kerb	2.4 metres (clearance from utility services to be investigated)

10.11.2 Design notes

The following should be considered when selecting filtering and screening devices:

1. Hydraulic impacts of the device must be considered in the drainage system design
2. Filtering and screening devices are part of the integrated stormwater management system to meet water quality targets
3. Cleaning using machine/s parked on trafficable streets is allowed only if the vehicle/s can legally park and be operated safely without extra traffic controllers
4. The trap shall be designed to allow cleaning of pollutants using a suction wand from outside without any need to enter the unit, and all filters / screens shall be removable to enable cleaning outside
5. The device shall be low maintenance and a cost-effective maintenance strategy shall be developed and included in the design submission
6. Constructed using durable materials
7. Pit baskets are not preferred however will be considered for gross pollutant removal in situations where catchments cannot drain directly to a filtering and screening device / GPT and where parking can be managed.
8. Access and space to the device shall allow heavy machinery to remove sediment and litter and lift up and clean screens outside the device. Truck access shall be as close as possible to the device to minimise spillage of material
9. The provision of filtering and screening devices shall be accompanied by supporting evidence from the respective manufacturer or designer as to the operation, performance and maintenance of the device in addition to site specific requirements
10. Designs shall address the considerations provided above and comply with the pollutant retention criteria in ***Table 23***

10.12 Stormwater harvesting and reuse

Stormwater harvesting has the potential to help reduce the impact of urban development on water quality and stream flow, along with meeting water conservation objectives. It involves collecting stormwater runoff from drains and may be used for irrigating large open space areas such as public parks and golf courses.

The key considerations in determining the type and scale of harvesting include:

- Proposed water source and quality – identifying any local baseflows and its source
- Proposed water use – what are the opportunities to consume water which will assist in lowering the volume of stormwater
- Demand patterns and volume – are the opportunities seasonal? How much water is used?
- Catchment available for harvesting and availability of water (seasonality, baseflows)
- Storage options and site constraints – consider underground and below ground storages or open water bodies
- Treatment – UV disinfection is highly recommended; chlorine may also be used but salt content can impact on the turf quality
- Review of factor of efficiency within the design modelling for harvesting system to address times when the system can't be used or is not operating during rainfall events
- Capital and operational costs

10.12.1 Design considerations

Stormwater harvesting and reuse schemes are unique and catchment specific. Each scheme must be considered on its own merits. The design process involves:

- Assessing the site, the catchment and appropriate regulatory requirements
- Identifying the objectives and targets
- Identifying potential options
- Consulting with key stakeholders and relevant authorities
- Evaluating options
- Preparing a detailed design of selected option(s)
- Undertaking the approvals process
- Developing an operation, maintenance and monitoring plan.

Table 32 Design data: stormwater harvesting and reuse schemes

ID	TASK	DESCRIPTION
1.	Assessing the site, the catchment, and appropriate regulatory requirements	Identify constraints and opportunities e.g. topography, land use, adjacent land uses, watercourse characteristics, presence of baseflows, vegetation and other sensitive ecosystems, soil characteristics, existing water management infrastructure, statutory or regulatory constraints.
2.	Identifying the objectives and targets	Reductions in mains water use, runoff flow rates/volumes, runoff pollution loads, effective impervious area of catchment.

ID	TASK	DESCRIPTION
3.	Identifying potential options	Consider offtake locations and type, storage, treatment, and distribution. Conduct a water balance and water quality modelling to assess impact of scheme over minimum period of 10 years Water storage options may include rainwater tanks, underground / above ground tanks, and surface water storages.
4.	Consulting with key stakeholders and relevant authorities	Key stakeholders may include designers, council officers and authorities. Consider approvals required (e.g. water licensing). Facilitate and educate community on scheme.
5.	Evaluating options	Evaluation techniques may include cost-benefit analysis, triple bottom line or multiple criteria decision analysis. Options should take into consideration social, economic, and environmental factors
6.	Preparing a detailed design of selection option(s)	Develop a risk management strategy to identify public health and environmental hazards and controls to be implemented during design and operation of scheme.
7.	Undertaking the approvals process	Review guidelines and seek advice from council for appropriate approvals Note: Sydney Water also has a Stormwater Harvesting and Re-use Agreement for stormwater harvesters, which sets out the conditions for extracting and managing stormwater from Sydney Water's stormwater network.
8.	Developing an operation, maintenance and monitoring plan	Appropriate maintenance is required for short term construction and long-term management to ensure scheme does not present health or environmental risks. Incident management plans should also be incorporated and contingencies in the event of contamination.

Table 33 Design considerations: stormwater storage options

ID	STORAGE TYPE	CONSIDERATIONS
1.	Open storages	Advantages: low capital and maintenance costs, water quality improvements Disadvantages: evaporation potential, potential contamination of stored water (accidental spills), mosquito breeding potential, public safety
2.	Above ground tanks	Advantages: no evaporation, limited public access, low capital and maintenance costs Disadvantages: location, space requirements and visual impact
3.	Below ground tanks	Advantages: no evaporation, limited public access Disadvantages: higher capital costs, consideration of geotechnical suitability of storage location

10.12.2 Guidelines

Recycled water produced from stormwater must be treated according to public health and environmental standards and requirements. National and state guidelines provide guidance on these schemes include health and environmental risk management.

National

Refer to NWQMS Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) – Stormwater Harvesting and Reuse (July 2009).

http://www.nepc.gov.au/system/files/resources/5fe5174a-bdec-a194-79ad-86586fd19601/files/wq-agwr-gl-stormwater-harvesting-and-reuse-final-200907.pdf

State

DEC NSW Managing Urban Stormwater Harvesting and Reuse (2006)

https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Water-quality/managing-urban-stormwater-harvesting-reuse-060137.pdf

10.13 Operation and maintenance

The designer is to provide maintenance information for each element of the stormwater harvesting and reuse system.

The success of a stormwater treatment train is dependent on the operation and maintenance of the system. It is up to designers to ensure that an appropriate system has been designed that will be maintainable by local council and their maintenance departments. The Guidelines for the Maintenance of Stormwater Treatment Measures by Stormwater NSW (January 2020), otherwise known as The Yellow Book should be referred to for specific operation and maintenance measures required for proprietary and non-proprietary products.

11 Stormwater Drainage

Design of stormwater infrastructure to meet the needs of future communities

11.1 Objectives

The objectives of stormwater drainage are to:

1. Provide a high level of safety for all users
2. Retain the natural stormwater system where possible
3. Efficiently convey stormwater and surface runoff from public and private property to ensure public safety and property protection
4. Ensure that the capacity of downstream drainage systems is not exceeded
5. Ensure that the stormwater drainage design has considered infrequent floods greater than the design flood
6. Minimise construction and avoid the need for property acquisitions and easements
7. Protect the environment from adverse impacts of development by stabilising the landform, controlling erosion, and maintaining / enhancing regional water quality
8. Protect aquatic biota and riparian vegetation
9. Ensure economic sustainability by creating systems with low maintenance

11.2 Major flow system

Many flooding problems exist due to inadequate provision of overland flow paths. Thus, all urban drainage designs shall incorporate an assessment of major system flows. The 'Major' system refers to the overland flow paths which are to be designed to convey major storm flows when the capacity of the minor system is exceeded to ensure that a safe and adequate "escape route" is achieved.

11.2.1 Design notes

1. The 'Major' urban drainage systems are to be of an 'open' style and designed to convey storm flows up to the 1%AEP. Flows in excess of the 1% AEP event must be considered in terms of safety and impacts but are not required to be fully contained within the major system. Major system flows designed to be conveyed in road reserves must be conveyed with a velocity depth product of < 0.4 to allow for the safe access of pedestrians and maximum allowable depth of water is 200mm.
2. Special consideration shall be given to trapped lowpoints where the overland flowpath may divert surcharge into properties. This is especially important when designing "downhill" cul-de-sac and kerb returns adjacent to a sag vertical curve. In the former case the overland flow path shall incorporate a depressed pathway with reverse crossfall in the footway. In the latter case consideration shall be given to grading the Kerb Return such that water flows around the Return and away before it breaks over the top of kerb at the lowpoint
3. Developments shall be designed to avoid and minimise overland flow paths through private properties as much as possible

4. When streets, pathways and easements are used to convey major system flows:
    a. Where a pathway is used as an overland flowpath, the crossfall in the footpath shall be reversed
    b. If the overland flow capacity is inadequate, the minor system capacity must be increased to ensure that safe major system overland flow is achieved
    c. Where stormwater easements are used as overland flow paths a restriction-as-to-user (RATU) shall be placed on the title of the affected lots preventing the alteration of surface levels within the drainage easement and limiting permissible fencing across the easement to an open form fence to allow overland flow to be contained within the easement. No development / building storage shall be allowed in the flowpath
    d. The effects of the Probable Maximum Flood (PMF) shall also be analysed to ensure there is no catastrophic failure of the proposed system/structures which could cause property damage or human injury

11.3 Minor system

The 'Minor' system refers to the underground piped system and gutters capable of carrying runoff from minor storms. The 'Minor' urban drainage systems are to be designed to cater for an Annual Exceedance Probability (AEP) as determined in this Manual.

Where overland flows cannot be safely conveyed, the minor system must be updated.

11.3.1 Design data

Table 34 Design data: design recurrence intervals

ID	PIPED DRAINAGE (MINOR SYSTEM)	ANNUAL EXCEEDENCE INTERVAL
	Street Drainage (General Longitudinally)	
1.	Rural Residential (where required)	20%
2.	Urban Residential	20%
3.	Commercial	5 %
4.	Industrial	5 %
	Street Crossings (With Unobstructed Floodway)	
5.	Local / Collector	20 %
6.	Sub-Arterial	5 %
7.	Arterial	1 %
8.	Access to Emergency Facilities	0.2 %

The design freeboard is to be applied to the overland flow levels calculated when the blockage factors in ***Table 35*** are applied.

Table 35 Design data: piped drainage – minor system

ID	DATA DESCRIPTION	VALUE
1.	Maximum HGL level below ground level at each pit/manhole and along pipeline for design Minor AEP event	150mm
2.	Minimum velocity for 1% AEP flow for self-cleansing	1.0m/s
3.	Maximum velocity in the pipe for the design AEP for scour protection	6.0m/s
4.	Maximum drainage length in pipelines between adequate inspection manholes:	
a.	Where dia is less than 1200mm	75m
b.	Where dia is greater than or equal to 1200mm	100m
5.	Blockage factor for 1% AEP flow	
a.	Pipe / culvert inlets	50%
b.	Sag pits	50%
c.	On grade pits	20%
6.	Blockage factor for 1% AEP flows	
a.	Inlet headwalls	50%
b.	Culverts <3m in diameter	50%
7.	Scour protection at the outlet where maximum velocity exceeds	2m/s
8.	Kerb inlet pits required where flows (in minor events):	
a.	In the gutter exceed	20L/s
b.	Where flows in gutter at an intersection exceed width of	1m
c.	Where flows in gutter at bus stops exceed width of	450mm
d.	Where flows in gutters are greater in width than	2m
9.	Kerb inlet pits are required upstream of tangent point of curves in the gutter line where radius is	<30m
10.	To calculate ponding depth at road sags, minimum blockage factor shall be applied to pits and pipes:	50%
11.	VD ratio for roadway gutter flow for the design AEP	$\leq 0.4 m^2/s$

Table 36 Design data: naturalised systems

ID	DATA DESCRIPTION	VALUE
1.	Minimum freeboard between top water level during a 1% AEP storm event and the ground level of the developed site at that location in the watercourse unless otherwise approved	500mm
2.	Maximum depth of flow in roadway formation for the 1% AEP flow shall not exceed	200mm

Table 37 Design data: recommended tailwater levels

ID	OUTLET TYPE	ADOPTED TAILWATER LEVEL (1)
1.	Free outfall	Pipe obvert
2.	Discharge into receiving waters	Design AEP flood level
3.	Discharge to an existing system (HGL unknown) distance below the natural surface/invert of kerb in the minor AEP event	150 mm
4.	Discharge to a point designed to surcharge	Height of surcharge
5.	Discharge to kerb and gutter or existing pipe	Top of kerb

(1) The tailwater level shall not be below pipe obvert.

Table 38 Fraction impervious

ID	DEVELOPMENT TYPE	FRACTION IMPERVIOUS
1.	Passive Open Space	10%
2.	Active Open Space	30%
3.	Residential (Lot size 500m2 min.)	75%
4.	Medium Density and small lot residential	80%
5.	Commercial/Industrial	90%
6.	Roads	Value to match Street Design Guidelines (unless varied in a Development Control Plan or other planning instrument)

11.3.2 Design notes

1. Design of pipelines as part of the 'minor' urban drainage system shall generally be in accordance with the design AEP's outlined in ***Table 34*** of this Manual
2. Pipes shall be self-cleansing under the design AEP flows
3. The piped drainage system shall be designed using a Hydraulic Grade Line Analysis as an overall system, not in isolation, having regard to the hydraulic influences of the upstream and downstream system
4. Hydraulic grade/energy line calculations will be required for all pipelines, and these are to be shown on long sections. Consideration shall be given to the head available in order to determine whether the system can achieve the capacity required
5. Drainage systems shall be designed to drain by gravity to an existing street network or approved council drainage system. Pump out systems will not be approved except in limited circumstances where a basement carpark is proposed or applications for industrial land such as loading docks, in this instance the pump out system shall comply with AS3500 and the council's requirements

6. Charged lines are discouraged, however, may be used where other reasonably practicable alternatives are not viable
7. The pipeline is to be designed so that the depths of the gully pits are sufficient to induce the designed velocity. Gully pits, junction pits and change of direction pits are to be so designed to minimise pressure head losses
8. Pipe inverts shall be designed as shallow as practical taking into consideration minimum pipe cover, physical constraints and hydraulic grade requirements
9. Pipelines shall be designed in straight lines between pits. Where possible, in order to reduce head losses, changes of direction greater than 90 degrees (measured from upstream to downstream) are to be avoided
10. For any pipe system, a downstream pipe of smaller diameter than the upstream pipe will not be permitted. The exception to this is drainage systems where surcharge has been designed for and approved by council
11. Complex or unusual pipeline situations should be approved by the council prior to the finalisation of design
12. The inlets and outlets to pipelines are to be designed so as to avoid scouring or silting velocities during storm flows, and adequate scour protection satisfactory to council is to be provided at the outlet of all stormwater lines
13. Where determination of a tailwater level is in doubt, it shall be necessary to confirm the value with the council prior to proceeding. Tailwater levels shall generally be in accordance with the **Table 37**
14. Standard pits shall be provided in drainage lines at all changes in grade, level, or direction and at all pipe junctions
15. Locating gully pits in vehicular entrances shall be avoided
16. Locating gully pits on curves is to be avoided
17. Gully pits shall not be placed in passage of pedestrians
18. Additional inlet pits may be required at the discretion of the council if blocking of a single pit could cause serious flooding
19. Sag pits shall be designed based on a maximum depth of ponding up to the top of the kerb for 1% AEP.
20. Where surface inlet pits are located within open channels, a lockable hinged grate shall be used in all cases unless otherwise approved by council. Generally, the pits are to be located below the 1% AEP top water level and preferably at the channel invert
21. All urban stormwater drainage designs shall incorporate an assessment of major system flows. The aim of this check is to ensure that the 1% AEP flow has a safe and adequate 'egress route' when the minor system fails
22. The use of natural waterways, watercourses and drainage depressions to convey major system flows must be maximised and where opportunities exist to return formalised systems to a more natural state, these opportunities must be taken. A minimum 500 mm freeboard is to be provided between the top water level during a 1% AEP storm event and the ground level of the developed site at that location in the watercourse, unless otherwise approved
23. Streets, pathways and stormwater easements may also be used to convey and route major system flows, either to the trunk drainage system or to a low point with sufficient hydraulic capacity to capture the flows.
24. The location of existing and proposed utilities must be considered and resolved in conjunction with the stormwater design prior to SWC approval

25. Where the higher fraction impervious is permitted by DCPs or proposed as part of development then the higher value must be used

26. The following figures may be used for determining pit inlet flows

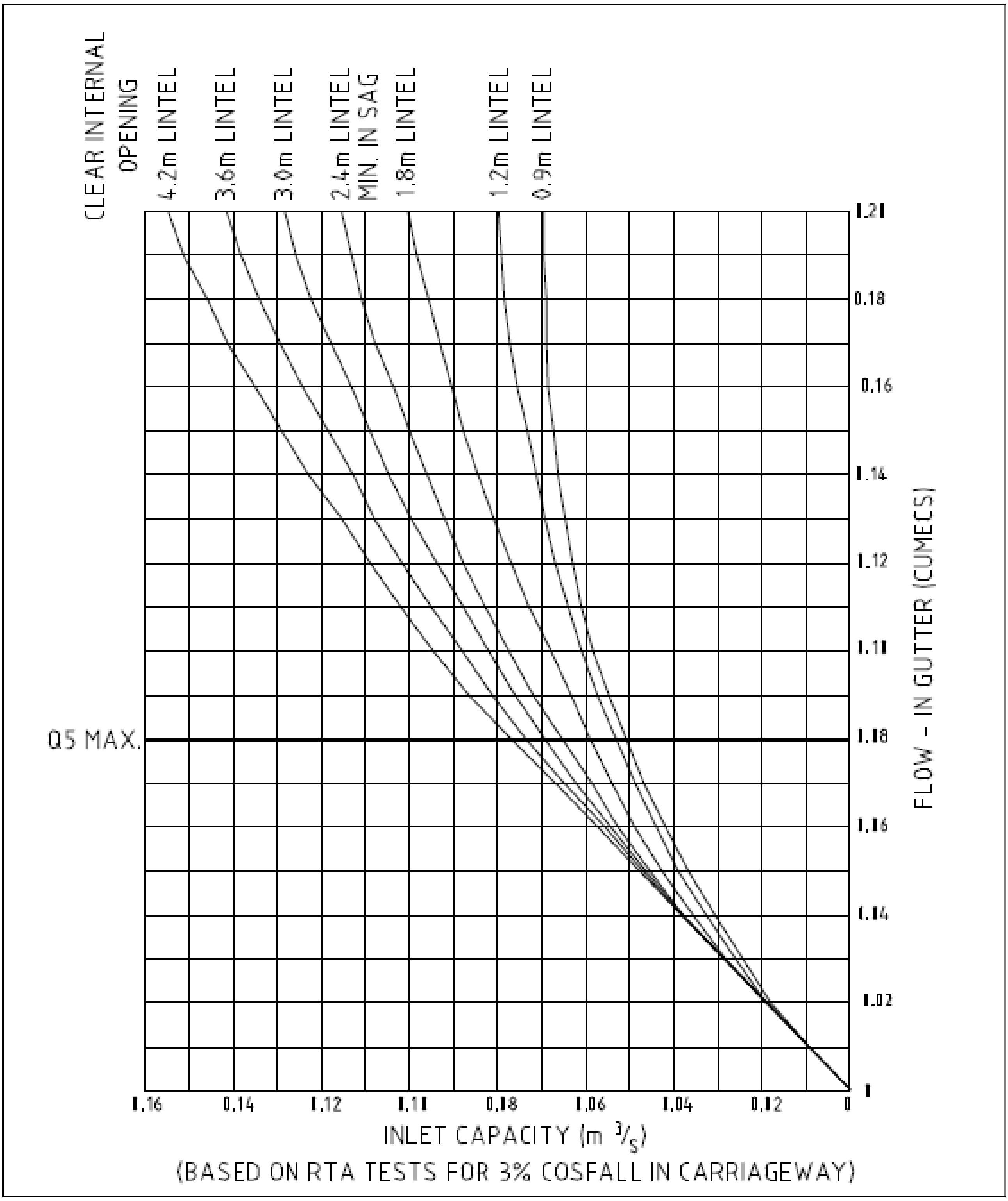


Figure 51 Grated kerb inlet independent of grade

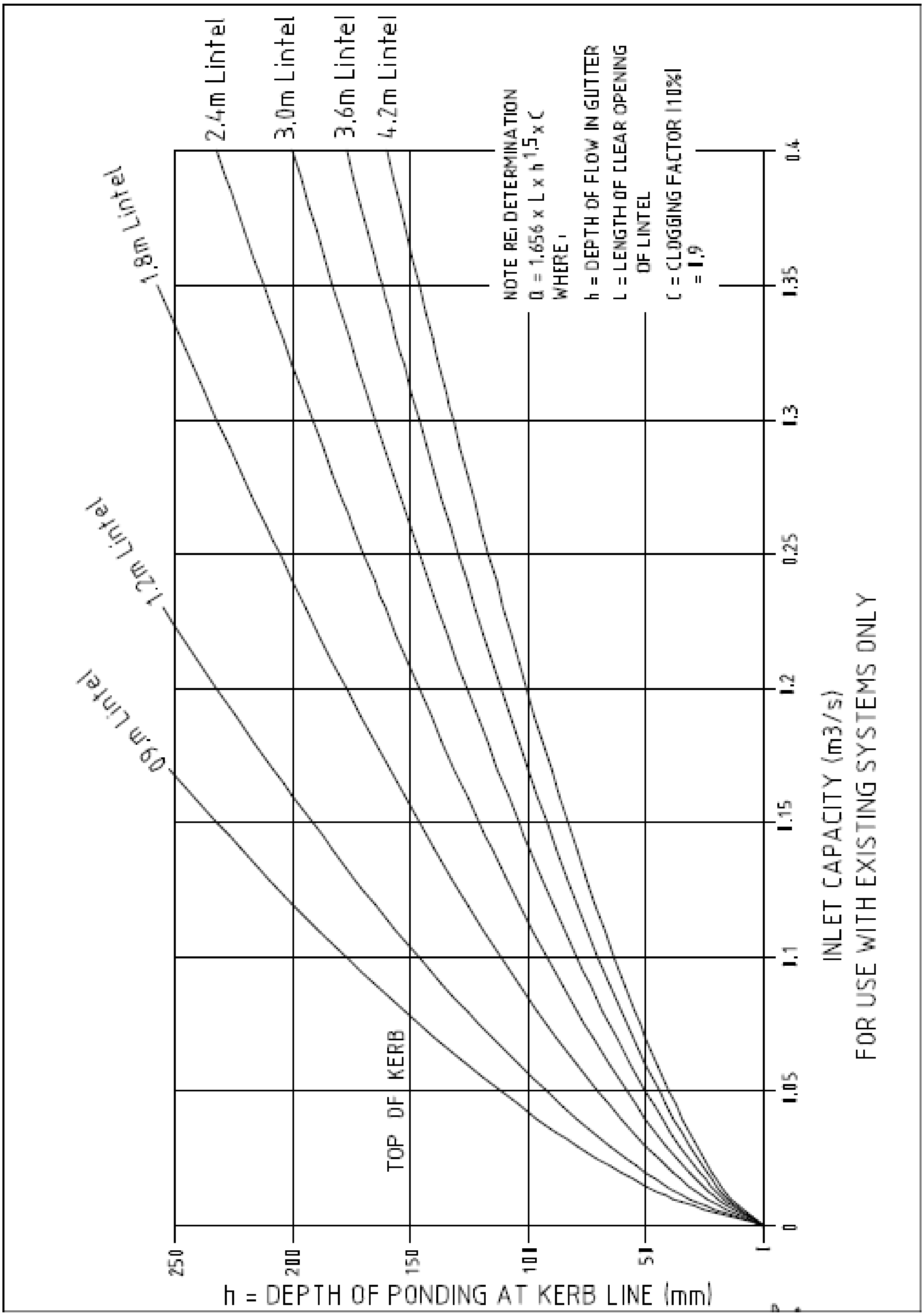


Figure 52 Inlet capacities for kerb inlets in SAGs

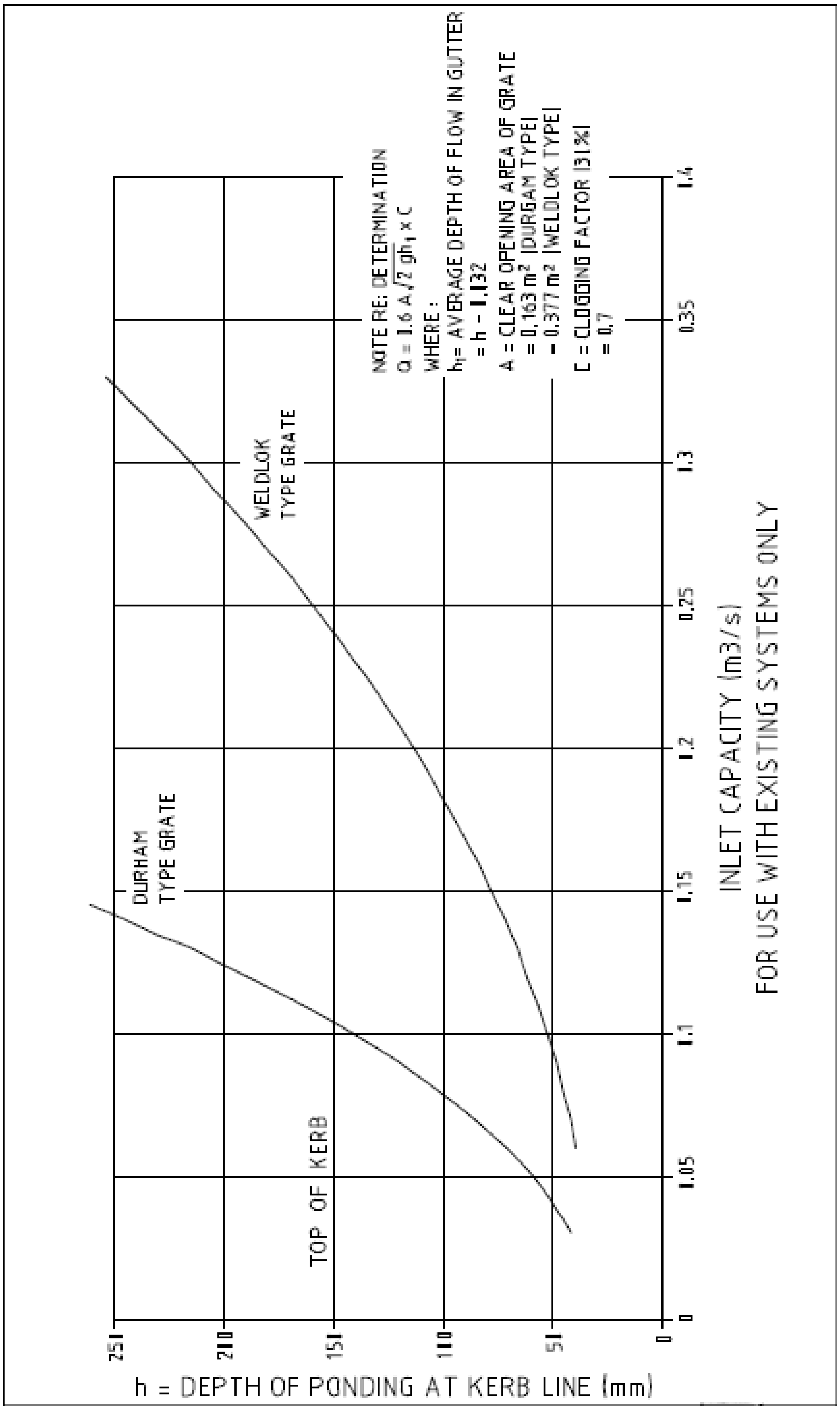


Figure 53 Inlet capacities for gratings in SAGs

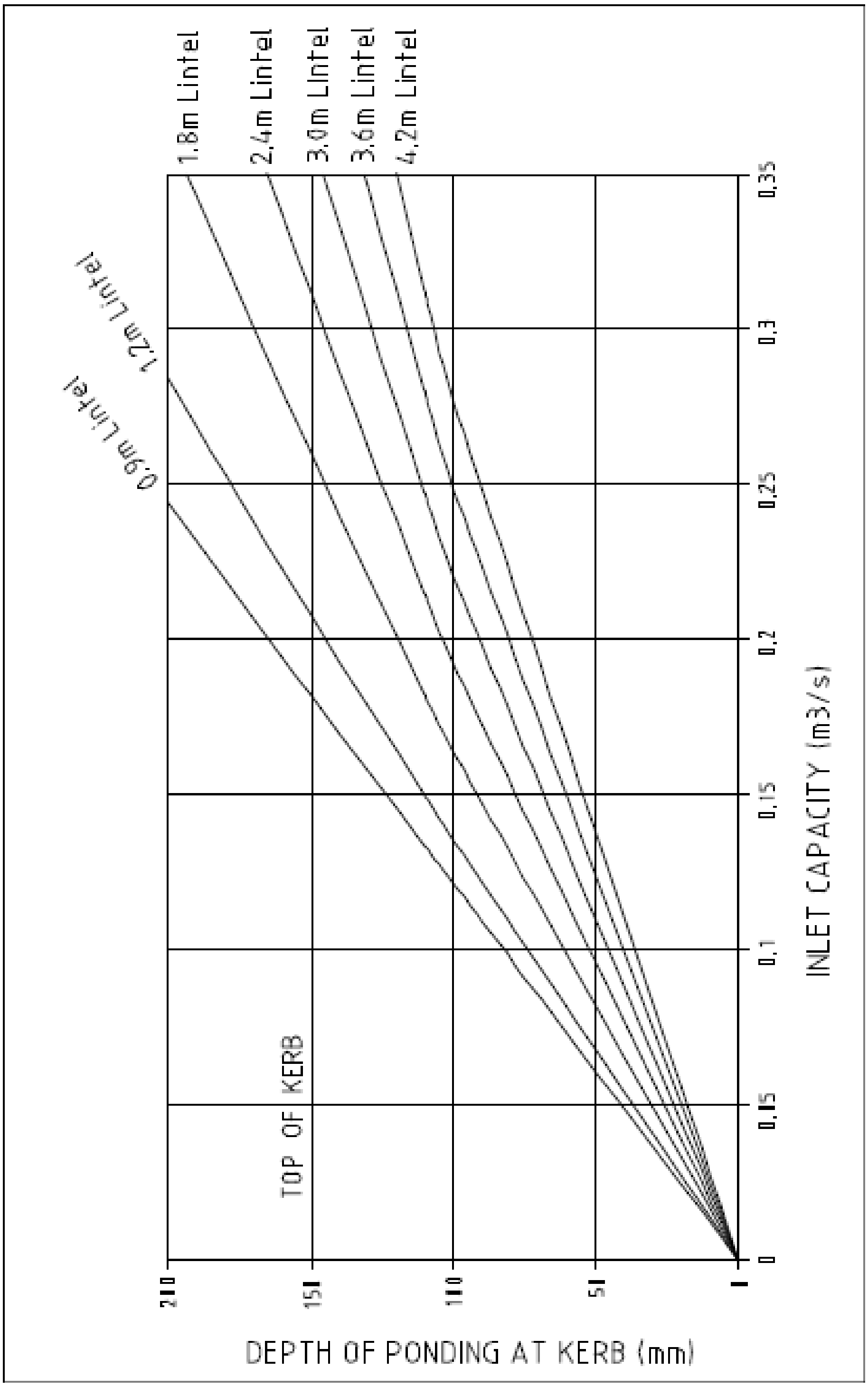


Figure 54 Inlet capacities for kerb inlets with "Durham" type grates for SAGs

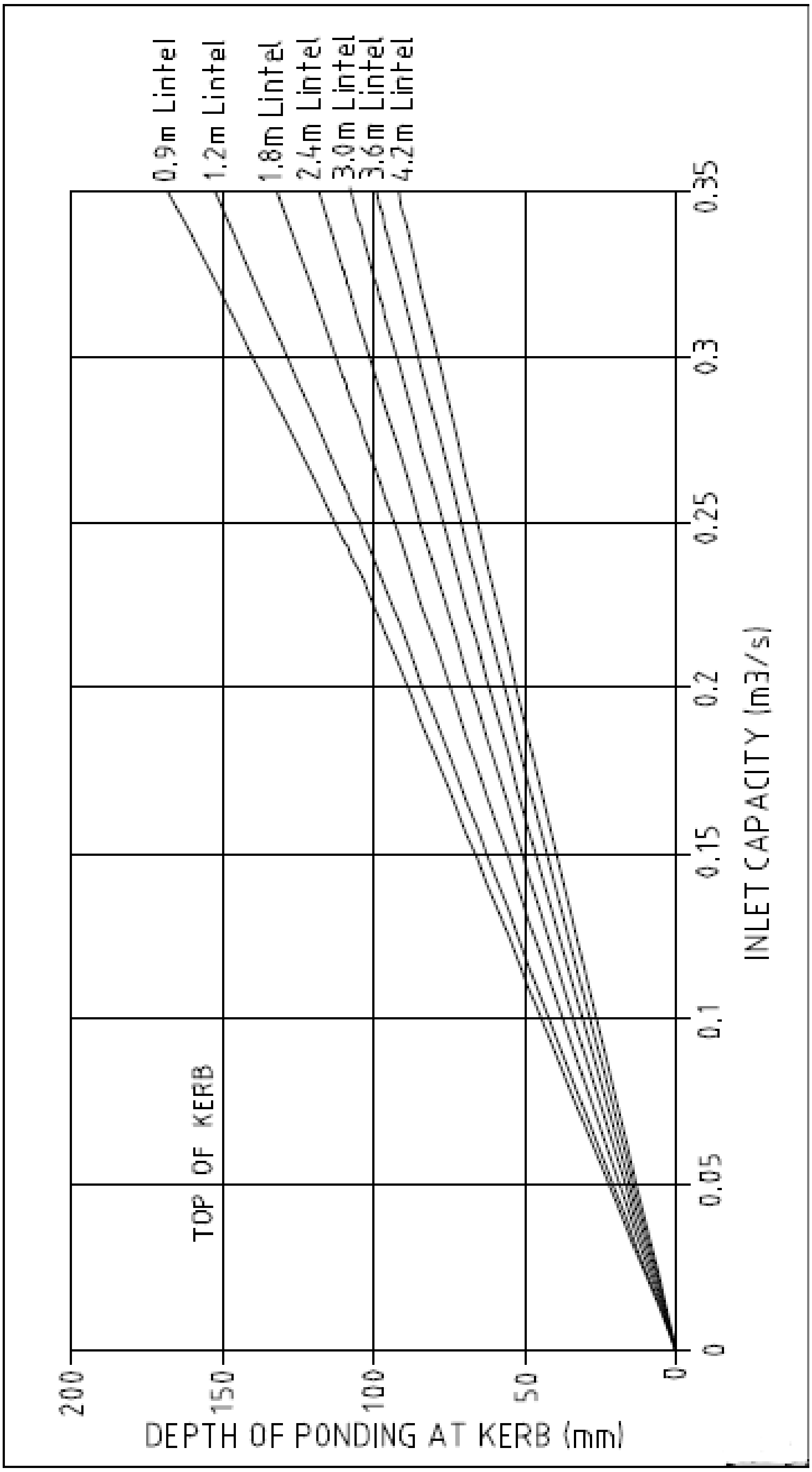


Figure 55 Inlet capacities for kerb inlets with "Weldlock" type grates in SAGs

11.4 Interallotment systems

The installation of interallotment drainage systems is required where roof water and surface water cannot be discharged directly to the street gutter or council's stormwater system. Interallotment drainage systems are intended to collect both roof water and surface water.

11.4.1 Design data

Table 39 Design data: interallotment drainage

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Interallotment drainage sized to accommodate flows to the stated value assuming impervious area in accordance with *Error! Reference source not found.*	20% AEP
2.	Minimum pipe size diameter	150mm
3.	Minimum grade	1%
4.	Hydraulic capacity, cover and grade in accordance with	AS3500.3
5.	Maximum interval between inspection pits/manholes	75m
6.	Minimum internal dimension of interallotment drainage pits in accordance with	AS3500.3.

11.4.2 Design notes

1. The design of interallotment drainage systems shall include inspection pits/manholes at the upstream end of the line and at the lowest point of each lot along the line
2. Pits shall also be provided at changes of pipe grade, size or direction
3. Interallotment drainage line connections to stormwater drainage lines shall be provided by the construction of an inspection pit located inside the property boundary
4. Interallotment drainage lines are to be located centrally within an easement a minimum width of 1.5 metres and shall be in the higher property not the lower property
5. The number of lots served by the IAD should be minimised as reasonably practical. Preference shall be given to increasing the number of connections to street drainage as a means of reducing the number of lots serviced. The maximum number of lots served by an interallotment drainage line shall generally not be more than eight, unless the catchment area is less than 3500m^2 in which the maximum number of lots can be increased to ten
6. Hydraulic grade line analysis shall be provided if the number of lots serviced exceeds five (5)
7. Unless homes are being delivered as integrated housing, each lot benefitted shall have a stub for roof water connection at the downstream pit
8. Stormwater from public roads are not to be diverted through private property where an alternate route exists

11.5 Easements

Drainage easements are to be created in situations where stormwater is concentrated or discharged onto adjoining lands other than an existing easement or natural watercourse. It shall be the responsibility of the owner/applicant to obtain a drainage easement through such land, sufficient in dimension to convey the drainage to an easement or natural watercourse, and to transfer easement rights to council or to the entities that benefit from the proposed drainage easement.

Notwithstanding the requirements outlined above, creation of a drainage easement must consider the following hierarchy:

1. The use of natural waterways, watercourses and drainage depressions as drainage easements must be maximised
2. Where a man-made system is required, it shall be designed as a 'soft' engineered system such as landscaped channel or similar
3. Where the above cannot be provided a piped drainage system may be considered
4. Structures adjacent to an easement shall be designed to utilise a beam or pier system of footing or other approved method designed by an Accredited Professional so that the zone of influence of the load from the building or structure passes beneath the invert of the existing pipeline. The design of the structure must also consider the maintenance, repair and replacement of the pipe in the easement
5. The zone of influence is that area below a line drawn from lowest point of the structure nearest the pipeline towards the pipeline at 45degrees from the vertical
6. A drainage easement shall be provided for any pipeline within private property which carries stormwater from upstream private properties or from any public land. The width of easement shall be generally in accordance with ***Table 40***. Where overland flow also occurs a restriction on the use (RATU) shall be placed on the 88B instrument.

11.5.1 Design data

Table 40 Design data: minimum width of easements

ID	LOCATION OF EASEMENT	MINIMUM WIDTH (1)
1.	Interallotment Drainage – Residential	
a.	The greater of:	1.5 metres
b.	or	1.5 x depth of trench + nominal diameter of pipe (in metres)
2.	Interallotment Drainage – Industrial	
a.	The greater of:	3.0 metres
b.	or	1.5 x depth of trench + nominal diameter of pipe (in metres)
3.	Council Piped Drainage (2)	Same as industrial
4.	Open Channel / Floodway	Top width of 1% AEP flow with freeboard + 3.0 metres (3)
5.	Brownfield development (infill)	900mm (nominal pipe sizes ≤375mm)

(1) Easement widths to be increased in 0.5 metre increments

(2) Minimum pipe cover is 0.6 metres

(3) Additional 3.0 metres allowed for maintenance access on one side of the channel

11.5.2 Design notes

1. Where pits are required in easements, the width is to be at least 600 mm wider than the pit width.
2. A positive covenant, requiring maintenance of the easement by owners of land which contains the easement will be required, under Section 88E of the Conveyancing Act 1919.
3. For twin pipelines or greater, easement widths are to be aligned with the trench width as referred to in AS 3725

11.5.2.1 Adjoining Owners Consent / Creation of Drainage Easements

Where drainage involves the provision of drains across land owned by others, evidence that the owner's consent for the creation of easements over the downstream properties must be lodged with council. The downstream owner's consent to carry out the proposed works must be lodged with the initial set of submission drawings. Details of the easement and proposed works must be shown on the submission drawings and downstream owners consent to carry out the proposed works.

Similarly, evidence of denial of an easement is required before Council will consider charged lines or pump out systems.

11.6 Drainage structures

Drainage structures such as inlet headwalls present specific risks during flood conditions that could result in drowning, particularly the drowning of children. Relevant guidelines should be consulted to ensure that this risk is preferably eliminated, but at the very least minimised as far as is reasonably practicable.

11.6.1 Reinforced concrete pipes (RCP)

Pipes shall be constructed with spigot and socket rubber ring joints either of fibre reinforced concrete or precast reinforced concrete which shall conform respectively to the requirements of AS 4139 and AS/NZS 4058. Spigot and socket rubber ring joint for fibre reinforced concrete pipe must be achieved using external collar.

The use of Fibre Reinforced Cement (FRC) pipes must be supported in any salinity management plan for the project.

The use of FRC pipes is not permitted within Blacktown and Campbelltown Councils.

11.6.2 UPVC Pipes

In trafficable areas on private property, the use of UPVC pipe Class SN4 up to and including 300 mm diameter may be permitted. UPVC pipes shall be backfilled with approved compacted granular material (e.g. washed river sand) for the trench depth in trafficable areas and 150 mm above the pipe in other areas.

11.6.3 Change of Direction (C.O.D) Pits and Junction Pits

C.O.D. and junction pits are to be designed in accordance with Standard Drawing No.SD-S12.

11.6.4 Surface Inlet Pits

Where surface inlet pits or surcharge pits are required, they are to be designed in accordance with Standard Drawing SD-S11

11.6.5 Special Pits

Circumstances may require the inclusion in the design of a special inlet pit or other special structure. Council shall be consulted as to their use in a particular circumstance and of the inlet capacities to be used in each instance. A detail of any non-council standard pits shall be included on engineering drawings and signed off by an Accredited Professional.

The use of precast pits shall be considered in consultation with council.

11.6.6 Headwalls

Concrete headwalls for pipe outlets greater than or equal to 900 mm diameter are to be cast in-situ. Precast concrete headwalls may be used for pipes outlets up to and including 825 mm diameter, in situ concrete cut-off walls under the end of the apron are required to prevent future undermining.

Concrete headwalls cast in-situ are to be designed in accordance with Standard Drawing SD-R63 or SD-R64

Rock headwalls at pipe outlets are to be in constructed in accordance with Office of Water guidelines for outlet structures on waterfront land.

11.6.7 Approved materials

Unless otherwise specified, only the drainage materials listed in this EDM may be used for all developments within the council areas.

Consideration will be given to application of alternative materials if a site-specific analysis indicates that issues such as saline vulnerability, bushfire propensity, design traffic loadings and or insufficient cover are an issue on the site. Prior to using alternative materials, approval by council must be obtained

11.6.8 Pipelines - design notes

1. Pipelines are to be placed on the high side of streets wherever possible
2. All pipes to be graded at minimum of 1% except where site constraints require adoption of minimum grades as per AS3500
3. An absolute minimum grade of 0.5% for pipes with a diameter in excess of 900 mm may be permitted up to a maximum length of 75 metres
4. Where pipe grades are in excess of 15%, concrete bulkheads are to be placed at every second collar and are to be constructed in accordance with the engineering drawings
5. A minimum cover of 0.6 metres at the collar shall be maintained. Where this cannot be achieved the pipes shall be encased with reinforced concrete to ensure structural integrity of the pipe. Alternatively, a suitable reinforced concrete box culvert, or higher class of reinforced pipes may be used
6. Ideally cover to the collar of the pipe shall be at 1100mm to allow electrical services to cross over the top - see SD-R29
7. Pipes shall be located under the kerb and gutter so that the edge of the pipe does not encroach onto the footway beyond the back of the kerb
8. Pipelines crossing roads shall be located at an angle of between 90 and 45 degrees streamlined to the direction of flow, to the street centreline
9. In general, the selection of pipe material and class must be based on the anticipated design loading on the pipe and the proposed pipe cover. Suitable plastic pipes may be considered where not subject to

traffic or similar loadings and terrain makes installation of concrete pipes difficult (e.g. steeply sloping land)

10. Pipelines within roadways and council lands shall have a minimum diameter of 375 mm and shall be minimum Reinforced Concrete Class 2, spigot and socket, Rubber Ring Joint Pipes, constructed in accordance with AS 4139 (where fibre reinforced concrete pipes are to be accepted for use by council used) or AS/NZS 4058 (where precast reinforced concrete pipes are to be used). Where fibre reinforced concrete pipes are to be used, a proprietary collar is to be applied over the pipe joints
11. Curved pipelines where permitted are to be installed strictly in accordance with the manufacturer's recommended radii and specification
12. Pipe friction coefficients are to generally be in accordance with Table 41
13. Pipelines shall be designed to match obverts of connecting pipes
14. Pipelines under roadways shall be minimum Class 3
15. Pipelines greater than 600mm in diameter shall be minimum Class 3

Table 41 Design Data: Recommended Pipe Friction Coefficients

ID	PIPE MATERIAL	MANNING'S '*n*'	COLEBROOK-WHITE 'K' (mm)
1.	Concrete	0.013	0.60
2.	UPVC	0.010	0.03

11.6.9 Pits

All pits are to be generally in accordance with the Standard Drawings.

All pits must have an opening to the surface to permit a person to enter for maintenance access, minimum 600x600mm. All pits for pipes up to 1050 mm diameter are to be designed in accordance with Standard Drawing SD-S06. Where pipes sizes exceed 1050 mm structural details shall be provided and certified by a Accredited Professional structural engineer.

Table 42 Design data: pits

ID	DESIGN DATA DESCRIPTION	VALUE
1.	Grade in pit floor upstream to downstream (regardless of changes in diameter or direction) (equivalent of 50 mm fall over a 1.0 metre pit)	5%
2.	Maximum interval between surface inlet pits	75m
3.	Maximum width of stormwater flows adjacent to kerb in minor events	2m
4.	Minimum clear vehicular passage in 1% AEP event (defined as the street carriageway/central pavement that has a maximum ponding depth of 60mm or any other obstruction)	3.5m
5.	Minimum nominal lintel size for gully pits on grade clear opening	1.2m
6..	Minimum nominal lintel size for sag pits clear opening	2.4m

11.6.9.1 Design notes

The following design criteria shall apply for drainage pit designs:

1. Note: clear vehicular passage (excluding medians) is defined as within the street carriageway/central pavement that is clear of any ponding and any other obstruction
2. Drainage pits are to be designed where possible so that inlet and outlet walls are perpendicular to the centreline of the inlet and outlet pipes
3. Drainage pits are to be designed where possible, so that the pipe centrelines intersect on the downstream pit face
4. Step irons are to be provided in all drainage pits deeper than 1.2 metres as measured from the top of kerb to the invert of the pit in accordance with the Standard Drawing S09. The first step iron is to be provided a maximum of 600mm below the invert of the gutter and are to be spaced 300mm apart
5. All drainage pits are to be reinforced in accordance with the standard drawings. Pits > 2 metres deep are to be designed by an Accredited Professional. Refer to the standard drawings for further detail
6. Concrete is to have minimum compressive strength of 25MPa at 28 days unless otherwise approved by the council
7. All drainage pits are to be designed to minimise work, health and safety impacts with special consideration given to the confined spaces legislation, this is to cater for safe working environment to the personnel carrying out maintenance work
8. Provide mass concrete benching to streamline flows through the pit. This applies particularly to trunk drainage systems

11.6.9.2 Pit Losses

The pit pressure change coefficient (Ku) for each pit shall be determined using the tables from the Hare or Missouri Charts. Notwithstanding, the following should be considered when adopting pit losses:

1. The water level in a pit may be assumed to be coincided with the HGL level
2. When the water level (i.e. HGL) calculated is below the obvert level of the upstream pipe, the obvert level of the upstream pipe shall be adopted as the water level for calculation of upstream pipe HGL
3. Where pits are located at the top of a drainage branch or where the obvert of the outlet pipe is 25% of its diameter or greater below the invert of the upstream pipe then the Ku shall be no less than 4.5
4. Intermediate cases may be determined by linear interpolation of Ku up to 4.5
5. For drop pits with more than 600 mm drop, the length of the pit shall be designed to avoid direct fall onto the wall which will induce scouring of the pit wall. As a conservative starting point, this may be achieved by assuming a 45-degree angle down from the horizontal taken from the obvert of the inlet pipe

11.6.10 Subsoil drainage design notes

Sub-soil drains are to be provided behind all kerbs in accordance with standard drawing SD-R05, except where drainage lines are laid under the kerb and gutter. Sub-soil drainage lines shall be graded to suitable outlets such as stormwater pits.

Subsoil drainage shall be designed and installed with consideration given to the following:

1. Subsoil drainage pipes 100mm diameter for a minimum distance of 3 metres are to be provided at gully pits, junction pits and culverts so that the upstream end of the subsoil drain is capped and the downstream end discharges through the pit wall at a level above the invert of the outlet pipe flush with the inside wall

2. The subsoil pipe shall be laid on the kerb side of the stormwater drainage trench unless otherwise directed
3. Additional subsoil drainage is to be provided at locations of known seepage or springs
4. The subsoil drainage should consist of 100 mm diameter corrugated UPVC agricultural pipe in an approved geotechnical stocking. The filter stocking shall be appropriately tied at the upstream end of the subsoil pipe to preclude the entry of filter material
5. The absolute minimum grade shall be 1%
6. Flushing points for cleaning out the subsoil drainage shall be provided at the ends of lines and at intermediate points such that the distance between pits and/or rises shall not exceed 60 metres
7. Flushing points shall be marked (SS) on the flush point cover, by means of a stencil (on kerb, not cover)
8. Additional subsoil drainage shall be installed if during construction, the council considers them necessary
9. For trenches containing pipelines greater than 525mm diameter, subsoil drainage shall be provided on both sides of the trench

11.6.11 Bridges and large culverts

Bridges are typically designed for the 1% AEP flow with a freeboard of 500mm to the underside of the bridge. The effects of a 0.05% AEP (1 in 2000 year ARI) shall also be assessed consistent with the requirements of the bridge design code. Afflux and hydraulic grade lines are to be assessed in all cases.

The minimum clearance to be provided to the soffit of the bridge structure above the expected design flood level is to be generally in accordance with ***Table 43***.

Table 43 Design data: bridge/culvert minimum clearance for the 1%AEP flow

ID	BRIDGE / CULVERT STRUCTURE	CLEARANCE (1)
1.	Box Culverts with waterway area greater than 10m^2 and deck used as street surface	500 mm
2.	Bridges with concrete in structure and a maximum velocity less than 3 m/s	500 mm
3.	Bridges with concrete in structure and a maximum velocity greater than 3 m/s	1000 mm
4.	Bridges with no concrete in structure and a maximum velocity less than 3 m/s	1000 mm
5.	Bridges with no concrete in structure and a maximum velocity greater than 3 m/s	1250 mm

(1) Clearance to underside of structure (soffit)

It is critical that freeboard and other design requirements are achieved during the designated flood on evacuation routes.

For box culverts, the base slab shall be cast in-situ and designed by an accredited professional.

11.7 Catchment areas

The contributing catchment area at any point is to be defined by the limits from where surface runoff will make its way, either by natural or man-made paths, to this point. Consideration is to be given to likely changes to individual catchment areas due to the full development of the catchment. Catchment area land uses are to be based on current available land zonings or proposed future land zonings where applicable.

11.8 Computer Models

Where catchments are large and reasonably accurate levels of flow rate prediction are necessary, the use of proprietary software for the hydraulic and hydrologic design is to be provided by a designer that has knowledge and expertise with the specific software. The industry standard computer models are presented in ***Table 44***.

Table 44 Industry Standard Computer Models

HYDROLOGY	HYDRAULICS
DRAINS	HEC-RAS
XPRAFTS	HEC-RAS 2D
TUFLOW	MIKE-11, 21, flood
WPSWMM	SWMM-2D
HMS	TUFLOW
RORB	XP-STORM
	SOBEK

Should consultants wish to use other models not listed, prior consultation with council is required to provide justification for the adopted models, expected orders of accuracy and associated assumptions.

The selected models shall be calibrated against historic flood data if available, otherwise against other calculation methods and results

A Design Report shall be submitted stating all design parameters, modelling assumptions and report calculations. An electronic copy of computer input and output data files for all hydrological, hydraulic and water quality models shall be submitted, together with accompanying catchment and layout plans at the time of lodging the Engineering Plans.

12 Trunk Drainage

Infrastructure to cater for larger scale regional Stormwater Drainage

12.1 Objectives

The objectives of trunk drainage are to:

1. Provide acceptable levels of amenity and protection from the impact of flooding
2. Maintain existing natural creek lines and watercourses largely intact and continue to function as viable ecological system
3. Restore ecological and habitat systems to mimic the natural condition of Western Sydney creeks as closely as is reasonably practicable
4. Provide appropriate flood conveyance within all trunk drainage flow paths
5. Provide low maintenance, naturalised, landscaped watercourses and/or floodplains
6. Reflect indigenous flora representative of the natural riparian environment of Western Sydney creek lines

Trunk drainage should also create assets for community use and contribute to broader urban amenity including mitigating heat island effects and they should be designed for multiple purposes and outcomes

All trunk drainage analysis and designs shall comply with the following requirements unless requested otherwise by council. This section of the EDM is to be read in conjunction with the following references:

- NSW Floodplain Development Manual
- Australian Rainfall and Runoff
- Australian Emergency Management Manual Series

12.2 Trunk Drainage System

Trunk drainage systems include detention / retention basins, major drainage lines, waterways and overland flow paths and shall be designed for the 1% AEP event + freeboard unless specified otherwise by council. Flood evacuation planning shall be based on the Probable Maximum Flood Event (***Table 45***).

Any flood planning area should be fully contained within the public drainage reserve.

12.2.1 Design data

Table 45 Design data: trunk drainage

ID	REQUIREMENT	AEP (Note 1)
1.	Flow to be carried in-bank, such that erosion does not occur.	50%AEP (1 in 2-year ARI)

ID	REQUIREMENT	AEP (Note 1)
2.	The level of walkways and cycleways adjacent to the creeks are to be above the stated flood level except under special circumstances (and exposed for only short durations) Water quality control ponds, filter strips and structures are to be above the stated flood level, but can be below the 1%AEP flood level Open spaces containing active facilities, i.e. playing fields, park furniture, BBQ's, public buildings, etc, adjacent to creeks are to be above the 20% AEP flood level.	20%AEP (1 in 5-year ARI)
3.	Flows to the stated event are to be carried within the public space corridors, and are to be further designed such that floodplain management and hazard management guidelines are accommodated to minimise risk to life	1%AEP (1 in 100-year ARI)
4.	Flood extent to be mapped (whilst complying with the Floodplain Development Manual (FDM) and SES requirements):	
a.	Floor levels for properties adjacent to the creek are to be set at least 0.5m above the stated level	1%AEP
b.	Obverts of bridge decks of evacuation routes are to be set at least 0.5m above the stated level (See Section 11.6.11) and in accordance with the NSW FDM	1%AEP
5.	Evacuation planning Flood hazards and risk to life Flood extent to be mapped	Probable Maximum Flood
6.	Active open space facilities, containing high quality playing fields and buildings shall be above	1% AEP
7.	Flood evacuation routes	Provide trunk infrastructure to achieve 0.2% AEP level of services or as confirmed by SES

Note 1:
Modification of these values will depend on individual cases. e.g. it may be necessary for a structure to be checked for a Probably Maximum Flood in areas where failure could significantly increase the danger to life and property or create unacceptable or prolonged isolation, subject to the request of the council.

12.3 Natural watercourses / urbanised channels

Existing natural watercourses or gully systems that convey stormwater runoff should be conserved with minor modifications for flood conveyance control. Where an urbanised channel system is required, it shall be designed as a 'soft' engineered system but with allowance for natural growth to ensure the intended function of the waterway. In cases where there is high potential for environmental impacts such as significant trees, archaeological sites etc, appropriate bank erosion protection measures shall be applied to ensure there are no impacts on adjacent properties.

A detailed examination of the effect of changes of alignment, grading and channel section shall be carried out to determine water profiles and to identify areas requiring scour protection.

Naturalised channel design should also assess shear stresses as these are a better indicator of scour potential than velocity particularly in existing channels/watercourses.

Naturalised channel designs shall be consistent with the principles of the Brisbane City Council Natural Channel Design Guidelines dated November 2003.

The final design shall be carried out using 1D or 2D hydraulic analysis as appropriate and subject to council Engineer's approval.

12.3.1 Design data

Table 46 Design data: natural watercourses / urbanised channels

ID	DESIGN DATA	VALUE
1.	Minimum freeboard to residential land from urbanised channel above the maximum flood level for the 1% AEP event	500mm
2.	Maximum flow velocity in vegetated urbanised channels for the 1% AEP event unless otherwise approved by council for the proposed vegetation type	2.0m/s
3.	Minimum flow velocity in grass-lined urbanised channels for 6EY flows	0.6m/s
4.	Froude number for urbanised channel designs for the 1% AEP event Otherwise, stabilisation measures must be installed e.g. drop structures, to dissipate the energy and reduce the bed slope upstream and downstream of the drop	<0.8
5.	Maximum batter slopes of grass channels	1(V):4(H)
6.	Maximum batter slope landscaped/planted (riparian vegetation)	1(V):4(H)
7.	Benching may be used on batters. The maximum bench crossfall is	1(V):8(H)
8.	Where the overall height of batter is >3m then the average batter slope including benches must not exceed	1(V):6(H)
9.	Minimum crossfall in low flow channels with a depressed channel invert	1%

12.3.2 Design notes

1. Natural watercourses and urbanised channels must be designed using appropriate Manning’s n coefficients, to represent overbank and in-channel conditions, including trees, vegetation, and partial obstructions by debris. A range of Mannings values reflective of fully maintained and just prior to maintenance are to be considered
2. Channels upstream of street or bridge crossings shall include the estimated afflux through the crossing
3. Adequate scour protection shall be designed for all discharge points into and out of the channel, or at any point in the channel where there is a significant change in flow conditions
4. Provision of access for appropriate maintenance machinery shall be incorporated in the design of all urbanised channels
5. Channel designs need to consider base flows and how sediment movement and deposition through the system are being conveyed
6. Adjacent piped systems shall be connected to the low flow pipe system as a continuation of the side lines. If existing, the connection point shall be a surcharge pit capable of surcharging the side lines total discharge. Surcharge points shall occur in the channel batter below the 1% AEP water level

7. All urbanised channels where velocity exceeds 2.0 m/s, in any design event, shall be stabilised with ground reinforcing material with a minimum life expectancy of 20 years
8. Energy dissipaters such as stilling basins or drop structures shall be introduced where the discharge velocity and shear stresses from pipes or culverts into natural or urbanised channels are likely to cause scour, or where considered necessary by council
9. Works on bed or banks of watercourses is integrated development and requires approval from NSW Natural Resource Access Regulator (NRAR)
10. All plans (both design and WAE) are to clearly delineate the extent/location of flood lines including the 1% AEP, 5% AEP, 20% AEP & 50% AEP Flood Planning Level and PMF
11. Where WAE levels departure significantly from the design the system is to be remodelled to verify performance. Works significantly out of tolerance may be rejected and require reconstruction
12. Design must consider scour potential during the plant establishment phase not just the ultimate case, to ensure the channel remains stable. Checks are to be undertaken for the 0.5EY flows and low n values for the just constructed conditions
13. Rock work in channels shall be kept to an absolute minimum
14. Existing stream lengths and grades should be maintained

12.4 Riparian corridor

The 1% AEP flood extent shall be contained within the creek corridor (i.e. no residential development (excluding roadways) or significant amenities should be placed within the 1% AEP flood extent unless approved otherwise by council).

Release areas or very large infill developments will require the design of trunk drainage infrastructure. The basic philosophy is that natural creek lines and watercourses must remain largely intact and continue to function as viable ecological systems. Where the existing riparian environments are largely degraded, it is expected that the trunk drainage design will address this issue and restore ecological and habitat systems to mimic the natural condition of Western Sydney creek lines as closely as is practicable.

Solutions/designs that integrate with Water Sensitive Urban Design principles and mimic natural flow regimes and restore / enhance / maintain the existing riparian environment and floodplain should be proposed as part of the development.

The following information is for general guidance only and does not in any way constitute the only acceptable approach to trunk drainage design. The designer should be primarily interested in superior aesthetic, environmental and recreational outcomes for riparian corridors, which are a very valuable community resource. Leading edge or innovative trunk drainage design strategies will be assessed on their merits. The following are primary considerations:

1. The extent of “trunk drainage” in a catchment will be defined by areas shown as “Drainage Reserve” SP2 in the LEP, and/or flood extents mapping as defined on council’s Geographical Information System, including the following zonings RE1, E2 – E4 and RU
2. A flood analysis is to be prepared by the applicant detailing design flood modelling pre and post development and for interim conditions
3. All trunk drainage systems shall be designed for the 1% AEP event plus freeboard and in accordance with the procedures of Australian Rainfall and Runoff
4. There will be nil negative flood impact, were reasonably practical to achieve (level, velocity, hazard, loss of storage) outside of the site, and must be safely managed within the site. Council engineers will provide guidance to designers on tolerances relating to flood impacts

12.5 Hydrology

Discharge of runoff into natural waterways shall address stream forming events such as the 50%AEP events to minimise adverse environmental impacts. Strategies to achieve such a result may include drainage swales/bio-swales, rainwater tanks and other stormwater harvesting techniques, OSD and regional detention basins and wetlands.

12.5.1 Design notes

1. Design flow hydrographs for natural and urbanised catchments are to be generated in accordance with Australian Rainfall and Runoff. Rainfall runoff routing computer models such as RAFTS-XP, RORB, XP-SWMM, DRAINS, WBNM, HEC-HMS, TUFLOW or other approved equivalent models specified by council may be used as appropriate
2. Rainfall runoff models shall be calibrated or verified using historical data or alternative methods prior to use for design, if possible. The model parameters adopted shall be within the range of those published in industry guidelines (e.g. Australian Rainfall and Runoff, 2019), or model user manuals
3. Urbanised or post-development design flow hydrographs are to match those for the undeveloped natural catchment or existing catchment as closely as possible for all storm events, including general shape, flow peaks, timing, and volume of hydrographs
4. Current and future impacts of climate change on rainfall shall be assessed in accordance with existing NSW Government Policy. Alternatively, sensitivity analysis may be undertaken where specified by council

12.6 Hydraulic analysis

A low maintenance, naturalised, landscaped watercourse and floodplain is the preferred outcome. Hard engineering structures are to be avoided wherever possible in favour of more natural rock walls, riprap scour protection etc. However, rock outcrops are not common along Western Sydney creek lines and are only to be used where potential or existing scouring of creek beds and banks require such measures. Suitable sandstone is preferred to igneous rock such as granite, basalt, dolerite etc.

Designers are to factor for future ongoing asset management, how to clean with vegetation, any approvals/REF required.

Current and future impacts of climate change on flood behaviour shall be assessed in accordance with existing NSW Government Policy or as specified by council.

12.6.1 Design data

Design and freeboard provisions for urbanised water infrastructure shall comply with the criteria below in ***Table 47*** and ***Figure 56***

Table 47 Design data: freeboard provisions

ID	DRAINAGE SYSTEM	RESIDENTIAL			INDUSTRIAL / COMMERCIAL	
		LAND LEVEL (#)	HABITABLE FLOOR LEVEL	GARAGE FLOOR LEVEL	LAND LEVEL (#)	FLOOR LEVEL
1.	Trunk Drainage Creeks and open channels for 1% AEP	0.5m	0.5m	0.1m	0.1m	0.3m
2.	Overland Flow for 1% AEP	N/A	0.3m	0.1m	N/A	0.3m
3.	Basins for 1% AEP	0.15m	0.2m	0.1m	N/A	0.2m
4.	Street Drainage – Minor Systems (Gutter & Pipe Flows) below top of grate	0.15m				
5.	Street Drainage – Major Systems (Street Capacity)	Refer to ***Figure 56*** below				
6.	Spillways below top of embankment (1%AEP)	0.5m				

Land level at subdivision stage

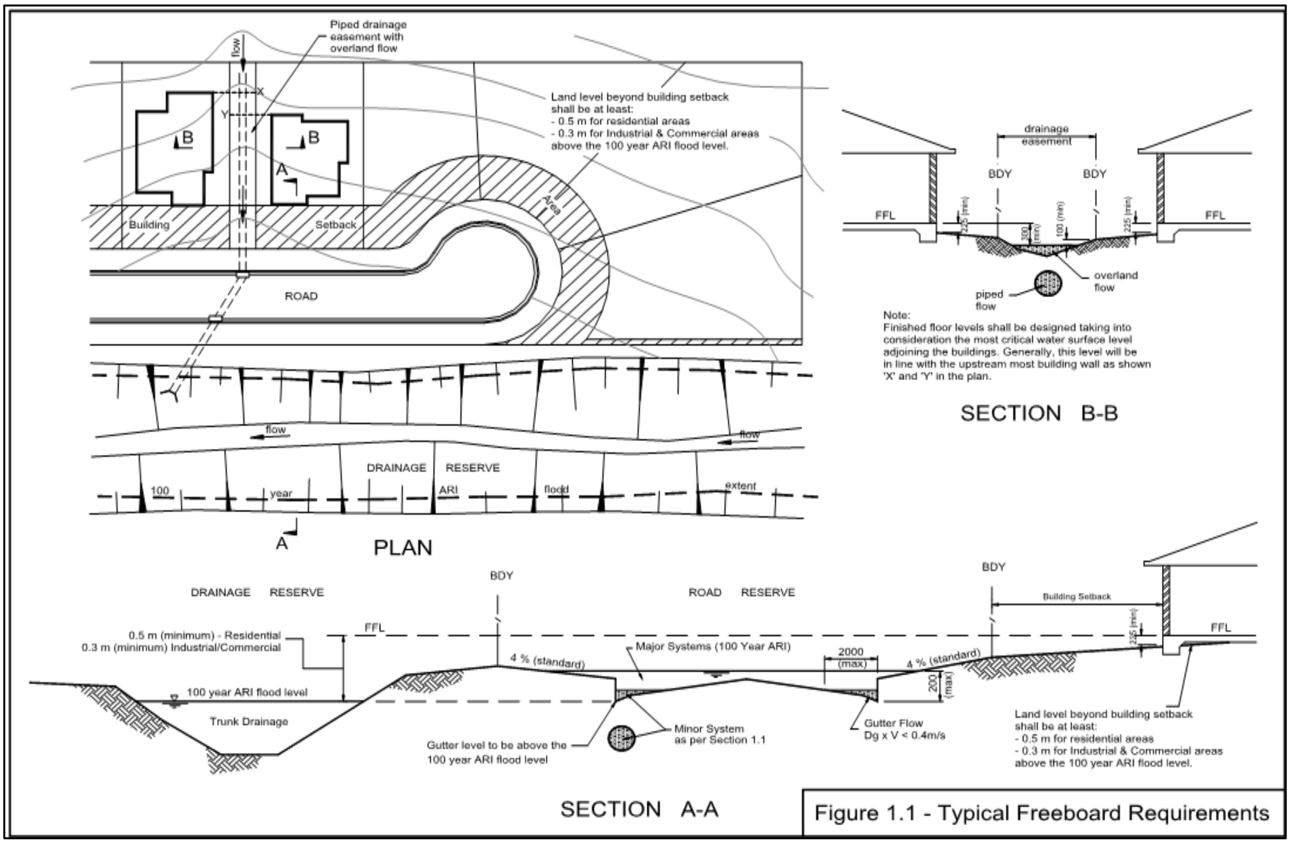


Figure 56 Typical Freeboard Requirements

12.6.2 Design notes

1. Flood behaviour in natural watercourses and urbanised channels must be hydraulically analysed using appropriate flood modelling software such as HEC-RAS, SWMM, TUFLOW, MIKE-11, MIKE-FLOOD or equivalent
2. Flood levels and extents for the 50% AEP, 20% AEP, 5% AEP, 1% AEP events and the PMF are to be provided in a digital format suitable for importation to council's GIS
3. Model input and output data files in digital format must be provided to council for checking and future reference. The modelling must be done to the council’s approved software requirements which are to be confirmed prior to commencing modelling
4. Flood modelling software must be calibrated or verified using historical data to the extent possible prior to use for design
5. Modelling procedures and parameters adopted shall be in accordance with Australian Rainfall and Runoff
6. Interlocking loose packed rock walls and riprap is preferred over gabion or mattress type structures
7. The design should aim to achieve a slow moving, steady flow regime to minimise scouring potential and maximise safety outcomes. Rock drop structures, incorporating low flow riffle zones, and dense (increasing floodplain roughness) riparian plantings may help achieve these outcomes on steeper sections of some watercourses
8. Bridges are preferred to RCBC's at street crossings and must facilitate the safe movement of fauna and provide for fish passage where appropriate, however where crossings are less than 5m wide a RCBC with armouring, aprons and fauna passage is an acceptable solution
9. Landscaping must reflect endemic flora representative of the natural riparian environment of Western Sydney creek lines
10. Freeboard clearances apply to the current climate conditions, ie no allowance for Climate Change effects.
11. Flood mapping must include hazard and risk mapping and other information that may be required by SES.
12. Flood modelling shall consider blockage factors for all trunk drainage infrastructure in accordance with the risk assessment procedures nominated in ARR 2019. Any assessment shall be nominated in the safety in design report and design measures to overcome impacts to the risk of blockage

Figure 57 Flood impact Australian urban area

Appendix A Glossary

1(V):6(H) refers to a slope of 1 vertical to 6 horizontal.

AC refers to asphaltic concrete.

Accredited Certifier means the holder of a certificate of accreditation as an accredited certifier under the *Building Professionals Act 2005* acting in relation to matters to which the accreditation applies.

ADAC - Asset Design As Constructed is a non-proprietary data specification and transport format (XML) for the description and transmission of asset design and as constructed data.

AEP refers to the Annual Exceedance Probability, which is the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year.

AHD refers to Australian Height Datum and is the datum are to be used for all levels.

AMCORD (Australian Model Code for Residential Development) refers to the Commonwealth of Australia publication ‘A National Resource document for Residential Development’ 1995.

Applicant refers to any person/s, company or entity being the owner, or representing the owner or applicant, for the purpose of applying for approval to construct the Works. The applicant may also be the council.

Approved material refers to materials approved by the Certifier before use in or on the work.

ARR refers to the latest edition of Australian Rainfall and Runoff prepared by the Engineers Australia

ARQ refers to Australian Runoff Quality: Guide to Water Sensitive Urban Design available from Engineers Australia.

AS refers to the designation used for Australian Standards published by the Standards Association of Australia and being current at the time of application.

AUSTROADS refers to association of Australian and New Zealand road transport and traffic authorities.

CBR refers to California Bearing Ratio.

Certifier means a council or an accredited certifier.

Consultant refers to a company or individual engaged by the applicant, council or superintendent to provide advice or services in a particular field of expertise as part of the works proposed by the Applicant and as cited and approved by a Certifier in a Subdivision Works Certificate.

Contractor refers to a company or individual engaged by the Applicant, council, or superintendent to undertake a specific job as part of the works proposed by the applicant and as cited and approved by council in a Subdivision Works Certificate.

Council refers to the Western Sydney Planning Partnership Councils as represented by its employees or as defined in the *Environmental Planning and Assessment Act 1979* can also be referred to as either a Certifying, Consent, Principal Certifying and Determining Authority. Under the *Roads Act 1993* the council is also the Roads Authority.

Council’s Engineer refers to either the Land Development Engineer or the Director of Infrastructure Services or similar title, of the Western Sydney council or a representative thereof unless otherwise stated.

CPTED refers to Crime Prevention through Environmental Design.

DC or Consent refers to the Notice of Determination giving subdivision or development approval.

Design Speed refers to a nominal speed fixed to determine the geometric feature of a street.

Determining Authority shall refer to either **council** and/or a **Public Authority**.

Documents refers to all Specifications, Standards, Drawings and Correspondence which are related to the works and referred to by council or issued by council.

DPIE refers to the NSW Department of Planning, Industry and Environment.

Driveway is that portion of the road reserve which is constructed to provide vehicular access across the verge from the carriageway of the street to the property. Some refer to this as a Vehicular Crossing. The whole of the driveway consists of a layback in the kerb if there is a kerb present, the concrete or other material approved by the council from the kerb line to the property boundary.

EDM refers to this Engineering Design Manual.

Engineering Plans refers to plans associated with Subdivision Works Certificates issued by the Certifier under the Environmental Planning and Assessment Act 1979, and Engineering Approvals issued by council under the Roads Act 1993 and Local Government Act 1993.

EPA refers to the NSW Environmental Protection Authority.

ESCP refers to an Erosion and Sediment Control Plan.

Excavation refers to excavation in all classes of materials and shall include the removal of loose earth, sand, clay, all growth, shale, igneous, metamorphic and sedimentary rock, ironstone, concrete, masonry, pipes and conduits.

EY refers to events per year.

Flow path refers to the overland or underground path, from the highest point to the lowest point, by which rainwater that is not absorbed into the soil during a storm event flows toward receiving waters.

Freeboard refers to the water depth used in relation to the setting of floor levels and the like, to allow for wave action, localised hydraulic behaviour and system blockages.

GPT Gross pollutant trap

LGA refers to Local Government Area.

MGA refers to Map Grid of Australia and is the coordinate system are to be used for all coordinates on plans.

NATA refers to the National Association of Testing Authorities.

NPER refers to the National Professional Engineers Register.

NCC refers to the National Construction Code Vol 2 by the Australian Building Codes Board (this has replaces the BCA).

NER refers to the National Engineering Register.

NSW SOCC refers to the NSW Streets Opening Coordination Council.

OEH refers to the NSW Office of Environment and Heritage.

OSD refers to On-site Stormwater Detention.

Owner refers to the property owner at the time (registered proprietor).

Principal Certifier (PC) for building or subdivision work means the certifier appointed as the principal certifier for the building work under section 6.6(1) or for the subdivision work under section 6.12(1) of the *Environmental Planning and Assessment Act 1979*.

Probable Maximum Flood (PMF) refers to the largest flood that could conceivably occur at a location because of the PMP.

Probable Maximum Precipitation (PMP) refers to the greatest depth of precipitation meteorologically possible for a given duration for a given size storm area at a location at a particular time of year.

PSD refers to Permissible Site Discharge.

RCP refers to Reinforced Concrete Pipe.

Restriction-As-To-User (RATU) refers to the restriction on use of lands that can be incorporated in an instrument under Section 88B of the Conveyancing Act 1919. A positive covenant may also be imposed under Section 88E of that Act.

Road Authority refers to either **Western Sydney Planning Partnership Councils**, **RMS** or a **specified Public Authority** as defined under the *Roads Act 1993*.

RL refers to the reduced level in relation to the Australian Height Datum.

RMS refers to the Transport for NSW Roads and Maritime.

RSA means Road Safety Audit.

SC - Subdivision Certificate.

Section 10.7 Certificates (were S149 Certificates).

Section 149 Certificates or S149 Certificates refer to Clause 279 of the Environment Planning and Assessment Regulation 2000 which prescribes the matters to be specified in a planning certificate under Section 149(2) and (5) of the EP&A Act.

SI refers to International System of units and are the units are to be used for all purposes.

Site refers to the area of land being developed or the works undertaken as per the application.

Superintendent refers a natural person appointed under a contract to carry out the specified duties within the contract which are generally to administer the contract fairly and impartially.

Supervisor is the on-site representative of the principal construction contractor and liaises with the superintendent, sub-contractors, and council.

Surveyor refers to a consultant that is a Registered Surveyor.

SWC - Subdivision Works Certificate.

UPVC refers to an unplasticised polyvinyl chloride.

VC refers to vehicle crossing point across a kerb

WAE refers to the Works as Executed Plan.

WHS refers to requirements under the *Work Health and Safety Act 2011*.

Works refers to the development of land as described by the Drawings and Specifications (the documents) as proposed by the applicant and as cited and approved by council in a Subdivision Works Certificate including all the area of the land being developed.

WSUD refers to Water Sensitive Urban Design.

Appendix B Codes, design standards, specifications, and references

AUSTRALIAN STANDARDS	
AS 1100.101	Technical Drawings - General Principals
AS 1100.401	Technical Drawing - Engineering survey and Engineering Survey Design Drawing
AS/NZS 1158.0	Lighting for Roads and Public Spaces - Introduction
AS/NZS 1158.1.1	Lighting for Roads and Public Spaces - Vehicle traffic (Category V) lighting Performance and Design Requirements
AS/NZS 1158.3.1	Lighting for Roads and Public Spaces - Pedestrian Area (Category P) Lighting - Performance and Design Requirements
AS 1289.0	Methods of testing soils for engineering purposes - Definitions and general requirements
AS 1289.5.1.1	Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort
AS 1289.5.3.1	Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the field density of a soil - Sand replacement method using a sand-cone pouring apparatus
AS 1289.5.8.1	Methods of testing Soils for Engineering Purposed - Soil Classification Tests - Dispersion - Determination of Emerson Class Number of a Soil
AS 1428.1	Design for Access and Mobility - General Requirements for Access - New Building Work
AS 1428.4.1	Design for Access and Mobility - Means to Assist the Orientation of People with Vision Impairment - Tactile Ground Surface Indicators
AS 1726	Geotechnical Site Investigations
AS 1742.1	Manual of Uniform Traffic Control Devices - General Introduction and Index of Signs
AS 1742.2	Manual of Uniform Traffic Control Devices -Traffic Control Devices for general Use
AS 1742.3	Manual of uniform traffic control devices - Traffic control for works on streets
AS/NZS 1906.1	Retroreflective Materials and Devices for Road Traffic Control Purposes - Retroreflective Sheeting
AS 1906.3	Retroreflective Materials and Devices for Road Traffic Control Purposes - Raised Pavement Markers (retroreflective and Non-retroreflective)
AS 2601	The Demolition of Structures
AS/NZS 2890.1	Parking Facilities - Off-street Parking
AS2890.2	Parking facilities—Off-street commercial vehicle facilities
AS 2890.3	Parking Facilities - Bicycle Parking

AS 2890.5	Parking facilities—On-street parking
AS/NZS 2890.6	Parking facilities—Off-street parking for people with disabilities
AS/NZS 3500.3	Plumbing and drainage - Stormwater drainage
AS/NZS 3725	Design for installation of buried concrete pipes
AS 3798	Guidelines on earthworks for commercial and residential developments
AS/NZS 4058	Precast concrete pipes (pressure and non-pressure)
AS 4139	Fibre reinforced concrete pipes and fittings
AS 4970	Protection of Trees on Development Sites
RMS SPECIFICATIONS	
R131	Guide Posts
R132	Safety Barrier Systems
R201	Fencing
3411	Supply of Guide Posts (Timber)
3412	Supply of Guide Posts (Non-Timber)
REFERENCE	
RMS	Guide to Traffic Generating Developments V2.2
RMS	RMS TDT 2013/04 - Updated Traffic Surveys
RMS	NSW Bicycle Guidelines V1.2
RMS	Traffic Control at Work Sites V4.0 Issue 2
RMS	Supplement to Australian Standards 1742 - Manual of Uniform Traffic Control Devices
RMS	Delineation
RMS	RMS sign Register (website)
RMS	All Supplements available (website)
RMS	"Concrete Roundabout Pavements: A Guide to their Design and Construction "
RMS	RMS Form 76 (supplement to the AUSTROADS guide)
RMS	RMS 'Concrete Pavement Manual'

Austroads	AGRD - Austroads Guide to Road Design (Parts 1 to 8)
Austroads	AGPT02/17 - Austroads Guide to Pavement Technology - Part 2 Pavement Structural Design
Austroads	APT47-06 - Austroads Revision of Guide to traffic Engineering Practice Part 8 : Traffic Control devices
Austroads	AGTM - Austroads Guide to Traffic Management (Parts 1 to 13)
Austroads	AP-T36-06 - Austroads Pavement Design for Light Traffic – A Supplement to Austroads Pavement Design Guide
Austroads	AGPT04B/14 - Austroads Guide to Pavement Technology - Part 4B Asphalt
Austroads	AP-G88/14 - Austroads Cycling Aspects of Austroads Guide
ARRB	SEA002 - Transport Research 'Sealed Local Roads Manual – Guidelines to Good Practice for the Construction, Maintenance and Rehabilitation of Pavements'
ARR	Australian Rainfall and Runoff
Australian Govt	Disability Standards for Accessible Public Transport 2002
Australian Govt	National Strategy for Ecologically Sustainable Development
CC&AA	T51 - Guide to Residential Streets and Paths
CC&CA	T56 - Guide to Residential Slabs and Footings in a Saline Environments
DSC	DSC3A to DSC3G Dam Safety Committee Guides
DSC	DSC3A - Guidelines on the Consequence Categories for Dams
NSW Police	Crime Prevention through Environmental Design (CPTED) principles and protocols
NSW Police	Safer by Design
NSW Govt	NSW Planning Guidelines for Walking and Cycling
	98/7 - Managing Urban Stormwater Using Constructed Wetlands (2nd edition)
	Policy and Guidelines for fish habitat conservation and Management (update)
	NSW Floodplain Development Manual
NSW Rural Fire Services	Planning for Bushfire Protection
	NSW State Rivers and Estuaries Policy
	Guide to Codes and Practices for Streets Opening (7th edition)
	Constructed Wetlands Manual (Vol1 & 2)

	NSW Bus Infrastructure Guide (Issue 2)
	Disability Standards for Accessible Public Transport 2002 (as amended)
	Managing Urban Stormwater - Soils and Construction (Vol 1) (4th edition)
	Map of Salinity Potential in Western Sydney
	Guidelines to accompany Map of Salinity Potential in Western Sydney
OEH	Local Government Salinity Initiative Publications (various)
	Western Sydney Salinity Code of Practice
LGSI	Site Investigations for Urban Salinity
LGSI	Indicators of Urban Salinity
LGSI	Introduction to Urban Salinity
LGSI	Roads and Salinity
LGSI	Broad Scale Resources for Urban Salinity Assessment
LGSI	Building in a Saline Environment
LGIS	Booklet No.7 - Waterwise Parks and Gardens
OEH	Processes of Salinity (Website)
NCC	NATIONAL CONSTRUCTION CODE
NCC	NCC 3.2.2.6 (Vapour Barriers)
NCC	NCC 3.3.1.0 (Masonry units)
NCC	NCC 3.3.1.0 (Mortar Mixes)
NCC	NCC 3.2.2.2 (Filling Under Concrete Slabs)
NCC	NCC 3.3.4.0 (Damp Proof courses – Material)
	FN-1181 - Fish Friendly Waterway Crossings Policy and Guidelines
	Endeavour Energy document SPJ 4004 Network Connections Contestable Works General Terms and Conditions 'Section 6 - Public Lighting Assets'
	Water Sensitive Urban Design - Technical Guidelines for Western Sydney
	Australian Runoff Quality

AMCORD	AMCORD (Australian Model Code for Residential Development) 'A National Resource document for Residential Development'
Acts **(all NSW Acts and Regulations are available at** https://www.legislation.nsw.gov.au/#/**)** **Reference is to be made to the latest in force Acts and Regulations**	
	Environmental Planning and Assessment Act 1979
	Local Government Act 1993
	NSW Dams Safety Act 2015
	Protection of the Environment Operations Act 1997
	Roads Act 1993
	Soil Conservation Act 1938
	Water Management Act 2000

Appendix C Drawing requirements

C.1 Processes

Engineering designs for subdivisions, land development and capital infrastructure work requires specialist knowledge and accordingly council must be satisfied with the competence and suitability of engaged consultants. This gives rise to the requirements for Accredited Professionals to endorse submissions as covered in ***Section 2.9*** of this Manual.

Council requires that design drawings, prepared in accordance with council's requirements, be designed and endorsed by suitably experienced people. Each prepared design drawing is to be endorsed on each drawing, by a suitably accredited professional, with proven experience in the preparation of designs, for land development or capital works infrastructure.

After the applicant has received notification of Development Application approval, and if such approval includes conditions requiring the carrying out of any work such as the construction of streets, the building of drains, stormwater systems, culverts, bridges and the like, the requisite engineering drawings and specifications, where necessary, adequately describing the same in accordance with the standards and principles defined in this Engineering Design Manual and council's Engineering Construction Specification shall be first submitted along with an appropriate application and payment of fees to obtain a Subdivision Works Certificate before any such work is commenced.

The lodgement of complete submissions at the appropriate time will assist in the efficient processing and approval of such submissions. Consultants are advised to fully address the peculiarities of each site and the impact on adjoining land to ensure that proposed construction works are acceptable in terms of safety and operational effectiveness.

Initially one A3 paper copy and one digital copy in PDF of the engineering drawings with the relevant stormwater data plus the Subdivision Works Certificate application and the relevant fee shall be forwarded to the certifier for approval.

If council is the certifier, and the plans require amendment, council will return the plans for amendment. One A3 paper copy, and a digital copy in PDF as well as council's 'marked up' drawings shall then subsequently be forwarded to council and so on until the drawings are approved. It should be noted that an additional Subdivision Works Certificate fee shall apply for checking of subsequent amended engineering drawings.

For capital works, delivery of design drawings and documentation, shall be in accordance with the scoping requirements of the procurement arrangement entered into, by the professional services consultant.

C.2 Submission Drawings

In this Engineering Design Manual "Submission Drawings" means any set of drawings used to present engineering details associated with development work or new work being undertaken by a developer or a council.

C.2.1 Plans

(a) Plans for submission will be provided in digital format as PDF without password security. Paper plans can be submitted in A3. Plans should be drawn in native file at A1 size or A3 size.

(b) Plan size, lettering, line work and symbols are to conform to the relevant part of AS1100.101 and AS1100.401.

(c) Minimum font size at A1 sheet size is to be 3.5mm.

(d) Maximum number of integers following the decimal point is to be two only, eg RL28.54, CH132.48.

(e) When dimensions are less than 1.0m these are to be expressed in mm, eg 950mm NOT 0.95m.

(f) All Plans submitted for approval shall be provided using SI units and all levels shown shall be to the Australian Height Datum (AHD) and in Map Grid of Australia (MGA) coordinate projection with relevant date to ensure correct projection of all plans.

C.2.2 Scales

Scales of all Submission Drawings are to be shown by bar scales as follows:

(g) Engineering Detail Plan - 1:1000, 1:500 or 1:200 or 1:250

(h) Street Longitudinal Section - 1:100 (vertical) to 1:500 (horizontal)

(i) Street Cross Section - 1:100 or 1:200 Natural or 1:100 (vertical) to 1:200 (horizontal)

(j) Intersection Details - 1:250, 1:200 or 1:100

(k) Layout Plan - 1:500, 1:1000, 1:2000 or 1:4000

(l) Catchment Plan - 1:500, 1:1000, 1:2000 or 1:4000 (for external catchments)

(m) Locality Plan - 1:500, 1:1000, 1:2000 or 1:4000

(n) Kerb Return Plan - 1:200

(o) Kerb Return Longitudinal Section - 1:100 (vertical) to 1:200 (horizontal)

(p) Details - 1:10, 1:20, 1:50 or 1:100 as required

C.2.3 Drawing title

All sheets must show the following information in the title block:

(a) Development Consent and/or Subdivision Works Certificate number

(b) Property Description

(c) Owner/applicant

(d) Surveyor/Engineer

(e) Scale and Datum and projection

(f) Plan Number and Sheet Number

(g) Description of Work on Sheets

(h) Amendment/revision number, date and description

C.2.4 Drawing details

The following items shall be detailed in the drawings, and the layout of each shall be on a separate sheet unless otherwise approved by the **Certifier**:

(a) A Cover Sheet with a suitable Locality Plan, List of Final Drawings with revision identifier, DA and / or SWC number and the name of the council

(b) General Layout Plan

(c) General Notes are optional as required by individual councils. Where no General Notes are provided on the drawings they must be covered in Specifications and/or Special Conditions of Contract

(d) Site Regrading/Bulk Earthworks and/or filling including contour information and site sections

(e) Tree Management Plan showing trees to be retained and trees to be removed (can be on Bulk Earthworks plan for small sites) as represented in the arboricultural report for the project

(f) Soil and Water Management Plan (Erosion and Sediment Control Plan)

(g) Streets and Kerb and Gutter

(h) Drainage, ie stormwater system details including pipe long sections, pit numbers and catchment details

(i) Water Quality facilities

(j) Landscaping Plan including all existing and proposed trees, shrubs and groundcover, soil types, watering, and drainage provisions

(k) Traffic Control Plan (if required)

(l) Traffic Management Plan (if required)

(m) Parking Plan (if required)

(n) Structural Plans, e.g. Pits (if required are to be certified by an Accredited Professional)

(o) Other Structures, e.g. Dams, detention basins (if required)

(p) Identified Extent of Flooding (if applicable) for 20%, 1% AEP and PMF critical events

(q) Demolition plan where any demolition is proposed

(r) Swept Path plan where any intersections are not an Acceptable Solution

(s) A north point is to be provided on each drawing to indicate the orientation of the plans

(t) All drawings shall be signed by the respective Design Consultant engaged by the owner/applicant

C.2.5 Detailed street design drawings

C.2.5.1 Layout plans

These plans shall be drawn to an appropriate scale as provided in ***Appendix C.2.2*** and will illustrate everything in the road reserve including hard infrastructure and non-frangible trees including but not limited to the following:

(a) Boundaries of street reserves, pathways, public reserves, lots, lot numbers and easements both existing and proposed in relation to street chainages

(b) Public Road, Private Road and Pathway numbers or names

(c) Existing contours, spot levels and final surface design contours (min interval 0.5 metre) to AHD including:

1. The whole street width for existing public streets to the boundary on the opposite side of the street
2. At least 20m beyond the boundaries of the site fronting an existing public street or future street
3. At least 20m beyond the boundary of the site showing existing, proposed and future levels and features

(d) State Survey Marks including Northing and Easting coordinates in MGA format, with ties to existing boundaries and Benchmarks to AHD

(e) Existing and proposed services allocation e.g. power lines (overhead and underground), Gas, telecommunications, water etc

(f) Existing natural features such as cliffs, watercourses, swamps, dams, ditches

(g) Existing constructed features including building structures, retaining walls, fences, kerb and gutter, street pavement, pipe, pits, existing wastewater facilities and adjacent subdivisions

(h) Limits of work

(i) Road chainage pegs and other survey lines and sections

(j) Schedule of symbols and notation of items e.g. kerb and gutter, gully pits, pipelines

(k) Kerb and gutter alignment and concrete path paving

(l) Existing and proposed drainage lines and structures suitably numbered and location chainages. Identified extent of flooding (if applicable)

(m) Proposed fencing and retaining wall details

(n) Details and schedule of subsoil drainage lines

(o) Notation regarding provision of guideposts and guard fences

(p) Street centreline bearing radii and chainages, kerb return and cul-de-sac kerb alignment radii and chainages

(q) Show any centreline line marking of a street

(r) Tangent points to curves

(s) The location and level of all existing utility services including pits, poles and structures with construction notes relating to any necessary alterations

(t) Pavement requirements, surfacing requirements, lead in and tail out works, pipe types and classes, drainage structure types, kerb types, concrete strengths, pipe bedding types

(u) Footpath and carriageway widths

(v) Street Furniture e.g. street, speed, warning and regulatory signs, guideposts, street lighting, bus shelters

(w) Site regrading areas indicated by shading

(x) Extent of cut and fill batters of significance

(y) Significant trees with trunk diameters greater than 100 mm measured 1 metre above the ground

(z) Location of bus stop construction

(aa) Kerb return numbers

(bb) Proposed utility and service crossings

(cc) Location of parking bays

(dd) North point

C.2.5.2 Street longitudinal section

The longitudinal section of the centreline of all streets shall be drawn at scale of 1:500 horizontal and 1:100 vertical and will illustrate:

(a) Chainages running left to right across the page and extend 20m beyond the new road to show how the new road fits into the landscape context

(b) Reduced level of existing surface

(c) Design levels of street centre lines

(d) Design grades and length of vertical curves and horizontal curves

(e) Chainage and RL of each intersection point

(f) Chainage and RL at Intersection with other streets

(g) The chainage and level of each crest and sag point

(h) Position and levels of culverts, drainage lines and public utility mains

(i) Work as executed rows for street surface and drainage as required

(j) Limits of construction

(k) Proposed street name and number

(l) Longitudinal levels shall be taken at a maximum of 15 metre intervals and at all intermediate changes of grade

(m) Longitudinal sections shall not be terminated at the extent of works but shall be levelled a distance of 15 metres or as required beyond the limit of works to show transitions to existing street levels

(n) Where construction and/or reconstruction adjoins an existing street, the longitudinal section shall extend for at least 20m but preferably 100 metres beyond the proposed extent of works or as required to reasonably assess smooth transition

(o) Existing and proposed services allocation e.g. power lines (overhead and underground), Gas, telecommunications, water etc

C.2.5.3 Street cross sections

Cross sections shall be drawn at an appropriate natural scale as provided in ***Appendix C.2.2*** and be provided at a maximum of 15 metre intervals. In addition, cross sections shall be drawn at sag points, kerb tangent points and transition points. Cross sections will be drawn at least property line to property line showing the full road reserve. Cross-sections may need to be extended to show level changes from the public domain to private property and should extend 10m beyond the property boundary to ensure there is no blockage to existing overland flow paths.

For Rural roads, cross sections shall be supplied as above and at all culvert sites and at the transition points around super elevated curves if applicable. Rural road cross-sections shall be defined at 10 metre chainages for curves under a radius of 1000 metres.

Where construction and/or reconstruction adjoins an existing street, the cross-sections shall extend for at least 20m but preferably 100 metres beyond the proposed extent of works or as required to reasonably assess smooth transition.

Cross sections shall illustrate:

(a) Street centreline chainage below each section

(b) Offset chainage from the pegged centreline

(c) Reduced levels of existing surface

(d) Design levels of pavement, top of kerb, invert and lip of gutters and at concrete paths

(e) The position, size and level of any existing public utility, mains, cables and services affecting the work

(f) Existing and proposed street reserve boundaries including adjacent property boundary alignments

(g) Work as executed row

(h) Proposed street name and number

(i) For areas with considerable cut and fill earthwork proposed, RL for adjoining property will be required

(j) Existing and proposed services allocation e.g. power lines (overhead and underground), Gas, telecommunications, water etc

A typical cross section is to be included at a scale of 1:100 vertical, 1:200 horizontal. Typical street cross sections are to be provided for each street as additional detail on at least one cross section on each sheet of cross sections or alternatively, may be provided separately as a set of typical cross sections. The additional detail for a typical street cross section will illustrate the following:

(a) Footway and carriageway widths

(b) Crossfalls

(c) Pegged centrelines

(d) Kerb type

(e) Kerb line

(f) Boundary line

(g) Typical batter slopes for cut and fill with batter slopes to have a maximum slope of 1(V):4(H)

(h) Differences in levels offsets, relative to the centreline

(i) Type of surfacing

(j) Subsoil drainage

(k) Footpath location and standard if required

Where a proposed street makes a junction with an existing street, longitudinal and cross sections extending at least 50 metres either side of the centre line intersection point of the existing street shall be submitted. The cross sections shall include sections at the tangent points and kerb returns.

C.2.5.4 Intersection, cul-de-sac and turning head plans

A contour plan at an appropriate scale as provided in ***Appendix C.2.2*** and must be drawn showing the finished level at all intersections, cul-de-sacs and turning heads.

All intersections shall have two-way crossfall.

Each plan shall include the following:

(a) Reference points corresponding with points shown on the kerb return profile

(b) Contours at minimum 0.1 metre interval

(c) Kerb return and centreline chainages

(d) Radii of kerb returns

(e) Kerb return numbers if applicable (are to be shown on a separate kerb return plan)

(f) Tangent points identified by chainage

(g) Location of drainage pits and other structures

(h) Swept paths and Traffic Control Devices Plans/ details (for Local Traffic Committee approval)

C.2.5.5 Kerb return longitudinal sections

The design of kerb returns is necessary at all street junctions to ensure a smooth trafficable surface around the return and where necessary to locate low points for drainage purposes.

Kerb return longitudinal sections shall be drawn at an appropriate scale as provided in ***Appendix C.2.2*** for all kerb returns and culs-de-sac.

Each kerb return longitudinal sections shall have a kerb return number corresponding with a number shown on the plan view.

The profile shall represent the view as looking from the street to the face of the kerb. The kerb return profile shall show:

(a) Chainages – both the running chainage related to the profile together with the chainage related to the street centreline

(b) Design kerb lip RL – with a minimum grade of 1%

(c) Existing kerb lip RL

(d) Gradings, vertical curves and radii

(e) Sags and crests

(f) For tie ins to existing kerbs a 15metre tail out showing transition in and out of kerb return

(g) The applicable street name and number leading into the profile

(h) Instantaneous grade at beginning and end of kerb return profile if applicable
(i) Work as executed row

C.2.5.6 Kerb return plan view

Each kerb return must have a plan view drawn at 1:200. The plan must have, but not limited to the following:

(a) Kerb return numbers
(b) Contours at maximum 0.1 metre spacing
(c) All proposed drainage lines and structures
(d) Reference points corresponding to long sections
(e) Lip lines
(f) Maximum depth of ponding at sag points limited to 150 mm – show extent in plan view as well
(g) Two-way crossfall 2% minimum, 4% maximum
(h) Minimum kerb return radius in accordance with the standard drawings to the face of the kerb

C.2.6 Detail drainage drawings

C.2.6.1 General requirements

(a) Stormwater drainage design details shall be submitted with the engineering details and shall include but not be limited to methods, parameters, assumptions made for design purposes and calculations and certifications from the consultant that it has been prepared in accordance with the current edition of Australian Rainfall and Runoff.
(b) Full catchment details including areas are to be provided for checking with all stormwater drainage design. The extent of the catchment including that outside the development must be shown and accounted for in the calculations.
(c) Each pit sub-catchment shall have a reference number/letter which must be consistently used on both the catchment plan, drainage calculation sheet and in the associated computer modelling
(d) Show proposed ownership and any land dedication applicable
(e) Show phasing of any interim and permanent facilities
(f) Identify and assess connectivity to future and masterplanned facilities
(g) Identify and assess values of the receiving waterway system and environment
(h) Identify and assess activities or land uses with potential to damage the local or receiving environment
(i) Identify stormwater threats
(j) Identify the legal point of discharge
(k) Identify flood extents and that the development is in accordance with the flood policy

C.2.6.2 Catchment plan

A contoured catchment plan shall be provided at an appropriate scale as provided in ***Appendix C.2.2*** shall show:

(a) The total catchment area that will drain to the downstream boundary of the development in hectares
(b) The boundaries of all sub-catchment with contributing pervious and impervious areas in hectares or m2, with sub-catchment names or labels, existing or known proposed cadastre and road network layout plans

(c) Defined watercourses and drains, either natural or manmade, and marsh/swamp areas

C.2.6.3 Drainage layout plan

A drainage layout plan shall be incorporated in the General Arrangement Plan and shall show:

(a) Boundaries of lots, streets, easement etc.

(b) Existing and proposed drainage lines (both major and minor routes) identified with line numbers, pipe diameters

(c) All drainage structures numerically identified and located by centreline chainage

(d) Limits of open channels, inlet and outlet drains

(e) Schedule of existing and proposed drainage structures including type, size, cover/lid description and identification number

(f) The location of any public utility mains and cables crossing influenced by the work

(g) Finished contours, crests and sags in streets

(h) Table drains, overflow paths, pathways, private streets, streetways, all notable vegetation

(i) Manmade features including control structures, energy dissipaters, detention basins, dams, edge of bitumen, kerb and gutter and fences

(j) 1% AEP flood line and FPL if applicable, include 10%, 5% and PMF where required by the council

(k) 5% AEP flood line where on-site wastewater disposal is proposed

(l) Overland flow paths for storms up to the 1% AEP and calculations showing flows are contained within street reserves, public reserves or drainage channels/swales, assuming pipelines and pits are 50% blocked for sag pits and 20% for grade pits

(m) An additional scenario must be run with no blockage. Blockage scenario will give the required pit configuration Non-blockage scenario will give the required pipe configuration

C.2.6.4 Drainage calculations

A drainage report shall be presented generally in the form shown in Australian Rainfall and Runoff (2019). The drainage calculations shall be included in the Design Report for the DA and SWC / CC Submission.

C.2.6.5 Longitudinal sections

The longitudinal section shall be plotted on the sheet so that the chainages run left to right across the sheet starting at the upstream end of the system and shall be drawn:

(a) To a scale of 1:500 horizontal

(b) The furthest downstream pit shall be shown on the left side of the longitudinal section or at the starting chainage.

(c) Pits shall be sequentially numbered followed by the drainage line alphabetic designation. Pits shall be clearly labelled and matched with the plan drawing(s).

(d) To a scale of 1:100 vertical

The longitudinal section shall show:

(e) Running chainages along the drainage line together with street centreline chainages where applicable

(f) Reduced levels to AHD of natural surface and finished surface levels

(g) Existing invert of drain where applicable

(h) Design invert level and grade of pipelines, open drains, channels, and watercourses

(i) Lead in and tail out works to match existing forms

(j) Invert levels at pit inlet and outlet

(k) Alignment, length, and design invert levels of stub lines

(l) Datum levels to AHD

(m) Pipe diameter, pipe type, pipe class and joint type

(n) Capacity in m^3/s, design discharge flow in m^3/sec and discharge velocity in m/s

(o) Hydraulic grade line and levels

(p) The accurate position and level of any proposed and existing major utility and services in the vicinity of the pipeline

(q) Drainage structures

(r) 1% AEP water level in open channels including backwater effects

(s) Velocity and flow depth product (in the case of open channels)

(t) Work as executed row

C.2.6.6 Cross sections

For the case of open channels, cross sections shall be detailed at minimum 10 metre intervals and maximum of 30 metre intervals. Cross sections shall extend to show at least 5 metres either side of the proposed open channel works to show the transition with the natural form. Obstructions such as buildings, fences, constructions etc shall also be detailed, where necessary, to provide for the calculation of backwater effects.

Open channel cross sections shall be drawn at a scale of 1:100.

Generally, survey information is to be provided for a minimum of 50 metres upstream and downstream of the work.

C.2.6.7 Special drainage structures

Any drainage structures not covered by the Standard Drawings shall be drawn to a scale of 1:20 or as otherwise suitable for the required detailing.

C.2.7 Structural drawings

Structural drawings of any building or structure not detailed in the Standard Drawings shall be submitted at an appropriate scale.

The design and specification for all load carrying structures shall be prepared by an Accredited Professional and certified on the plans by an Accredited Professional, that the structure has been designed to Australian Standards and will resist the imposed design loads. Upon completion of the structural work, an Accredited Professional must certify that the structural work has been constructed in accordance with the approved plans.

C.2.8 Approval of engineering plans

Engineering Plans will be checked by a Certifier for compliance with the Engineering Design Manual. This does not imply that all calculations and designs will be scrutinised. It is the entire responsibility of the owner/applicant submitting the documents, to ensure that the designs comply with the following:

(a) Development Consent

(b) Engineering Design Manual for Western Sydney

(c) Council’s Engineering Construction Specification

(d) Relevant Australian Standards (current)

(e) Relevant Local, State and Federal Government Legislation

(f) Current engineering best practice

Subdivision Works and Compliance Certificates for Subdivision and Development Works are to be issued by a Certifier in accordance with the *Environmental Planning and Assessment Act 1979*.

Engineering approvals from council for all Subdivision and Development Works on or adjacent public streets must be issued in accordance with the *Roads Act 1993*. As part of these Works the RMS may have provided conditions are to be included in the DA consent. If so, RMS concurrence/approval of the design must be provided to council prior to issue of a Subdivision Works Certificate.

The council's approval is conditional on the above basis and does not relieve the owner/applicant from rectifying any errors or omissions, which become evident during construction.

If work has not commenced prior to the lapsing of the development Consent, the Development Application and associated Subdivision Works Certificate has lapsed a new Application and revised Engineering Plans must be submitted with the appropriate fees for approval.

C.3 Drawing standard notes

The standard notes provided below shall be included on the submission drawings when required by the council or in the technical specification or special conditions of contract for the project.

C.3.1 General notes

G1 All work is to be carried out in accordance with the Engineering Design Manual (this document) and Engineering Construction Specifications and to the requirements of the Principal Certifier

G2 Inspections by a Certifier are required at the following stages and the works approved prior to continuing work:

(a) Following installation of erosion and sediment control structures/measures
(b) Prior to backfilling pipelines, subsoil drains and dams
(c) Prior to casting of pits and other concrete structures, including kerb and gutter but following placement of footings, formwork, and reinforcement
(d) Prior to placement of subbase and all subsequent pavement layers, a proof roller test of each pavement layer is required
(e) Formworks prior to pouring concrete for footpath and other associated work
(f) Prior to backfilling public utility crossings in road reserves and share paths
(g) Final inspections after all works are completed and 'works as executed' plans have been submitted to council

G3 No trees or vegetation is to be removed or damaged unless approval is granted by council's Landscape Compliance Officer or as authorised by Development Consent

G4 Make smooth junctions with existing works

G5 No work is to be carried out on council property or adjoining properties without the written permission from the owner/s

G6 Vehicular access and all utilities/services are to be maintained at all times to adjoining properties affected by construction

G7 All rubbish, buildings, sheds and fences are to be removed to satisfaction of the Principal Certifier

G8 **Certifiers** have discretion to vary, as considered necessary, the engineering requirements in respect of a particular subdivision or development having regard to the site context

G9 Vibration and compaction works shall be managed to minimise impact on adjoining properties

G10 A dilapidation report is required prior to commencement of any work other than installation of soil and water management measures

G11 Should unexpected contaminated materials be found on site work shall cease until an assessment is conducted by a contaminated lands specialist Accredited Professional

C.3.2 Earthworks notes

E1 Earthworks are to be carried out to the satisfaction of the council. Unsuitable materials are to be removed from streets and lots prior to filling. The contractor is to arrange and make available compaction testing results for all areas that contain fill in excess of 200 mm

E2 Compaction of earthworks shall continue until a dry density ratio of 95% for site filling and 100% for street pavement subgrades has been achieved in accordance with test method **AS 1289.5.3.1** or **AS 1289.5.1.1.** The control testing of earthworks shall be in accordance with the guidelines in **AS 3798**. Where it is proposed to use test method **AS 1289.5.8.1** to determine the field density, a sand replacement method shall be used to confirm the results

E3 A suitably qualified Geotechnical Engineer, shall have a level 1 responsibility, unless agreed otherwise by the council, in accordance with AS 3798, for all filling as defined in **AS 3798**, and at the end of the works shall confirm the earthworks comply with the requirements of the specification and drawings by written notification

E4 In areas to be filled, where the slope of the natural surface exceeds 1(V):4(H), benches are to be cut to prevent slipping of the placed fill material as required by the council

E5 All batters are to be scarified to a depth of 50 mm to assist with adhesion of top soil to batter face

E6 Provide minimum 100 mm and maximum 300 mm topsoil on footpaths, filled areas and all other areas disturbed during construction. Topsoiled areas are to be stabilised with approved vegetation a maximum of 14 days after topsoiling and are to be watered to ensure germination

E7 The contractor shall control sedimentation, erosion and pollution during construction in accordance with the requirements of '**Managing Urban Stormwater - Soils and Construction'** produced by Landcom. Measures must be reviewed for suitability and maintained throughout the life of the project

E8 A minimum 1 metre wide, continuous strip of couch grass with return for every 10m (as per 'Blue Book' SD6-13) shall be placed behind the back of all kerbs and other concrete structures immediately after the completion of the footpath grading or other elements as applicable and shall be maintained and replaced as required during the construction maintenance period

E9 Waste material is to be classified and disposed of at a facility licensed to receive the waste

C.3.3 Roadworks notes

R1 Subgrades and subbases are to be compacted in accordance with council's Construction Specification. Density tests and confirmation that the results have satisfied the requirements of the engineering specification must be provided to council and approval obtained prior to the next layer being installed

R2 Subsoil drains are to be provided on both sides of streets (except where there is stormwater drainage)

R3 150 x 50 H.D. galvanised steel kerb outlets (200 x 100 in Hawkesbury) or a proprietary kerb adaptor where accepted by the council are to be placed in all kerb types on low side of lots. The outlet is to continue across footway to 300mm within the property boundary, an elbow shall be installed to bring the pipe to the surface and the pipe end capped to prevent entry of foreign material

R4 Lipless perambulator crossings are to be provided in all kerb returns and where required by council.

R5 Service conduits are to be placed as directed by all public utility authorities including but not limited to Endeavour Energy, NBN or other telco, Jemena and Sydney Water

R6 Proposed utilities and services crossing existing streets shall be provided for using a trenchless technique so as not to damage the existing surface. All service conduits under streets must be laid to a minimum depth of 750 mm.

R7 All temporary streets must be temporarily sealed with a two-coat flush seal

R8 All permanent streets must be sealed in accordance with the approved drawings

R9 Signposting and line marking shall conform to **AS 1742.2**, **'RTA Supplement to Australian Standards 1742'**, the '**RTA Delineation'** Guidelines and **RMS Signs Database**. Raised retro-reflective pavement markers to conform to **AS/NZS 1906.1** and **AS 1906.3** are to be provided. All aprons and kerb face on central islands of roundabouts and all other islands are to be delineated by reflective white marking

R10 All lot numbers and street names must be stencilled on kerb face unless required otherwise by the council

R11 Street signs to council standard using materials consistent with AS1906 Retro-reflective Materials and Devices for Road Traffic Control Purposes must be installed by the contractor

C.3.4 Stormwater notes

S1 All pipes are to be spigot and socket, rubber ring jointed

S2 All longitudinal pipelines in streets must be located under kerb and gutter and be backfilled with approved granular material unless otherwise approved by the **Certifier**

S3 Drainage lines must be backfilled with approved granular material in trafficable areas. Three (3) metres of subsoil drainage wrapped in geotextile stocking must be provided to all downstream pits

S4 All gully pits to council's standard and lintels centrally placed at sag pits

S5 All pits must be benched and streamlined. Reinforcement and galvanised step irons must be provided to all pits over 1.2 metres deep as measured from the grate / lid opening to the invert of the pit

S6 Concrete is to have minimum compressive strength of 25MPa at 28 days unless otherwise approved by the **Certifier**

S7 All interallotment drainage must have a minimum pipe diameter of 150 mm and a minimum grade of 1% unless otherwise approved by the **Certifier**

S8 All interallotment drainage lines must be laid centrally within drainage easements. Inspection pits must be provided for each lot and at all changes of grade and direction

S9 Interallotment drainage lines must be installed after Sydney Water sewerage lines have been installed where sewer is proposed adjacent to interallotment drainage lines

S10 1% AEP overland flow paths must be formed and shown on 'works as executed' drawings

S11 All plans (both design and WAE) are to clearly delineate the extent/location of flood lines including the 5% AEP, 1% AEP and PMF, where the PMF has been determined

S12 Adequate provision is to be made to prevent scouring and sedimentation for all drainage works in accordance with council's requirements

S13 Pit lintels are to be stencilled with applicable destination stencil available from council

S14 Catch drains must be constructed as required by the approved plans or the Principal Certifier

S15 Soil and Water Management Plans are to be prepared for all sites and adhered to at all times during the construction and maintenance periods. Plans must address and make provision for the dynamic nature of the site for each stage of the development

C.3.5 Soil and water management notes

SC1 All soil and water management (erosion and sediment control measures) are to be installed and maintained in accordance with '**Managing Urban Stormwater - Soils and Construction**' Edition 4 published by Landcom

SC2 All soil and water management measures shall be implemented prior to the commencement of any work being carried out. All measures shall be maintained and kept in place for the duration of the works and may only be removed upon final stabilisation of the site

SC3 All soil and water management measures shall be constructed and maintained as indicated on the approved drawings. The actual location and extent of soil and water management devices shall be confirmed on site prior to commencement

SC4 The contractor shall be solely responsible for the control of erosion and sedimentation to the satisfaction of council and shall inform all subcontractors and all employees of their responsibilities with regards erosion and sediment control

SC5 When any sediment is deposited on an existing public street it is to be removed by the end of the day it is deposited by use of a vacuum sweeper truck. No sediment is to be washed off into drainage pits, structures, swales, natural water courses or other receiving waters

SC6 The contractor shall regularly maintain all soil and water management measures to the satisfaction of the superintendent and council. Repairs and maintenance shall be undertaken as required, particularly after storm events

SC7 A self-auditing program shall be established based on a check sheet developed for the site. A site inspection using the check sheet shall be made by the **Site Supervisor** at least weekly, immediately before site closure, and immediately following rainfall events greater than 5 mm in 24 hours

SC8 Site access shall only be achieved via a truck shaker at the designated access point as shown on the approved plans. The truck shaker is to be regularly maintained to ensure effectiveness

SC9 Dust control measures and vibration impact control shall be implemented continuously during construction works. Such measures are to be to the satisfaction of the superintendent and council

SC10 The areas over stormwater and sewer lines and electricity, telephone and gas supply trenches are to be seeded and mulched as soon as possible but no later than within 14 days after backfilling

SC11 No more than 150 metres of trench is to be open at any one time

SC12 Stockpiles shall be in low mounds no more than 2 metres high and not located within 5 metres of hazard areas, including likely areas of concentrated or high velocity flows

SC13 The contractor shall stabilise all stockpiles and disturbed areas, by hydroseeding or as directed by the superintendent or council, as soon as they are formed to final levels. All seeded areas shall be watered at least twice weekly until grass cover is established

SC14 All temporary earth berms, diversion and sediment basin embankments are to be track rolled, seeded or mulched for temporary vegetation cover as soon as they have been formed

SC15 All fills are to be left with a windrow at least 200 mm high at the top of the slope at the end of each day's earthworks, and all earthwork areas shall be rolled each evening to "seal" the earthworks

SC16 Stabilisation of all cut and fill slopes shall be commenced within 14 days of completion of formation

SC17 Upon completion of final earthworks or after written direction of council, immediate silt conservation treatments shall be applied so as to render areas that have been disturbed, erosion proof within 14 days

SC18 All erosion and sediment control measures affected by works shall be re-established prior to the completion of each day's work

SC19 All topsoil is to be stockpiled on site for re-use (away from trees and drainage lines). Measures shall be applied to prevent erosion of the stockpiles

SC20 A strip of turf is to be placed immediately behind the kerb and gutter on all new streets and at additional locations as determined by the **Certifier**

SC21 Topsoil shall be re-spread on disturbed areas as required and stabilised as soon as possible and within 14 days of disturbance. All disturbed areas shall be left scarified to encourage water infiltration and assist with keying of topsoil

SC22 Sediment basins shall be maintained for the entire duration of the project or until such time as all disturbed areas are stabilised or until ultimate design - WSUD bio-retention Basin completed satisfactory

SC23 Any basins are to be de-silted shall be flocculated to settle any suspended solids. Upon approval from council, clear water shall then be pumped out in a manner that will not cause downstream erosion. When dry, the silt shall be mixed with topsoil for future spreading or removed from site

SC24 The contractor shall maintain a logbook detailing:

(a) Records of all rainfall
(b) Daily condition of all soil and water management measures
(c) Any application of flocculation agents to sediment basins
(d) Method and volume of water discharged from basins
(e) Any additional remedial works required

The logbook shall be made available to any authorised person upon request and issued to the project manager upon completion of works.

SC25 All final erosion prevention measures, including establishment of grassing, are to be completed prior to the final inspection of the works

SC26 Where a site will be filled using imported material a wheel wash is to be installed to ensure that no sediment is tracked onto existing public streets

Appendix D Submission Checklist - Development Application

ID	SUBMISSION CHECKLIST DEVELOPMENT APPLICATION	DESIGNER Yes/No/NA	CERTIFIER Cross-check
1.	**Submission Drawings**		
1.1.	Submission Drawings have been prepared to satisfy the requirements of ***Appendix C*** of the Engineering Design Manual for Western Sydney		
2.	**Design Report**		
2.1.	A Design Report endorsed by an Accredited Professional accompanies this submission		
2.2.	The Design Report considers and details how the design has addressed safety of all users of the proposed works		
3.	**Varying the Acceptable Solution**		
3.1.	Where it is intended to Vary the Acceptable Solution, details are contained in the Design Report		
3.2.	A risk assessment has been undertaken as part of the submission to Vary the Acceptable Solution		
4.	**Other associated submissions**		
4.1.	Other associated submissions have been endorsed by the relevant accredited professional as listed in ***Table 2*** of the Engineering Design Manual for Western Sydney		
5.	**Checklist Endorsement**		
5.1.	Where the Designer responds No or NA the reasons why are set out in the Design Report		
5.2.	Name of person endorsing this checklist		
5.3.	Accreditation of person endorsing this checklist		
5.4.	Accreditation number of person endorsing this checklist		
5.5.	Signature of person endorsing this checklist and date		
6.	**Cross-check by Certifier**		
6.1.	Name of certifier and registration number		
6.2.	Signature of certifier and date		

Appendix E Submission Checklist - Drawings

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
1.	**Plans**		
1.a.	Plans for submission will be provided in digital format as PDF without password security. Paper plans can be submitted in A3. Plans should be drawn in native file at A1 size or A3 size		
1.b.	Plan size, lettering, line work and symbols are to conform to the relevant part of AS1100.101 and AS1100.401.		
1.c.	Minimum font size at A1 sheet size is to be 3.5mm.		
1.d.	Maximum number of integers following the decimal point is to be two only, eg RL28.54, CH132.48.		
1.e.	When dimensions are less than 1.0m these are to be expressed in mm, eg 950mm NOT 0.95m.		
1.f.	All Plans submitted for approval shall be provided using SI units and all levels shown shall be to the Australian Height Datum (AHD) and in Map Grid of Australia (MGA) coordinate projection with relevant date to ensure correct projection of all plans.		
2.	**Scales**		
2.a.	Engineering Detail Plan - 1:1000, 1:500 or 1:200 or 1:250		
2.b.	Street Longitudinal Section - 1:100 (vertical) to 1:500 (horizontal)		
2.c.	Street Cross Section - 1:100 or 1:200 Natural or 1:100 (vertical) to 1:200 (horizontal)		
2.d.	Intersection Details - 1:250, 1:200 or 1:100		
2.e.	Layout Plan - 1:500, 1:1000, 1:2000 or 1:4000		
2.f.	Catchment Plan - 1:500, 1:1000, 1:2000 or 1:4000 (for external catchments)		
2.g.	Locality Plan - 1:500, 1:1000, 1:2000 or 1:4000		
2.h.	Kerb Return Plan - 1:200		
2.i.	Kerb Return Longitudinal Section - 1:100 (vertical) to 1:200 (horizontal)		
2.j.	Details - 1:10, 1:20, 1:50 or 1:100 as required		
3.	**Drawing Title**		
3.a.	Development Consent and/or Subdivision Works Certificate number		
3.b.	Property Description		
3.c.	Owner/applicant		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
3.d.	Surveyor/Engineer		
3.e.	Scale and Datum and projection		
3.f.	Plan Number and Sheet Number		
3.g.	Description of Work on Sheets		
3.h.	Amendment/revision number, date and description		
4.	**Drawing Details**		
4.a.	A Cover Sheet with a suitable Locality Plan and List of Final Drawings DA and or SWC number		
4.b.	General Layout Plan		
4.c.	General Notes are optional as required by individual councils. Where no General Notes are provided on the drawings they must be covered in Specifications and/or Special Conditions of Contract		
4.d.	Site Regrading/Bulk Earthworks and/or filling including contour information and site sections		
4.e.	Tree Management Plan showing trees to be retained and trees to be removed (can be on Bulk Earthworks plan for small sites)		
4.f.	Soil and Water Management Plan (Erosion and Sediment Control Plan)		
4.g.	Streets and Kerb and Gutter		
4.h.	Drainage, ie stormwater system details including pipe long sections, pit numbers and catchment details		
4.i.	Water Quality facilities		
4.j.	Landscaping Plan		
4.k.	Traffic Control Plan (if required)		
4.l.	Traffic Management Plan (if required)		
4.m.	Parking Plan (if required)		
4.n.	Structural Plans, e.g. Pits (if required are to be certified by an Accredited Professional)		
4.o.	Other Structures, e.g. Dams, detention basins (if required)		
4.p.	Identified Extent of Flooding (if applicable) for 20%, 1% AEP and PMF critical events		
4.q.	Demolition plan where any demolition is proposed		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
4.r.	Swept Path plan where any intersections are not an Acceptable Solution		
4.s.	A north point is to be provided on each drawing to indicate the orientation of the plans		
4.t.	All drawings shall be signed by the respective Design Consultant engaged by the owner/applicant		
5.	**Detailed street design drawings** - Layout plans		
5.a.	Boundaries of street reserves, pathways, public reserves, lots, lot numbers and easements both existing and proposed in relation to street chainages		
5.b.	Public Road, Private Road and Pathway numbers or names		
5.c.	Existing contours, spot levels and final surface design contours (min interval 0.5 metre) to AHD including:		
5.d.	The whole street width for existing public streets to the boundary on the opposite side of the street		
5.e.	At least 20m beyond the boundaries of the site fronting an existing public street or future street		
5.f.	At least 20m beyond the boundary of the site showing existing, proposed and future levels and features		
5.g.	State Survey Marks including Northing and Easting coordinates in MGA format, with ties to existing boundaries and Benchmarks to AHD		
5.h.	Existing and proposed services allocation e.g. power lines (overhead and underground), Gas, telecommunications, water etc		
5.i.	Existing natural features such as cliffs, watercourses, swamps, dams, ditches		
5.j.	Existing constructed features including building structures, retaining walls, fences, kerb and gutter, street pavement, pipe, pits, existing wastewater facilities and adjacent subdivisions		
5.k.	Limits of work		
5.l.	Road chainage pegs and other survey lines and sections		
5.m.	Schedule of symbols and notation of items e.g. kerb and gutter, gully pits, pipelines		
5.n.	Kerb and gutter alignment and concrete path paving		
5.o.	Existing and proposed drainage lines and structures suitably numbered and location chainages. Identified extent of flooding (if applicable)		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
5.p.	Proposed fencing and retaining wall details		
5.q.	Details and schedule of subsoil drainage lines		
5.r.	Notation regarding provision of guideposts and guard fences		
5.s.	Street centreline bearing radii and chainages, kerb return and cul-de-sac kerb alignment radii and chainages		
5.t.	Show any centreline line marking of a street		
5.u.	Tangent points to curves		
5.v.	The location and level of all existing utility services including pits, poles and structures with construction notes relating to any necessary alterations		
5.w.	Pavement requirements, surfacing requirements, lead in and tail out works, pipe types and classes, drainage structure types, kerb types, concrete strengths, pipe bedding types		
5.x.	Footpath and carriageway widths		
5.y.	Street Furniture e.g. street, speed, warning and regulatory signs, guideposts, street lighting, bus shelters		
5.z.	Site regrading areas indicated by shading		
5.aa.	Extent of cut and fill batters of significance		
5.bb.	Significant trees with trunk diameters greater than 100 mm measured 1 metre above the ground		
5.cc.	Location of bus stop construction		
5.dd.	Kerb return numbers		
5.ee.	Proposed utility and service crossings		
5.ff.	Location of parking bays		
5.gg.	North point		
6.	Detailed street design drawings - Street longitudinal section		
6.a.	The longitudinal section of the centreline of all streets shall be drawn at scale of 1:500 horizontal and 1:100 vertical		
6.b.	Chainages running left to right across the page and extend 20m beyond the new road to show how the new road fits into the landscape context		
6.c.	Reduced level of existing surface		
6.d.	Design levels of street centre lines		
6.e.	Design grades and length of vertical curves and horizontal curves		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
6.f.	Chainage and RL of each intersection point		
6.g.	Chainage and RL at Intersection with other streets		
6.h.	The chainage and level of each crest and sag point		
6.i.	Position and levels of culverts, drainage lines and public utility mains		
6.j.	Work as executed rows for street surface and drainage as required		
6.k.	Limits of construction		
6.l.	Proposed street name and number		
6.m.	Longitudinal levels shall be taken at a maximum of 15 metre intervals and at all intermediate changes of grade		
6.n.	Longitudinal sections shall not be terminated at the extent of works but shall be levelled a distance of 15 metres or as required beyond the limit of works to show transitions to existing street levels		
6.o.	Where construction and/or reconstruction adjoins an existing street, the longitudinal section shall extend for at least 20m but preferably 100 metres beyond the proposed extent of works or as required to reasonably assess smooth transition		
6.p.	Existing and proposed services allocation e.g. power lines (overhead and underground), Gas, telecommunications, water etc		
7.	Detailed street design drawings - Street cross sections		
7.a.	Cross sections shall be drawn at an appropriate natural scale as provided in SCALES above and be provided at a maximum of 15 metre intervals. In addition, cross sections shall be drawn at sag points, kerb tangent points and transition points.		
7.b.	For Rural roads, cross sections shall be supplied as above and at all culvert sites and at the transition points around super elevated curves if applicable. Rural road cross-sections shall be defined at 10 metre chainages for curves under a radius of 1000 metres.		
7.c.	Where construction and/or reconstruction adjoins an existing street, the cross-sections shall extend for at least 20m but preferably 100 metres beyond the proposed extent of works or as required to reasonably assess smooth transition		
7.d.	Street centreline chainage below each section		
7.e.	Offset chainage from the pegged centreline		
7.f.	Reduced levels of existing surface		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
7.g.	Design levels of pavement, top of kerb, invert and lip of gutters and at concrete paths		
7.h.	The position, size and level of any existing public utility, mains, cables and services affecting the work		
7.i.	Existing and proposed street reserve boundaries including adjacent property boundary alignments		
7.j.	Work as executed row		
7.k.	Proposed street name and number		
7.l.	For areas with considerable cut and fill earthwork proposed, RL for adjoining property will be required		
7.m.	Existing and proposed services allocation e.g. power lines (overhead and underground), Gas, telecommunications, water etc		
7.n.	A typical cross section is to be included at a scale of 1:100 vertical, 1:200 horizontal. Typical street cross sections are to be provided for each street as additional detail on at least one cross section on each sheet of cross sections or alternatively, may be provided separately as a set of typical cross sections. The additional detail for a typical street cross section will illustrate the following:		
7.o.	Footway and carriageway widths		
7.p.	Crossfalls		
7.q.	Pegged centrelines		
7.r.	Kerb type		
7.s.	Kerb line		
7.t.	Boundary line		
7.u.	Typical batter slopes for cut and fill with batter slopes to have a maximum slope of 1(V):4(H)		
7.v.	Differences in levels offsets, relative to the centreline		
7.w.	Type of surfacing		
7.x.	Subsoil drainage		
7.y.	Footpath location and standard if required		
7.z.	Where a proposed street makes a junction with an existing street, longitudinal and cross sections extending at least 50 metres either side of the centre line intersection point of the existing street shall be submitted. The cross sections shall include sections at the tangent points and kerb returns.		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
8.	Detailed street design drawings - Intersection, cul-de-sac and turning head plans		
8.a.	A contour plan at an appropriate scale as provided in SCALE above and must be drawn showing the finished level at all intersections, cul-de-sacs and turning heads.		
8.b.	All intersections shall have two-way crossfall		
8.c.	Each plan shall include the following		
8.d.	Reference points corresponding with points shown on the kerb return profile		
8.e.	Contours at minimum 0.1 metre interval		
8.f.	Kerb return and centreline chainages		
8.g.	Radii of kerb returns		
8.h.	Kerb return numbers if applicable (are to be shown on a separate kerb return plan)		
8.i.	Tangent points identified by chainage		
8.j.	Location of drainage pits and other structures		
8.k.	Swept paths and Traffic Control Devices Plans/ details (for Local Traffic Committee approval)		
9.	Detailed street design drawings - Kerb return longitudinal sections		
9.a.	The design of kerb returns is necessary at all street junctions to ensure a smooth trafficable surface around the return and where necessary to locate low points for drainage purposes.		
9.b.	Kerb return longitudinal sections shall be drawn at an appropriate scale as provided in Appendix G.2.2 for all kerb returns and culs-de-sac		
9.c.	Each kerb return longitudinal sections shall have a kerb return number corresponding with a number shown on the plan view		
9.d.	The profile shall represent the view as looking from the street to the face of the kerb. The kerb return profile shall show:		
9.e.	Chainages – both the running chainage related to the profile together with the chainage related to the street centreline		
9.f.	Design kerb lip RL – with a minimum grade of 1%		
9.g.	Existing kerb lip RL		
9.h.	Gradings, vertical curves and radii		
9.i.	Sags and crests		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
9.j.	For tie ins to existing kerbs a 15metre tail out showing transition in and out of kerb return		
9.k.	The applicable street name and number leading into the profile		
9.l.	Instantaneous grade at beginning and end of kerb return profile if applicable		
9.m.	Work as executed row		
10.	Detailed street design drawings - Kerb return plan view		
10.a.	Each kerb return must have a plan view drawn at 1:200. The plan must have, but not limited to the following:		
10.b.	Kerb return numbers		
10.c.	Contours at maximum 0.1 metre spacing		
10.d.	All proposed drainage lines and structures		
10.e.	Reference points corresponding to long sections		
10.f.	Lip lines		
10.g.	Maximum depth of ponding at sag points limited to 150 mm – show extent in plan view as well		
10.h.	Two-way crossfall 2% minimum, 4% maximum		
10.i.	Minimum kerb return radius in accordance with the standard drawings to the face of the kerb		
11.	**Detail drainage drawings -** General		
11.a.	Stormwater drainage design details shall be submitted with the engineering details and shall include but not be limited to methods, parameters, assumptions made for design purposes and calculations and certifications from the consultant that it has been prepared in accordance with the current edition of Australian Rainfall and Runoff.		
11.b.	Full catchment details including areas are to be provided for checking with all stormwater drainage design. The extent of the catchment including that outside the development must be shown and accounted for in the calculations		
11.c.	Each pit sub-catchment shall have a reference number/letter which must be consistently used on both the catchment plan, drainage calculation sheet and in the associated computer modelling.		
11.d.	Show proposed ownership and any land dedication applicable		
11.e.	Show phasing of any interim and permanent facilities		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
11.f.	Identify and assess connectivity to future and masterplanned facilities		
11.g.	Identify and assess values of the receiving waterway system and environment		
11.h.	Identify and assess activities or land uses with potential to damage the local or receiving environment		
11.i.	Identify stormwater threats		
11.j.	Identify the legal point of discharge		
11.k.	Identify flood extents and that the development is in accordance with the flood policy		
12.	Detail drainage drawings - Catchment plan		
12.a.	A contoured catchment plan shall be provided at an appropriate scale as provided SCALES above and shall show: The total catchment area that will drain to the downstream boundary of the development in hectares		
12.b.	The boundaries of all sub-catchment with contributing pervious and impervious areas in hectares or m^2, with sub-catchment names or labels, existing or known proposed cadastre and road network layout plans		
12.c.	Defined watercourses and drains, either natural or manmade, and marsh/swamp areas		
13.	Detail drainage drawings - Drainage layout plan		
13.a.	A drainage layout plan shall be incorporated in the General Arrangement Plan and shall show:		
13.b.	Boundaries of lots, streets, easement etc		
13.c.	Existing and proposed drainage lines (both major and minor routes) identified with line numbers, pipe diameters		
13.d.	All drainage structures numerically identified and located by centreline chainage		
13.e.	Limits of open channels, inlet and outlet drains		
13.f.	Schedule of existing and proposed drainage structures including type, size, cover/lid description and identification number		
13.g.	The location of any public utility mains and cables crossing influenced by the work		
13.h.	Finished contours, crests and sags in streets		
13.i.	Table drains, overflow paths, pathways, private streets, streetways, all notable vegetation		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
13.j.	Manmade features including control structures, energy dissipaters, detention basins, dams, edge of bitumen, kerb and gutter and fences		
13.k.	1% AEP flood line and FPL if applicable, include 10%, 5% and PMF where required by the council		
13.l.	5% AEP flood line where on-site wastewater disposal is proposed		
13.m	Overland flow paths for storms up to the 1% AEP and calculations showing flows are contained within street reserves, public reserves or drainage channels/swales, assuming pipelines and pits are 50% blocked for sag pits and 20% for grade pits		
13.n.	An additional scenario must be run with no blockage. Blockage scenario will give the required pit configuration Non-blockage scenario will give the required pipe configuration		
14.	Detail drainage drawings - Drainage calculations		
14.a.	A drainage report shall be presented generally in the form shown in Australian Rainfall and Runoff (2019).		
14.b.	The drainage calculations shall be included in the Design Report for the DA and SWC/CC Submission		
15.	Detail drainage drawings - Longitudinal sections		
15.a.	The longitudinal section shall be plotted on the sheet so that the chainages run left to right across the sheet starting at the upstream end of the system and shall be drawn: (a) To a scale of 1:500 horizontal		
15.b.	The furthest downstream pit shall be shown on the left side of the longitudinal section or at the starting chainage		
15.c.	Pits shall be sequentially numbered followed by the drainage line alphabetic designation. Pits shall be clearly labelled and matched with the plan drawing(s).		
15.d.	To a scale of 1:100 vertical		
15.e.	The longitudinal section shall show:		
15.f.	Running chainages along the drainage line together with street centreline chainages where applicable		
15.g.	Reduced levels to AHD of natural surface and finished surface levels		
15.h.	Existing invert of drain where applicable		
15.i.	Design invert level and grade of pipelines, open drains, channels, and watercourses		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
15.j.	Lead in and tail out works to match existing forms		
15.k.	Invert levels at pit inlet and outlet		
15.l.	Alignment, length, and design invert levels of stub lines		
15.m	Datum levels to AHD		
15.n.	Pipe diameter, pipe type, pipe class and joint type		
15.o.	Capacity in m^3/s, design discharge flow in m3/sec and discharge velocity in m/s		
15.p.	Hydraulic grade line and levels		
15.q.	The accurate position and level of any proposed and existing major utility and services in the vicinity of the pipeline		
15.r.	Drainage structures		
15.s.	1% AEP water level in open channels including backwater effects		
15.t.	Velocity and flow depth product (in the case of open channels)		
15.u.	Work as executed row		
16.	Detail drainage drawings - Cross sections		
16.a.	For the case of open channels, cross sections shall be detailed at minimum 10 metre intervals and maximum of 30 metre intervals. Cross sections shall extend to show at least 5 metres either side of the proposed open channel works to show the transition with the natural form. Obstructions such as buildings, fences, constructions etc shall also be detailed, where necessary, to provide for the calculation of backwater effects.		
16.b.	Open channel cross sections shall be drawn at a scale of 1:100.		
16.c.	Generally, survey information is to be provided for a minimum of 50 metres upstream and downstream of the work.		
17.	Detail drainage drawings - Special drainage structures		
17.a.	Any drainage structures not covered by the Standard Drawings shall be drawn to a scale of 1:20 or as otherwise suitable for the required detailing.		
18.	**Structural drawings**		
18.a.	Structural drawings of any building or structure not detailed in the Standard Drawings shall be submitted at an appropriate scale.		
18.b.	The design and specification for all load carrying structures shall be prepared by an Accredited Professional and certified on the plans by an Accredited Professional, that the structure has been		

ID	SUBMISSION DRAWINGS CHECKLIST	DESIGNER Yes/No/NA	CERTIFIER Cross-check
	designed to Australian Standards and will resist the imposed design loads.		
18.c.	Upon completion of the structural work, an Accredited Professional must certify that the structural work has been constructed in accordance with the approved plans.		
19.	**Drawing standard notes**		
19.a.	Standard notes are included on the drawings OR		
19.b.	Standard notes are included in technical specification or special conditions of contract		
20.	**Designer Checklist Endorsement**		
20.a.	Where the Designer responds NO or NA the reasons why are set out in the Design Report		
20.b.	Name of person endorsing this checklist		
20.c.	Accreditation of person and accreditation number		
20.d.	Signature of person endorsing this checklist and date		
21.	**Cross-check by Certifier**		
21.a.	Name of certifier and registration number		
21.b.	Signature of certifier and date		

Appendix F Submission Checklist - Subdivision Works

ID	SUBMISSION CHECKLIST SUBDIVISION WORKS CERTIFICATES	DESIGNER Yes/No/NA	CERTIFIER Cross-check
1.	**Submission Drawings**		
1.1.	Submission Drawings have been prepared to satisfy the requirements of ***Appendix C*** of the Engineering Design Manual for Western Sydney and the relevant Development Consent		
2.	**Design Report**		
2.1.	A Design Report endorsed by an Accredited Professional accompanies this SWC submission		
2.2.	The Design Report considers and details how the design has addressed safety of all users of the proposed subdivision works		
3.	**Varying the Acceptable Solution**		
3.1.	Where it is intended to Vary the Acceptable Solution, details are contained in the Design Report		
3.2.	A risk assessment has been undertaken as part of the submission to Vary the Acceptable Solution		
4.	**Other associated submissions**		
4.1.	Other associated submissions have been endorsed by the relevant accredited professional as listed in ***Table 2*** of the Engineering Design Manual for Western Sydney		
5.	**Checklist Endorsement**		
5.1.	Where the Designer responds No or NA the reasons why are set out in the Design Report		
5.2.	Name of person endorsing this checklist		
5.3.	Accreditation and accreditation number of person endorsing this checklist		
5.4.	Accreditation number of person endorsing this checklist		
5.5.	Signature of person endorsing this checklist and date		
6.	**Cross-check by Certifier**		
6.1.	Name of certifier and registration number		
6.2.	Signature of certifier and date		

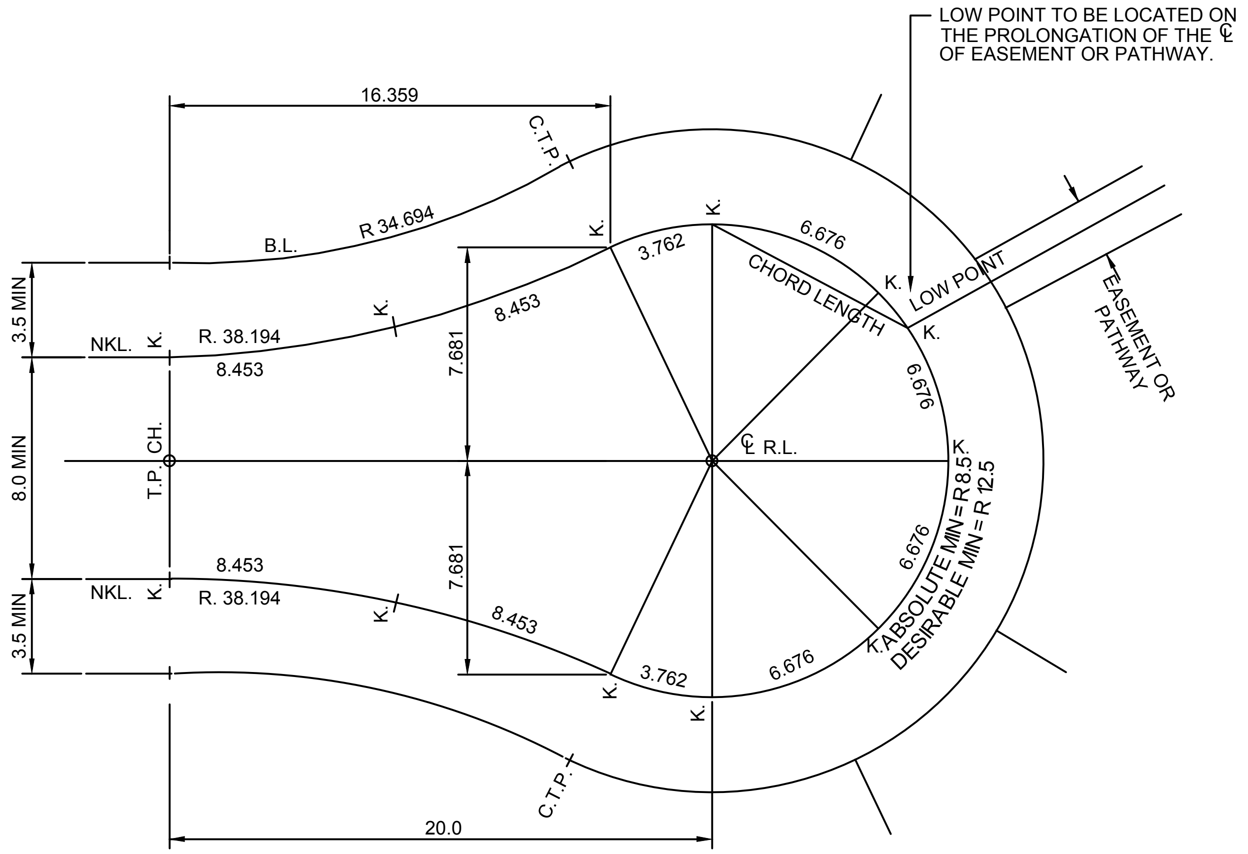
Appendix G Standard drawings

Count	Drg No.	Title	Rev	Date	Status
1	SD-R02	Residential Cul-De-Sac Standard	01	14-Apr-21	Post PCG Amendments
2	SD-R03	Kerb Return Layout & Design Details	01	14-Apr-21	Post PCG Amendments
3	SD-R04	Kerbs & Gutters	01	14-Apr-21	Post PCG Amendments
4	SD-R05	Subsoil Drainage	01	14-Apr-21	Post PCG Amendments
5	SD-R06	Kerb Roofwater Outlet & Kerb Adaptor	01	14-Apr-21	Post PCG Amendments
6	SD-R07	Kerb Ramps - General (sheet 1 of 4)	01	14-Apr-21	Post PCG Amendments
7	SD-R07	Kerb Ramps - Layout at Intersection (sheet 2 of 4)	01	14-Apr-21	Post PCG Amendments
8	SD-R07	Kerb Ramps - at Crossings (sheet 3 of 4)	01	14-Apr-21	Post PCG Amendments
9	SD-R07	Kerb Ramps - Details (sheet 4 of 4)	01	14-Apr-21	Post PCG Amendments
10	SD-R08	Residential Vehicle Crossing - Plan (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
11	SD-R08	Residential Vehicle Crossing - Sections (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
12	SD-R09	Multi-Unit Housing Vehicle Crossing - Plan (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
13	SD-R09	Multi-Unit Housing Vehicle Crossing - Sections (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
14	SD-R10	Commercial & Industrial Vehicle Crossing Plan (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
15	SD-R10	Commercial & Industrial Vehicle Crossing Sections (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
16	SD-R11	Footpath	01	14-Apr-21	Post PCG Amendments
17	SD-R12	Off Road Shared Bicycle & Footpaths	01	14-Apr-21	Post PCG Amendments
18	SD-R13	Low Mountable Island	01	14-Apr-21	Post PCG Amendments
19	SD-R15	Mountable Roadabouts	01	14-Apr-21	Post PCG Amendments
20	SD-R18	Street Sign (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
21	SD-R18	Street Sign (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
22	SD-R21	Shared Path Holding Rail	01	14-Apr-21	Post PCG Amendments
23	SD-R22	Laneway Baulks	01	14-Apr-21	Post PCG Amendments
24	SD-R23	Pathway Baulks	01	14-Apr-21	Post PCG Amendments
25	SD-R25	Accessway Detail - Single Driveway (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
26	SD-R25	Accessway Detail - Double Driveway (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
27	SD-R26	Threshold Pavements at Intersections	01	14-Apr-21	Post PCG Amendments
28	SD-R27	Typical Retaining Wall Section	01	14-Apr-21	Post PCG Amendments
29	SD-R28	Typical Rock Wall Geometry	01	14-Apr-21	Post PCG Amendments
30	SD-R29	Utility Trench Profiles	01	14-Apr-21	Post PCG Amendments
31	SD-R30	Pipe Installation Under Roadway	01	14-Apr-21	Post PCG Amendments
32	SD-R31	V Drain Pit (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
33	SD-R31	V Drain Pit (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
34	SD-R33	Intersection Dish Gutter	01	14-Apr-21	Post PCG Amendments
35	SD-R34	Raised Threshold Pavers (sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
36	SD-R34	Raised Threshold Pavers (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
37	SD-R34	Raised Threshold Pavers (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments
38	SD-R35	Raised Threshold Stencilled (sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
39	SD-R35	Raised Threshold Stencilled (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
40	SD-R35	Raised Threshold Stencilled (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments

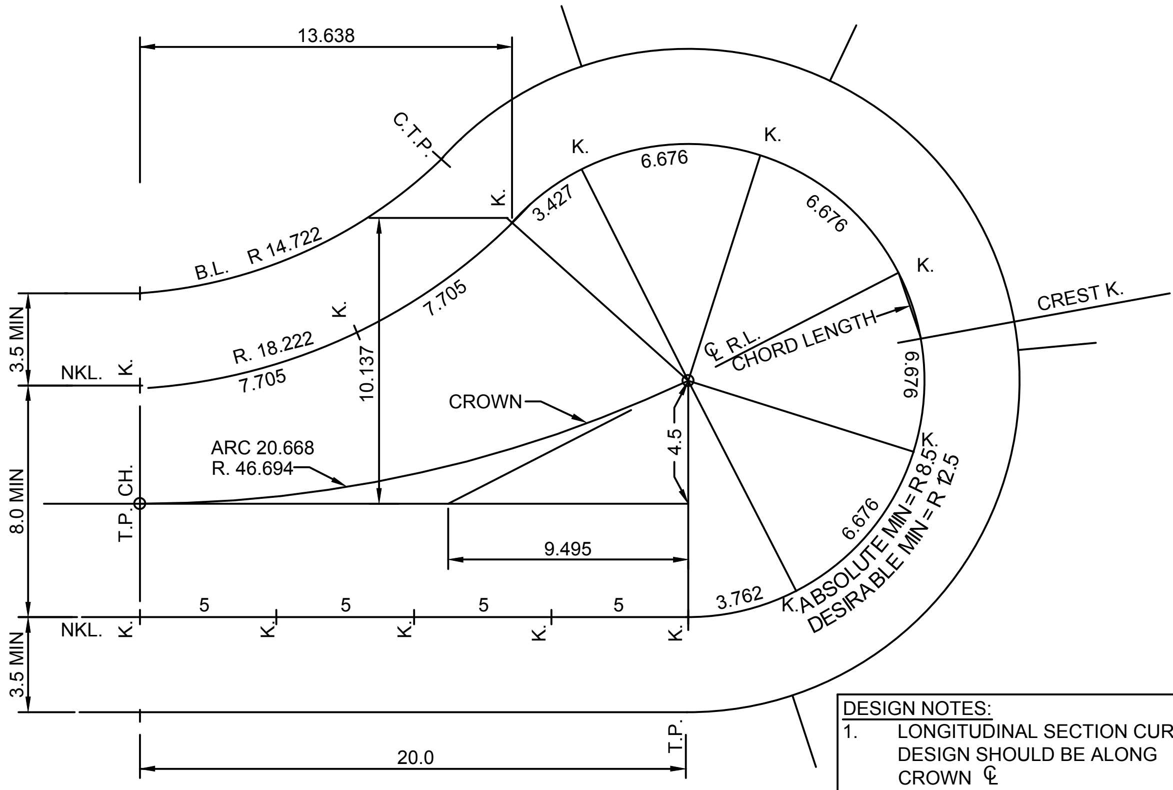
Count	Drg No.	Title	Rev	Date	Status
41	SD-R36	Raised Threshold Central Median (sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
42	SD-R36	Raised Threshold Central Median (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
43	SD-R36	Raised Threshold Central Median (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments
44	SD-R37	Wombat Crossing (sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
45	SD-R37	Wombat Crossing (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
46	SD-R37	Wombat Crossing (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments
47	SD-R38	Wombat Crossing Central Median (sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
48	SD-R38	Wombat Crossing Central Median (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
49	SD-R38	Wombat Crossing Central Median (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments
50	SD-R39	Pedestrian Refuge (Sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
51	SD-R39	Pedestrian Refuge (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
52	SD-R39	Pedestrian Refuge (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments
53	SD-R40	Pedestrian Refuge and Necking (sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
54	SD-R40	Pedestrian Refuge and Necking (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
55	SD-R40	Pedestrian Refuge and Necking (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments
56	SD-R42	Roundabout Central Island On Existing Pavement (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
57	SD-R42	Roundabout Central Island On Existing Pavement (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
58	SD-R43	Roundabout Central Island Edge Detail (sheet 1 of 3)	01	14-Apr-21	Post PCG Amendments
59	SD-R43	Roundabout Central Island Edge Detail (sheet 2 of 3)	01	14-Apr-21	Post PCG Amendments
60	SD-R43	Roundabout Central Island Edge Detail (sheet 3 of 3)	01	14-Apr-21	Post PCG Amendments
61	SD-R44	Road Opening Restoration	01	14-Apr-21	Post PCG Amendments
62	SD-R45	Footpath Cycleway and Kerb Reconstruction (sheet 1 of 4)	01	14-Apr-21	Post PCG Amendments
63	SD-R45	Footpath Cycleway and Kerb Reconstruction (sheet 2 of 4)	01	14-Apr-21	Post PCG Amendments
64	SD-R45	Footpath Cycleway and Kerb Reconstruction (sheet 3 of 4)	01	14-Apr-21	Post PCG Amendments
65	SD-R45	Footpath Cycleway and Kerb Reconstruction (sheet 4 of 4)	01	14-Apr-21	Post PCG Amendments
66	SD-R46	Expansion Joint Detail	01	14-Apr-21	Post PCG Amendments
67	SD-R48	Vehicular Dish Crossing Internal Use	01	14-Apr-21	Post PCG Amendments
68	SD-R49	Bus Stop With Proposed Shelter	01	14-Apr-21	Post PCG Amendments
69	SD-R50	Bulkhead Detail	01	14-Apr-21	Post PCG Amendments
70	SD-R51	Open Drainage Channel	01	14-Apr-21	Post PCG Amendments
71	SD-R52	Pedestrian Pathway Overland Flow Path Type 1	01	14-Apr-21	Post PCG Amendments
72	SD-R53	Pedestrian Pathway Overland Flow Path Type 2	01	14-Apr-21	Post PCG Amendments
73	SD-R54	Non-Pedestrian Pathway Overland Flow Path Type 1	01	14-Apr-21	Post PCG Amendments
74	SD-R55	Non-Pedestrian pathway Overland Flow Path Type 2	01	14-Apr-21	Post PCG Amendments
75	SD-R56	Footpath Treatment For Overland Flow Paths Type 1	01	14-Apr-21	Post PCG Amendments
76	SD-R57	Pathways Steps	01	14-Apr-21	Post PCG Amendments
77	SD-R58	Prohibited Location of Driveways	01	14-Apr-21	Post PCG Amendments
78	SD-R59	Street Sign Locations	01	14-Apr-21	Post PCG Amendments
79	SD-R60	Typical Rural Road Crossing Section	01	14-Apr-21	Post PCG Amendments
80	SD-R61	Rural Vehicular Crossing	01	14-Apr-21	Post PCG Amendments

Count	Drg No.	Title	Rev	Date	Status
81	SD-R62	Concrete Cradle Support	01	14-Apr-21	Post PCG Amendments
82	SD-R63	Concrete Headwall For Single Pipe Culverts	01	14-Apr-21	Post PCG Amendments
83	SD-R64	Concrete Headwall For Double Pipe Culverts	01	14-Apr-21	Post PCG Amendments
84	SD-R66	Road Opening Restotation Detail Temporary Treatment	01	14-Apr-21	Post PCG Amendments
85	SD-R67	Minor Drainage Connections	01	14-Apr-21	Post PCG Amendments
86	SD-R67	Minor Drainage Connections	01	14-Apr-21	Post PCG Amendments
87	SD-R68	Standard Indicative Busbay Plan And Section	01	14-Apr-21	Post PCG Amendments
88	SD-R69	Trimmer Bars Around Pipe Penetrations Into Pits	01	14-Apr-21	Post PCG Amendments
89	SD-R70	Granite Pavers Detail	01	14-Apr-21	Post PCG Amendments
90	SD-R70	Granite Pavers Detail	01	14-Apr-21	Post PCG Amendments
91	SD-R71	Granite Pavers And Bluestone Kerb And Gutter Details	01	14-Apr-21	Post PCG Amendments
92	SD-R71	Granite Pavers And Bluestone Kerb And Gutter Details	01	14-Apr-21	Post PCG Amendments
93	SD-R71	Granite Pavers And Bluestone Kerb And Gutter Details	01	14-Apr-21	Post PCG Amendments
94	SD-R71	Granite Pavers And Bluestone Kerb And Gutter Details	01	14-Apr-21	Post PCG Amendments
95	SD-R72	Granite Pavers And Concrete Kerb And Gutter Details	01	14-Apr-21	Post PCG Amendments
96	SD-R72	Granite Pavers And Concrete Kerb And Gutter Details	01	14-Apr-21	Post PCG Amendments
97	SD-R73	Periphry Paving Details	01	14-Apr-21	Post PCG Amendments
98	SD-R73	Periphry Paving Details	01	14-Apr-21	Post PCG Amendments
99	SD-R74	Street Paving Typology Map (Local Variation Liverpool)	01	14-Apr-21	Post PCG Amendments
100	SD-S01	Trash Rack Warning Sign	01	14-Apr-21	Post PCG Amendments
101	SD-S02	Pipe Flood Warning Sign	01	14-Apr-21	Post PCG Amendments
102	SD-S03	Floodway Warning Sign	01	14-Apr-21	Post PCG Amendments
103	SD-S06	Grated Gully Pit With Extended Kerb Inlet Pit	01	14-Apr-21	Post PCG Amendments
104	SD-S07	Kerb Inlet Median Pit	01	14-Apr-21	Post PCG Amendments
105	SD-S08	Surcharge Pit	01	14-Apr-21	Post PCG Amendments
106	SD-S09	Step Irons	01	14-Apr-21	Post PCG Amendments
107	SD-S10	Minor Drainage Connections	01	14-Apr-21	Post PCG Amendments
108	SD-S11	Surace Inlet & Letter Box Pit	01	14-Apr-21	Post PCG Amendments
109	SD-S12	Junction Pit	01	14-Apr-21	Post PCG Amendments
110	SD-S13	Outlet Details - Grass Lined Channel/ Creek (sheet 1 of 2)	01	14-Apr-21	Post PCG Amendments
111	SD-S13	Outlet Details - Grass Lined Channel/ Creek (sheet 2 of 2)	01	14-Apr-21	Post PCG Amendments
112	SD-S14	Reinforced Turf Detail	01	14-Apr-21	Post PCG Amendments
113	SD-S16	'No Climbing' Warning Sign	01	14-Apr-21	Post PCG Amendments
114	SD-S17	'No Planting' Warning Sign	01	14-Apr-21	Post PCG Amendments
115	WSUD 1	Coversheet, General Notes & Legend	01	14-Apr-21	Post PCG Amendments
116	WSUD 2	Bioretention - Standard Notes	01	14-Apr-21	Post PCG Amendments
117	WSUD 3	Bioretention - General Arrangement Sheet 1	01	14-Apr-21	Post PCG Amendments
118	WSUD 4	Bioretention - General Arrangement Sheet 2	01	14-Apr-21	Post PCG Amendments
119	WSUD 5	Bioretention Basin - Drainage Configuration	01	14-Apr-21	Post PCG Amendments
120	WSUD 6	Small Bioretention Systems	01	14-Apr-21	Post PCG Amendments

Count	Drg No.	Title	Rev	Date	Status
121	WSUD 7	Bioretention - Inlet Diversion Structures	01	14-Apr-21	Post PCG Amendments
122	WSUD 8	Bioretention - Inlet Structures	01	14-Apr-21	Post PCG Amendments
123	WSUD 9	Bioretention - Outlet Structures	01	14-Apr-21	Post PCG Amendments
124	WSUD 10	Bioretention - Outlet Scour Protection & Music Modelling Requirements	01	14-Apr-21	Post PCG Amendments
125	WSUD 11	Bioretention - Raingarden System Less Than 30m2	01	14-Apr-21	Post PCG Amendments
126	WSUD 12	Bioretention - Within Flood Detention Basin	01	14-Apr-21	Post PCG Amendments
127	WSUD 13	Bioretention - Landscaping	01	14-Apr-21	Post PCG Amendments
128	WSUD 14	Bioretention - Landscaping Blue Mountains Variation	01	14-Apr-21	Post PCG Amendments
129	WSUD 15	Bioretention - Construction Works Staging - 1	01	14-Apr-21	Post PCG Amendments
130	WSUD 16	Bioretention - Construction Works Staging - 2	01	14-Apr-21	Post PCG Amendments
131	WSUD 17	Vegetated Swales - Flat Sites	01	14-Apr-21	Post PCG Amendments
132	WSUD 18	Vegetated Swales - Steep Sites	01	14-Apr-21	Post PCG Amendments
133	WSUD 19	Pourous Paving	01	14-Apr-21	Post PCG Amendments
134	WSUD 20	Bioretention - Town Centres	01	14-Apr-21	Post PCG Amendments
135	WSUD 21	Tree Pit Bioretention - Street	01	14-Apr-21	Post PCG Amendments
136	WSUD 22	Drainage Signage	01	14-Apr-21	Post PCG Amendments
137	WSUD 23	OSD - Above Ground Storage	01	14-Apr-21	Post PCG Amendments
138	WSUD 24	OSD - Underground Storage	01	14-Apr-21	Post PCG Amendments
139	WSUD 25	OSD - Combined OSD & Filter Cartridges	01	14-Apr-21	Post PCG Amendments
140	WSUD 26	OSD Deemed to Comply Solution	01	14-Apr-21	Post PCG Amendments
141	WSUD 27	Rainwater Tank - Charged Line Systems & Music Modelling Requirements	01	14-Apr-21	Post PCG Amendments
142	WSUD 28	WSUD Flex Zone Swale	01	14-Apr-21	Post PCG Amendments
143	WSUD 29	WSUD Street Tree Pit Details Sheet 1	01	14-Apr-21	Post PCG Amendments
144	WSUD 30	WSUD Street Tree Pit Details Sheet 2	01	14-Apr-21	Post PCG Amendments
145	WSUD 31	WSUD Street Tree Pit Details Sheet 3	01	14-Apr-21	Post PCG Amendments
146	WSUD 32	WSUD Street Tree Pit Details Sheet 4	01	14-Apr-21	Post PCG Amendments



'K' DENOTES TOP OF KERB LEVEL



DESIGN NOTES:

1. LONGITUDINAL SECTION CURVE DESIGN SHOULD BE ALONG CROWN ℄
2. 'K' DENOTES TOP OF KERB LEVEL.

NOTES:

1. NO CROSS-SECTIONS REQUIRED BETWEEN T.P. AND CENTRE OF HEAD.
2. ALL DIMENSIONS SHOWN ARE IN METRES.
3. RADII REFERS TO NOMINAL KERB LINE SEE SD-R04
4. DIMENTIONS VARY ACCORDING TO STREET TYPE

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

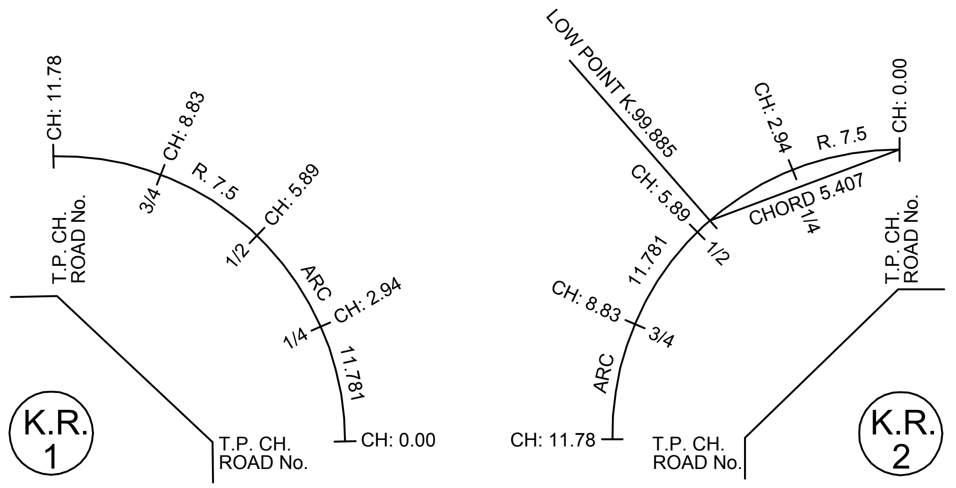
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

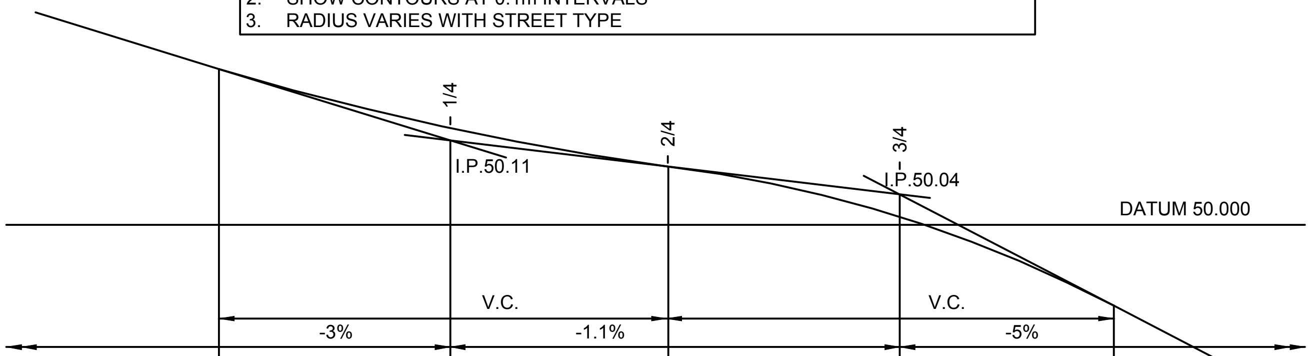
SHEET TITLE: RESIDENTIAL CUL-DE-SAC STANDARD

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R02	N.T.S	1 OF 1	01	APR'21



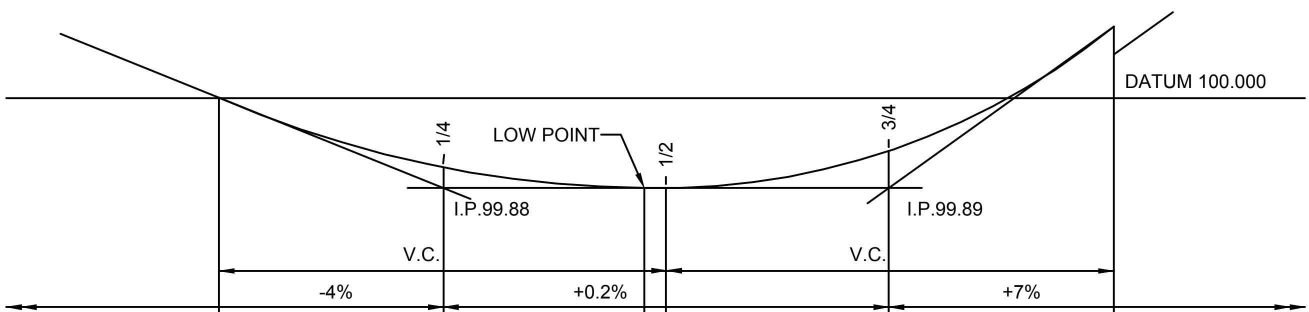
KERB RETURN LAYOUT PLANS

DESIGN NOTE:
1. K.R.2 IS INDICATIVE ONLY AND EVERY ATTEMPT SHOULD BE MADE TO ENSURE THAT THE LOWPOINT IS SHIFTED TO ONE OF THE K.R.T.P.'S. (MIN GRADE 1%)
2. SHOW CONTOURS AT 0.1m INTERVALS
3. RADIUS VARIES WITH STREET TYPE



KERB RETURN LEVEL	50.20	50.12	50.08	50.02	49.90
CHAINAGE	0.00	2.94	5.89	8.83	11.78

K.R.1.



KERB RETURN LEVEL	100.00	99.91	99.885	99.89	99.94	100.10
CHAINAGE	0.00	2.94	5.61	5.89	8.83	11.78

K.R.2.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

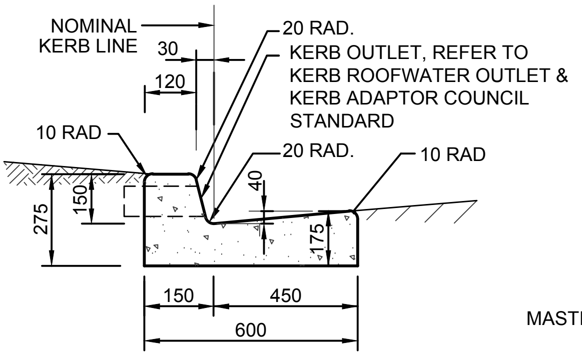
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

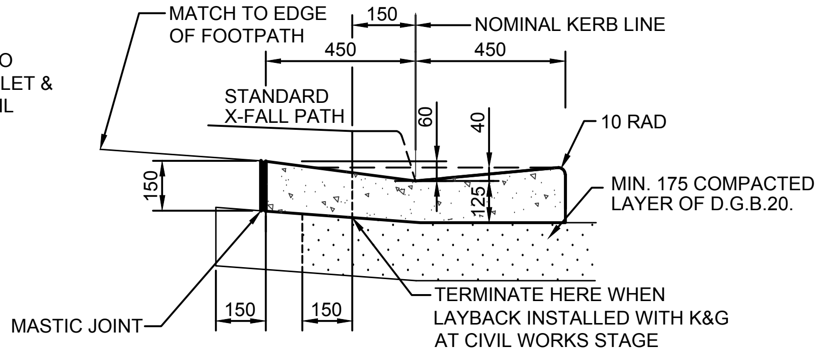
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: KERB RETURN LAYOUT & DESIGN DETAILS

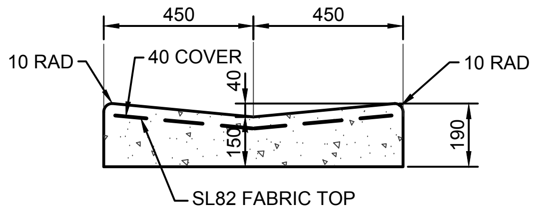
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R03	N.T.S	1 OF 1	01	APR'21



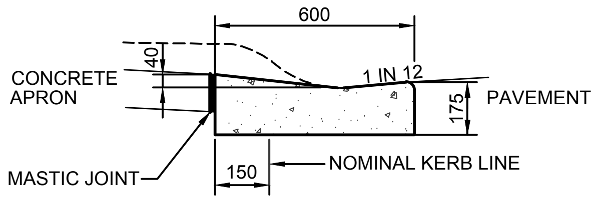
150mm KERB AND GUTTER



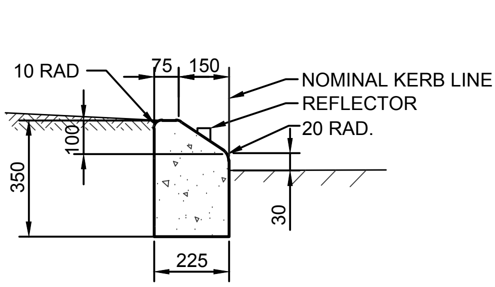
RESIDENTIAL LAYBACK



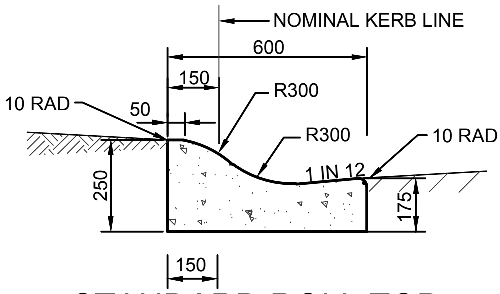
DISH CROSSING



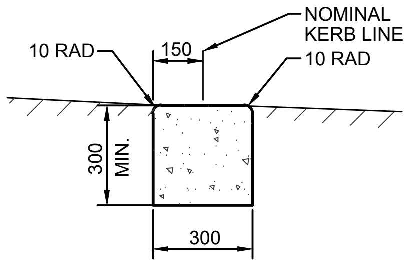
STANDARD ROLL TOP KERB AT VEHICULAR CROSSING



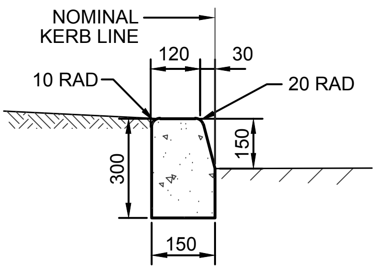
MEDIAN KERB



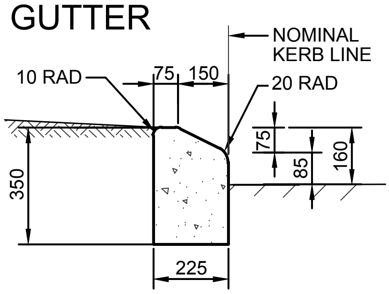
STANDARD ROLL TOP KERB AND GUTTER



EDGE STRIP



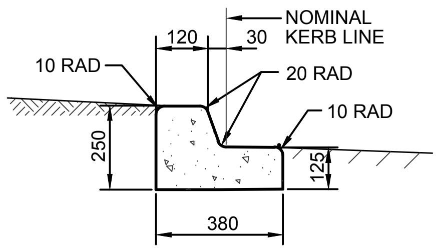
KERB ONLY



MOUNTABLE KERB

NOTES:

1. ROAD SUB BASE SHALL BE EXTENDED BENEATH KERBS. GUTTERS AND DISH CROSSINGS 300 BEHIND REAR OF KERB A MIN. DEPTH OF 175 & SUBJECT TO SUB-SOIL DRAINAGE REQUIREMENTS.
2. CONCRETE SHALL BE OF 25MPa COMPRESSIVE STRENGTH (F'c) AT 28 DAYS WITH NO SLUMP MIX FOR KERBS & GUTTERS, DISH CROSSINGS, MISCELLANEOUS KERBS AND EDGE STRIPS.
3. REINFORCING FABRIC SHALL BE AS 4671:2001 'STEEL WIRE REINFORCING FABRIC' WITH 40 COVER.
4. CONDUIT LOCATIONS SHALL BE MARKED ON KERB FACES WITH AN APPROVED TOOL OR AS OTHERWISE DIRECTED.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
6. NOMINAL KERB LINE 150 FROM BACK OF KERB (NKL)



KERB WITH TOE

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

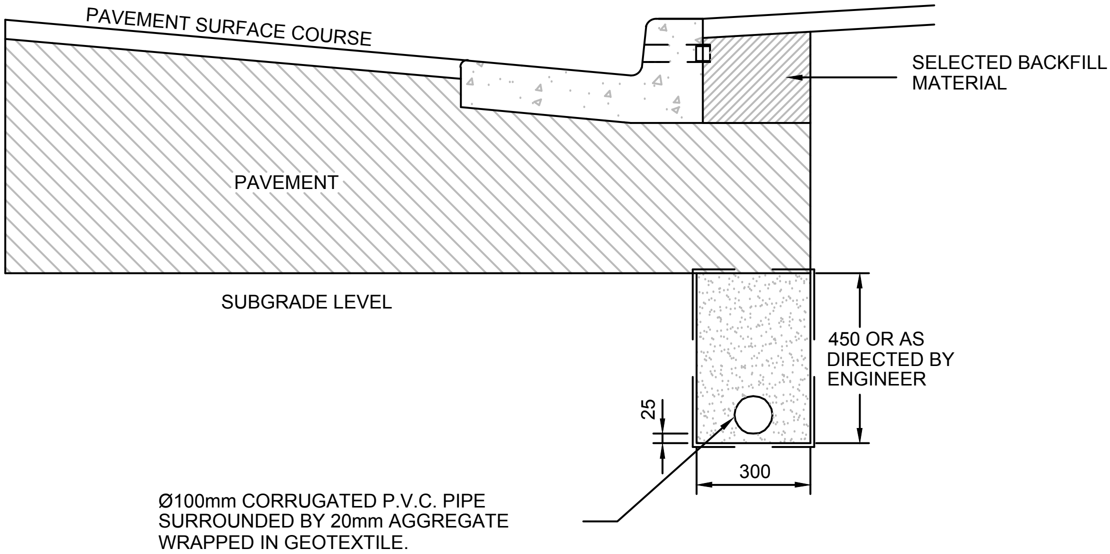
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
KERBS & GUTTERS	SD-R04	N.T.S	1 OF 1	01	APR'21



NOTE:

1. PROVIDE CLEANING RISERS AT 100m CENTRES, BEHIND DRAIN INSTALLED TO MANUFACTURER'S SPECIFICATIONS.
2. INSTALL FLUSHING POINTS AT 60 METER INTERVALS WITH 45° JUNCTION
3. SUBSOIL CAN BE INSTALLED UNDER KERBS AS DIRECTED BY ENGNINEER

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

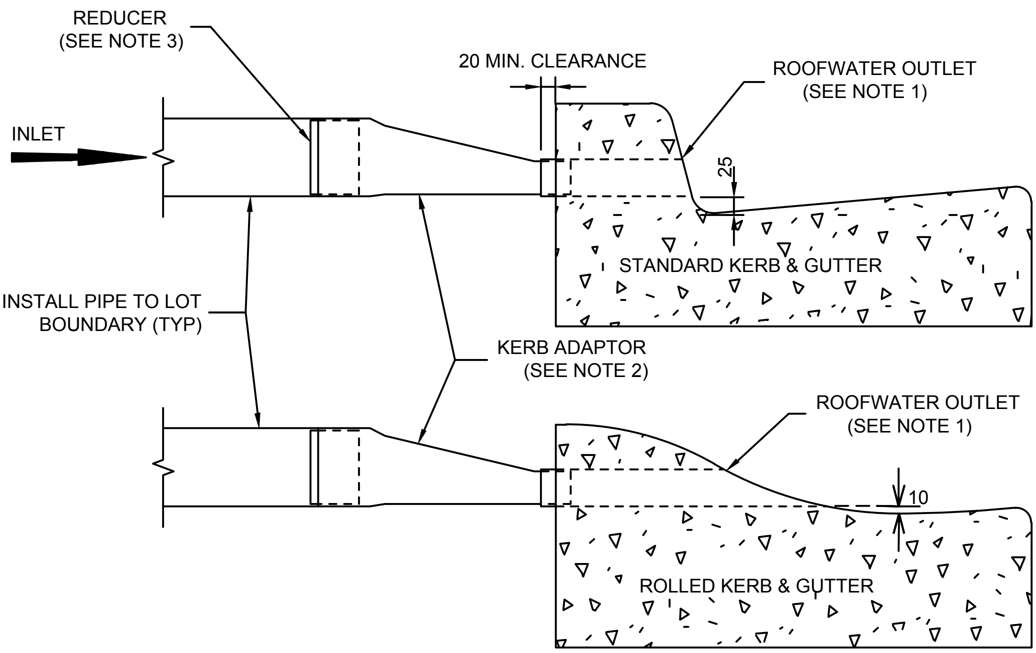
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

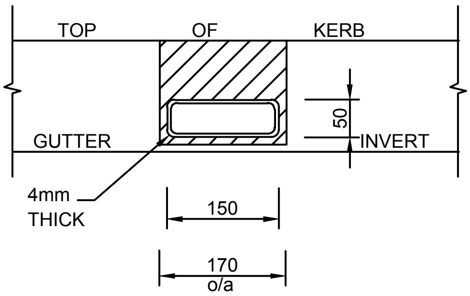
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: SUBSOIL DRAINAGE

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R05	N.T.S	1 OF 1	01	APR'21



TYPICAL CROSS SECTION



TYPICAL ELEVATION

* ALL DIMENSIONS ARE IN MILLIMETRES

NOTE:

1. ROOFWATER OUTLETS TO BE MANUFACTURED FROM 150 x 50 x 4 HOT DIPPED GAL. MILD STEEL, TO SUIT KERB TYPE, TO EXTEND MIN. 20mm BEHIND REAR OF KERB.
2. KERB ADAPTOR TO BE PVC 'CORDINA' TYPE OR SIMILAR, 4mm THICK & 355 LONG, TO SUIT PVC STORMWATER CONNECTION & ROOFWATER OUTLET SECTION.
3. PROVIDE REDUCER, IF REQUIRED, TO SUIT 90 PVC STORMWATER CONNECTION.
4. CHECK ROOFWATER OUTLET IS UNOBSTRUCTED PRIOR TO CONNECTING ADAPTOR.
5. SEAL JOINT BETWEEN ADAPTOR & OUTLET WITH APPROVED SILICON SEALANT.
6. ALL OUTLETS, ADAPTORS & REDUCERS TO BE FROM AN APPROVED MANUFACTURER AND ALL JOINTS TO BE SEALED & WATERTIGHT.
7. COUNCIL USE: - FITTING OUTLETS IN EXISTING KERB.
   SAWCUT KERB 10mm WIDER & DEEPER THAN KERB OUTLET. BED & BACKFILL WITH 'EPIREZ MUL' OR EQUIVALENT & MAKE SMOOTH JOIN WITH EXISTING KERB.
8. KERB ADAPTOR SHALL BE INSTALLED AT THE TIME OF KERB CONSTRUCTION TO ELIMINATE SAW CUTTING KERB.
9. KERB OUTLETS TO BE LOCATED ON THE LOW SIDE OF THE LOT STREET FRONTAGE.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

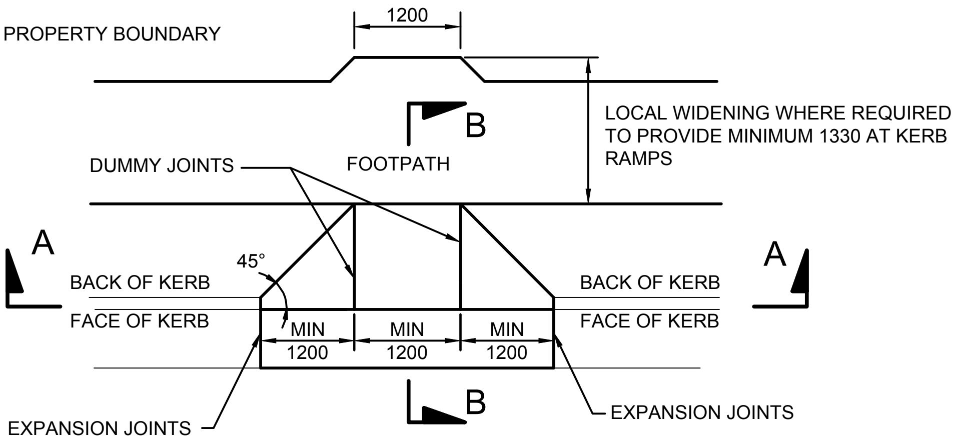
PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

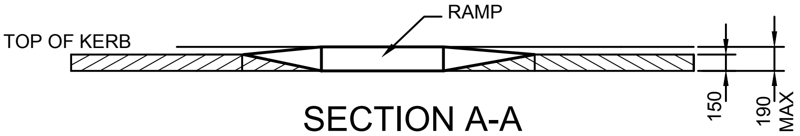
SHEET TITLE:
KERB ROOFWATER OUTLET & KERB ADAPTOR

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R06	N.T.S	1 OF 1	01	APR'21

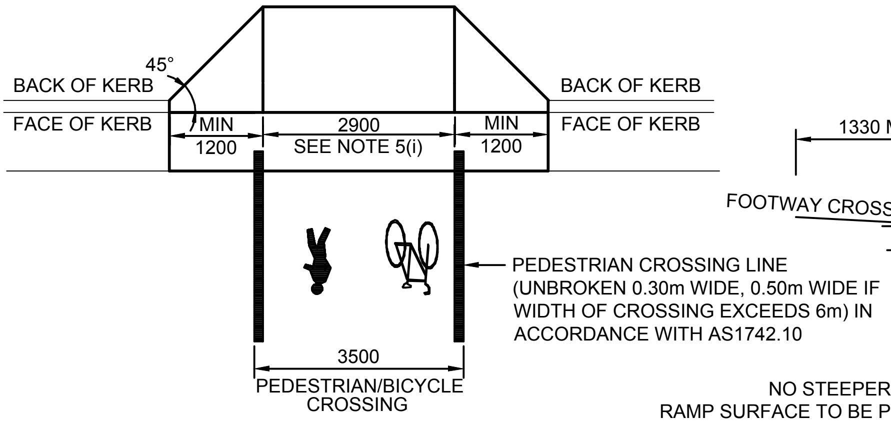
Apr 15, 2021 - 11:07am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R06.dwg

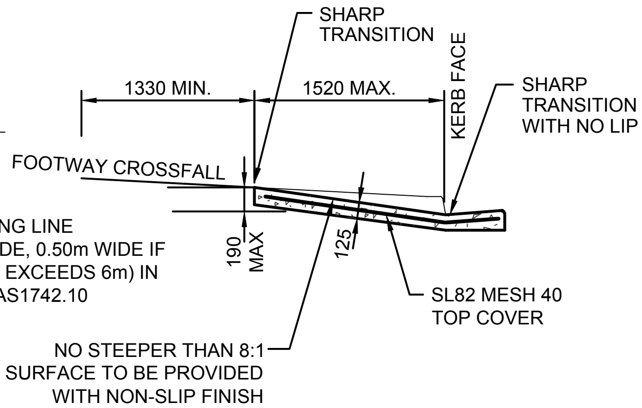


PLAN A



SECTION A-A





SECTION B-B

PLAN B
MARKED FOOT CROSSING
(SHARED PEDESTRIAN/BICYCLE CROSSING)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR DETAIL KERB & GUTTER OPTIONS SEE SD-R04
3. ALL KERB RAMPS ARE TO BE ALIGNED WITH THE DESIRED DIRECTION OF PEDESTRIAN TRAVEL & BE A MINIMUM OF 1500 WIDE.
4. AT PEDESTRIAN CROSSINGS AND MARKED FOOT CROSSING RAMPS MUST LINE UP WITH CROSSING AND CORRESPONDING CROSSING ON OTHER SIDE OF ROAD.
5. (i) FOR MARKED FOOT CROSSING (SHARED PEDESTRIAN/BICYCLE CROSSING) SLOPING FACE OF RAMP SHOULD BE AS WIDE AS THE INSIDE OF THE PAINT LINES. AT A PRACTICAL WIDTH NO LESS THAN 1500.
   (ii) AT PEDESTRIAN CROSSING (ZEBRA) THE SLOPING FACE OF THE RAMP SHOULD BE AS WIDE AS THE OUTSIDE EDGE OF THE ZEBRA STRIPES. WHERE THIS IS NOT POSSIBLE THE RAMP SHOULD BE AT A PRACTICAL WIDTH NO LESS THAN 1500.
   (iii)AT MARKED FOOT CROSSINGS (PEDESTRIAN ONLY CROSSINGS) THE SLOPING FACE OF THE RAMP SHOULD BE AS WIDE AS THE INSIDE OF THE PAINT LINES. WHERE THIS IS NOT POSSIBLE LOCATE RAMP CLOSE TO POST WITH A PUSH BUTTON ON IT AT A PRACTICAL WIDTH NO LESS THAN 1500.
6. EXPANSION JOINTS TO BE PROVIDED WHERE ENDS OF KERB RAMP ABUTS KERB AND GUTTER.
7. SEPARATE KERB RAMPS MUST BE USED FOR ADJACENT CROSSING AT INTERSECTIONS. (REFER TO PLAN SHEET 3).
8. AT SIGNALISED INTERSECTIONS REFER RMS STANDARD DRAWINGS
9. TACTILE INDICATORS TO BE PLACED IN ACCORDANCE WITH AS1428.4 WHERE REQUIRED.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

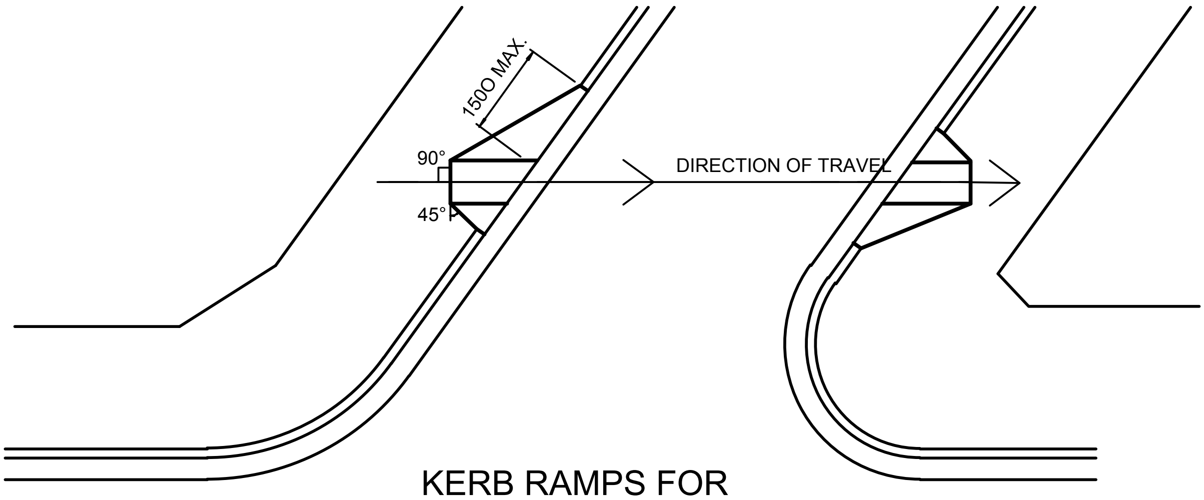
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

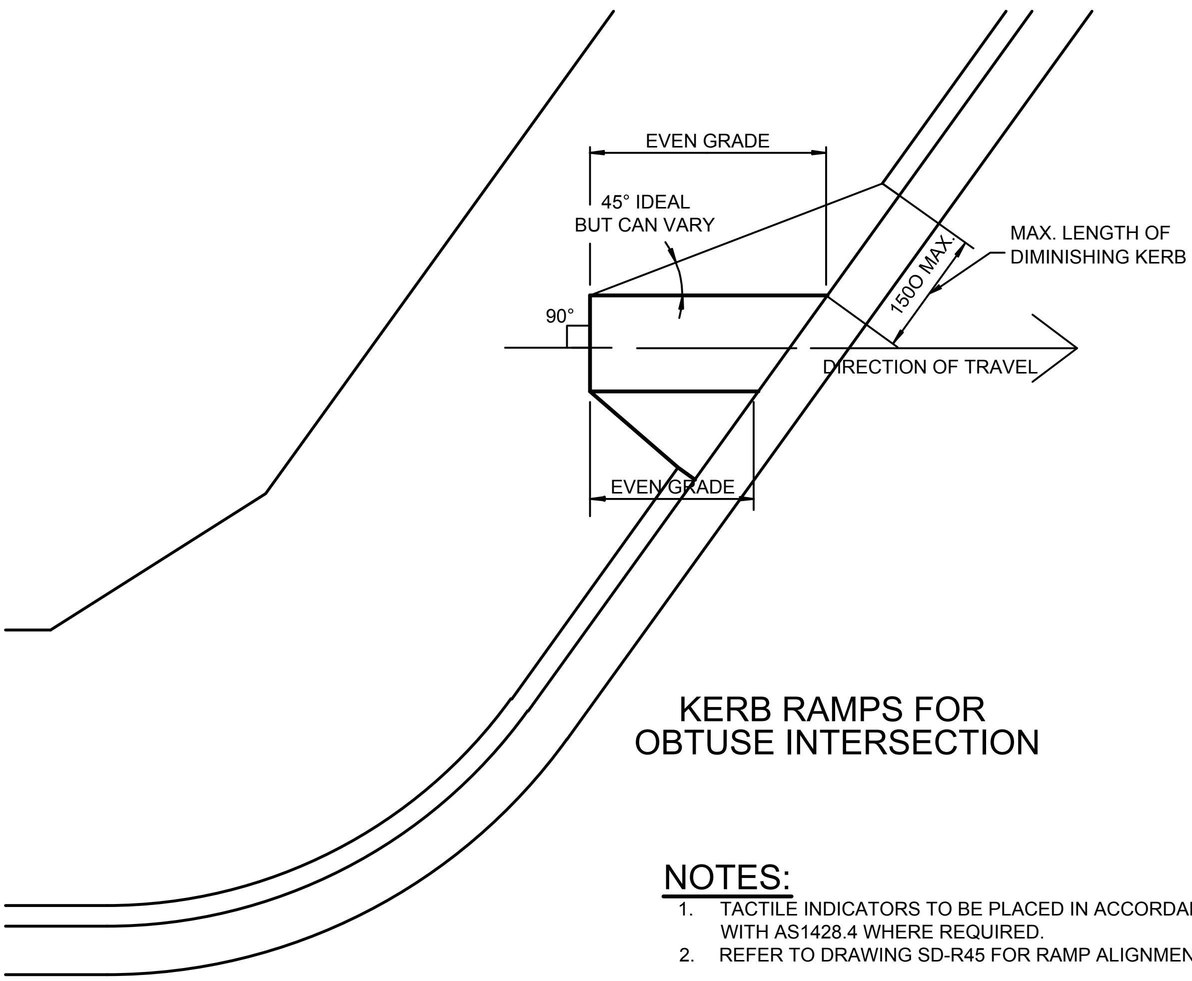
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
KERB RAMPS - GENERAL	SD-R07	N.T.S	1 OF 4	01	APR'21



KERB RAMPS FOR
ACUTE/OBTUSE INTERSECTION



KERB RAMPS FOR
OBTUSE INTERSECTION

NOTES:

1. TACTILE INDICATORS TO BE PLACED IN ACCORDANCE WITH AS1428.4 WHERE REQUIRED.
2. REFER TO DRAWING SD-R45 FOR RAMP ALIGNMENT

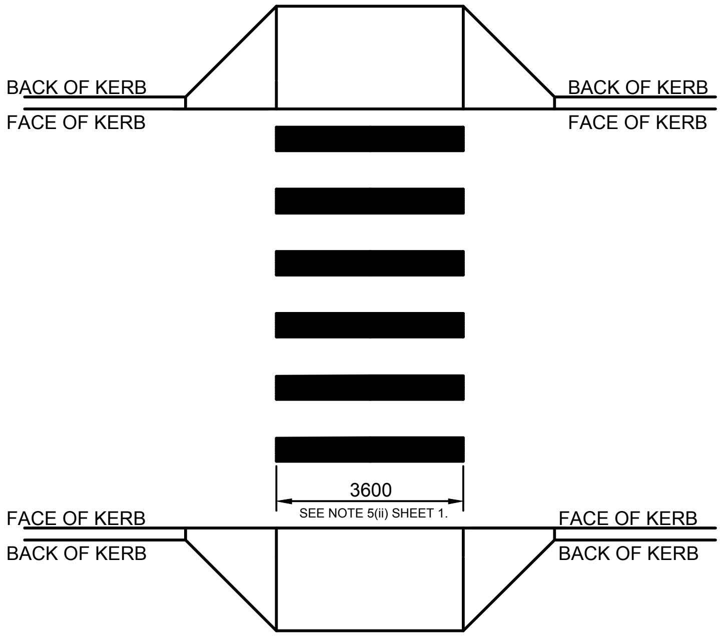
ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

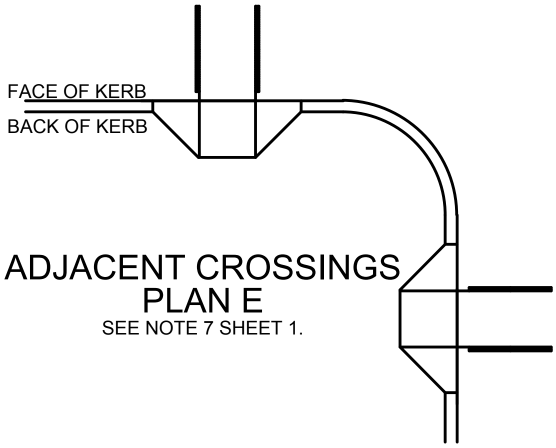
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
PROJECT TITLE:	WSPP STANDARD DRAWINGS
APPROVED:	SAG
DATE:	14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
KERB RAMPS - LAYOUT AT INTERSECTION	SD-R07	N.T.S	2 OF 4	01	APR'21



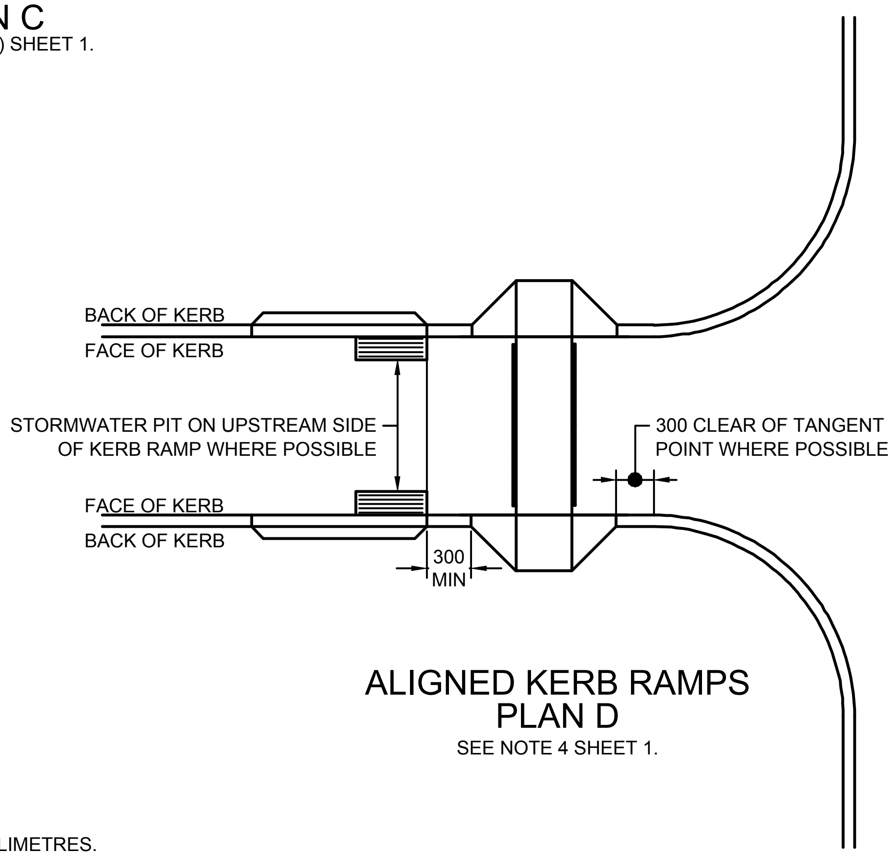
AT PEDESTRIAN CROSSING (ZEBRA) PLAN C

SEE NOTE 5(ii) SHEET 1.



ADJACENT CROSSINGS PLAN E

SEE NOTE 7 SHEET 1.



ALIGNED KERB RAMPS PLAN D

SEE NOTE 4 SHEET 1.

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR DETAIL KERB AND GUTTER OPTIONS SEE SD-R04
3. FOR SINGAGE REQUIREMENTS REFER AUSTRALIAN STANDARD AS 1742.10
4. AT SIGNALISED INTERSECTIONS REFER RMS STANDARD DRAWINGS
5. TACTILE INDICATORS TO BE PLACED IN ACCORDANCE WITH AS1428.4 WHERE REQUIRED.
2. REFER TO DRAWING SD-R45 FOR RAMP ALIGNMENT

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

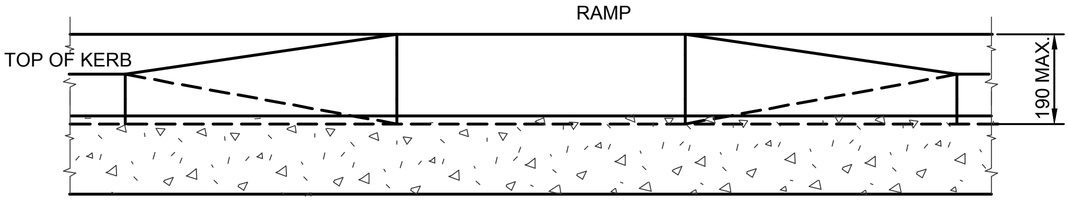
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: KERB RAMPS - AT CROSSINGS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R07	N.T.S	3 OF 4	01	APR'21



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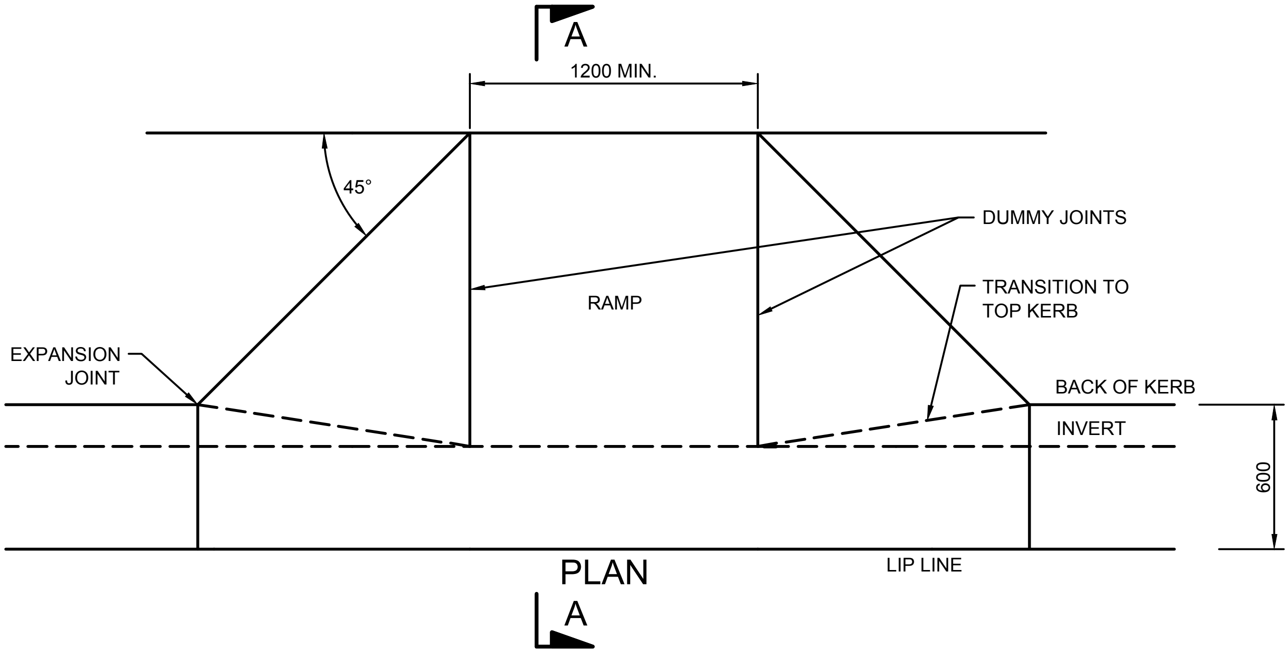
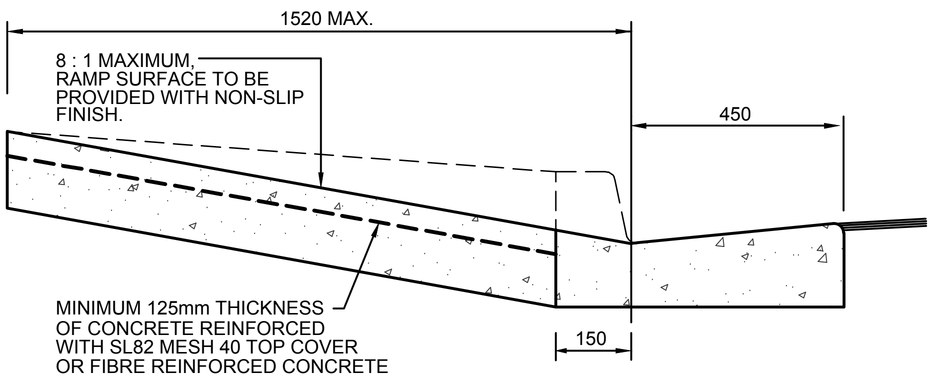


PLAN



SECTION A - A

DESIGN NOTE:

1. RAMP MUST BE IN A COLOUR THAT CONTRASTS WITH THE SURROUNDING CONCRETE TO AS2576-2000 FIG A-6 NOTE 1
2. TACTILE INDICATORS TO BE PLACED IN ACCORDANCE WITH AS1428.4 WHERE REQUIRED.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

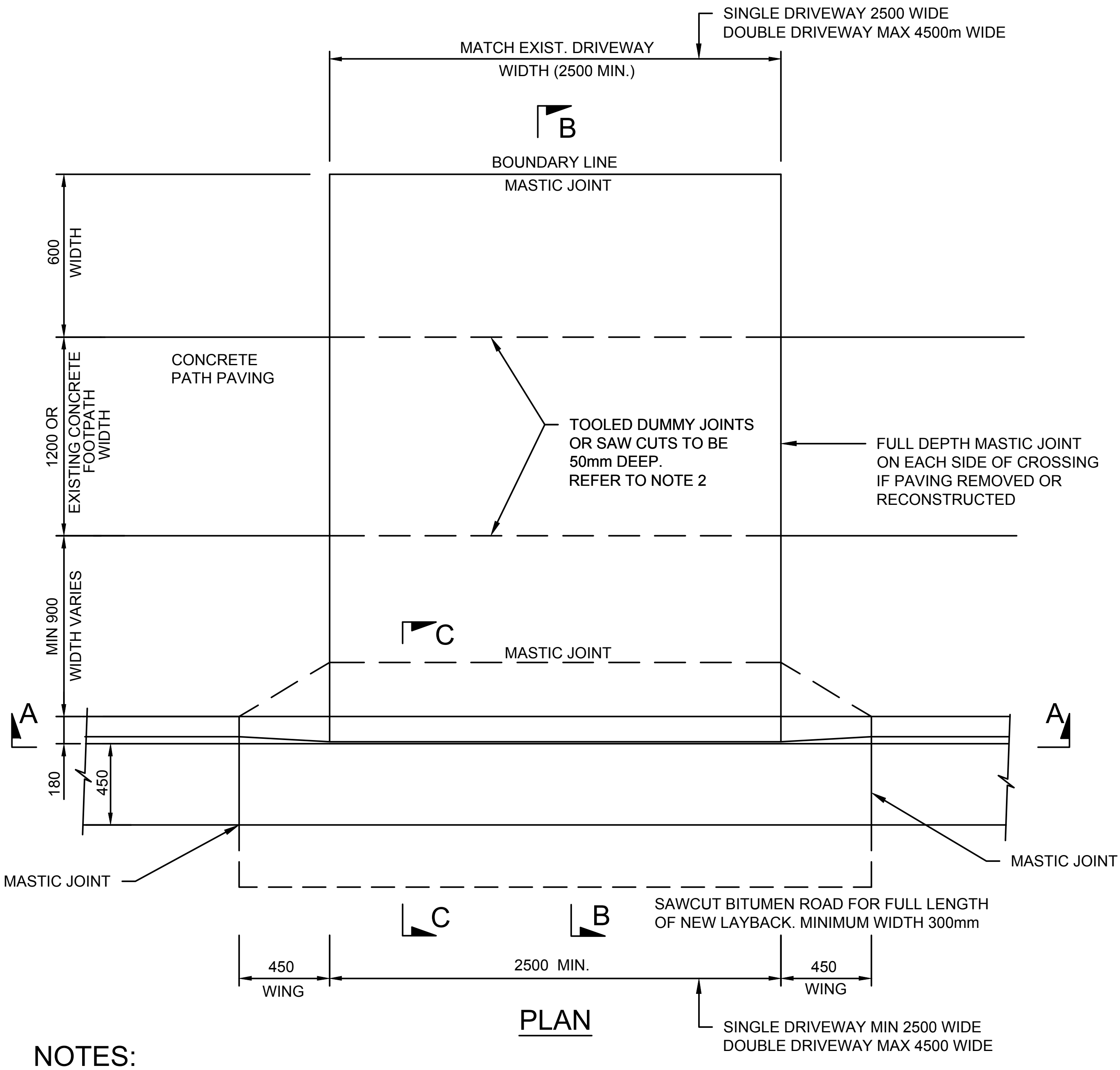
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
KERB RAMPS - DETAILS	SD-R07	N.T.S	4 OF 4	01	APR'21



PLAN

NOTES:

1. RESIDENTIAL VEHICULAR FOOTWAY CROSSING SHALL BE 100mm THICK CONCRETE, REINFORCED WITH SL82 MESH ON CHAIRS, 40mm COVER.
2. THE CONCRETE SHALL BE PLACED ON A 25mm LAYER OF APPROVED CLEAN WASHED NATURAL SAND, EXCEPT UNDER THE KERB & GUTTER LINE WHERE THIS SECTION SHALL BE PLACED ON A MINIMUM 150mm COMPACTED LAYER OF D.G.B 20.
3. EXISTING CONCRETE FOOTPATH SHALL BE SAW CUT EITHER SIDE OF THE CROSSING AND WHERE NECESSARY RECONSTRUCTED IN CONJUNCTION WITH THE CROSSING.
4. CONCRETE SHALL HAVE A 28 DAY STRENGTH (F'c) OF 25MPa AND A SLUMP OF 80mm.
5. ANY VARIATIONS TO STANDARD CROSSFALL 2.5% ON FOOTWAY SHALL HAVE THE PRIOR APPROVAL OF COUNCIL.
6. BITUMINOUS FIBRE BOARD 10mm THICK, 125mm DEEP TO BE PLACED AS PER THE PLAN.
7. SURFACE FINISH: ON PLAIN CONCRETE, THE EXPOSED SURFACE SHALL BE BROOM FINISHED WITH BULL NOSED EDGES TO LEAVE THE SURFACE PLAIN & SMOOTH & UNIFORM IN COLOUR & APPEARANCE. ALL KERB & GUTTERING & LAYBACKS SHALL BE FINISHED WITH A STEEL FLOAT TO LEAVE THE SURFACE PLAIN, SMOOTH & UNIFORM IN COLOUR & APPEARANCE. AFTER REMOVAL OF FORMWORK, ANY ROUGH OR POUROUS PLACES OR HOLES SHALL BE PICKED OVER & DRESSED UP WITH A TWO (2) TO ONE (1) CEMENT MORTAR. OTHER FINISHES MUST BE APPROVED IN WRITING FROM THE DIRECTOR OF CITY WORKS.
8. ALL DIMENSIONS ARE SHOWN IN MILLIMETRES.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

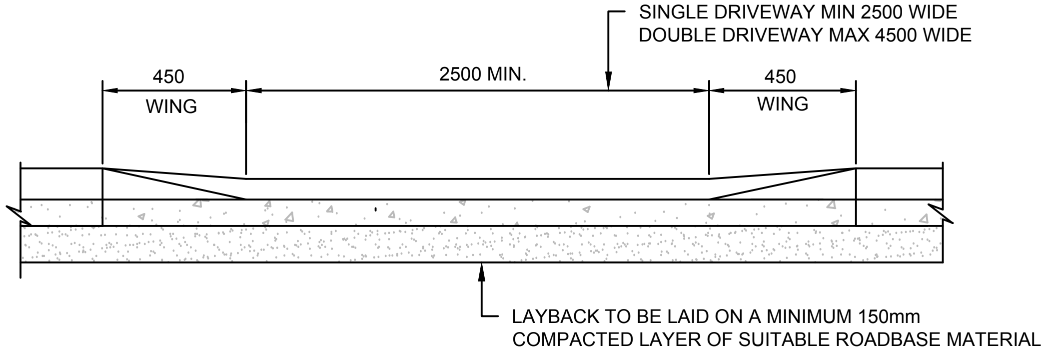
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

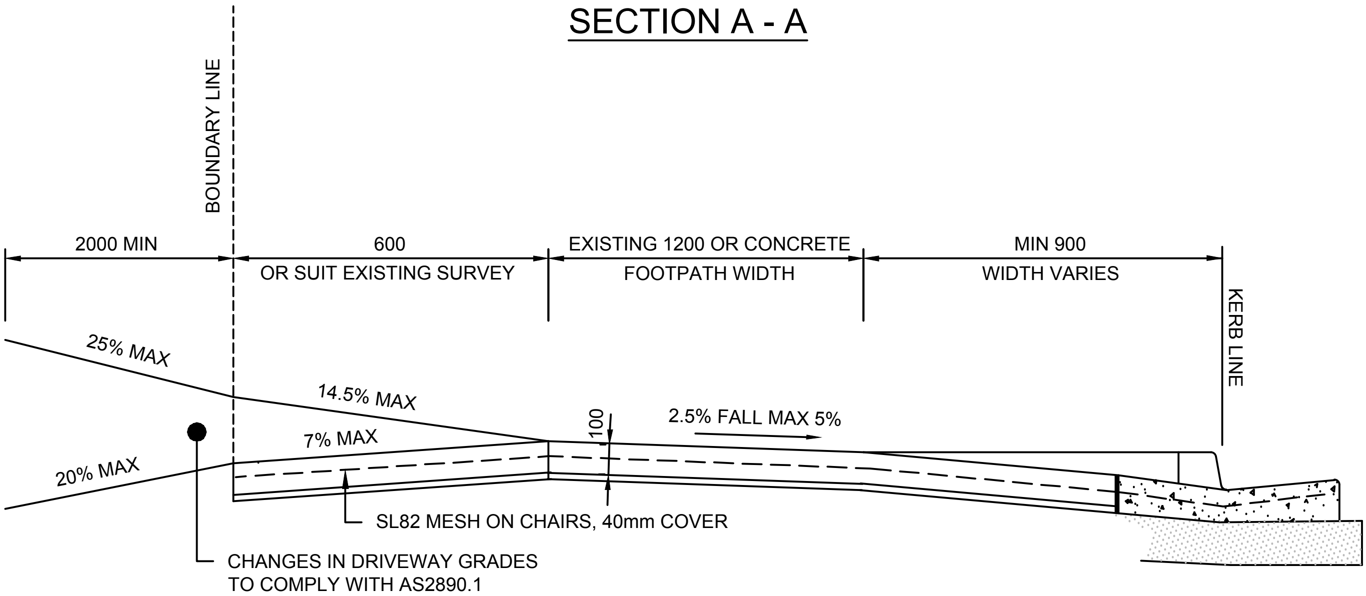
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

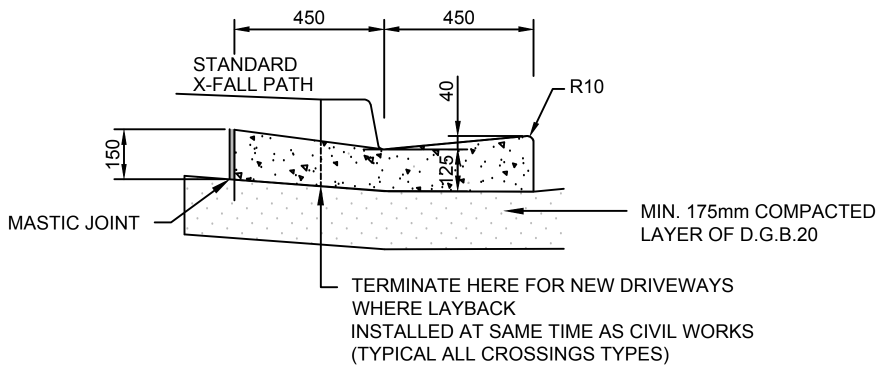
SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
RESIDENTIAL VEHICLE CROSSING - PLAN	SD-R08	N.T.S	1 OF 2	01	APR'21



SECTION A - A



SECTION B - B



SECTION C - C

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

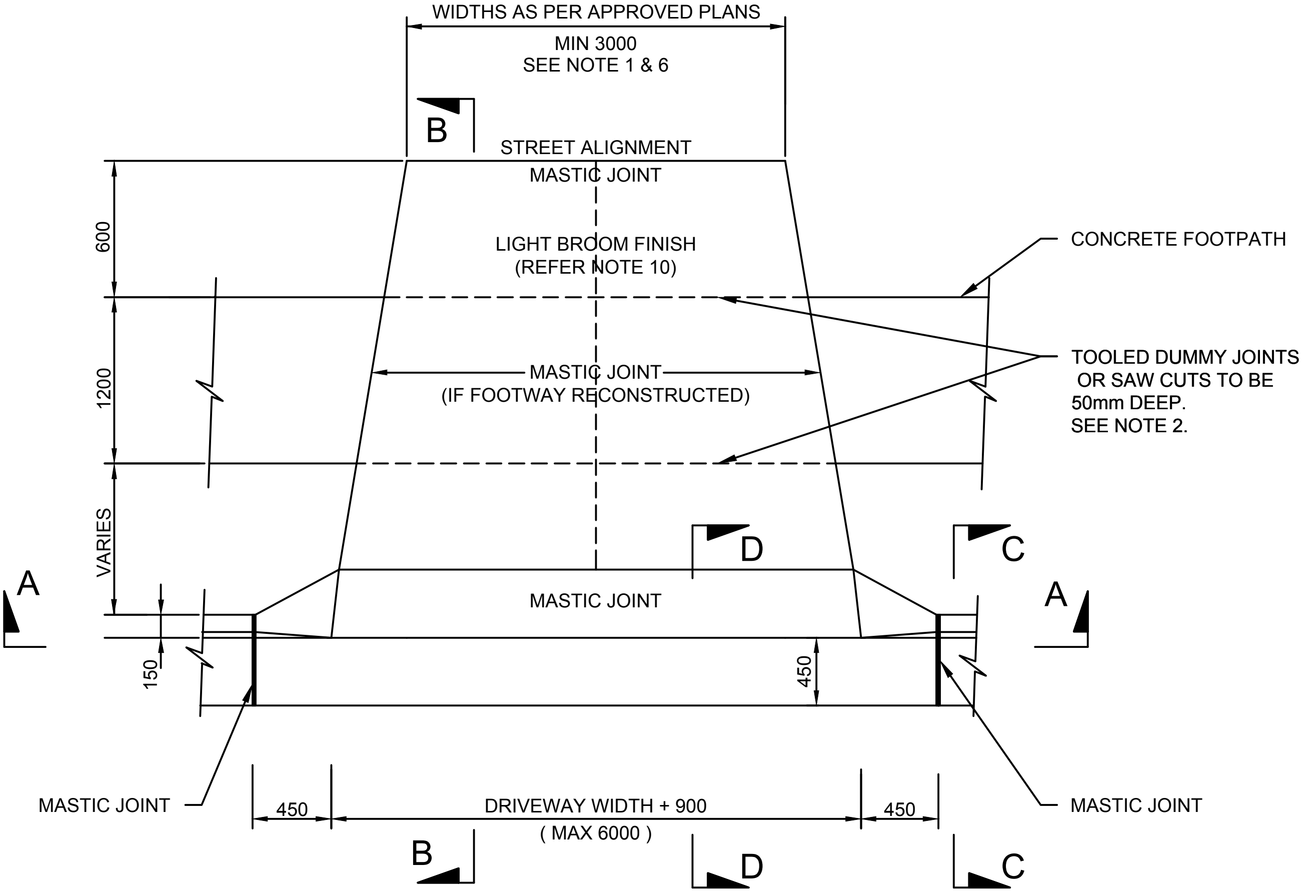
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
RESIDENTIAL VEHICLE CROSSING - SECTIONS

STD DWG No. SD-R08
SCALE: N.T.S
SHEET 2 OF 2
VERSION 01
DATE APR'21



PLAN

NOTES:

1. CROSSING LOCATIONS AND WIDTHS TO CONFORM WITH APPROVED PLANS.
2. DUMMY/KEY JOINTS OF APPROVED PROPRIETARY DESIGN SHALL BE PREPARED AS FOLLOWS:
   - IF WIDTH IS 6m - 9m: -SINGLE CENTRAL JOINT
   - IF WIDTH IS GREATER THAN 9m TWO JOINTS EQUALLY SPACED.
3. MEDIUM DENSITY VEHICULAR FOOTWAY CROSSINGS SHALL BE MINIMUM 175mm THICK CONCRETE, REINFORCED WITH SL82 MESH ON CHAIRS, 40mm COVER.
4. THE CONCRETE SHALL BE PLACED ON A 25mm LAYER OF APPROVED FINE, GRANULAR MATERIAL, EXCEPT UNDER THE KERB AND GUTTER LINE WHERE THIS SECTION SHALL BE PLACED ON A MINIMUM 175mm COMPACTED LAYER OF D.G.B 20.
5. MINIMUM WIDTH OF ENTRY AT KERB LINE SHALL BE 3m PLUS WINGS.
6. MAXIMUM WIDTH OF ENTRY AT KERB LINE IS SUBJECT TO TRAFFIC REGULATIONS, POLICY AND STANDARDS FOR TRAFFIC GENERATING DEVELOPMENTS.
7. EXISTING CONCRETE FOOTPATH SHALL BE SAW CUT EITHER SIDE OF THE CROSSING AND WHERE NECESSARY RECONSTRUCTED IN CONJUNCTION WITH THE CROSSING.
8. CONCRETE SHALL HAVE A 28 DAY STRENGTH (F'c) OF 25MPa AND A SLUMP OF 80mm.
9. ANY VARIATIONS TO STANDARD CROSSFALL 2.5% ON FOOTWAY SHALL HAVE THE PRIOR APPROVAL OF COUNCIL.
10. CONCRETE SHALL HAVE A LIGHT BROOM FINISH.
11. ALL DIMENSIONS ARE SHOWN IN MILLIMETRES.
12. SEE AS 2890 FOR GRADIENT DESIGN REQUIREMENTS

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

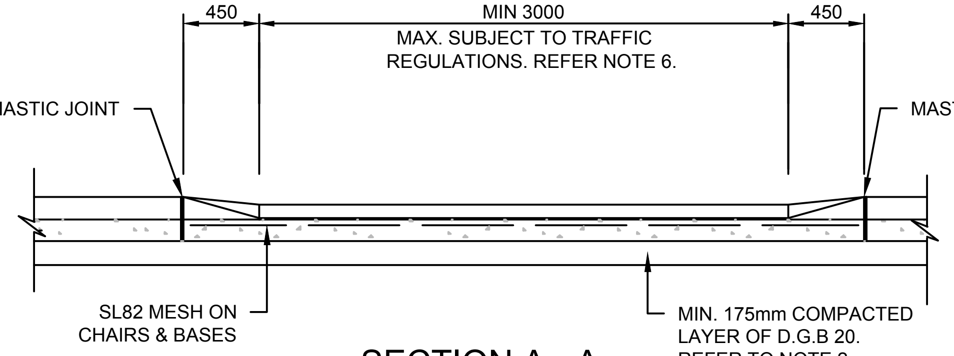
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

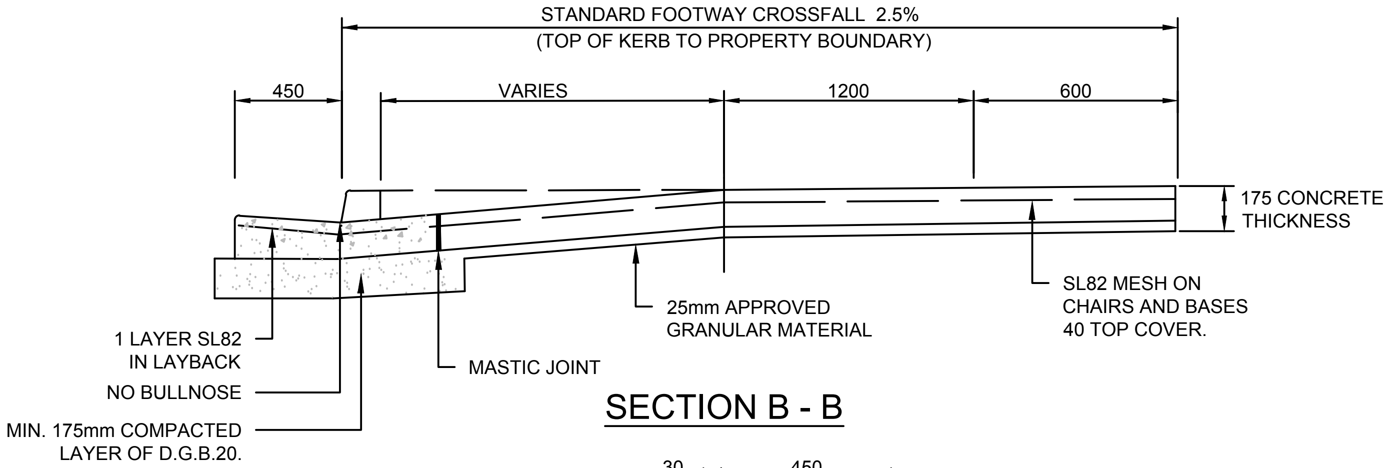
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: MULTI-UNIT HOUSING VEHICLE CROSSING - PLAN

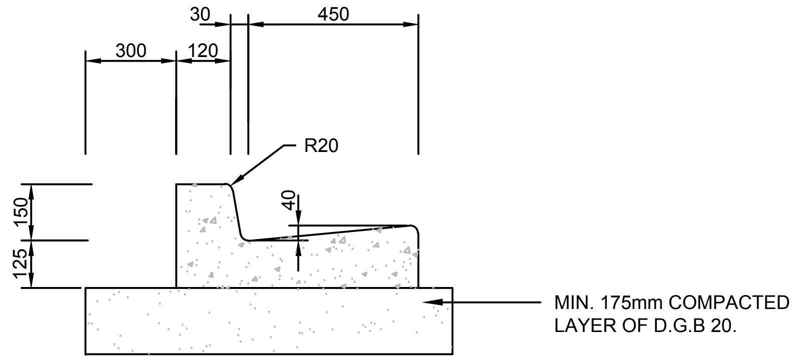
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R09	N.T.S	1 OF 2	01	APR'21



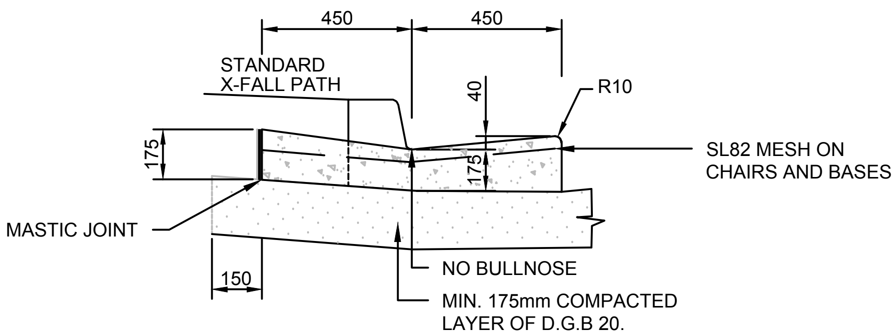
SECTION A - A



SECTION B - B



SECTION C - C



SEE NOTES ON SHEET 1 OF 2

SECTION D - D

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

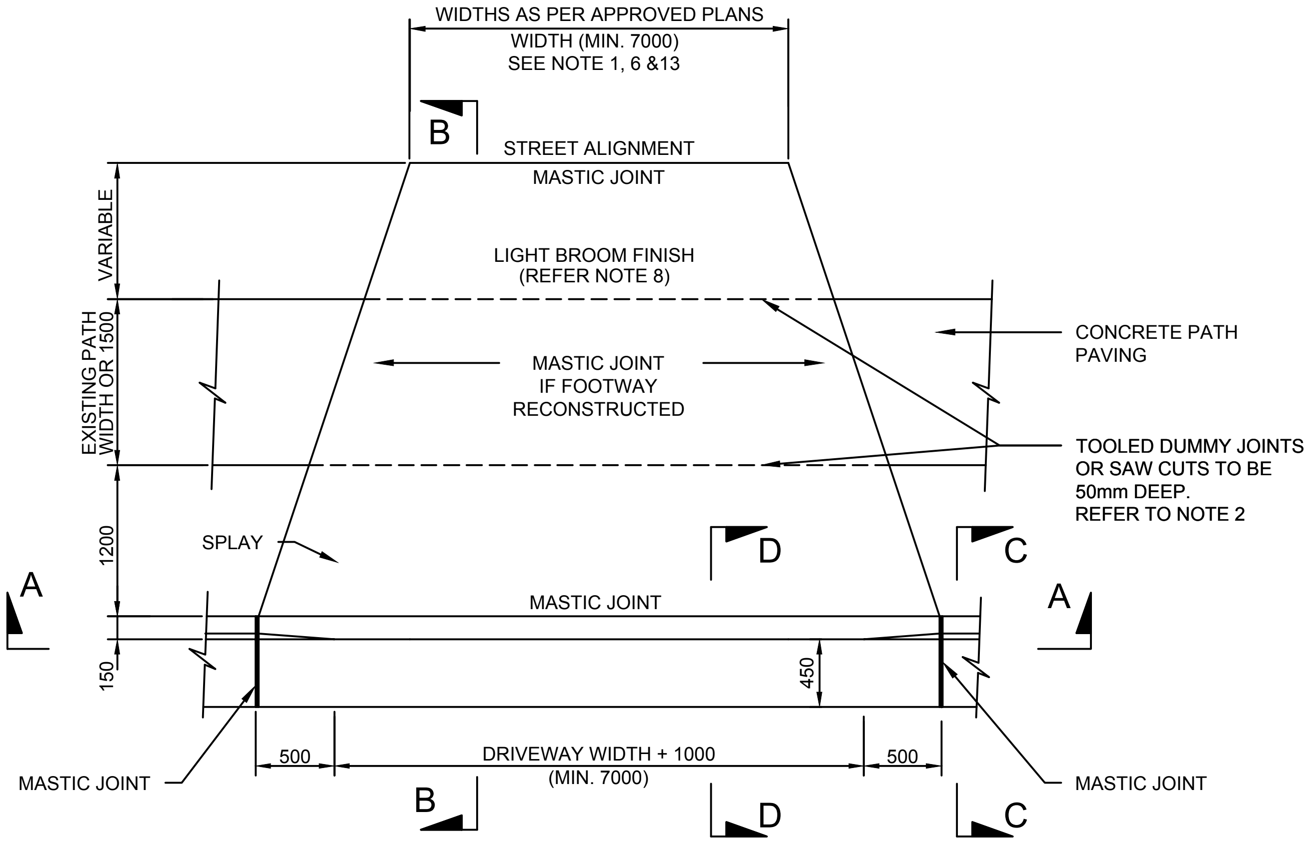
PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
MULTI-UNIT HOUSING VEHICLE CROSSING - SECTIONS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R09	N.T.S	2 OF 2	01	APR'21

Apr 15, 2021 - 11:07am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R09_1-2.dwg



PLAN

NOTES:

1. CROSSING LOCATIONS AND WIDTHS TO CONFORM WITH APPROVED PLANS AND SWEPT PATHS OF THE LARGEST DESIGN VEHICLE ACCESSING THE SITE.
2. DUMMY/KEY JOINTS OF APPROVED PROPRIETARY DESIGN SHALL BE PREPARED AS FOLLOWS:
   - IF WIDTH IS 6m - 9m: -SINGLE CENTRAL JOINT
   - IF WIDTH IS GREATER THAN 9m TWO JOINTS EQUALLY SPACED.
3. MEDIUM DENSITY VEHICULAR FOOTWAY CROSSINGS SHALL BE MINIMUM 175mm THICK CONCRETE (225mm CONCRETE FAIRFIELD COUNCIL VARIATION), REINFORCED WITH SL82 MESH ON CHAIRS, 40mm COVER.
4. THE CONCRETE SHALL BE PLACED ON A 25mm LAYER OF APPROVED FINE, GRANULAR MATERIAL, EXCEPT UNDER THE KERB AND GUTTER LINE WHERE THIS SECTION SHALL BE PLACED ON A MINIMUM 175mm COMPACTED LAYER OF D.G.B 20.
5. MINIMUM WIDTH OF ENTRY AT KERB LINE SHALL BE 3m PLUS WINGS.
6. MAXIMUM WIDTH OF ENTRY AT KERB LINE IS SUBJECT TO TRAFFIC REGULATIONS, POLICY AND STANDARDS FOR TRAFFIC GENERATING DEVELOPMENTS.
7. EXISTING CONCRETE FOOTPATH SHALL BE SAW CUT EITHER SIDE OF THE CROSSING AND WHERE NECESSARY RECONSTRUCTED IN CONJUNCTION WITH THE CROSSING.
8. CONCRETE SHALL HAVE A 28 DAY STRENGTH (F'c) OF 32MPa AND A SLUMP OF 80mm.
9. ANY VARIATIONS TO STANDARD CROSSFALL 2.5% ON FOOTWAY SHALL HAVE THE PRIOR APPROVAL OF COUNCIL.
10. CONCRETE SHALL HAVE A LIGHT BROOM FINISH.
11. ALL DIMENSIONS ARE SHOWN IN MILLIMETRES.
12. SPECIFIC STRUCTURAL DESIGN MAY BE REQUIRED WHERE THE DESIGN VEHICLE HAS A GROSS VEHICLE MASS GREATER THAN 10 TONNES.
13. REFER AS 2890 FOR DETAIL DESIGN CONSIDERATIONS

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

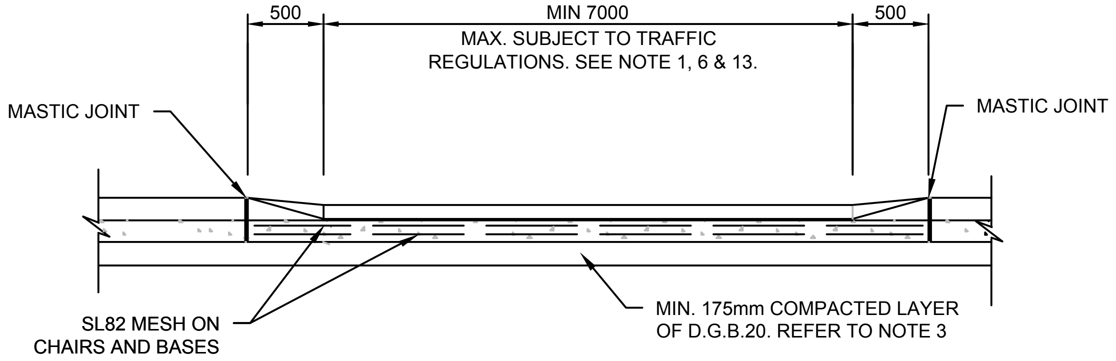
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

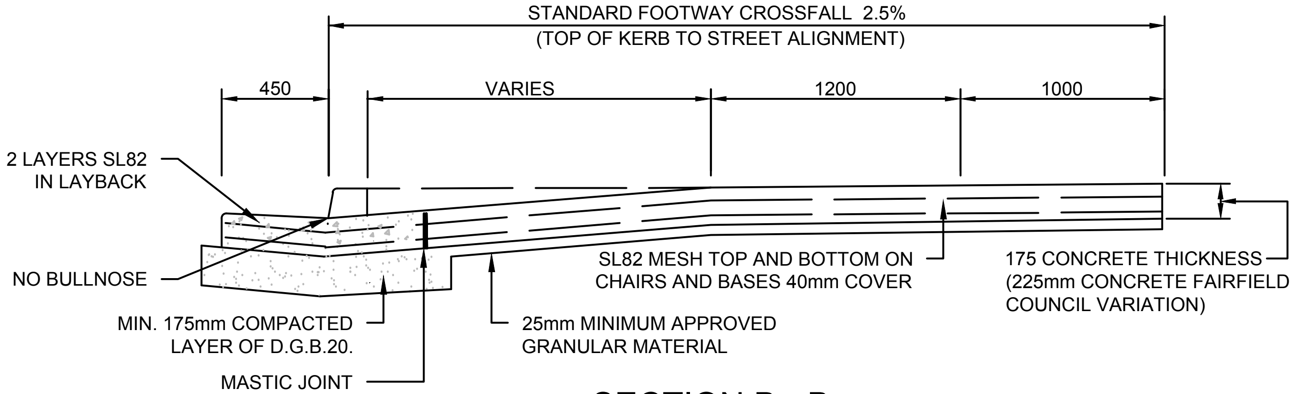
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: COMMERCIAL & INDUSTRIAL VEHICLE CROSSING - PLAN

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R10	N.T.S	1 OF 2	01	APR'21



SECTION A - A



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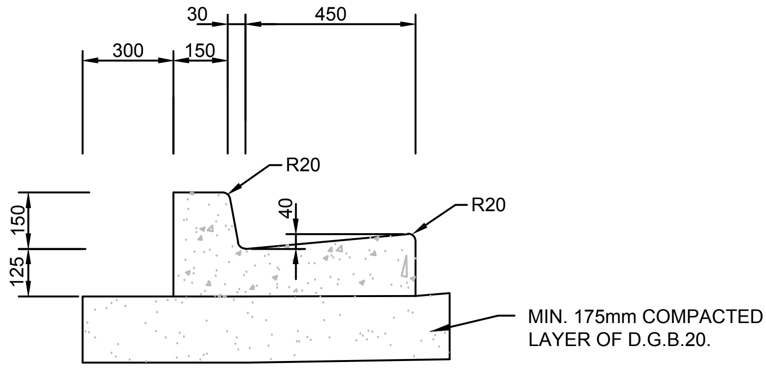

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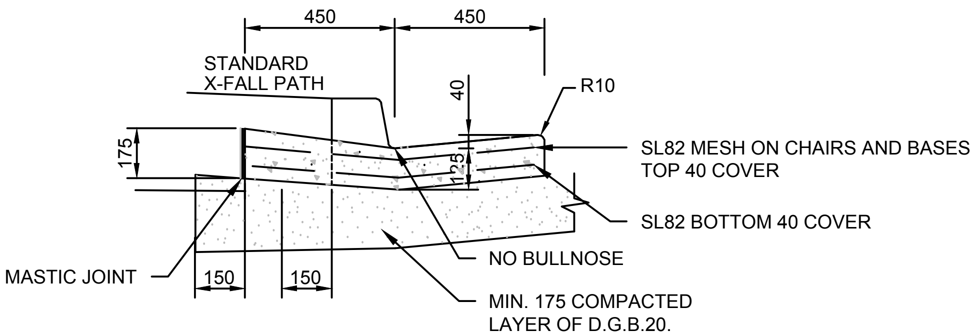


SECTION D - D

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

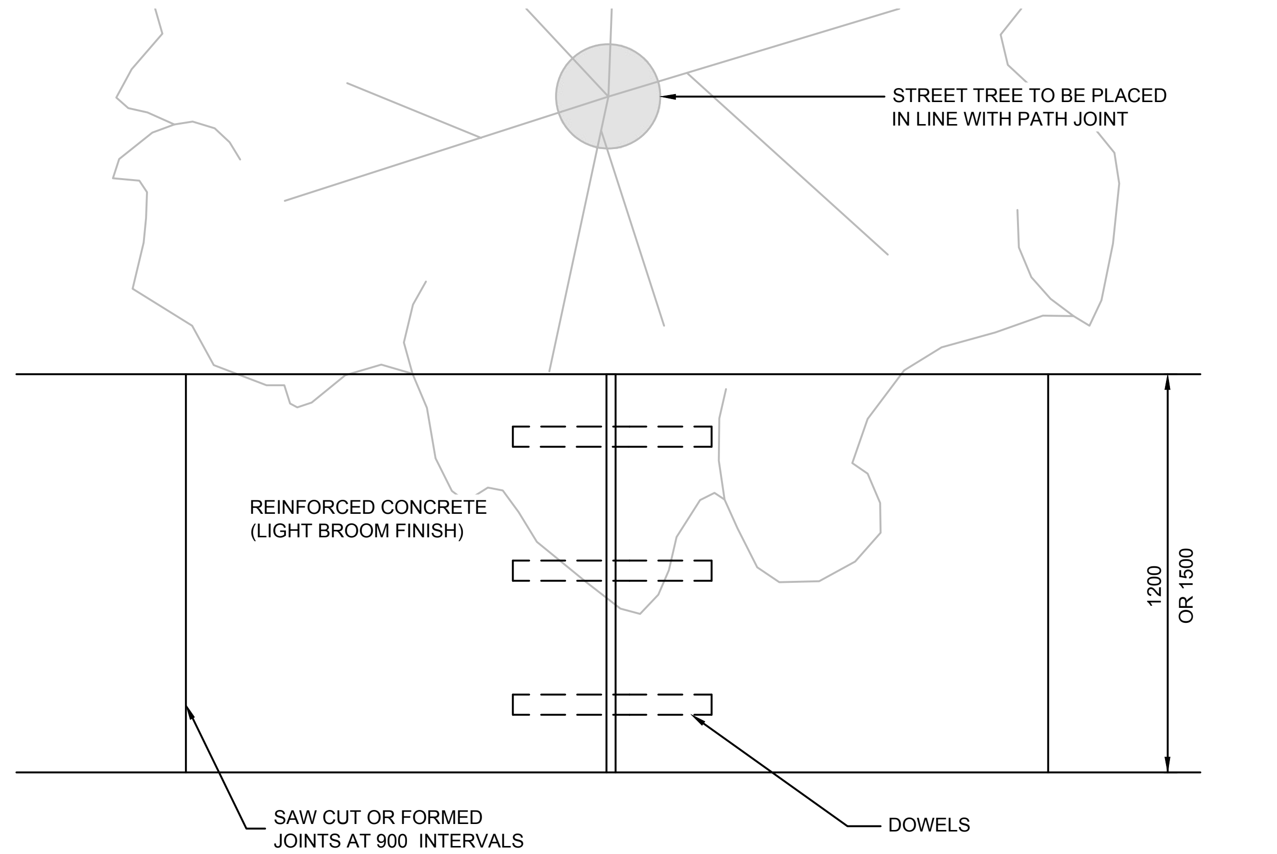
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

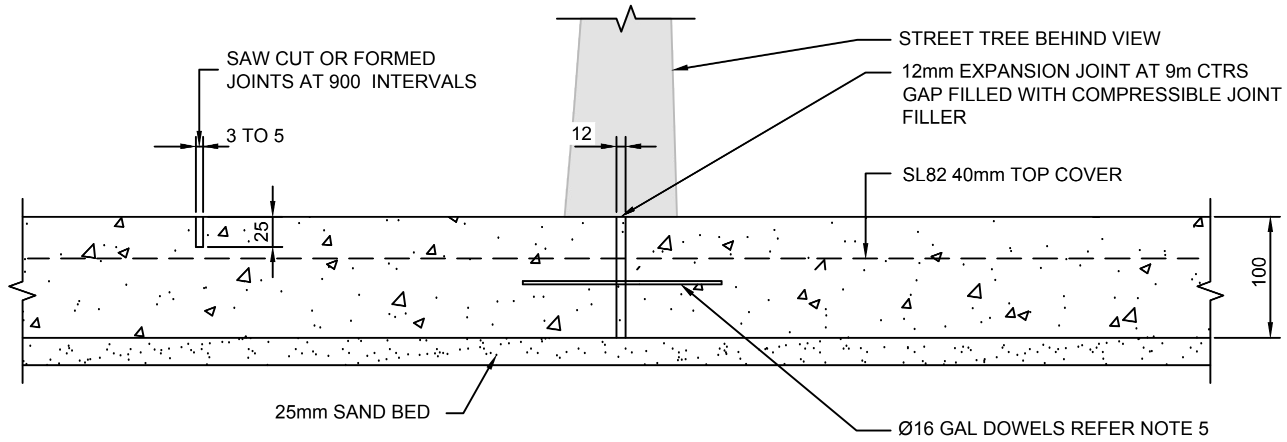
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: COMMERCIAL & INDUSTRIAL VEHICLE CROSSING - SECTIONS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R10	N.T.S	2 OF 2	01	APR'21



PLAN



CROSS SECTION

NOTES:

1. CONCRETE LAYER SHALL BE PLACED ON A LAYER OF 25MM SAND BED
2. CONCRETE TO BE MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 25MPa, 80mm SLUMP
3. ANY VARIATIONS TO STANDARD CROSSFALL, 2.5% ON FOOTPATH SHALL REQUIRE THE PRIOR APPROVAL OF COUNCIL'S ENGINEER.
4. CONCRETE FINISH TO BE A LIGHT BROOM FINISH.
5. ALL DOWELS TO BE 600mm LONG WITH 300mm PENETRATION INTO EACH SLAB. ONE END CAPPED OR TAPED.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
7. EXPANSION JOINTS TO BE PLACED AT 9m CTRS
8. FORMED CONTROL JOINTS 25mm DEEP AT 0.9m CTRS WITHIN 24 HOURS OF FINISHING CONCRETE.
9. CONCRETE TO BE VIBRATED INTO PLACE TO ACHIEVE COMPACTION.
10. KEYED JOINTS REQUIRED AT 9 METER INTERVALS
11. WHERE STREET TREES ARE REQUIRED THEY ARE TO BE PLACED PERPENDICULAR TO FOOTPATH JOINT

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE:
WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
FOOTPATH	SD-R11	N.T.S	1 OF 1	01	APR'21

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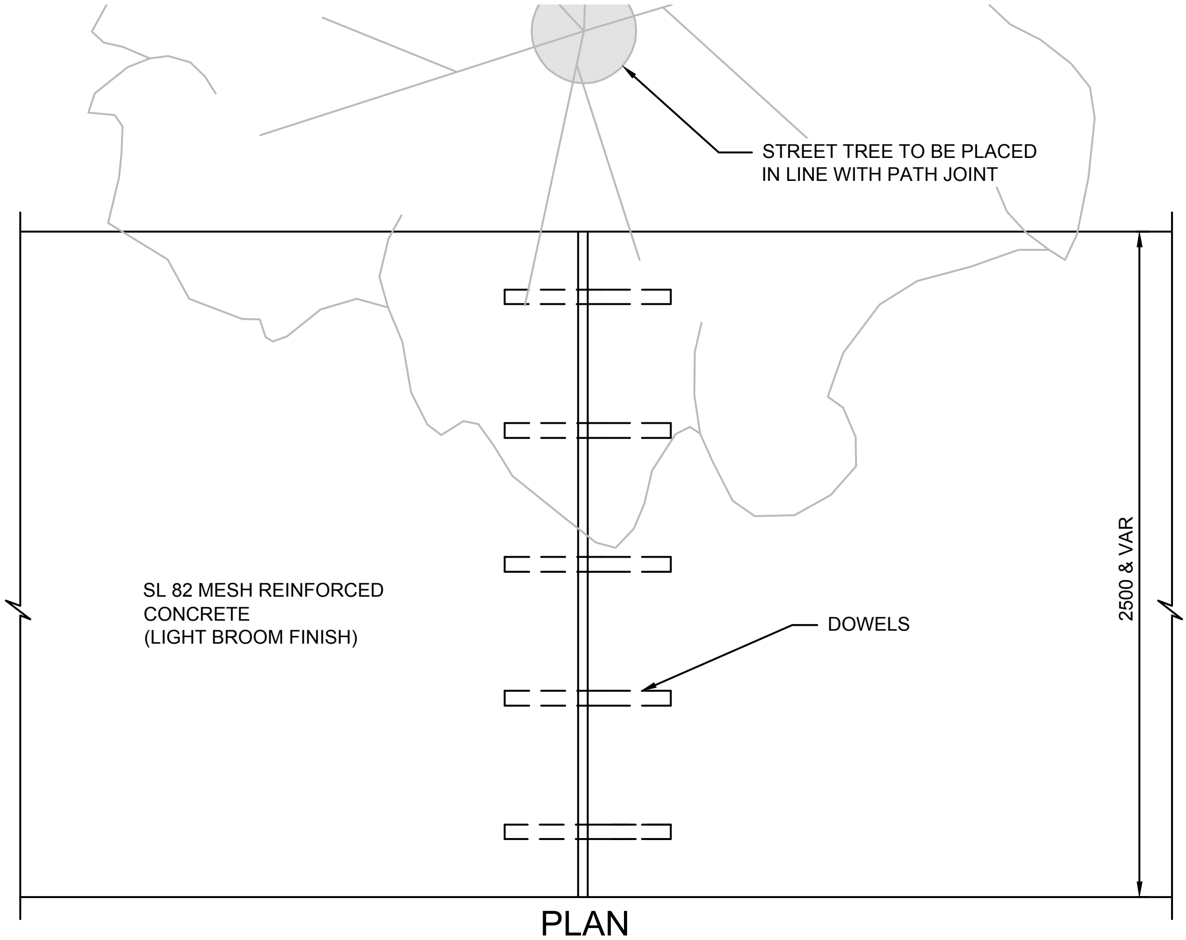

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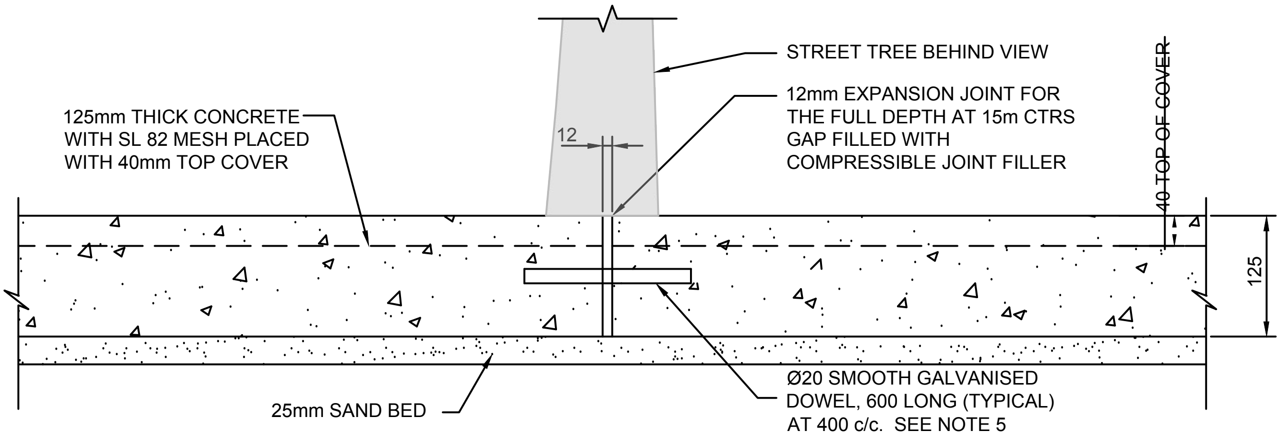


CROSS SECTION

NOTES:

1. CONCRETE LAYER SHALL BE PLACED ON A LAYER OF 25mm SAND BED.
2. CONCRETE TO BE MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 25MPa, 80mm SLUMP
3. ANY VARIATIONS TO STANDARD CROSSFALL, 2.5% ON CYCLEWAY SHALL REQUIRE THE PRIOR APPROVAL OF COUNCIL'S ENGINEER.
4. CONCRETE FINISH TO BE A LIGHT BROOM FINISH.
5. ALL DOWELS TO BE 600mm LONG WITH 300mm PENETRATION INTO EACH SLAB. ONE END CAPPED OR TAPED.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
7. EXPANSION JOINTS TO BE PLACED EVERY 15m
8. SAWCUT CONTROL JOINTS 30mm DEEP AT 3m CTRS WITHIN 24 HOURS OF FINISHING CONCRETE.
9. CONCRETE PATHS SHALL BE APPROPRIATELY CURED AFTER 24 HOURS CONTINUOUSLY FOR AT LEAST 3 DAYS UNDER AMBIENT CONDITIONS.
10. CONCRETE TO BE VIBRATED INTO PLACE TO ACHIEVE COMPACTION.
11. KEYED JOINTS MAY BE USED FOR EXPANSION JOINTS
11. WHERE STREET TREES ARE REQUIRED THEY ARE TO BE PLACED PERPENDICULAR TO FOOTPATH JOINT

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

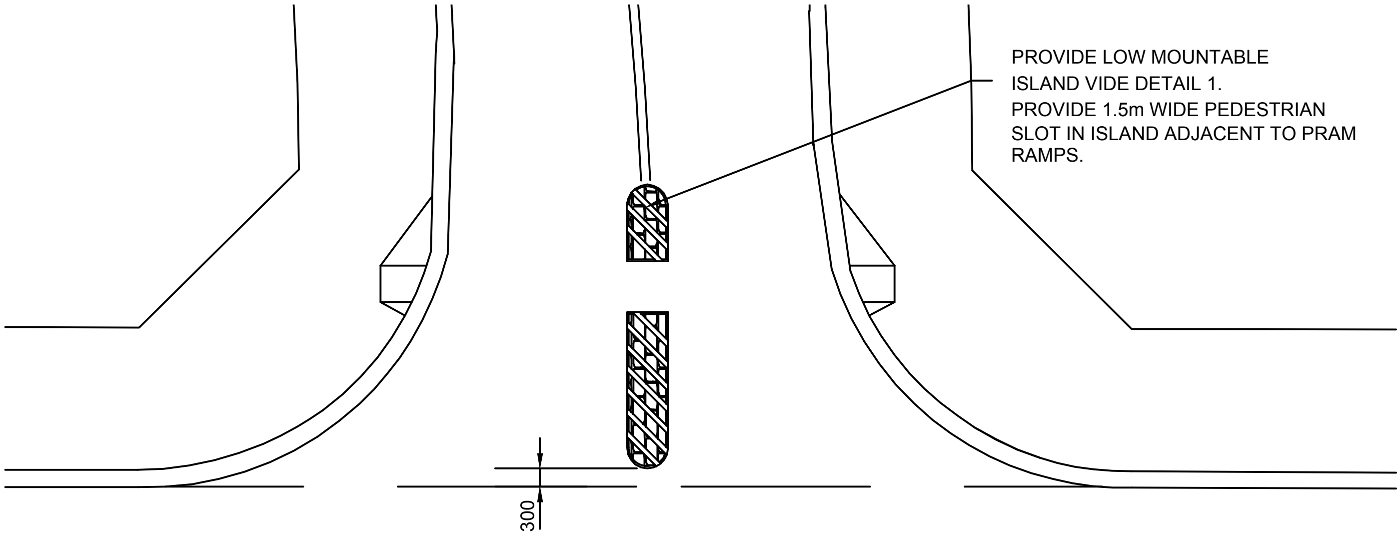
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE:
WSPP STANDARD DRAWINGS

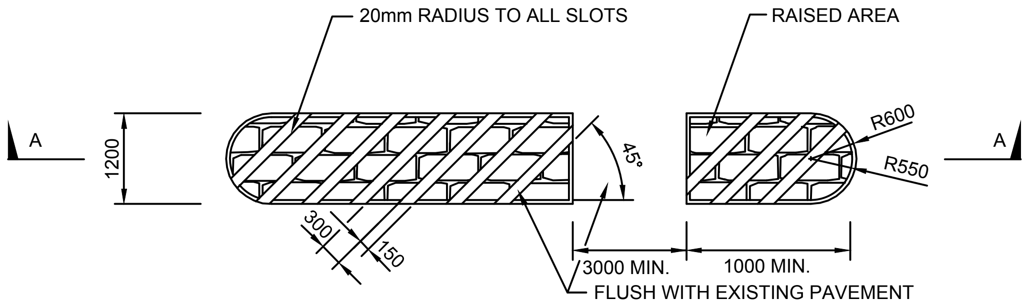
SHEET TITLE:
OFF ROAD SHARED BICYCLE & FOOTPATHS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R12	N.T.S	1 OF 1	01	APR'21

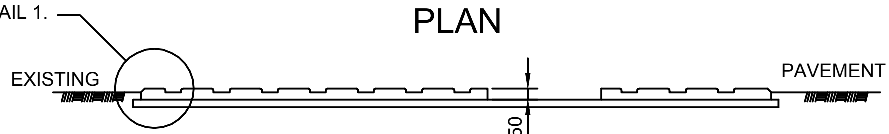
Apr 15, 2021 - 11:07am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R12.dwg



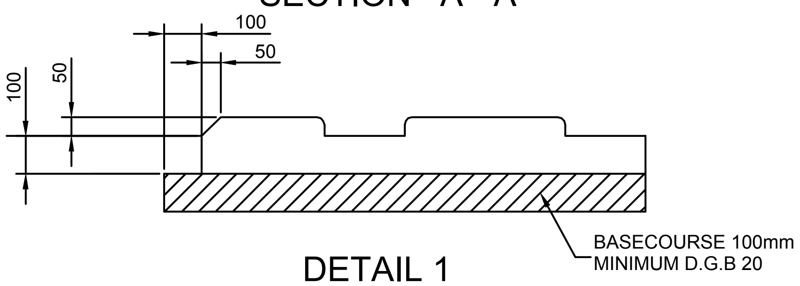
PLAN SHOWING LOCATION OF
LOW MOUNTABLE ISLAND



PLAN



SECTION A - A



DETAIL 1

NOTES:

1. THE FIBRE REINFORCED CONCRETE SHALL BE PLACED ON A LAYER OF 100mm D.G.B 20
2. FIBRE REINFORCED CONCRETE SHALL HAVE A 28 DAY STRENGTH (F'c) OF 32MPa.
3. PROVIDE COBBLESTONE PATTERN OR SIMILAR TO ISLAND IN TERRACOTTA COLOUR.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
5. MOUNTABLE ISLAND SHALL BE 100 THICK FIBRECRETE, FIBREMESH MULTI-DESIGNED (M.D.) COLLATED, FIBRILLATED FIBRES SHALL BE ADDED TO THE CONCRETE AT THE RATE OF 0.9kg PER CUBIC METRE OF CONCRETE AT THE BATCH PLANT & SHALL BE MIXED FOR A MINIMUM OF 5 MINUTES AFTER THE ADDITION OF FIBRES, TO ENSURE PROPER SEPARATION & DISTRIBUTION.
   FIBREMESH IS TO COMPLY WITH THE FOLLOWING:
   - FIBRE LENGTH - 12-19mm
   - MELT POINT - 160°C- 170°C
   - IGNITION POINT - 590°C
   - TENSILE STRENGTH - 560-770 MPa
   - MODULUS (YOUNGS) - 3500 MPa
   - CONCRETE STRENGTH - 32 MPa

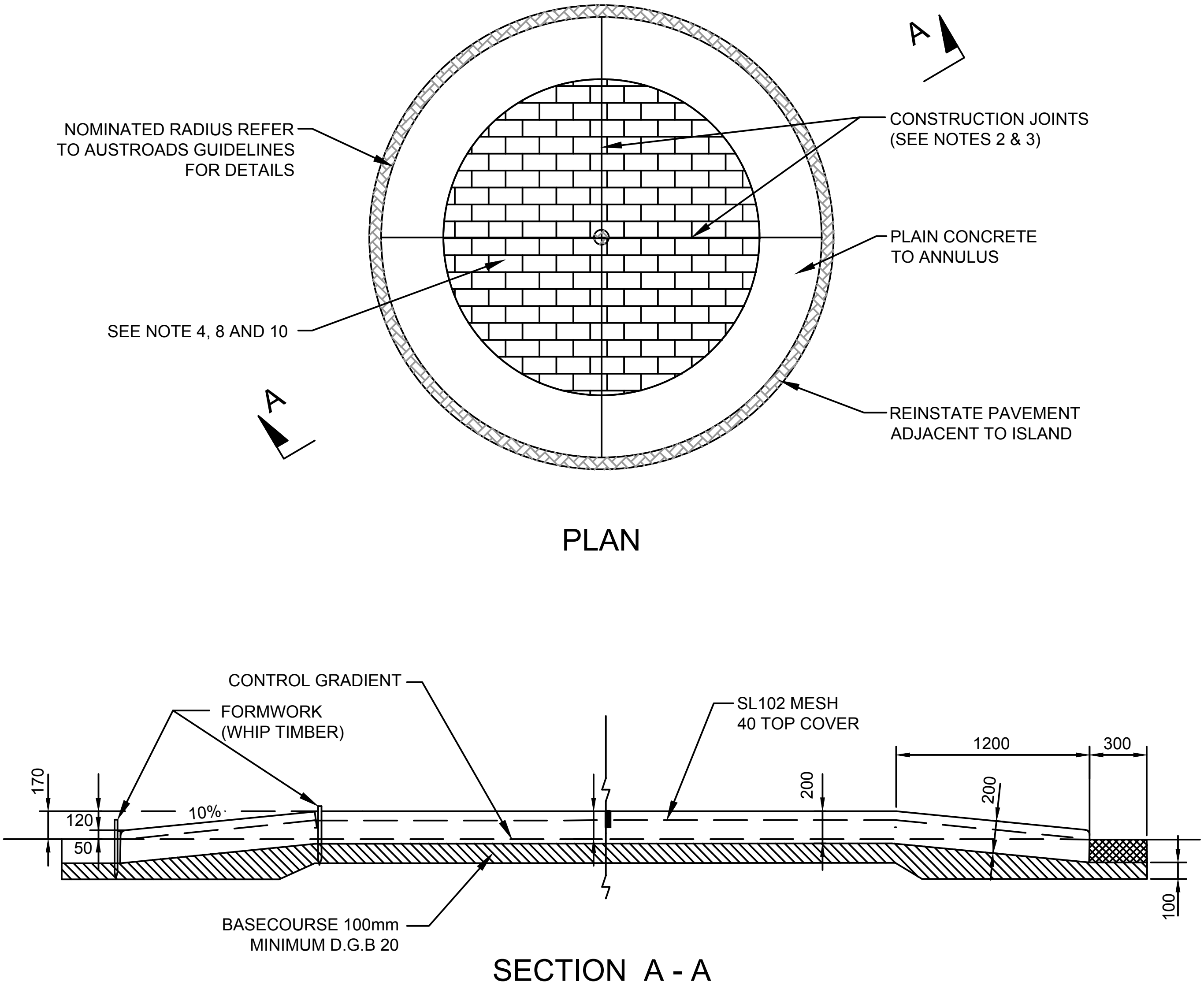
ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
PROJECT TITLE:	WSPP STANDARD DRAWINGS
APPROVED:	SAG
DATE:	14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
LOW MOUNTABLE ISLAND	SD-R13	N.T.S	1 OF 1	01	APR'21



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. ISLAND MAY BE POURED IN HALVES DEPENDING ON SIZE
3. PROVIDE MASTIC JOINT TO TOP HALF OF SLAB, MESH TO CONTINUE THROUGH JOINT
4. BOX OUT CENTRAL ISLAND AREA AS SHOWN. REMOVE & REPLACE UNSOUND SUBGRADE IF REQUIRED.
5. PROVIDE MINIMUM 100mm D.G.B.20 BASE, SHAPE & COMPACT TO 100% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH A.S.1289.5.1.1.
6. ISLAND TO BE CONSTRUCTED IN QUADRANTS (SEE NOTE 2.)
7. CONSTRUCT ALL ISLANDS & MEDIANS USING CONCRETE WITH MINIMUM STRENGTH OF 32MPa AND SLUMP OF 60mm.
8. PROVIDE COBBLESTONE PATTERN OR SIMILAR TO CONCRETE MEDIAN & ISLANDS IN TERRACOTTA COLOUR OR APPROVED COLOUR.
9. DETAIL OF ASSOCIATED LINEMARKING & SIGNPOSTING TO BE SHOWN ON DESIGN PLAN OR IN ACCORDANCE WITH RMS STANDARD TREATMENT, AND APPROVED BY RELEVANT COUNCIL'S LOCAL TRAFFIC COMMITTEE.
10. PATTERNS AND FINISHES TO STREETSCAPE THEME FOR EACH COUNCIL AND OR PRECINCT
11. BROOM FINISH CONCRETE FOR ANNULUS

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

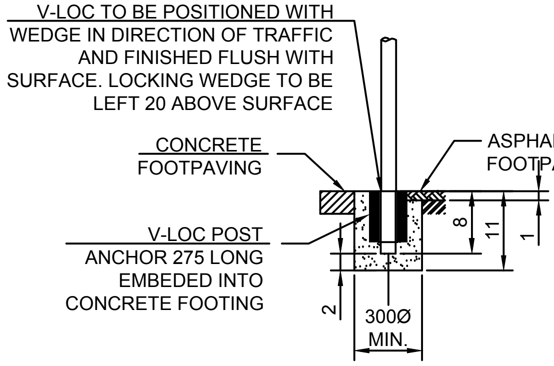
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

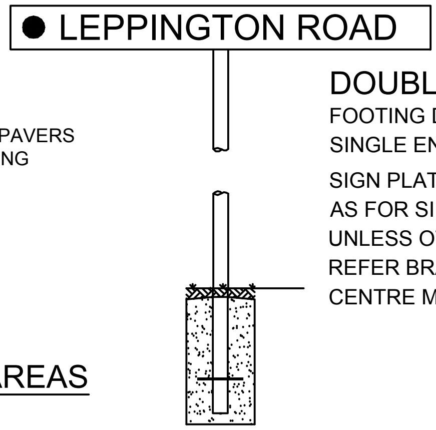
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: MOUNTABLE ROUNDABOUTS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R15	N.T.S	1 OF 1	01	APR'21



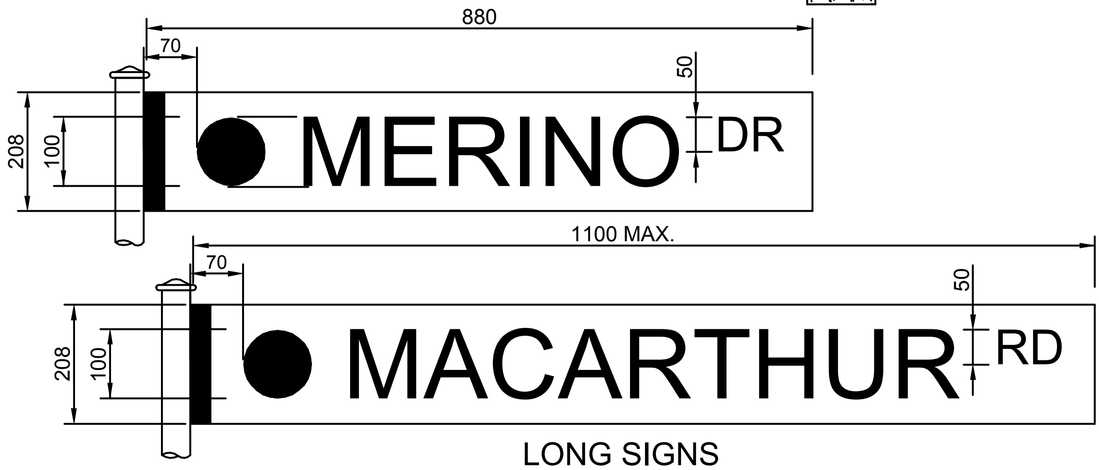
TYPE-2 FOOTING PAVED AREAS



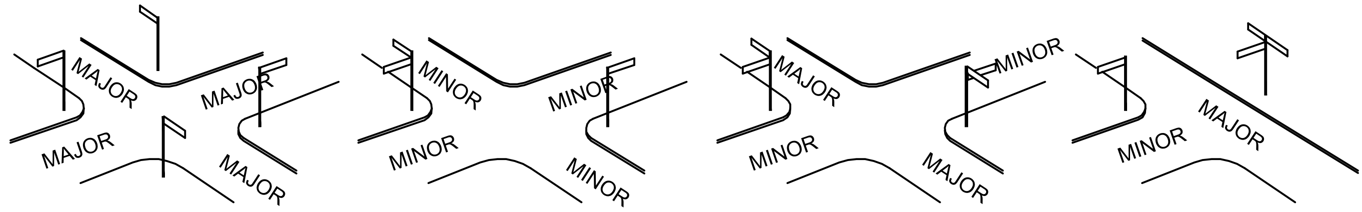
DOUBLE ENDED SIGN

FOOTING DETAILS AS PER SINGLE ENDED SIGN

SIGN PLATE DETAILS GENERALLY AS FOR SINGLE ENDED SIGN UNLESS OTHERWISE SPECIFIED. REFER BRACKET DETAIL FOR CENTRE MOUNTING



LONG SIGNS

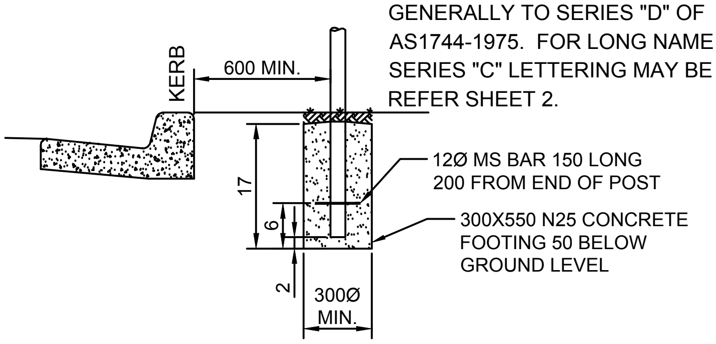


POST CONFIGURATION PLANS

SHORT SIGNS

SINGLE ENDED SIGN

SIGN PLATE FOR DETAIL REFER SHEET 2. LETTERING AND NUMERALS TO CONFORM GENERALLY TO SERIES "D" OF AS1744-1975. FOR LONG NAME ROADS SERIES "C" LETTERING MAY BE USED. REFER SHEET 2.



FOOTING DETAILS - TYPE 1 - STANDARD

NOTES:

1. ALL COLOURS TO MATCH CAMDEN COUNCILS CORPORATE COLOURS
2. ALL TEXT AND BACKGROUNDS TO BE
3. REFLECTIVE
   FONT TO BE ARIAL BOLD FOR SHORT NAMES
4. ARIAL BOLD CONDENSED FOR LONG NAMES
   COUNCIL LOGO TO ALWAYS BE POSITIONED
5. CLOSEST TO THE POLE
7. PANELS TO BE 880 OR 1100 LONG, BUT NO LONGER
8. LOWER EDGE OF SIGNS TO BE 3000mm ABOVE GROUND LEVEL.
   SIGNS TO BE BOLTED TO POST THROUGH
9. STRENGTHENING BARS WITH CADMIUM PLATED BOLTS AND NUTS.
   ALL POSTS ARE TO BE GALVANISED

ORIGINAL SOURCE FROM CAMDEN CITY COUNCIL STANDARDS

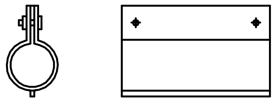
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

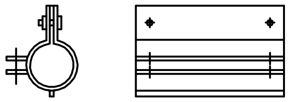
CHECKED: PWG COUNCILS	DATE: OCT 2020
APPROVED: SAG	DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

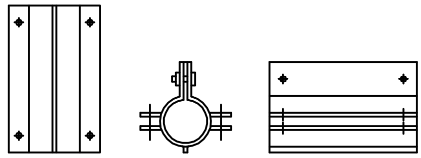
SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
STREET SIGN	SD-R18	N.T.S	1 OF 2	01	APR'21



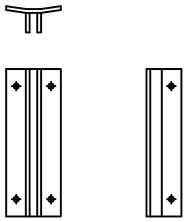
DETAIL 1
BRACKET FOR ATTACHING
SINGLE SIGN TO STEEL POST



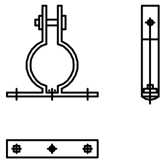
DETAIL 2
BRACKET FOR ATTACHING
TWO SIGNS TO STEEL POST



DETAIL 3
BRACKET FOR ATTACHING
THREE SIGNS TO STEEL POST

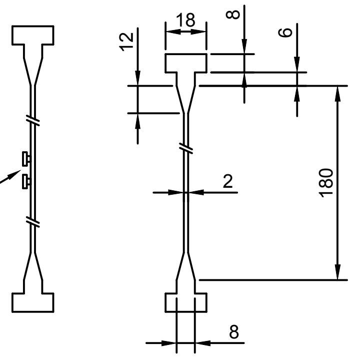


DETAIL 4
BRACKET FOR ATTACHING
TIMBER SIGN TO TIMBER POST



DETAIL 5
BRACKET FOR ATTACHING
EXTRA LENGTH SIGN TO MULTIPLE
POSTS OR CENTRE MOUNTING
DOUBLE ENDED SIGN

GROOVE ON SIGN
PLATE FOR BOLTS
ATTACHED TO BRACKET



DETAIL A

1.0 SIGN BLADE

1.1 SIGNS SHALL BE MANUFACTURED FROM AN APPROVED MARINE GRADE HIGH TENSILE STRENGTH ALUMINIUM EXTRUSION WITH SQUARE END.

1.2 THE LENGTH OF SIGNS SHALL NOT BE MORE THAN 1100mm

1.3 THE FLANGES SHALL BE 18mm MINIMUM WIDTH AND NO LESS THAN 6mm THICK. THE FILLET SHALL BE NOT LESS THAN 5mm WIDE AND 7mm MINIMUM THICKNESS AND THE WEB SHALL BE 2mm MINIMUM THICKNESS (REFER DETAIL A).

1.4 THE BLADES SHALL BE PRE-DRILLED TO COINCIDE WITH THE POSITION AND DIAMETER OF THE BRACKETS. THE BLADES SHALL BE 202mm BLADES.

2.0 STREET NAME SIGNS

2.1 BACKGROUND
THE BACKGROUND SHEETING SHALL BE "CLASS 1 REFLECTIVE WHITE" VINYL SHEETING BONDED TO THE PREPARED ALUMINIUM EXTRUSION BLADE BY THE APPROVED METHOD TO MEET AS/NZ 1906.1.2017 APPLICABLE FOR A 8 YEAR DURABILITY WARRENTY. THE SHEETING SHALL EXTEND FOR THE FULL LENGTH OF THE BLADE AND BE UNSPLICED ALONG ITS ENTIRE LENGTH. THE MINIMUM WIDTH OF THE BACKGROUND MATERIAL SHALL BE 180mm FOR 202mm BLADES.

3.0 BRACKETS

3.1 BRACKETS SHALL BE COMPATIBLE WITH THE SPECIFIED BLADE.

3.2 BRACKETS SHALL BE PRE-DRILLED (10mm DIA). BRACKETS SHALL BE SUPPLIED COMPATIBLE WITH BOLTS, NUTS AND WASHERS. BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED AND OF SUITABLE SIZE.

4.0 TOLERANCE

MANUFACTURING TOLERANCES OF SIGNS SHALL BE SPECIFIED IN SECTION 4 MANUFACTURING AND MATERIALS OF A.S. 1743.2018 SPECIFICATIONS.

5.0 PROTECTION AND PACKAGING

PROTECTION AND PACKAGING OF ALL BLADES, AND ASSOCIATED FITTINGS FOR DELIVERY TO COUNCIL SHALL BE THE RESPONSIBILITY OF THE SUPPLIER. SIGNS ARE TO BE PROTECTED FROM DAMAGE DURING TRANSIT BY APPROVED WRAPPING PRIOR TO DELIVERY.

6.0 WARRANTY

ALL STREET SIGN BLADES SHALL CARRY A 8 YEAR PERFORMANCE WARRENTY FROM THE RETRO-REFLECTIVE MATERIAL. MANUFACTURER DETAILS OF THE PERFORMANCE WARRENTY SHALL BE SUBMITTED WITH THE QUOTATION/TENDER.

NOTE

1. CONTRACT SIGN MANUFACTURERS TO OBTAIN COUNCIL LOGO AND SPECIFICATIONS FROM COUNCIL.
2. END MOUNTED SIGNS MUST HAVE STREET NAME ON BOTH SIDES.
3. DOUBLE ENDED SIGNS MUST HAVE STREET NAMES ON ONE SIDE ONLY.

ORIGINAL SOURCE FROM CAMDEN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

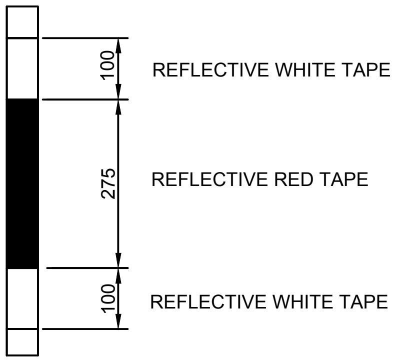
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

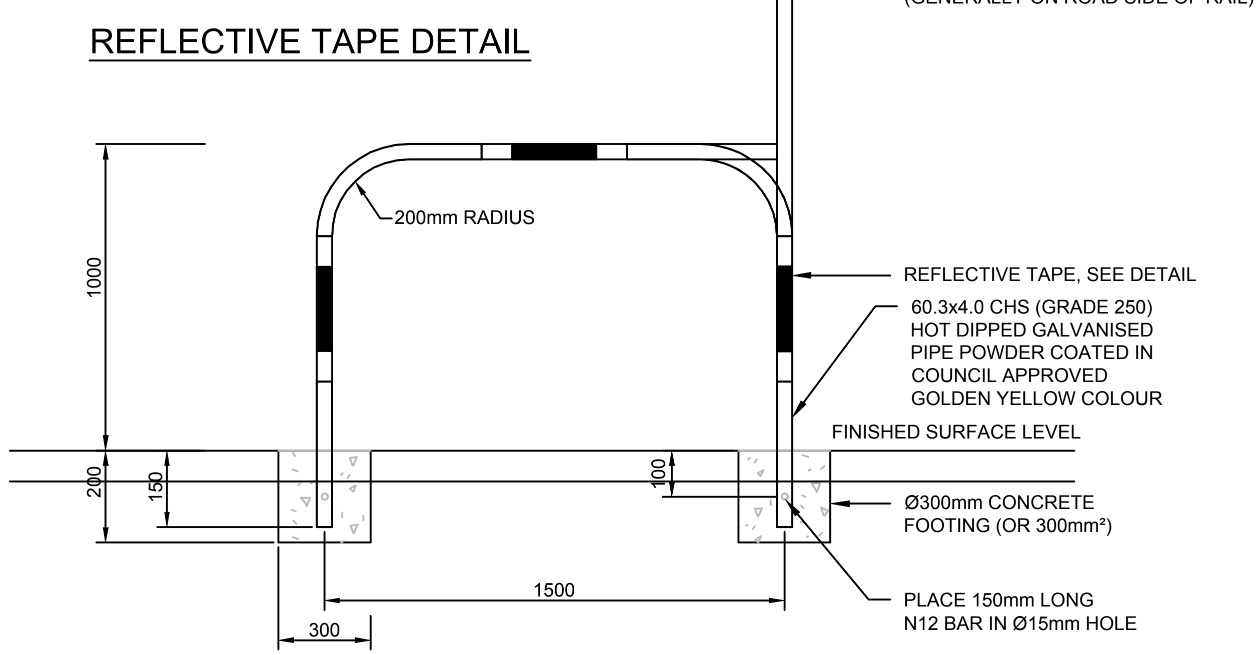
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: STREET SIGN

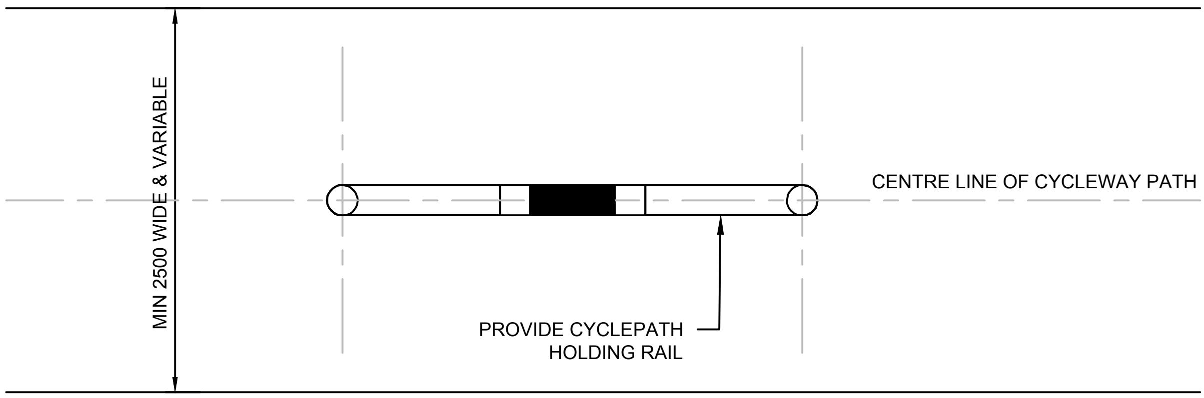
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R18	N.T.S	2 OF 2	01	APR'21



REFLECTIVE TAPE DETAIL



ELEVATION



PLAN

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. PLACE N12 BAR 150mm LONG IN HOLE BEFORE FIXING INTO PLACE
3. CONCRETE TO BE 25MPa @ 28 DAYS.
4. ALL STEEL WORK TO BE HOT DIPPED GALVANISED.
5. FABRICATE SO LOCKABLE AND REMOVABLE IF REQUIRED BY COUNCIL

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

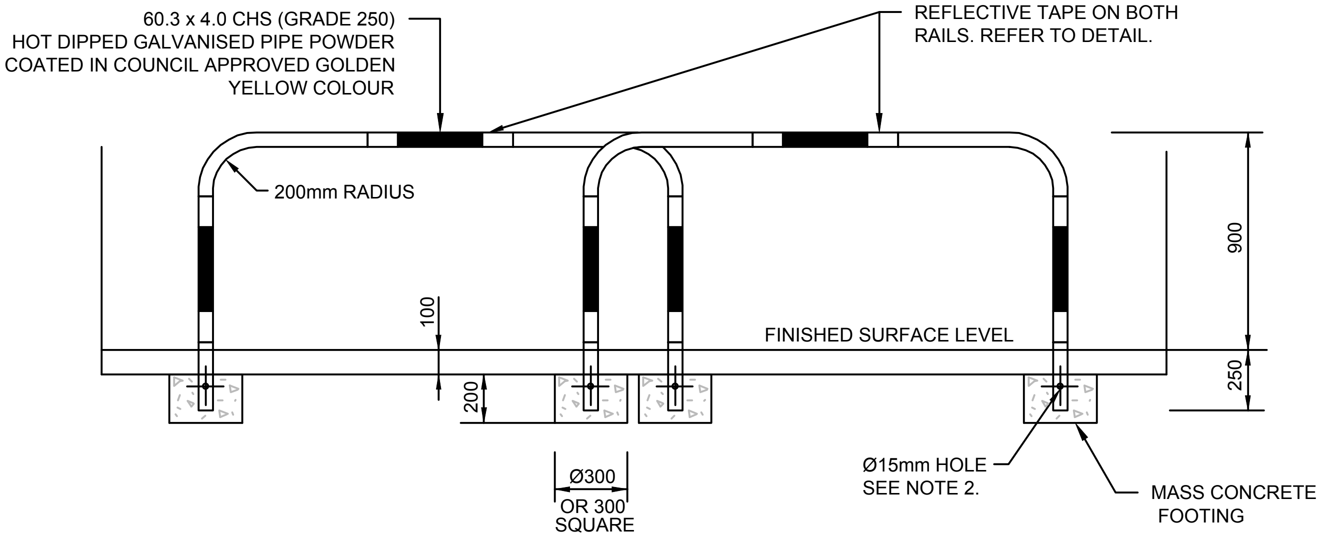
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
SHARED PATH HOLDING RAIL	SD-R21	N.T.S	1 OF 1	01	APR'21



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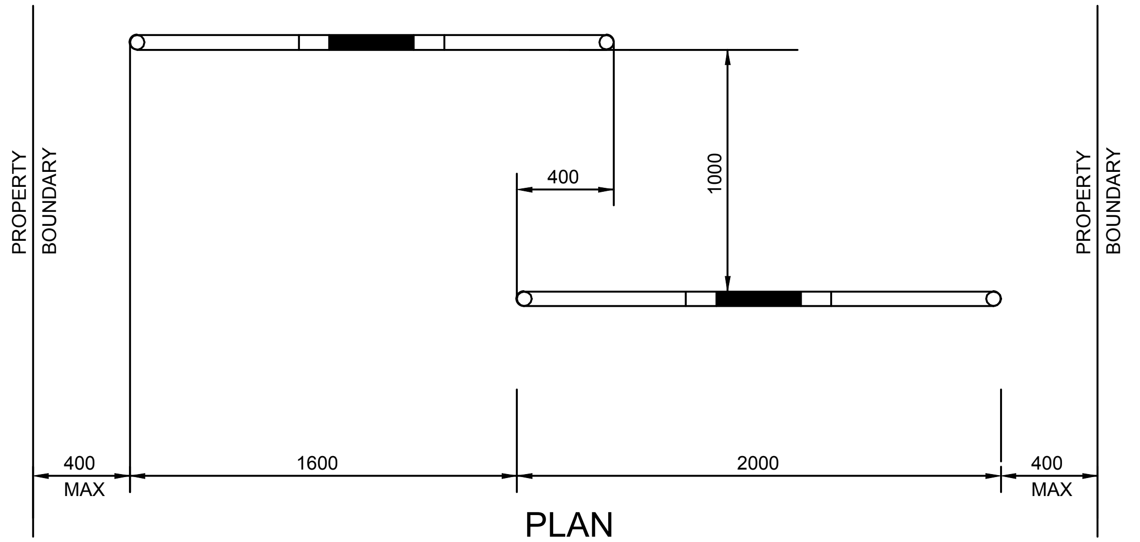
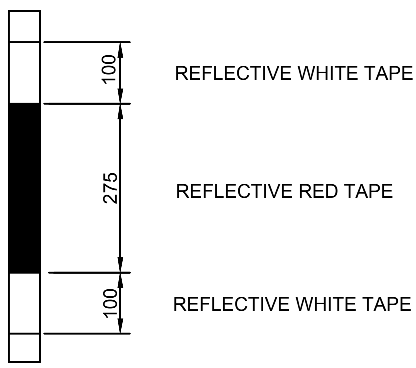


PLAN



REFLECTIVE TAPE DETAIL

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. PLACE N12 BAR 150mm LONG IN HOLE BEFORE FIXING INTO PLACE
3. CONCRETE TO BE 25MPa @ 28 DAYS.
4. ALL STEEL WORK TO BE HOT DIPPED GALVANISED.
5. FABRICATE SO LOCKABLE AND REMOVABLE IF REQUIRED BY COUNCIL

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

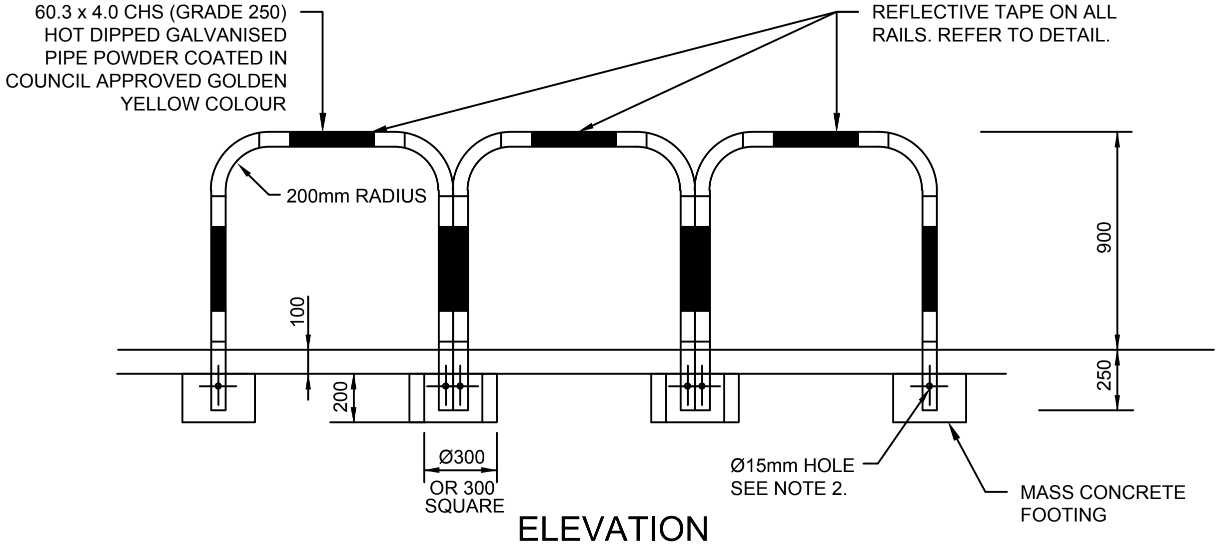
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

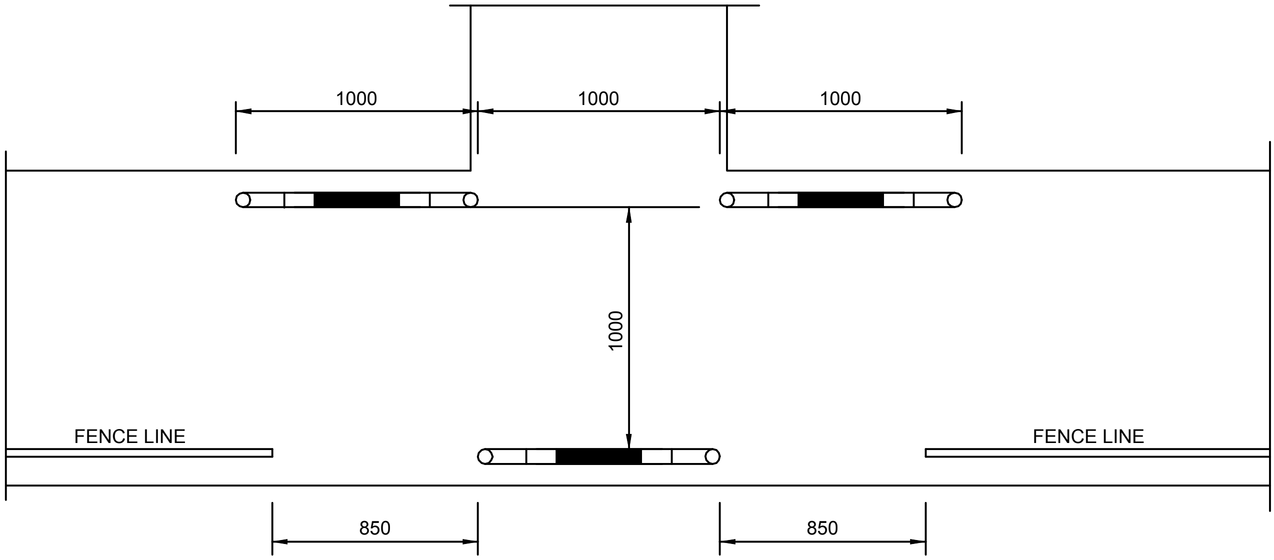
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: LANEWAY BAULKS

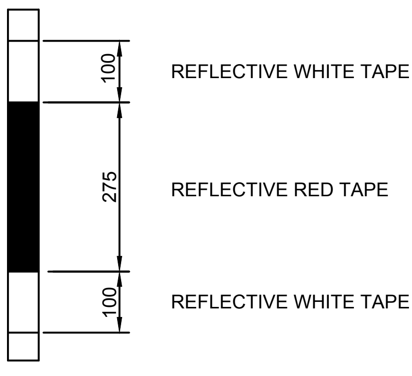
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R22	N.T.S	1 OF 1	01	APR'21



ELEVATION



PLAN



REFLECTIVE TAPE DETAIL

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. PLACE N12 BAR 150mm LONG IN HOLE BEFORE FIXING INTO PLACE
3. CONCRETE TO BE 25MPa @ 28 DAYS
4. ALL STEELWORK TO BE HOT DIPPED GALVANISED.
5. FABRICATE SO UNLOCKABLE AND REMOVABLE IF REQUIRED BY COUNCIL

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

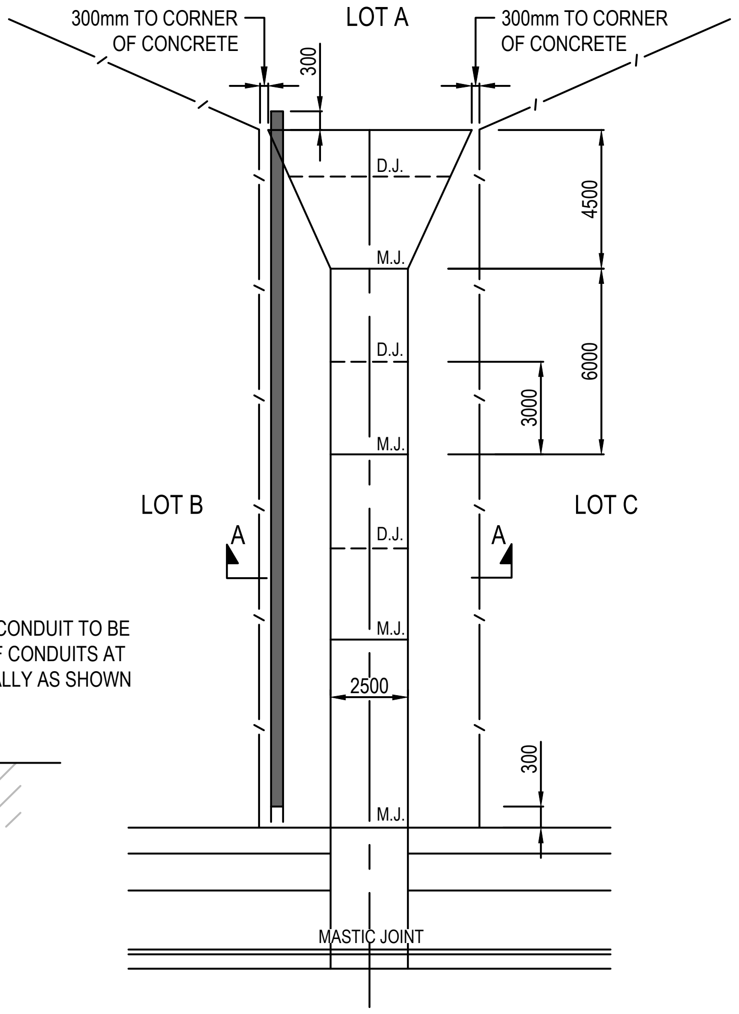
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

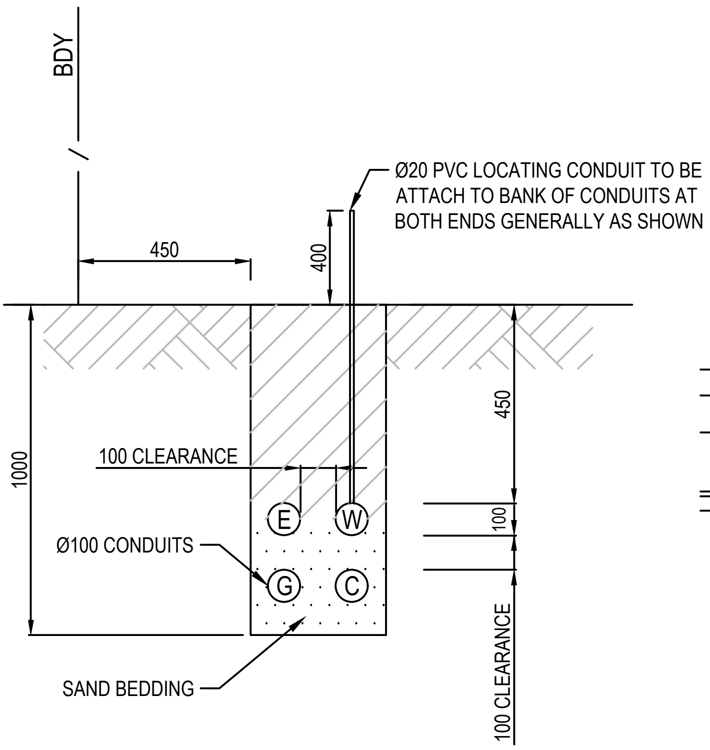
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

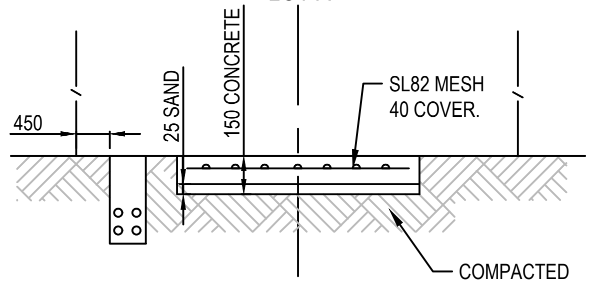
SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
PATHWAY BAULKS	SD-R23	N.T.S	1 OF 1	01	APR'21



PLAN



UTILITY CONDUITS
FOR BATTLE AXE LOTS



SECTION A-A

NOTES:

1. MASTIC JOINT TO BE PLACED EVERY 6m ALONG ACCESSWAY WITH DUMMY JOINT CENTRALLY LOCATED BETWEEN MASTIC JOINTS.
2. WHERE THE VEHICULAR FOOTWAY CROSSING (REFER A(BS)102S) IS CONSTRUCTED CONCURRENTLY WITH THIS ACCESSWAY, THE FOOTWAY CROSSING SHALL BE REINFORCED WITH SL82 MESH HAVING 40 COVER.
3. ALL DIMENSIONS ARE IN MILLIMETRES
4. TIE MARKER TAPE TO BOTH ENDS OF UTILITY CONDUITS AND BRING TO SURFACE WITH 300 LENGTH LEFT ON SURFACE FOR RECOVERY.
5. BED CONDUITS IN SAND

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

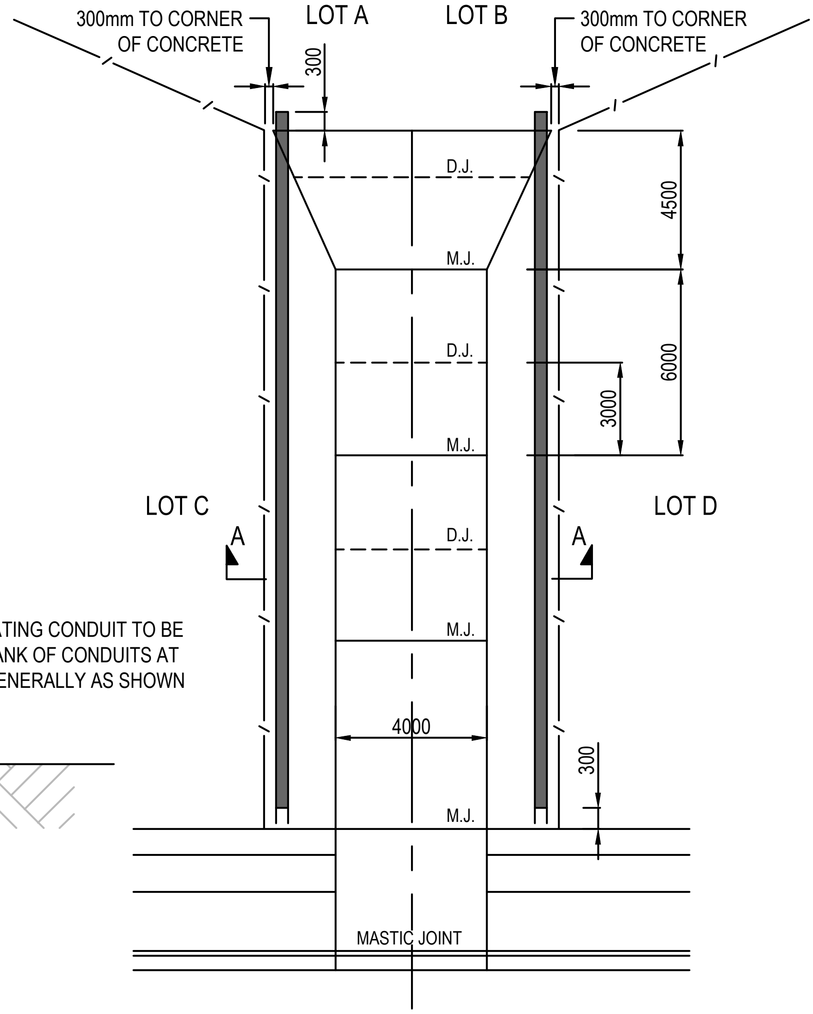
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

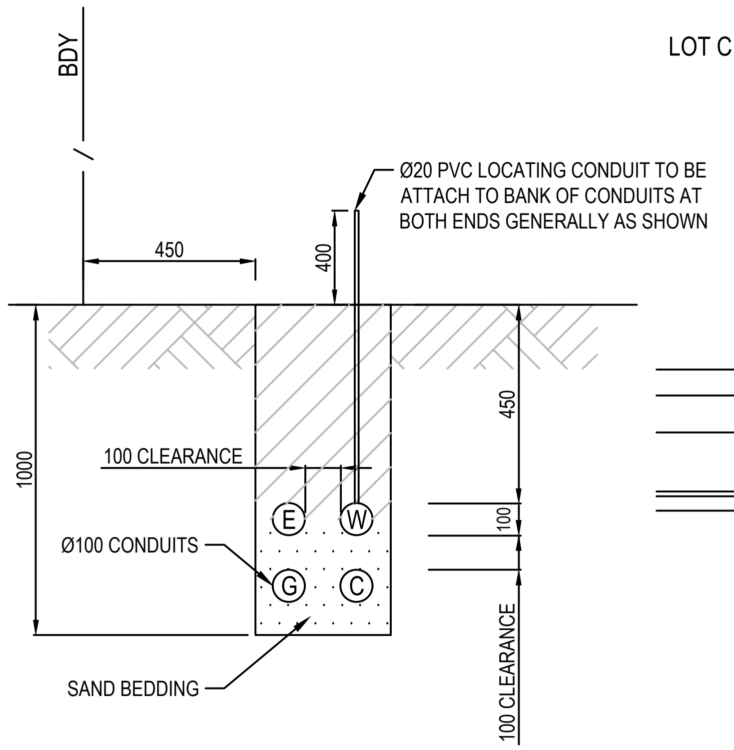
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: ACCESSWAY DETAIL - SINGLE DRIVEWAY

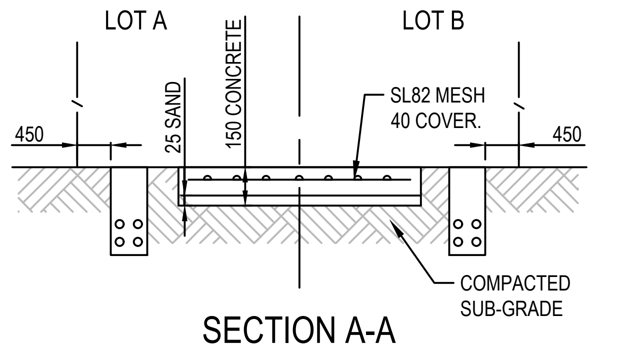
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R25	N.T.S	1 OF 2	01	APR'21



PLAN



UTILITY CONDUITS
FOR BATTLE AXE LOTS



SECTION A-A

NOTES:

1. MASTIC JOINT TO BE PLACED EVERY 6m ALONG ACCESSWAY WITH DUMMY JOINT CENTRALLY LOCATED BETWEEN MASTIC JOINTS.
2. WHERE THE VEHICULAR FOOTWAY CROSSING (REFER A(BS)102S) IS CONSTRUCTED CONCURRENTLY WITH THIS ACCESSWAY, THE FOOTWAY CROSSING SHALL BE REINFORCED WITH SL82 MESH HAVING 40 COVER.
3. ALL DIMENSIONS ARE IN MILLIMETRES
4. TIE MARKER TAPE TO BOTH ENDS OF UTILITY CONDUITS AND BRING TO SURFACE WITH 300 LENGTH LEFT ON SURFACE FOR RECOVERY.

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL STANDARDS

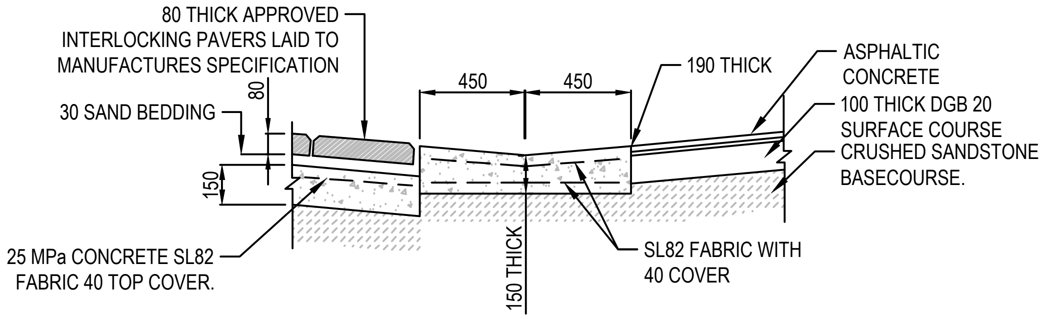
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

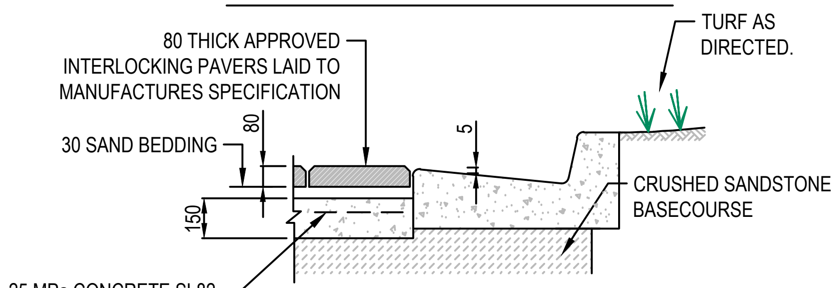
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

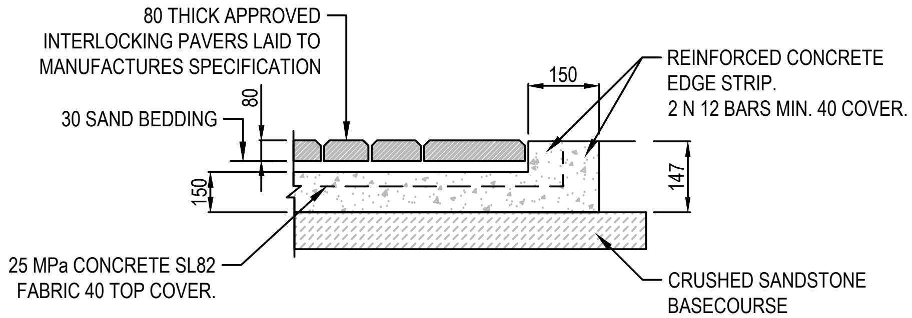
SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
ACCESSWAY DETAIL - DOUBLE DRIVEWAY	SD-R25	N.T.S	2 OF 2	01	APR'21



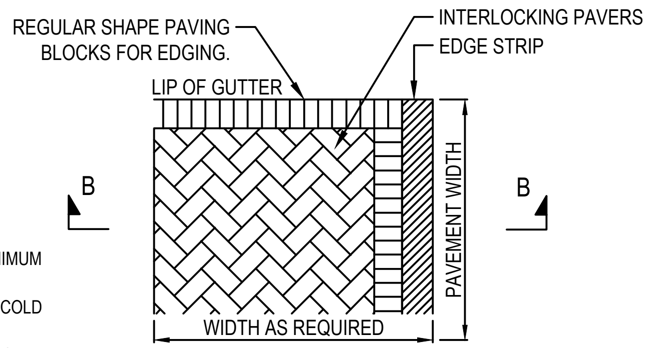
PAVERS AND DISH CROSSING



PAVERS AND KERB DETAIL (TYPICAL)



SECTION B - B
PAVERS AND EDGE STRIP DETAIL (TYPICAL)



TYPICAL PAVING PLAN

NOTES:

1. COMPRESSIVE STRENGTH (Fc) FOR CAST INSITU CONCRETE SHALL BE A MINIMUM 25 MPa AT 28 DAYS.
2. REINFORCEMENT SHALL BE SL82 TOP AND BOTTOM WHERE INDICATED AND COLD DRAWN BARS TO RELEVANT AUSTRALIAN STANDARD.
3. PAVERS SHALL BE 80mm THICK INTERLOCKING TYPE OF APPROVED MANUFACTURE AND SHALL BE LAID IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS ON MINIMUM 30mm APPROVED SAND BEDDING.
4. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

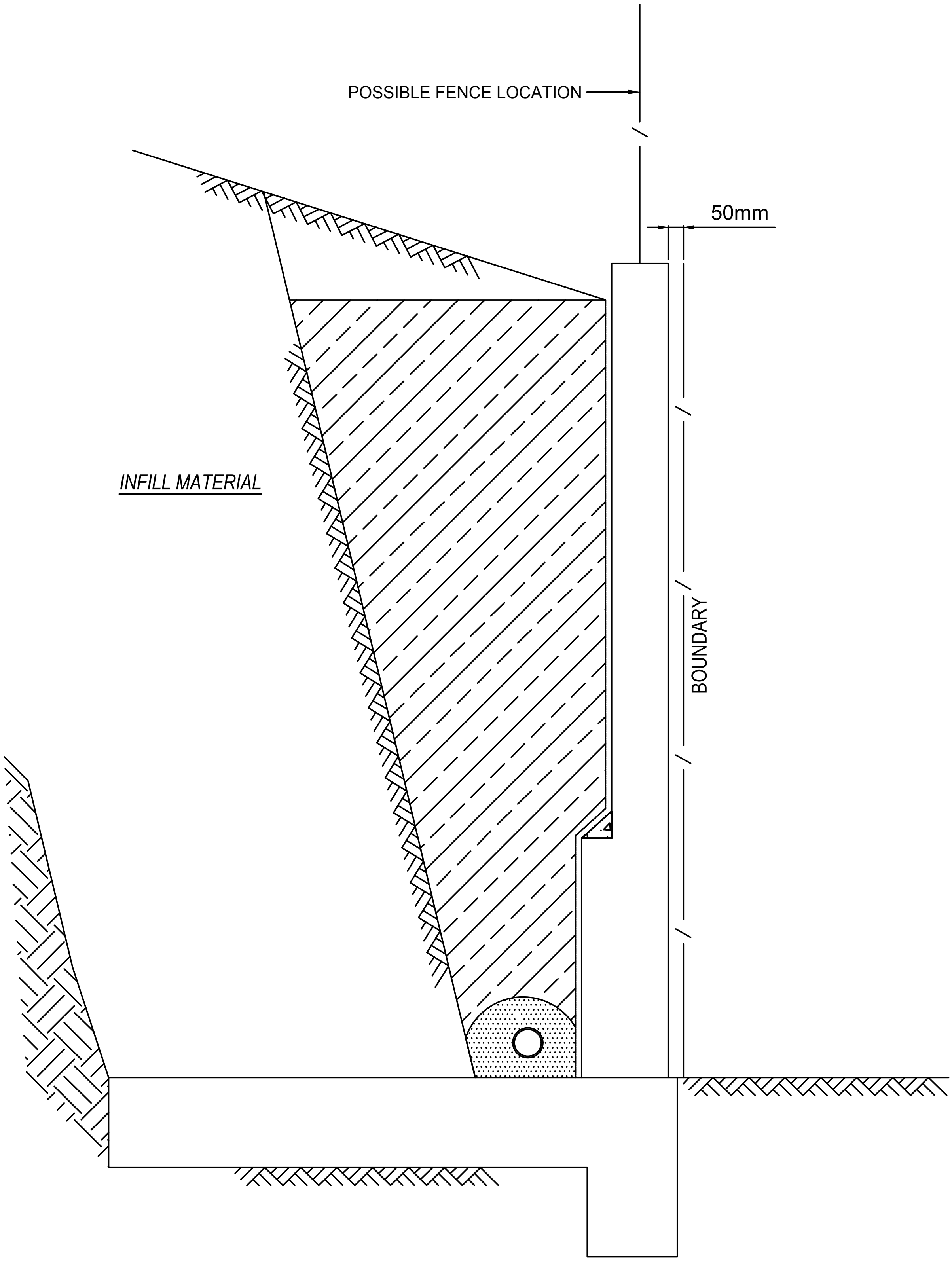
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: THRESHOLD PAVEMENTS AT INTERSECTIONS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R26	N.T.S	1 OF 1	01	APR'21



TYPICAL RETAINING WALL LOCATION

1:20

ORIGINAL SOURCE FROM ACOR STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

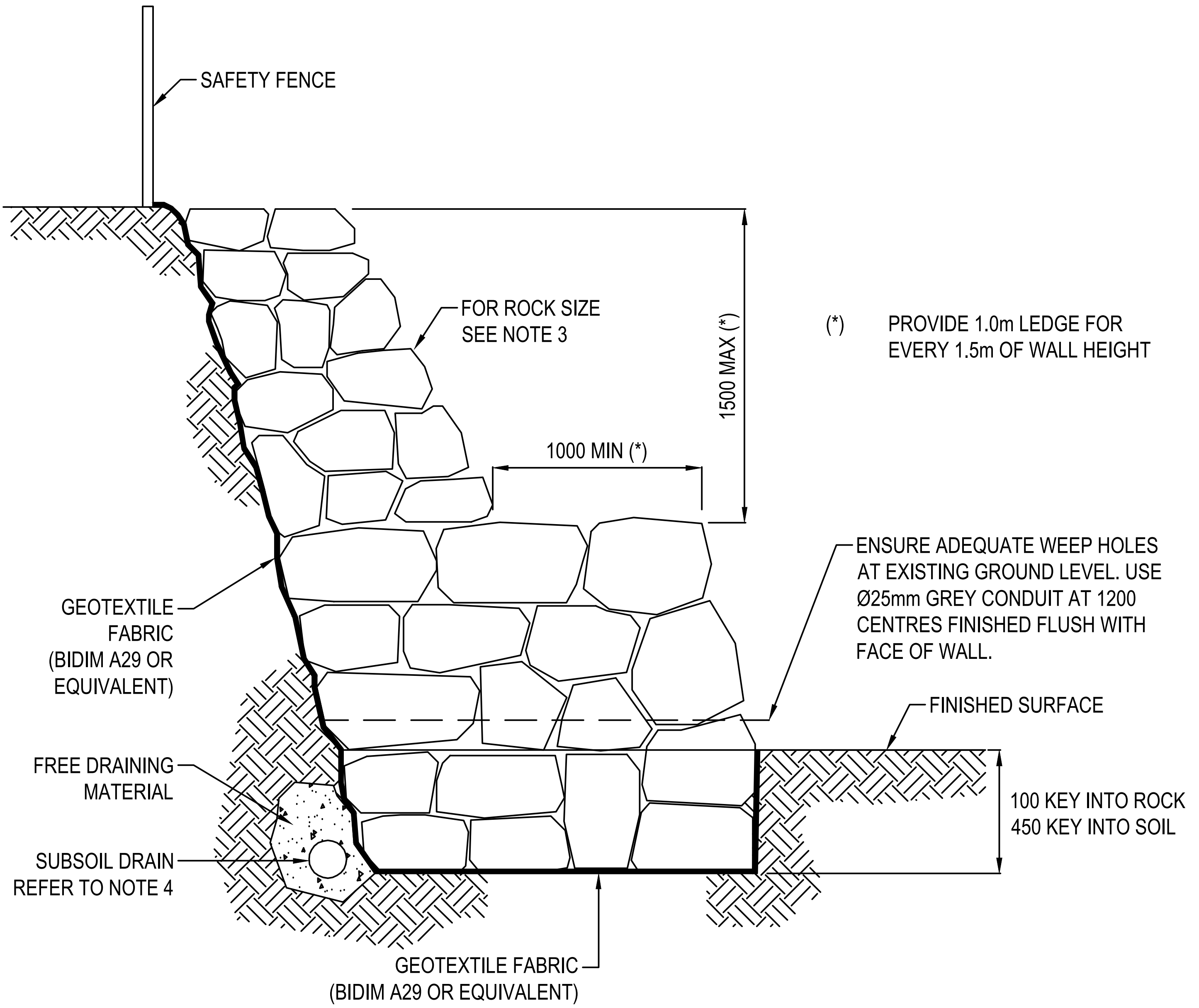
PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS
DATE: OCT 2020

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: TYPICAL RETAINING WALL SECTION

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R27	N.T.S	1 OF 1	01	APR'21



TYPICAL ROCK WALL GEOMETRY

N.T.S

NOTES:

1. DESIGN, INSPECTIONS AND CERTIFICATION ARE TO BE UNDERTAKEN BY A PRACTISING STRUCTURAL/ GEOTECHNICAL ENGINEER.
2. BACKFILL MATERIAL IS TO BE GRANULAR, FREE DRAINING AND COMPACTED.
3. ROCK IS TO BE SOUND, DURABLE SANDSTONE OR OTHER APPROVED MATERIAL AT LEAST $0.6m^2$ PLANE AREA.
4. Ø100mm SUBSOIL AG DRAIN WRAPPED IN FILTER SOCK. DRAIN TO BE 200mm x 200mm AND BACKFILLED WITH Ø20-30mm WASHED GRAVEL AND WRAPPED WITH APPROVED FILTER FABRIC. CONNECT DRAIN TO STORMWATER OR SOAKAGE TRENCH.
5. ROCKS SHALL BE PLACED IN SUCH A MANNER THAT THEY ARE STABLE AND INTERLOCKING AND LAID ROUGHLY COURSED AND BEDDED ON THEIR BROADEST BASE.
6. ALL DIMENSIONS ARE IN MILLIMETRES (UNO).

ORIGINAL SOURCE FROM THE HILLS SHIRE COUNCIL

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

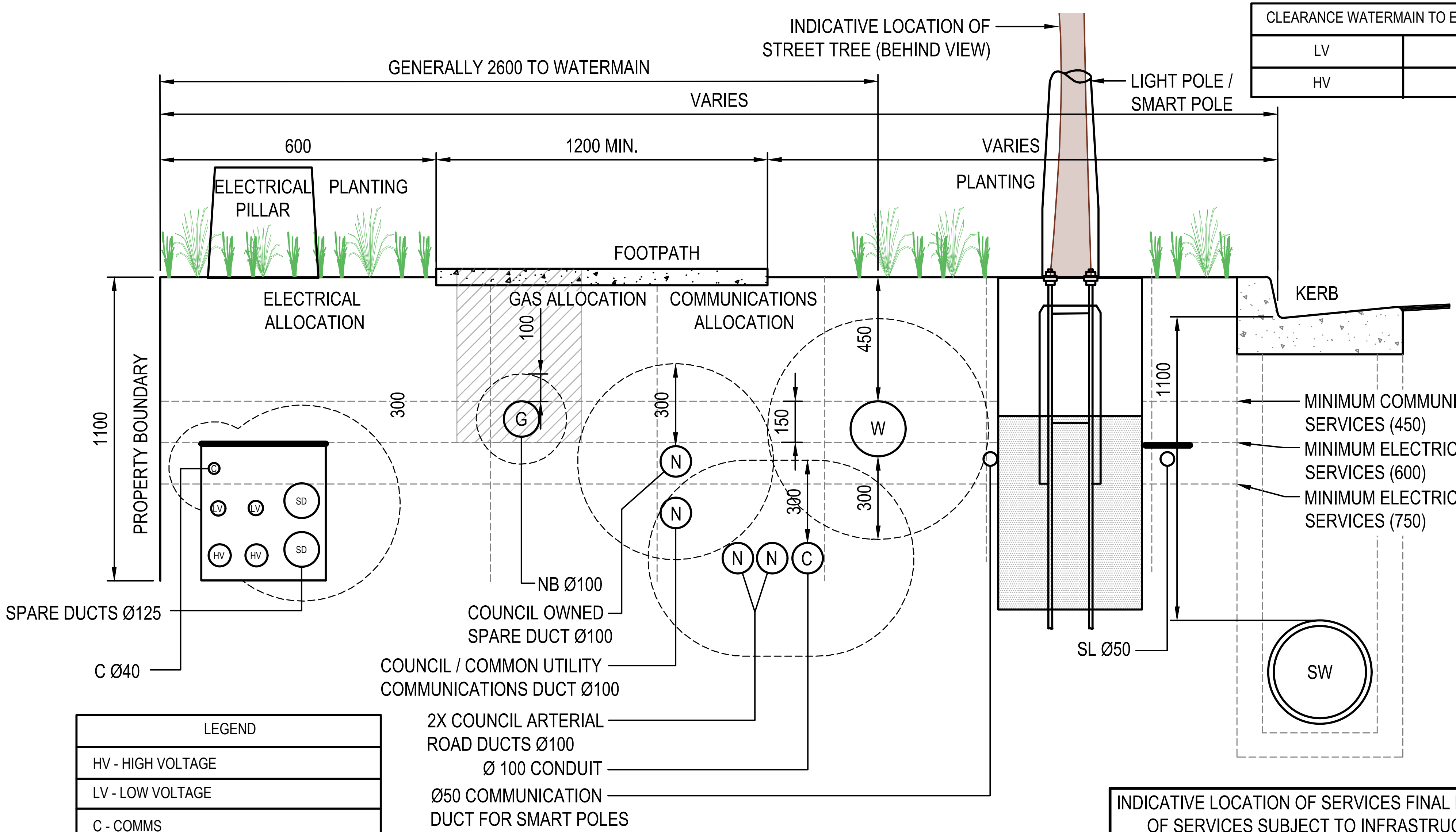
CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE:
WSPP STANDARD DRAWINGS

SHEET TITLE:
TYPICAL ROCK WALL GEOMETRY

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R28	N.T.S	1 OF 1	01	APR'21

CLEARANCE WATERMAIN TO ELECTRICITY	
LV	0.5 m
HV	1.0 m



INDICATIVE LOCATION OF SERVICES FINAL LOCATION OF SERVICES SUBJECT TO INFRASTRUCTURE PROVIDERS STANDARDS AND REQUIREMENTS

LEGEND
HV - HIGH VOLTAGE
LV - LOW VOLTAGE
C - COMMS
SD - SPARE DUCT
N - COUNCIL OWNED SD
W - WATERMAIN
SW - STORMWATER
NB - NOMINAL BORE
G - GAS
SL - STREET LIGHT

ORIGINAL SOURCE FROM ENDEAVOUR ENERGY

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

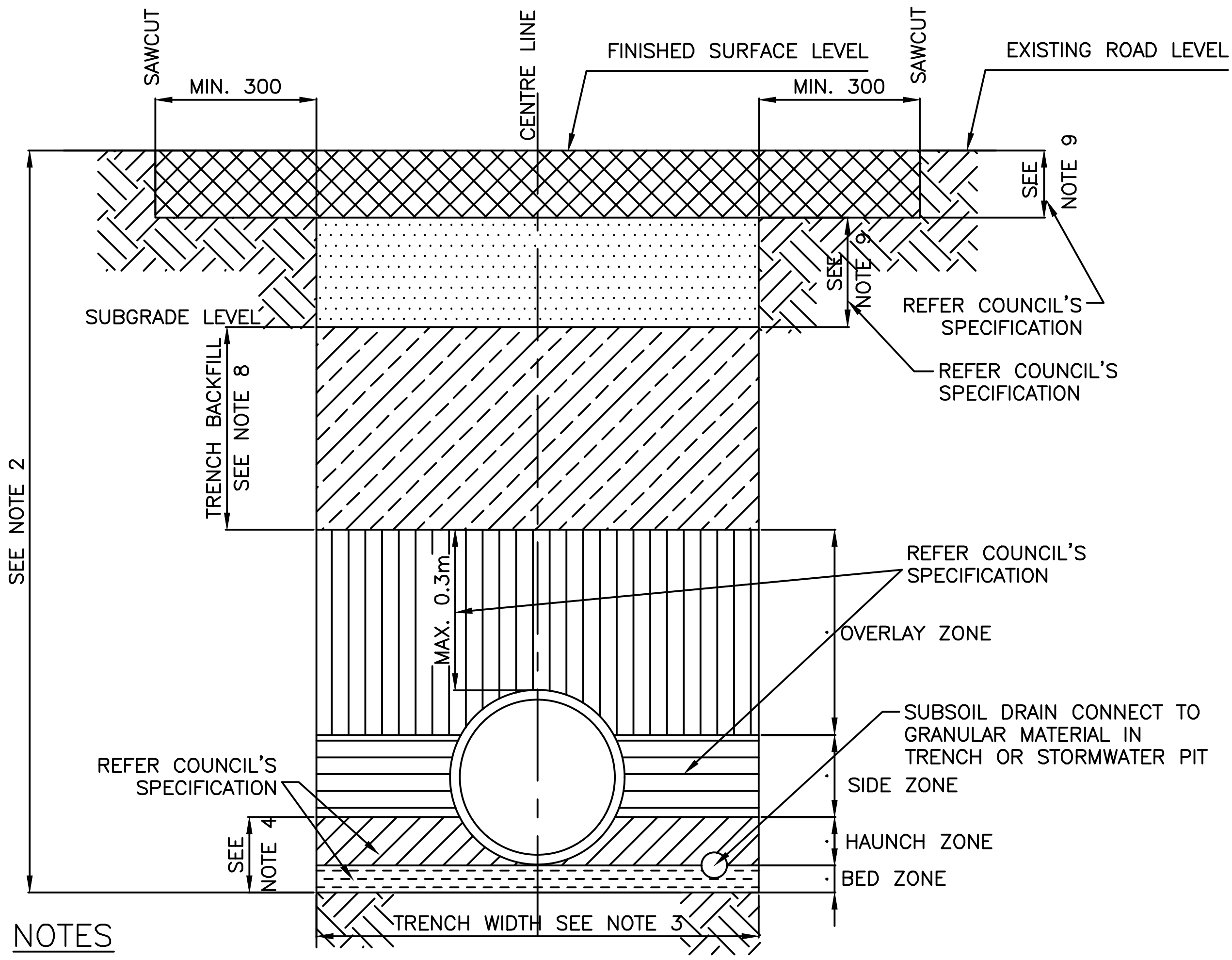
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 20
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE:
WSPP STANDARD DRAWINGS

SHEET TITLE:
UTILITY TRENCH PROFILES

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R29	N.T.S	1 OF 1	01	APR'21



NOTES

1. THIS PLAN MUST BE READ IN CONJUNCTION WITH COUNCIL'S SPECIFICATION.

2. IN UNDERTAKING TRENCH EXCAVATION, THE CONTRACTOR SHALL PROVIDE ANY SHORING, SHEET PILING OR OTHER STABILISATION OF THE TRENCH NECESSARY TO COMPLY WITH WHS REDULATIONS 2017 – PART 6 DIVISION 3 REQUIREMENTS. THE SIDES ARE NOT TO BE LOADED & SHALL BE KEPT CLEAR OF LOOSE MATERIAL ETC. SAFE ACCESS & EGRESS SHALL BE PROVIDED AT ALL TIMES.

3. THE TRENCH SHALL BE EXCAVATED TO A WIDTH 1.4 TIMES THE EXTERNAL DIAMETER OF THE PIPE, OR TO THE EXTERNAL DIAMETER OF THE PIPE PLUS 300mm ON EACH SIDE, WHICHEVER IS THE GREATER.

4. BEDDING SHALL BE IN ACCORDANCE WITH THIS SPECIFICATION AS3725 AND AS3725 SUPPLEMENT1 FOR THE PIPE SUPPORT TYPES AS SHOWN ON THE DRAWINGS. WHERE THE PIPE SUPPORT TYPE IS NOT SHOWN ON THE DRAWINGS, THE SUPPORT TYPE SHALL BE HS3 UNLESS OTHERWISE APPROVED.

5. ALL WORKS ARE TO BE CONDUCTED IN A SAFE MANNER WITH THE LEAST POSSIBLE OBSTRUCTION TO BOTH VEHICULAR & PEDESTRIAN TRAFFIC, A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO COUNCIL INDICATING ALL ACTIVITIES FOR CONTROLLING BOTH VEHICULAR & PEDESTRIAN MOVEMENTS & SHALL BE IN ACCORDANCE WITH AS1742.3 AND THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES.

6. THE CONTRACTOR SHALL ENSURE THAT ALL NECESSARY SEDIMENT CONTROL MEASURES ARE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES. ALL SEDIMENT & EROSION CONTROLS SHALL BE MAINTAINED THROUGHOUT THE PERIOD OF WORKS, INCLUDING REPAIR AND/OR REPLACEMENT OF DAMAGED SECTIONS. INSPECTIONS ARE TO BE MADE PERIODICALLY AND AFTER STORM EVENTS FOR DAMAGE.

7. ALL LINEMARKING & SIGNPOSTING AFFECTED BY WORKS IS TO BE REPLACED IN ACCORDANCE WITH AS1742 & THE TFNSW (RMS) DELINEATION – GUIDES AND MANUALS

8. 14:1 SAND/CEMENT BACKFILL TO BE COMPACTED AND TRIMMED LEVEL WITH SUBGRADE IN LAYERS NOT EXCEEDING 150mm COMPACTED THICKNESS.

9. REFER TO COUNCIL'S SPECIFICATION FOR FINAL RESTORATION OF CARRIAGEWAY SUBBASE AND BASE (FLEXIBLE) FOR FINAL RESTORATION OF CARRIAGEWAY WEARING SURFACE (COURSE).

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

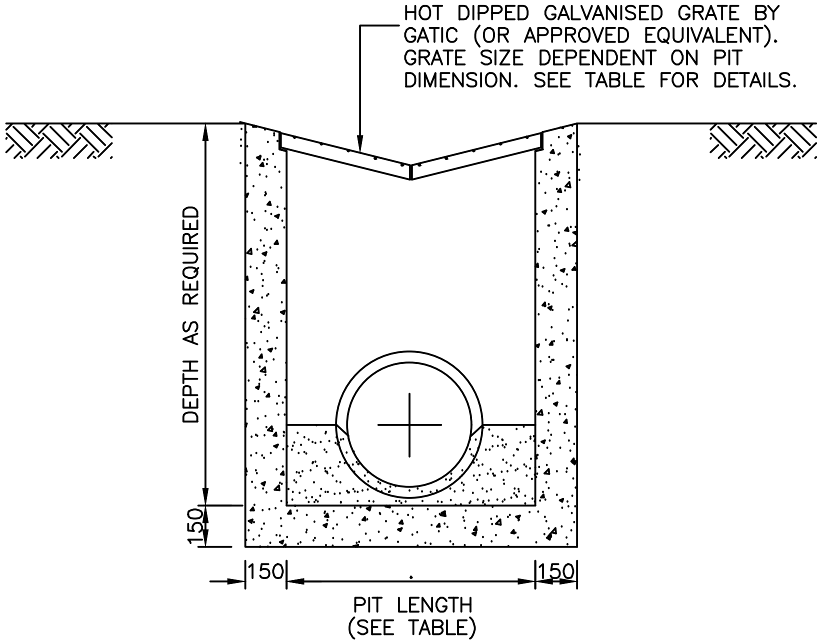
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: PIPE INSTALLATION UNDER ROADWAYS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R30	N.T.S	1 OF 1	01	APR'21



SECTION B
NOT TO SCALE

PITS SIZE TABLE

PIT LENGTH (mm)	PIT WIDTH (mm)	IPLEX CODE	GATIC GRATE TYPE
600	600	331V66H	B
900	600	331V96H	B

NOTES

1. CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH (F'c) OF 25MPa AT 28 DAYS.
2. TOP OF BENCHING TO BE 1/2 OF OUTLET PIPE DIAMETER.
3. PROVIDE 3m OF 100ø SUBSOIL DRAINAGE PIPE WRAPPED IN FABRIC SOCK ADJACENT TO INLET PIPE INVERTS AND DRAINING TO THE PIT.
4. ALL PITS TO BE PROVIDED WITH LOCKING CLIPS.
5. ALL GRATES TO BE HOT DIPPED GALVANISED.
6. STEP IRONS ARE TO BE PROVIDED TO ALL PITS GREATER THAN 1.2m DEPTH (FROM GRATE TO INVERT).
7. FOR PIT DEPTHS BETWEEN 1.8m AND 3.0m DEPTH, PROVIDE N12 @ 250 C/C EACH WAY AT 40 COVER TO INSIDE FACE OF WALLS AND BASE. PROVIDE 400 LAP AT CORNERS. FOR PIT DEPTHS GREATER THAN 3.0m, SEPERATE DESIGN IS REQUIRED.
8. INTERNAL PIT DIMENSION 600 x 600 IS ONLY PERMISSABLE FOR PIT DEPTHS UP TO 600mm.
9. V-DRAINS MUST NOT BE USED UNLESS SPECIFIED AND APPROVED BY COUNCIL
10. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

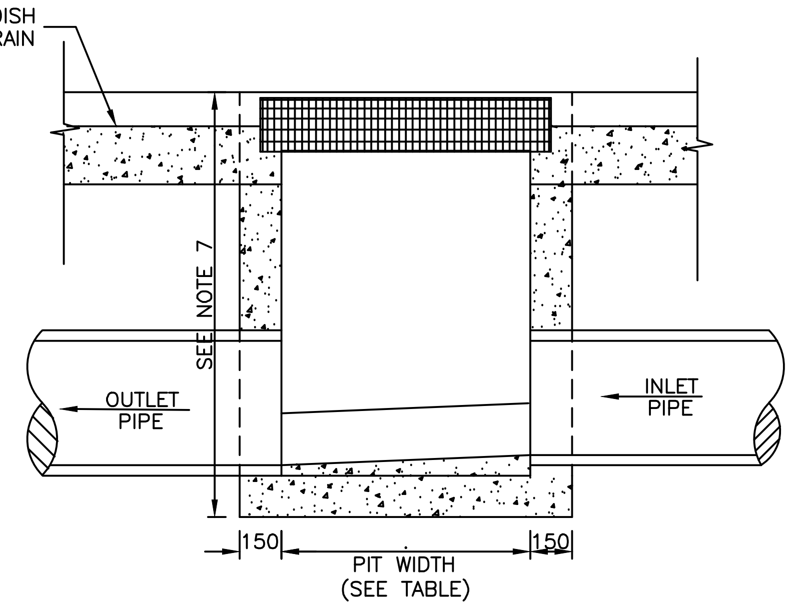
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

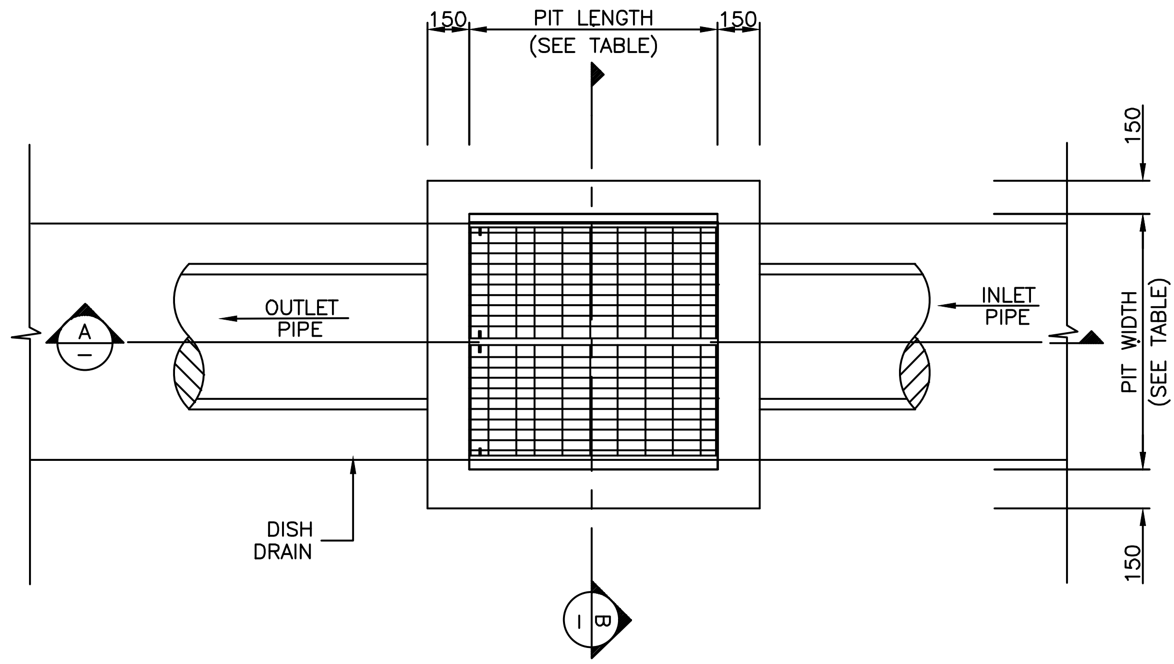
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: V DRAIN PIT

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R31	N.T.S	2 OF 2	01	APR'21



SECTION A
NOT TO SCALE



PLAN
NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

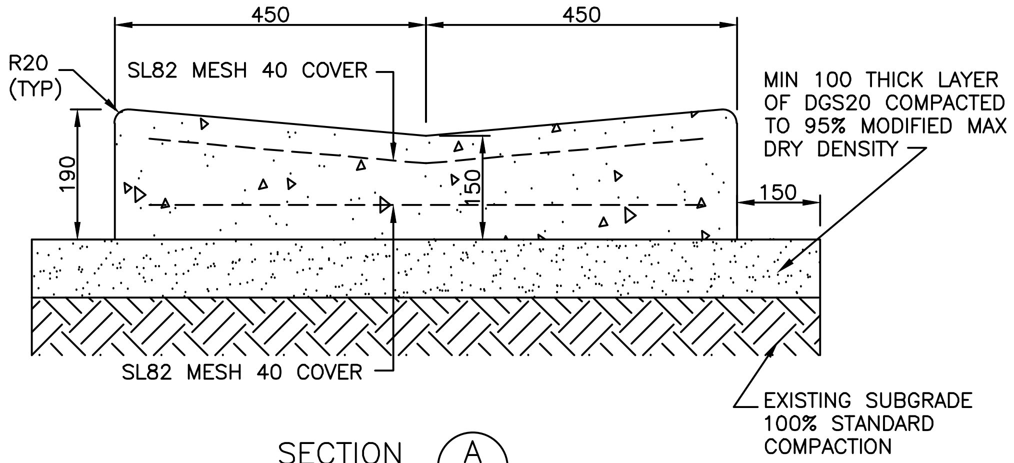
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

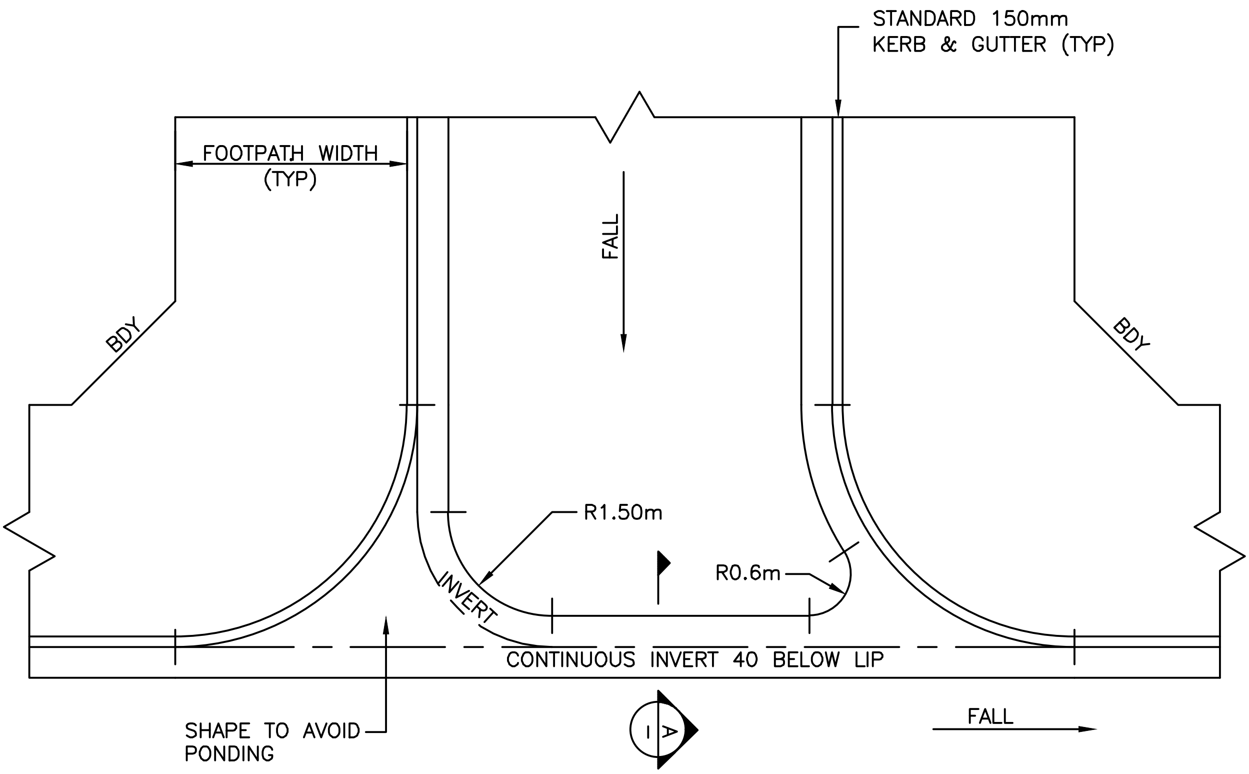
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
V DRAIN PIT	SD-R31	N.T.S	1 OF 2	01	APR'21



SECTION A / —
NOT TO SCALE



PLAN
NOT TO SCALE

NOTES:
1. CONCRETE COMPRESSIVE STRENGTH (F'C) AT 28 DAYS, TO BE 25MPa FOR DISH GUTTER.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

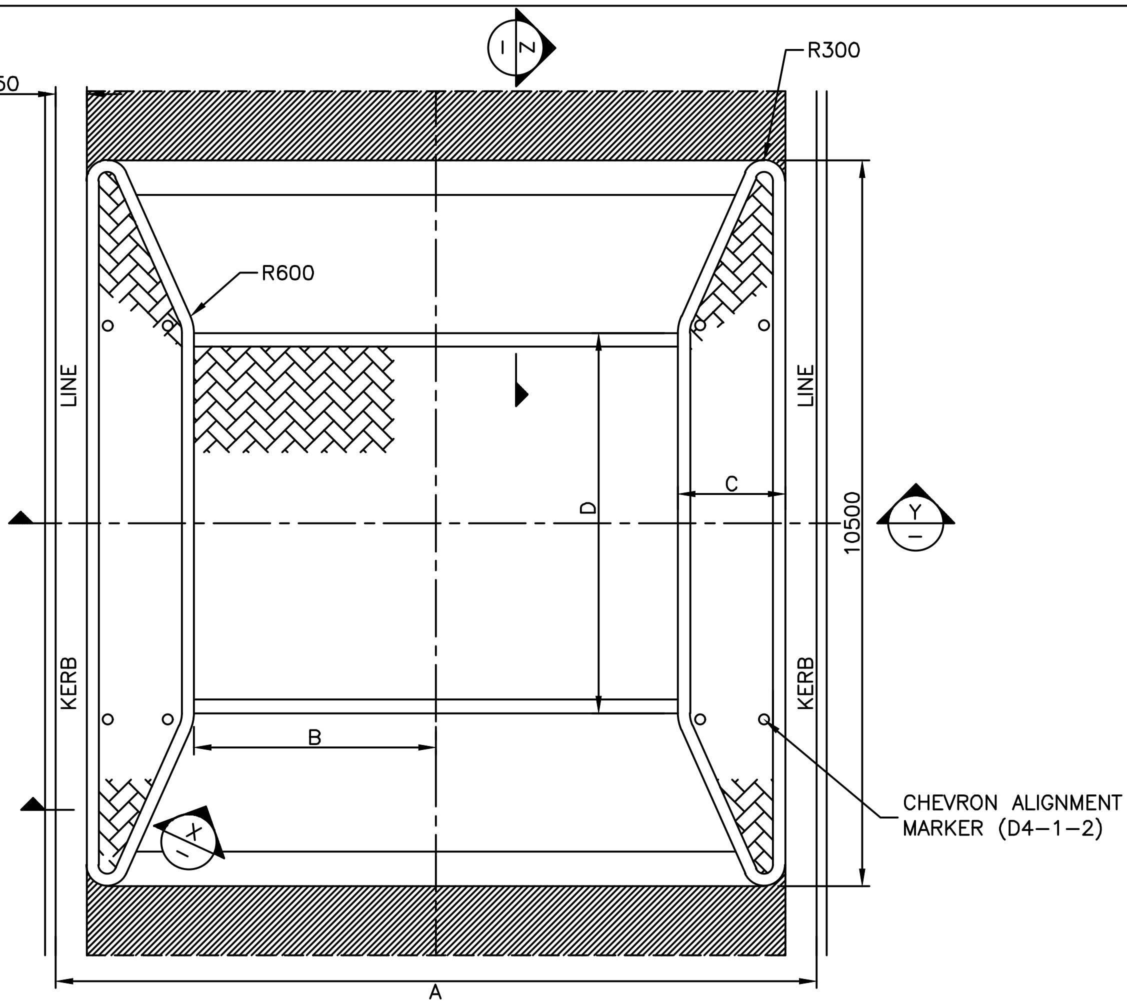
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: INTERSECTION DISH GUTTER

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R33	N.T.S	1 OF 1	01	APR'21



PLAN
NOT TO SCALE

DIM	A	B	C	D
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WIDTH 2	11.00	3.5	1.55	5.5
WIDTH 3	12.20	3.5	2.15	5.5
WIDTH 4	15.24	3.5	3.67	5.5
WIDTH 5	18.23	3.5	5.165	5.5

DIMENSION TABLE

NOTES:
1. ALL PAVERS TO BE IN ACCORDANCE WITH COUNCILS SPECIFICATION
2. PROVIDE GALVANISED STEEL PIPE, POWDER COATED AS SPECIFIED TO SUIT THE CHEVRON ALIGNMENT MARKER AND TO FACE THE DIRECTION OF TRAVEL.
4. FACE OF BARRIER KERB TO BE PAINTED WITH RETRO-REFLECTIVE WHITE PAINT.
5. CONCRETE TO BE OF 32MPa COMPRESSIVE STRENGTH (Fc) AT 28 DAYS.
6. REMOVE ALL REDUNDANT LINEMARKINGS AND SIGN POSTINGS.
7. PROVIDE "JOINTEX" MASTIC JOINT MATERIAL 5mm PROUD OF FINISHED SURFACE, WHERE PAVERS BUTT TO CONCRETE SURROUND.
8. PROVIDE ADEQUATE APPROACH WARNING SIGNS DURING CONSTRUCTION COMPLYING WITH THE REQUIREMENTS OF A.S.1742 & A.S.1743.
9. SIGNS ARE TO BE LOCATED CLEAR OF ANY DRIVEWAYS WHICH FALL AT DISTANCES SHOWN.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

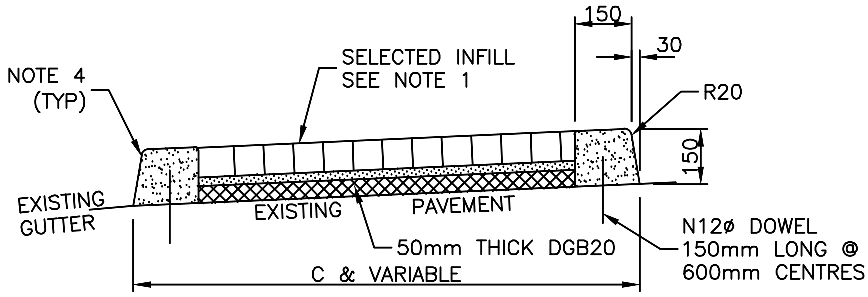
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

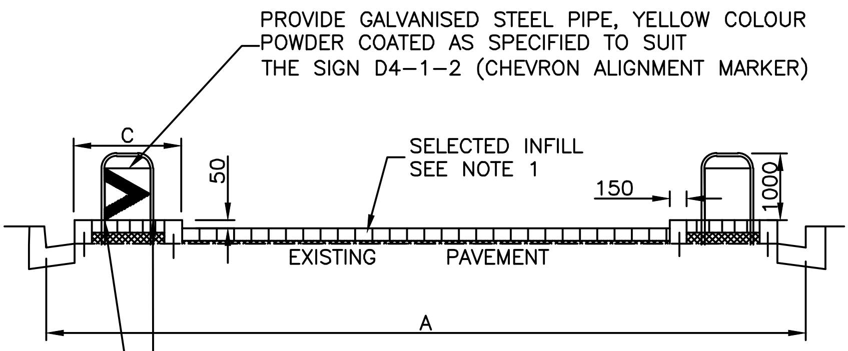
SHEET TITLE: RAISED THRESHOLD PAVERS

STD DWG No.: SD-R34 | SCALE: N.T.S | SHEET: 1 OF 3 | VERSION: 01 | DATE: APR'21



BARRIER KERB AND ISLAND DETAIL X/—

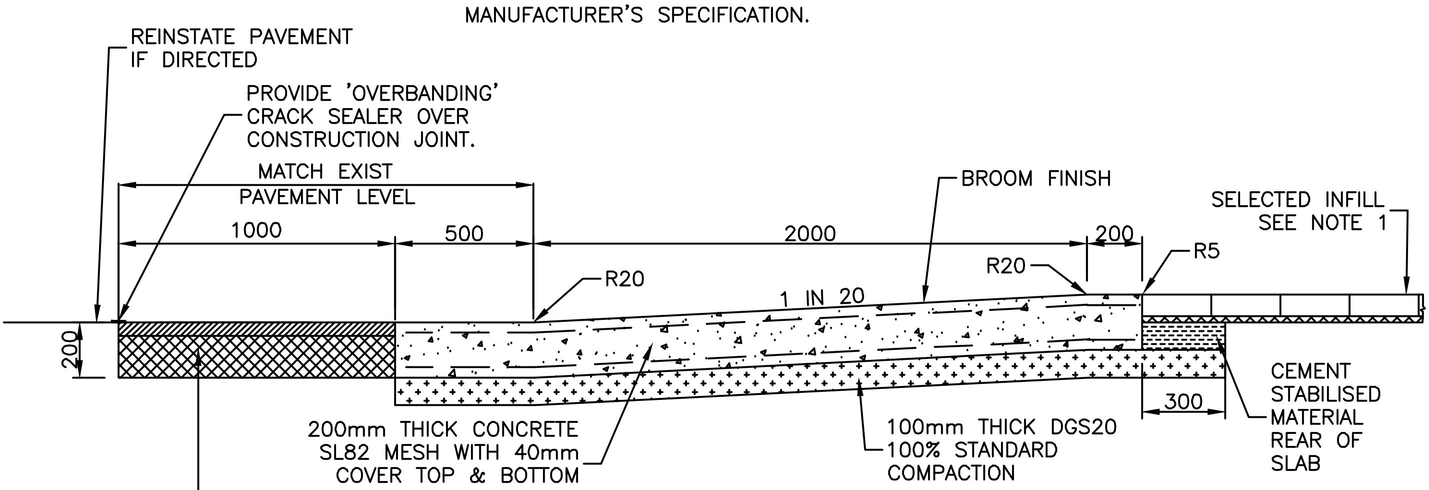
NOT TO SCALE



THRESHOLD DETAIL – SECTION Y/—

NOT TO SCALE

INSTALL POST IN PAVEMENT USING
"V-LOCK" SUPPORT SYSTEM AS PER
MANUFACTURER'S SPECIFICATION.



CONCRETE RAMP DETAIL – SECTION Z/—

NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

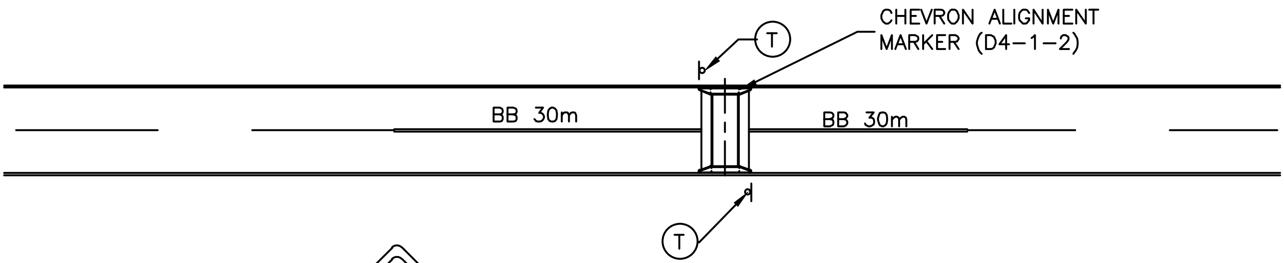
CHECKED: PWG COUNCILS
DATE: OCT 2020

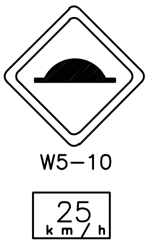
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: RAISED THRESHOLD PAVERS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R34	N.T.S	2 OF 3	01	APR'21





SIGNPOSTING AND LINEMARKING DETAIL

NOT TO SCALE

STATUTORY SIGNAGE TO LOCAL TRAFFIC COMMITTEE APPROVAL (TYP)

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

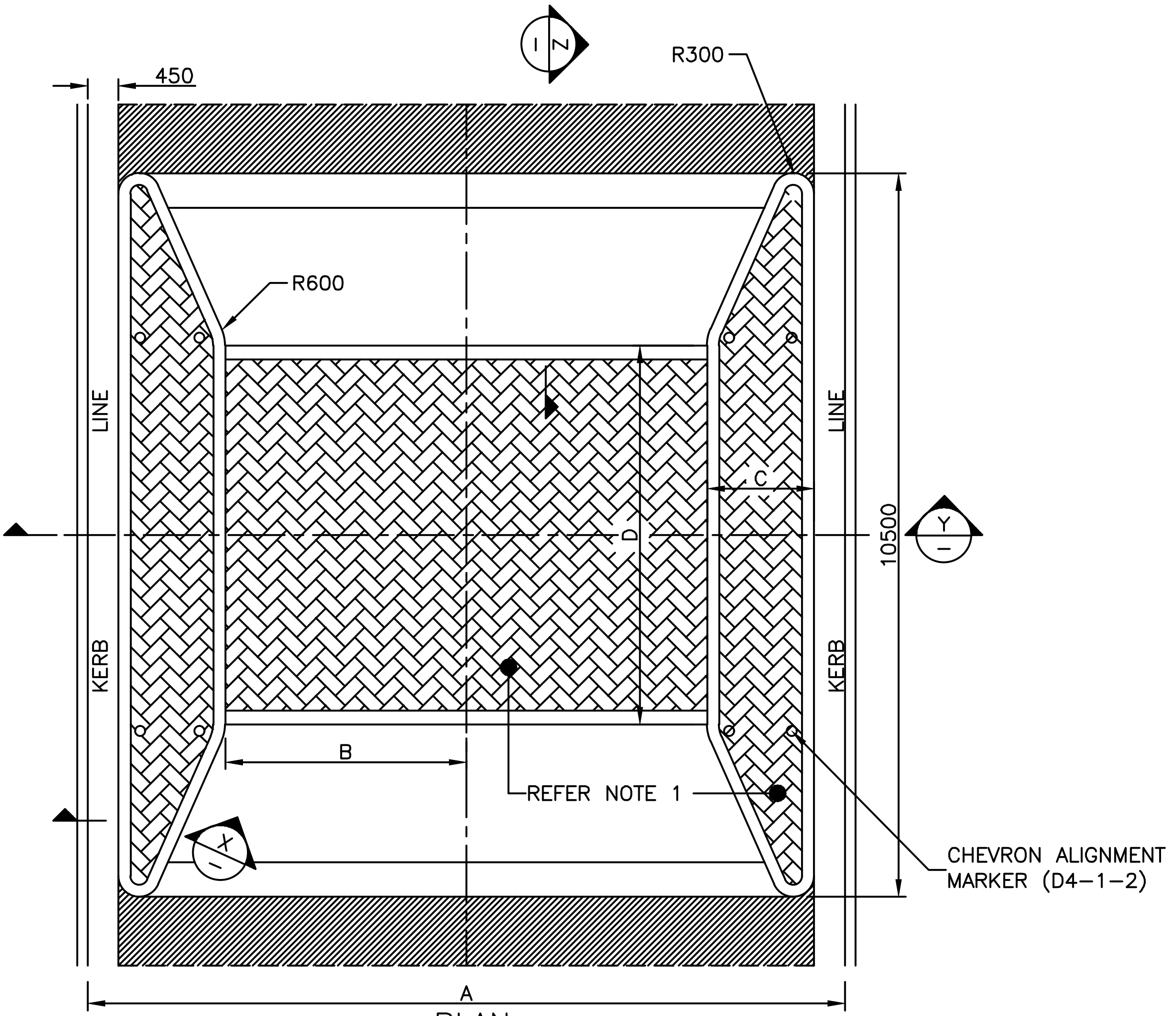
PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
RAISED THRESHOLD PAVERS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R34	N.T.S	3 OF 3	01	APR'21

Apr 15, 2021 - 11:08am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R34.dwg



PLAN
NOT TO SCALE

DIMENSION	A	B	C	D
WIDTH 1	8.90	3.0	1.00	5.5
WIDTH 2	11.00	3.5	1.55	5.5
WIDTH 3	12.20	3.5	2.15	5.5
WIDTH 4	15.24	3.5	3.67	5.5
WIDTH 5	18.23	3.5	5.165	5.5

DIMENSION TABLE

NOTES:
1. CONCRETE INFILL COLOUR AND STENCIL PATTERN TO COUNCIL SPECIFICATION
2. PROVIDE GALVANISED STEEL PIPE, POWDER COATED AS SPECIFIED TO SUIT THE CHEVRON ALIGNMENT MARKER AND TO FACE THE DIRECTION OF TRAVEL.
3. FACE OF KERB TO BE PAINTED WITH RETRO-REFLECTIVE WHITE PAINT.
4. CONCRETE TO BE OF 32MPa COMPRESSIVE STRENGTH (Fc) AT 28 DAYS.
5. REMOVE ALL REDUNDANT LINEMARKINGS AND SIGN POSTINGS.
6. PROVIDE ADEQUATE APPROACH WARNING SIGNS DURING CONSTRUCTION COMPLYING WITH THE REQUIREMENTS OF A.S.1742 & A.S.1743.
7. SIGNS ARE TO BE LOCATED CLEAR OF ANY DRIVEWAYS WHICH FALL AT DISTANCES SHOWN.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: RAISED THRESHOLD STENCILLED

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R35	N.T.S	1 OF 3	01	APR'21

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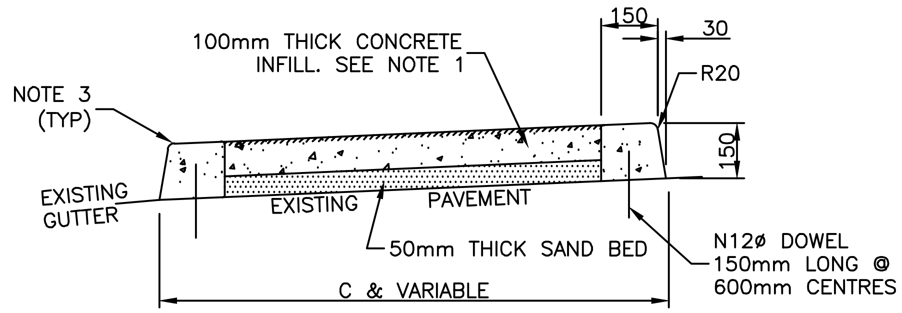
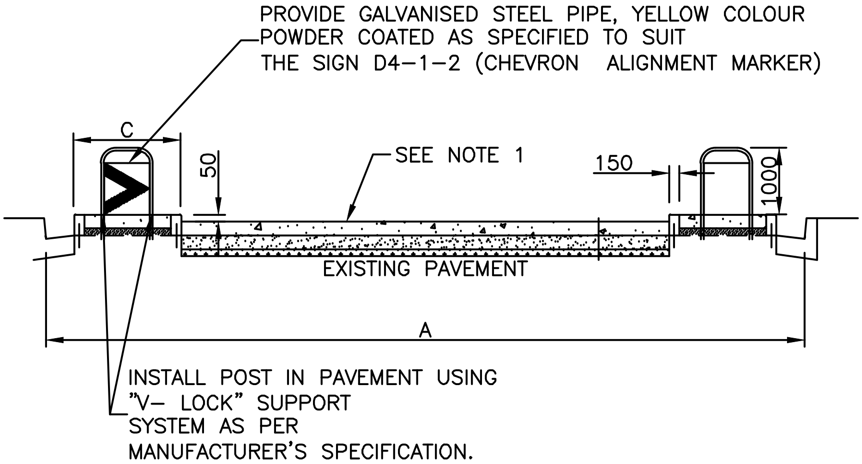
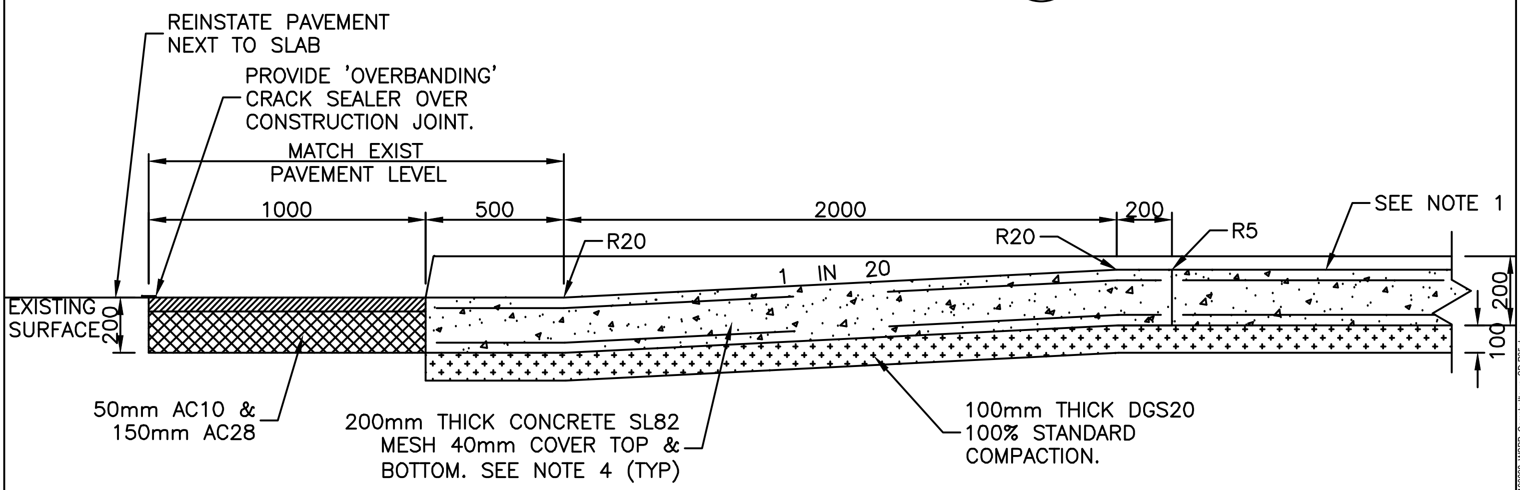
Apr 15, 2021 - 11:08am



BARRIER KERB & ISLAND DETAIL – SECTION X/–
NOT TO SCALE



THRESHOLD DETAIL – SECTION Y/–
NOT TO SCALE



CONCRETE RAMP DETAIL – SECTION Z/–
NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

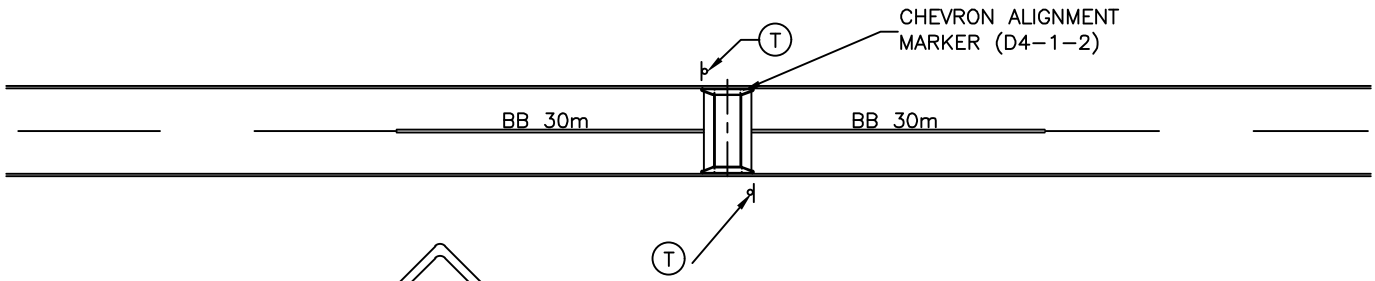
WESTERN SYDNEY PLANNING PARTNERSHIP

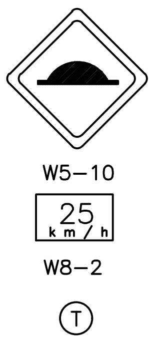
CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: RAISED THRESHOLD STENCILLED

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R35	N.T.S	2 OF 3	01	APR'21





SIGNPOSTING AND LINEMARKING DETAIL

NOT TO SCALE

STATUTORY SIGNAGE TO LOCAL TRAFFIC COMMITTEE APPROVAL (TYP)

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

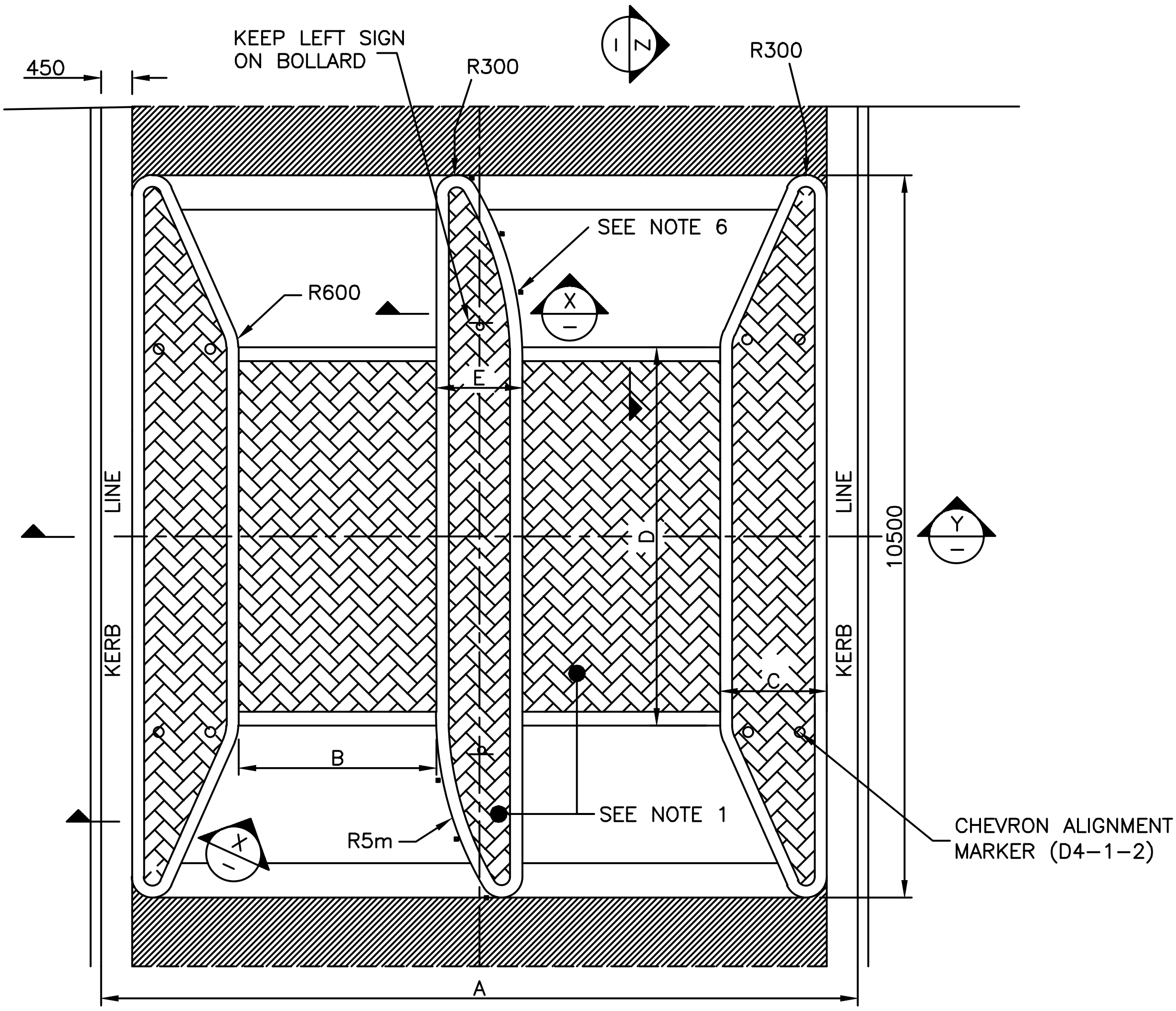
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
RAISED THRESHOLD STENCILLED

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R35	N.T.S	3 OF 3	01	APR'21



PLAN
NOT TO SCALE

NOTES:
1. CONCRETE INFILL COLOUR AND STENCIL PATTERN TO COUNCIL SPECIFICATION.
2. PROVIDE GALVANISED STEEL PIPE, POWDER COATED AS SPECIFIED TO SUIT THE CHEVRON ALIGNMENT MARKER AND TO FACE THE DIRECTION OF TRAVEL.
3. FACE OF KERB TO BE PAINTED WITH RETRO-REFLECTIVE WHITE PAINT.
4. CONCRETE TO BE OF 32MPa COMPRESSIVE STRENGTH (Fc) AT 28 DAYS.
5. REMOVE ALL REDUNDANT LINEMARKINGS AND SIGN POSTINGS.
6. PROVIDE MONO-DIRECTIONAL WHITE REFLECTIVE RAISED PAVEMENT MARKERS AT 900mm SPACING.
7. PROVIDE ADEQUATE APPROACH WARNING SIGNS DURING CONSTRUCTION COMPLYING WITH THE REQUIREMENTS OF A.S.1742 AND A.S.1743.
8. SIGNS ARE TO BE LOCATED CLEAR OF ANY DRIVEWAYS WHICH FALL AT DISTANCES SHOWN.

DIMENSION	A	B	C	D	E
WIDTH 1	10.15	3.0	1.00	5.5	1.25
WIDTH 2	11.00	3.3	1.125	5.5	1.25
WIDTH 3	12.20	3.5	1.45	5.5	1.40
WIDTH 4	15.24	3.5	2.57	5.5	2.20
WIDTH 5	18.23	3.5	3.665	5.5	3.00

DIMENSION TABLE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

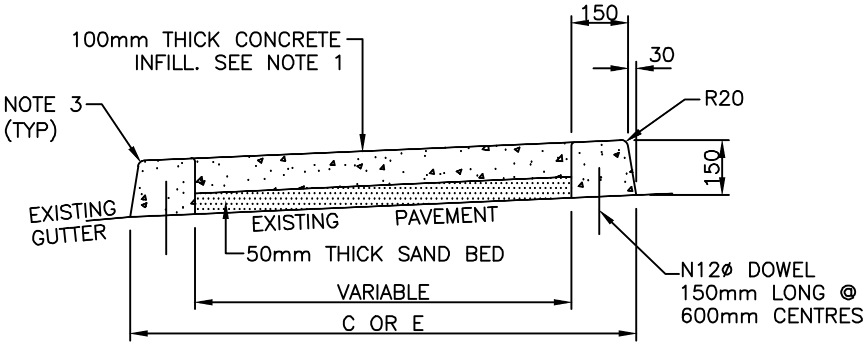
CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

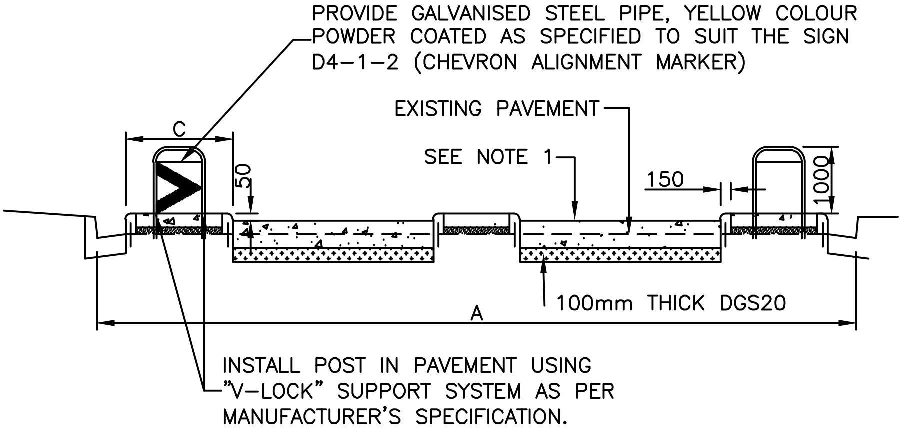
SHEET TITLE: RAISED THRESHOLD CENTRAL MEDIAN

STD DWG No. SD-R36
SCALE: N.T.S
SHEET 1 OF 3
VERSION 01
DATE APR'21

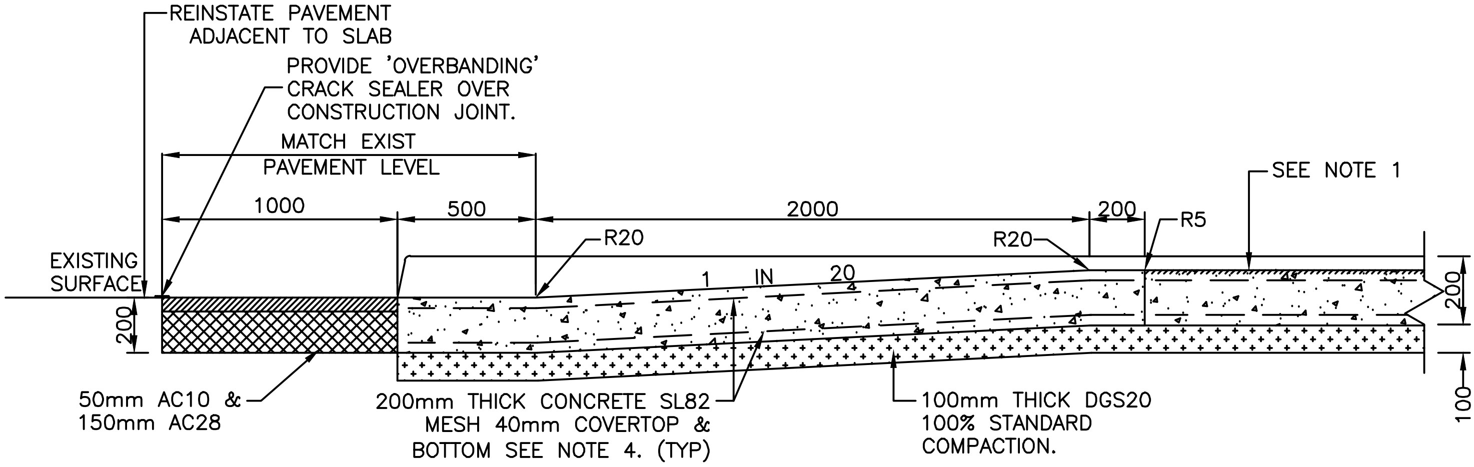
Apr 15, 2021 - 11:08am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R36.dwg



BARRIER KERB & ISLAND DETAIL – SECTION X/–
NOT TO SCALE



THRESHOLD DETAIL – SECTION Y/–
NOT TO SCALE



CONCRETE RAMP DETAIL – SECTION Z/–
NOT TO SCALE

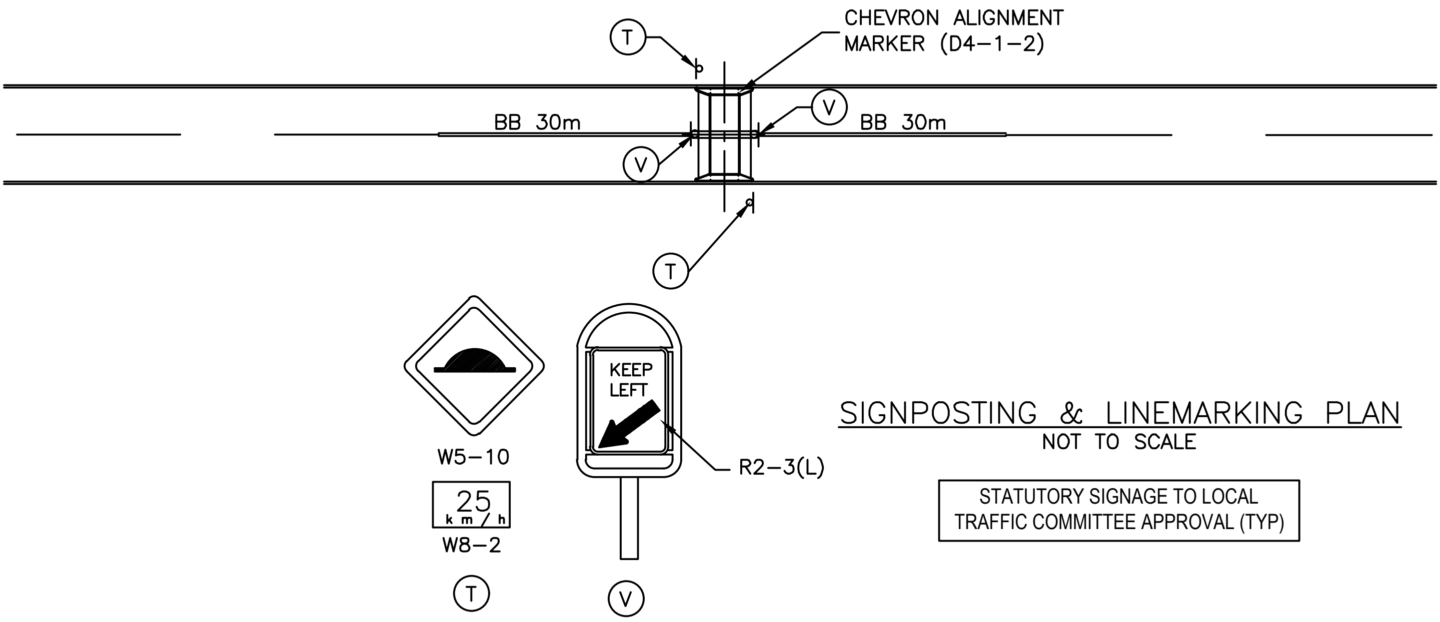
ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
PROJECT TITLE: WSPP STANDARD DRAWINGS
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
RAISED THRESHOLD CENTRAL MEDIAN	SD-R36	N.T.S	2 OF 3	01	APR'21



SIGNPOSTING & LINEMARKING PLAN

NOT TO SCALE

STATUTORY SIGNAGE TO LOCAL TRAFFIC COMMITTEE APPROVAL (TYP)

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

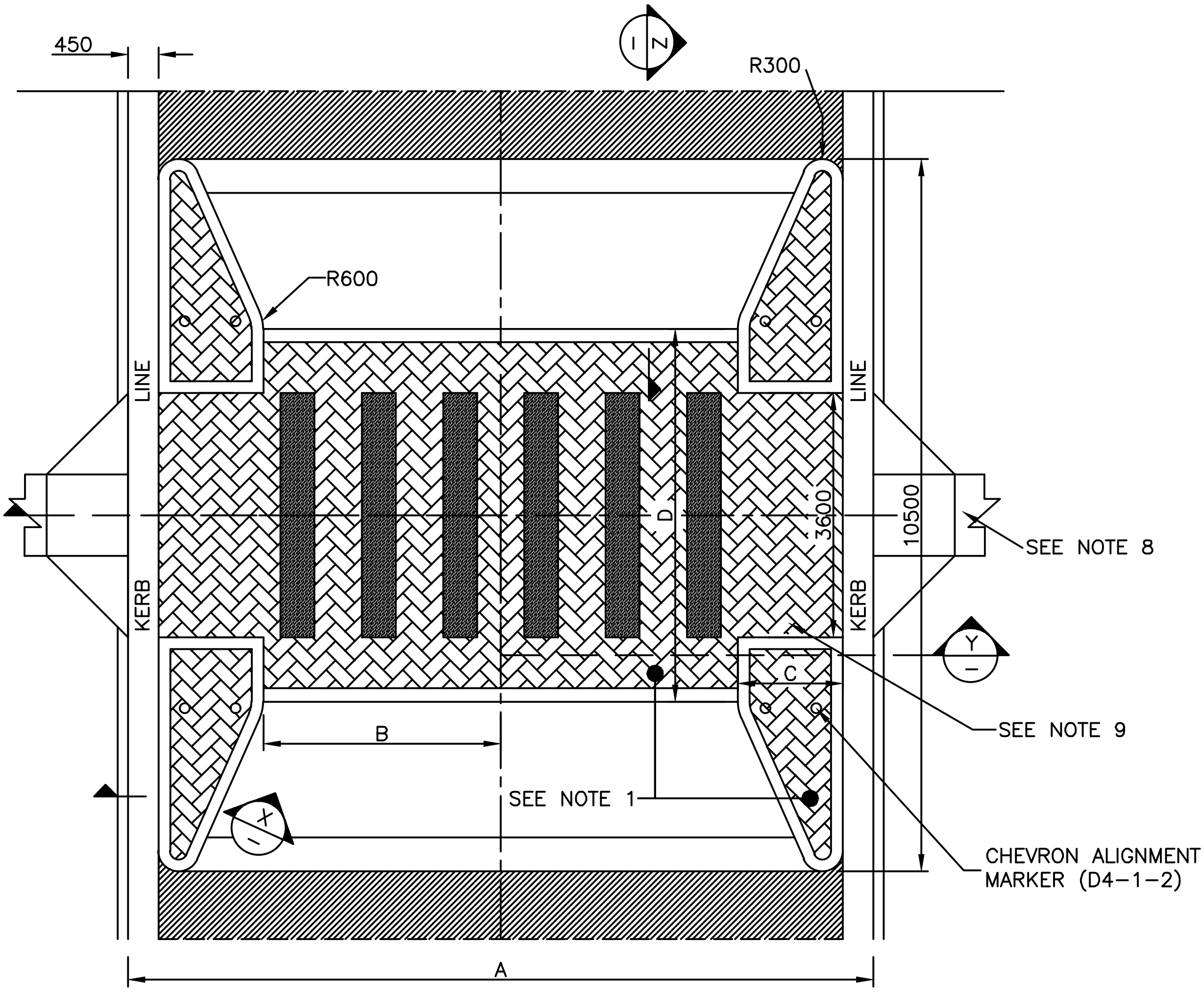
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: RAISED THRESHOLD CENTRAL MEDIAN

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R36	N.T.S	3 OF 3	01	APR'21



PLAN
NOT TO SCALE

NOTES:
1. CONCRETE INFILL COLOUR AND STENCIL PATTERN TO COUNCIL SPECIFICATION
2. PROVIDE GALVANISED STEEL PIPE, POWDER COATED AS SPECIFIED TO SUIT THE CHEVRON ALIGNMENT MARKER AND TO FACE THE DIRECTION OF TRAVEL.
3. FACE OF KERB TO BE PAINTED WITH RETRO-REFLECTIVE WHITE PAINT.
4. CONCRETE TO BE OF 32MPa COMPRESSIVE STRENGTH (Fc) AT 28 DAYS.
5. REMOVE ALL REDUNDANT LINEMARKINGS AND SIGN POSTINGS.
6. PROVIDE ADEQUATE APPROACH WARNING SIGNS DURING CONSTRUCTION COMPLYING WITH THE REQUIREMENTS OF A.S.1742 & A.S.1743.
7. SIGNS ARE TO BE LOCATED CLEAR OF ANY DRIVEWAYS WHICH FALL AT DISTANCES SHOWN.
8. CONSTRUCT PRAM RAMP AND CONCRETE PATH UP TO EXISTING PATH.
9. PEDESTRIAN CROSSING MARKINGS TO BE PAINTED IN ACCORDANCE WITH A.S.1742.13.
10. WHERE THE PEDESTRIAN CROSSING SYMBOL SIGN (R3-1) IS NOT CLEAR FOR 120m IN ADVANCE OF THE CROSSING WARNING SIGN ZIG-ZAG LINE TO BE MARKED ON THE ROAD ACCORDING TO THE RTA STANDARD
11. RAISED PEDESTRIAN CROSSING TO HAVE PIANO KEYS PAINTED ON RAMPS (NOT SHOWN) AS PER AS1742.10

DIMENSION	A	B	C	D
WIDTH 1	8.90	3.0	1.00	5.5
WIDTH 2	11.00	3.5	1.55	5.5
WIDTH 3	12.20	3.5	2.15	5.5
WIDTH 4	15.24	3.5	3.67	5.5
WIDTH 5	18.23	3.5	5.165	5.5

DIMENSION TABLE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

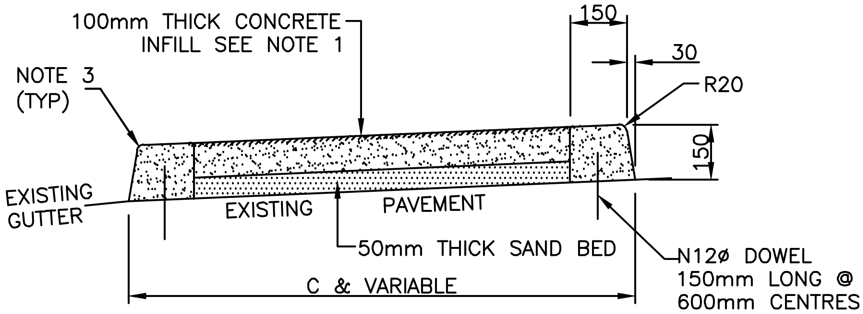
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

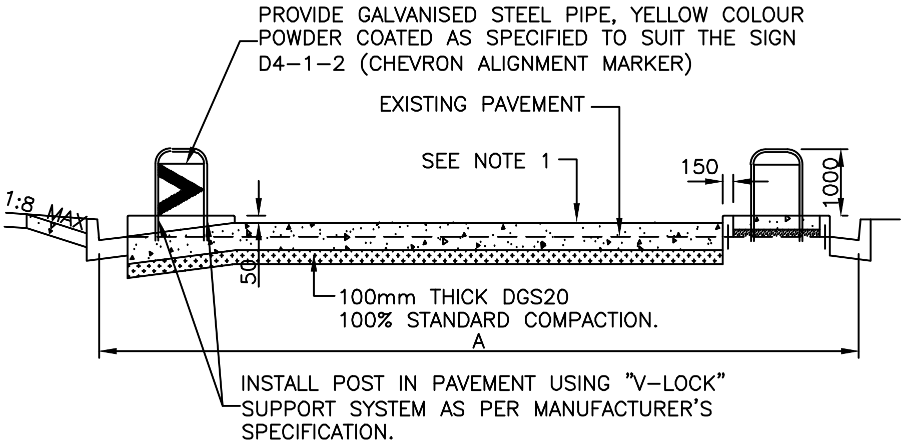
SHEET TITLE: WOMBAT CROSSING

STD DWG No. SD-R37 | SCALE: N.T.S | SHEET 1 OF 3 | VERSION 01 | DATE APR'21



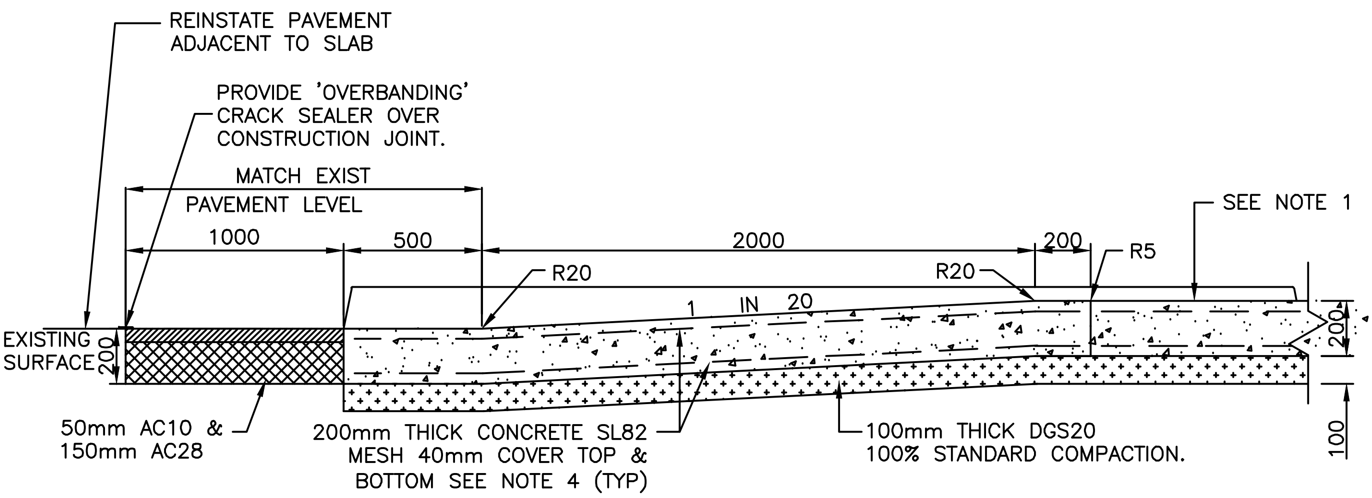
BARRIER KERB & ISLAND DETAIL – SECTION X/–

NOT TO SCALE



THRESHOLD DETAIL – SECTION Y/–

NOT TO SCALE



CONCRETE RAMP DETAIL – SECTION Z/–

NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

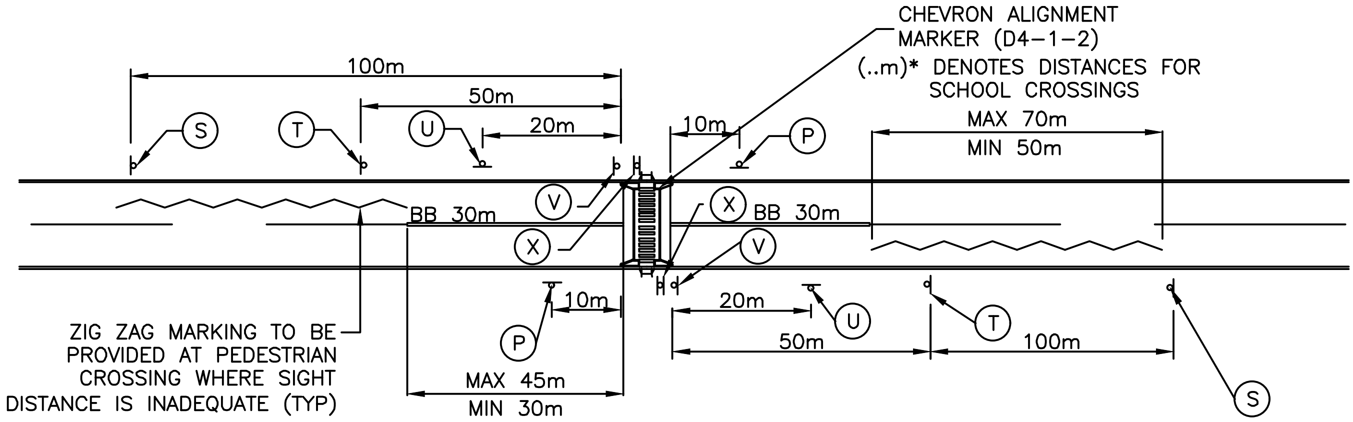
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: WOMBAT CROSSING

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R37	N.T.S	2 OF 3	01	APR'21

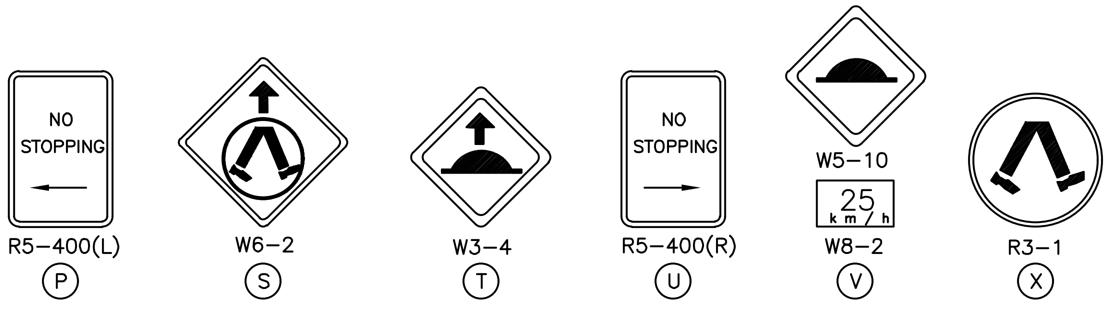


SIGNPOSTING & LINEMARKING DETAIL

NOT TO SCALE

STATUTORY SIGNAGE TO LOCAL TRAFFIC COMMITTEE APPROVAL (TYP)

FOR CHILDREN'S CROSSINGS REFER AS1742 FIGURES 3 AND 4



ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

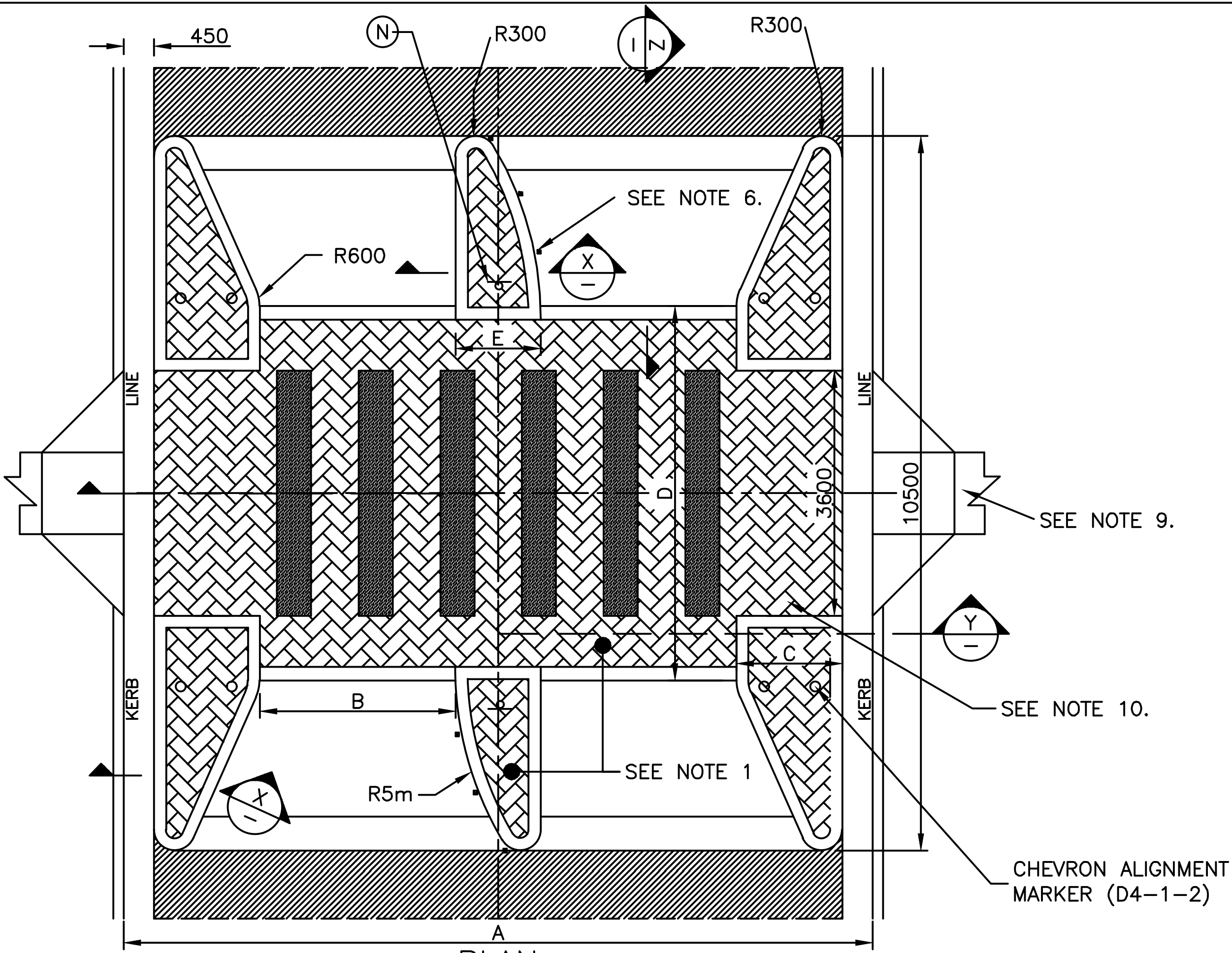
PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
WOMBAT CROSSING

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R37	N.T.S	3 OF 3	01	APR'21

Apr 15, 2021 - 11:08am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R37.dwg



PLAN

NOT TO SCALE

NOTES

1. CONCRETE INFILL COLOUR AND STENCIL PATTERN TO COUNCIL SPECIFICATION.
2. PROVIDE GALVANISED STEEL PIPE, POWDER COATED AS SPECIFIED TO SUIT THE CHEVRON ALIGNMENT MARKER AND TO FACE THE DIRECTION OF TRAVEL.
3. FACE OF KERB TO BE PAINTED WITH RETRO-REFLECTIVE WHITE PAINT.
4. CONCRETE TO BE OF 32MPa COMPRESSIVE STRENGTH (Fc) AT 28 DAYS.
5. REMOVE ALL REDUNDANT LINEMARKINGS AND SIGN POSTINGS.
6. PROVIDE MONO-DIRECTIONAL WHITE REFLECTIVE RAISED PAVEMENT MARKERS AT 900mm SPACING.
7. PROVIDE ADEQUATE APPROACH WARNING SIGNS DURING CONSTRUCTION COMPLYING WITH THE REQUIREMENTS OF A.S.1742 & A.S.1743.
8. SIGNS ARE TO BE LOCATED CLEAR OF ANY DRIVEWAYS WHICH FALL AT DISTANCES SHOWN.
9. CONSTRUCT PRAM RAMP AND CONCRETE PATH UP TO EXISTING FOOTPATH.
10. PEDESTRIAN CROSSWALK MARKINGS TO BE PAINTED IN ACCORDANCE WITH A.S.1742.13.
11. WHERE THE PEDESTRIAN CROSSING SYMBOL SIGN (R3-1) IS NOT CLEAR FOR 120m IN ADVANCE OF THE CROSSING WARNING SIGN ZIG-ZAG LINE TO BE MARKED ON THE ROAD ACCORDING TO THE RTA STANDARD.
11. RAISED PEDESTRIAN CROSSING TO HAVE PIANO KEYS PAINTED ON RAMPS (NOT SHOWN) AS PER AS1742.10

DIM.	A	B	C	D	E
WIDTH 1	10.15	3.0	1.00	5.5	1.25
WIDTH 2	11.00	3.3	1.125	5.5	1.25
WIDTH 3	12.20	3.5	1.50	5.5	1.30
WIDTH 4	15.24	3.5	2.67	5.5	2.00
WIDTH 5	18.23	3.5	3.965	5.5	2.40
OTHERS					

DIMENSION TABLE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

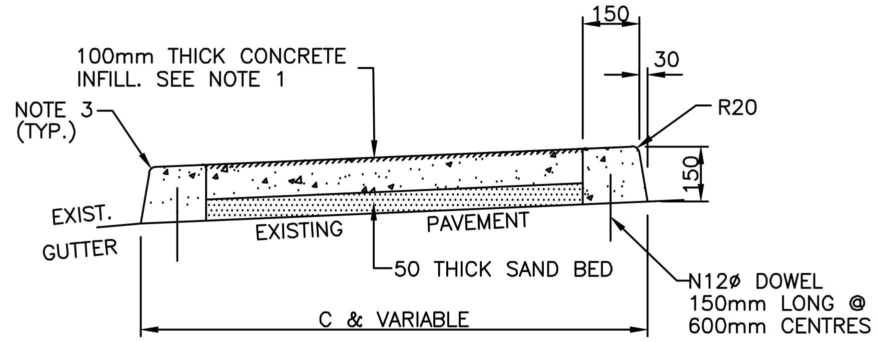
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: WOMBAT CROSSING CENTRAL MEDIAN

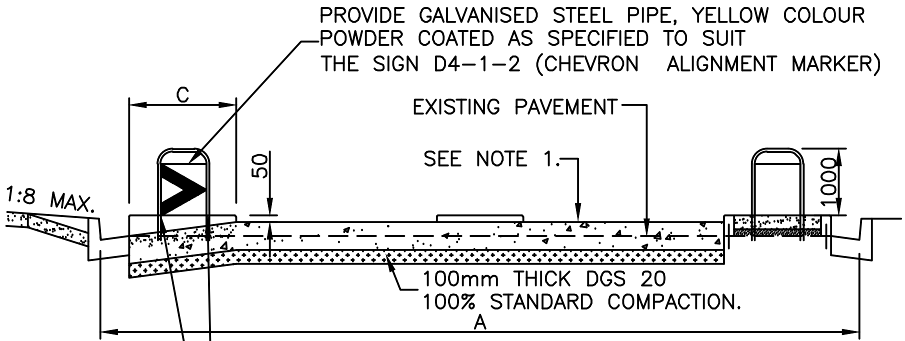
STD DWG No. SD-R38 | SCALE: N.T.S | SHEET 1 OF 3 | VERSION 01 | DATE APR'21

\\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R38.dwg Apr 15, 2021 - 11:08am



BARRIER KERB & ISLAND DETAIL – SECTION X/–

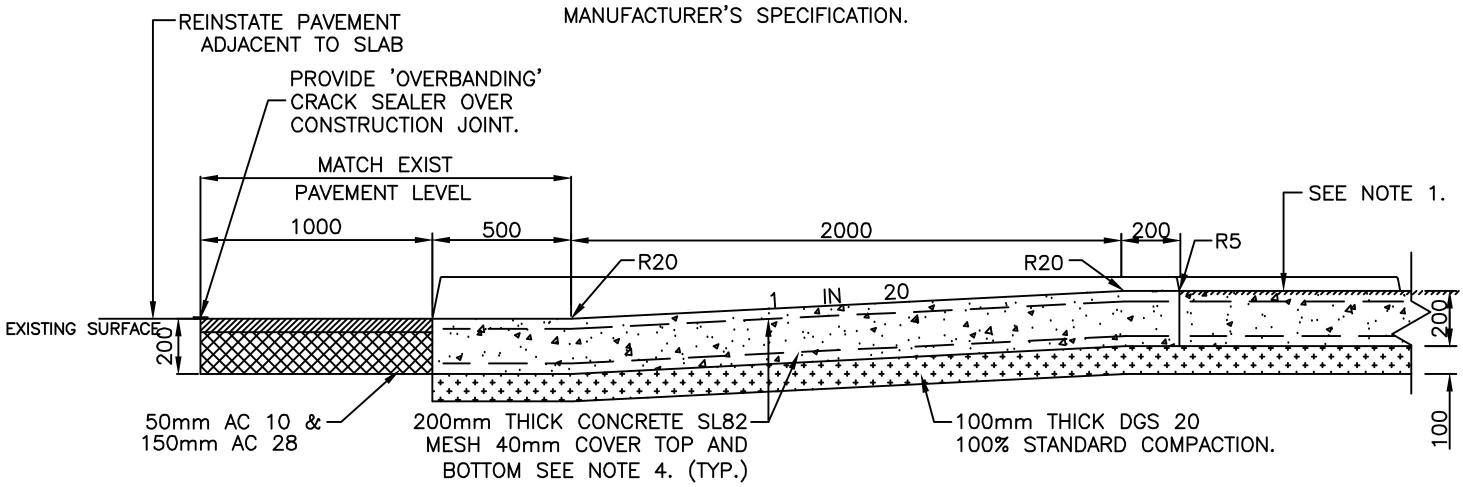
NOT TO SCALE



THRESHOLD DETAIL – SECTION Y/–

NOT TO SCALE

INSTALL POST IN PAVEMENT USING
"V– LOCK" SUPPORT
SYSTEM AS PER
MANUFACTURER'S SPECIFICATION.



CONCRETE RAMP DETAIL – SECTION Z/–

NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
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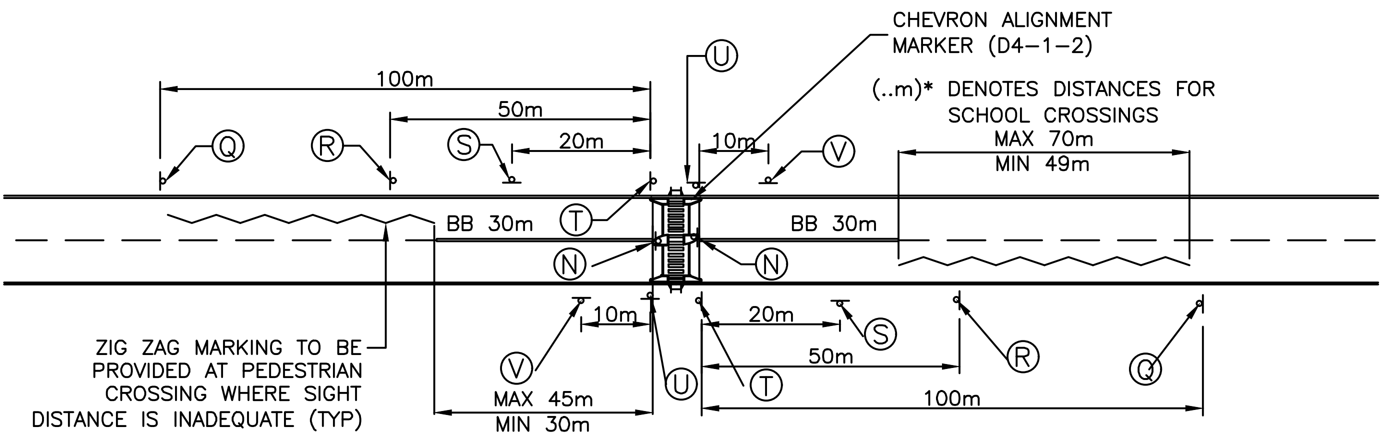
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: WOMBAT CROSSING CENTRAL MEDIAN

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R38	N.T.S	2 OF 3	01	APR'21

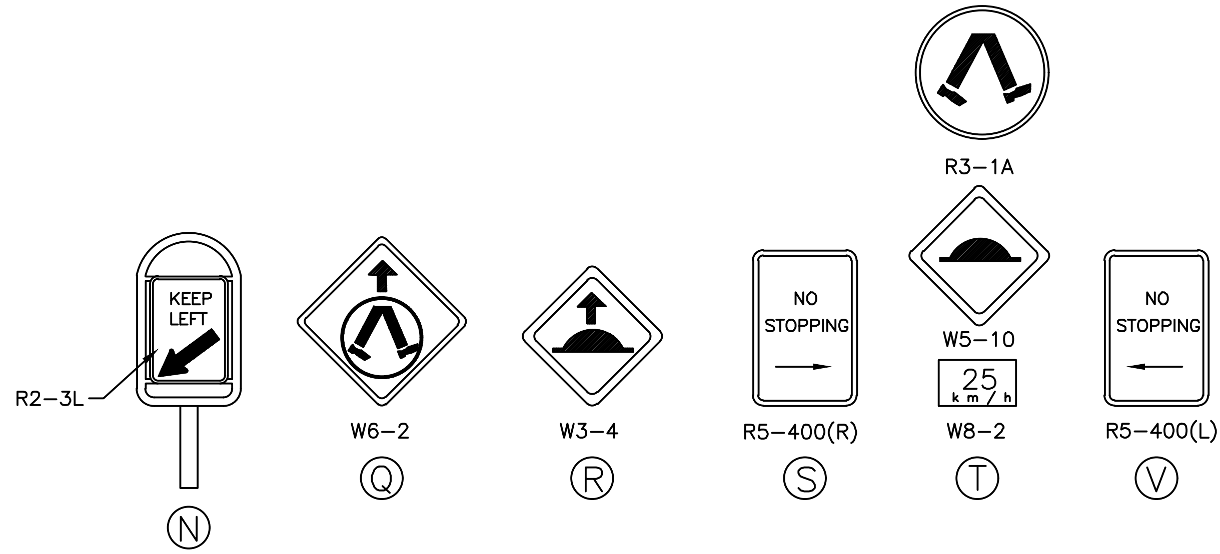


SIGNPOSTING & LINEMARKING DETAIL

NOT TO SCALE

STATUTORY SIGNAGE TO LOCAL TRAFFIC COMMITTEE APPROVAL (TYP)

FOR CHILDREN'S CROSSINGS REFER AS1742 FIGURES 3 AND 4



ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

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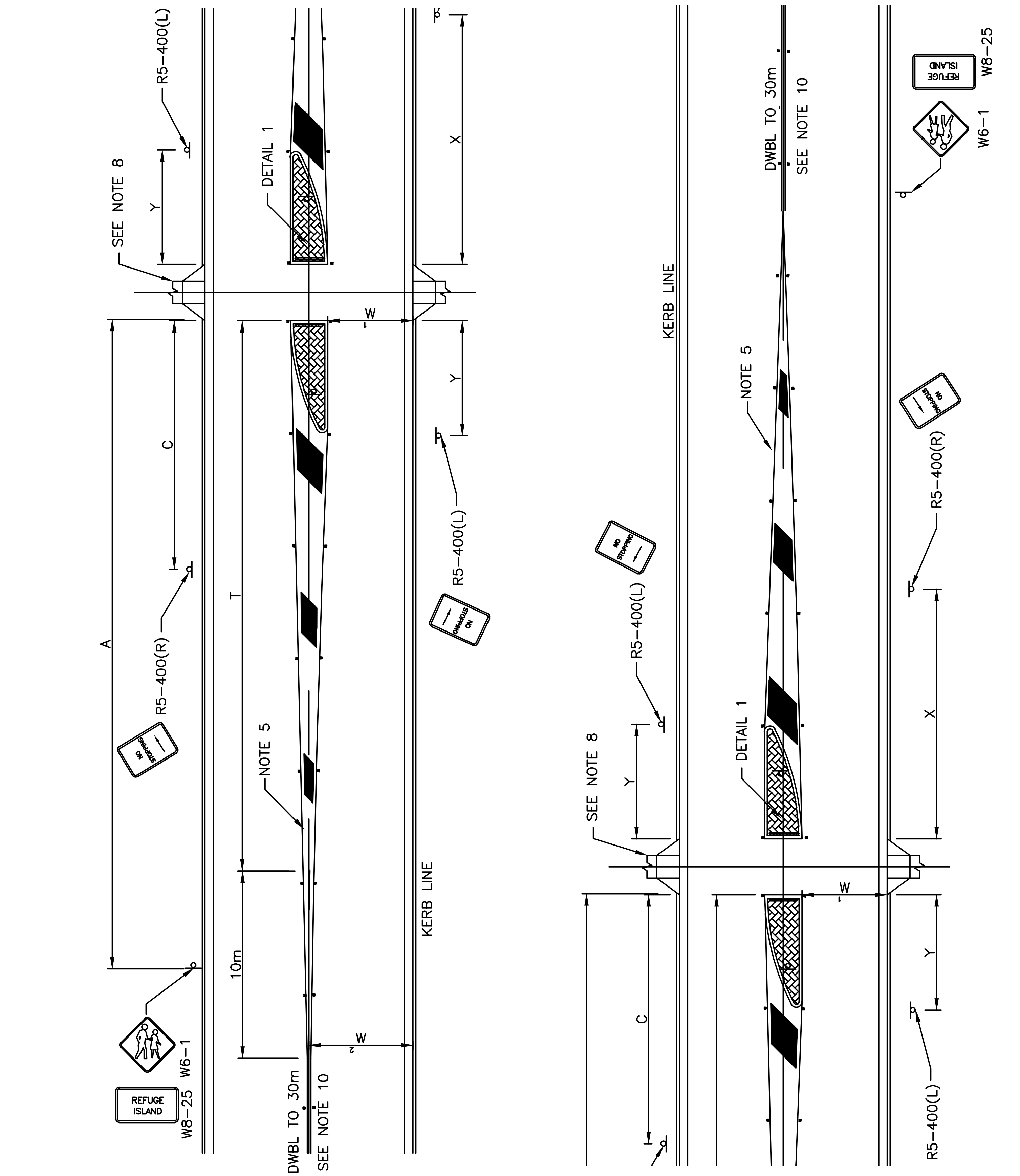
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: WOMBAT CROSSING CENTRAL MEDIAN

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R38	N.T.S	3 OF 3	01	APR'21



PLAN
NTS

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

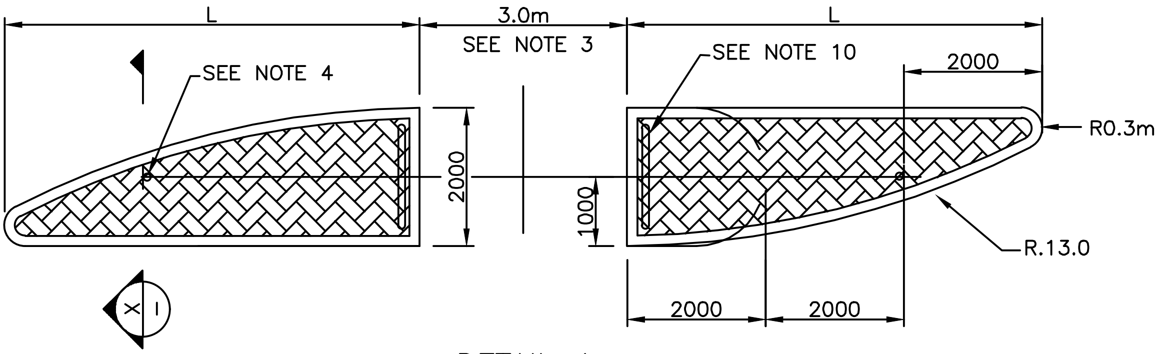
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

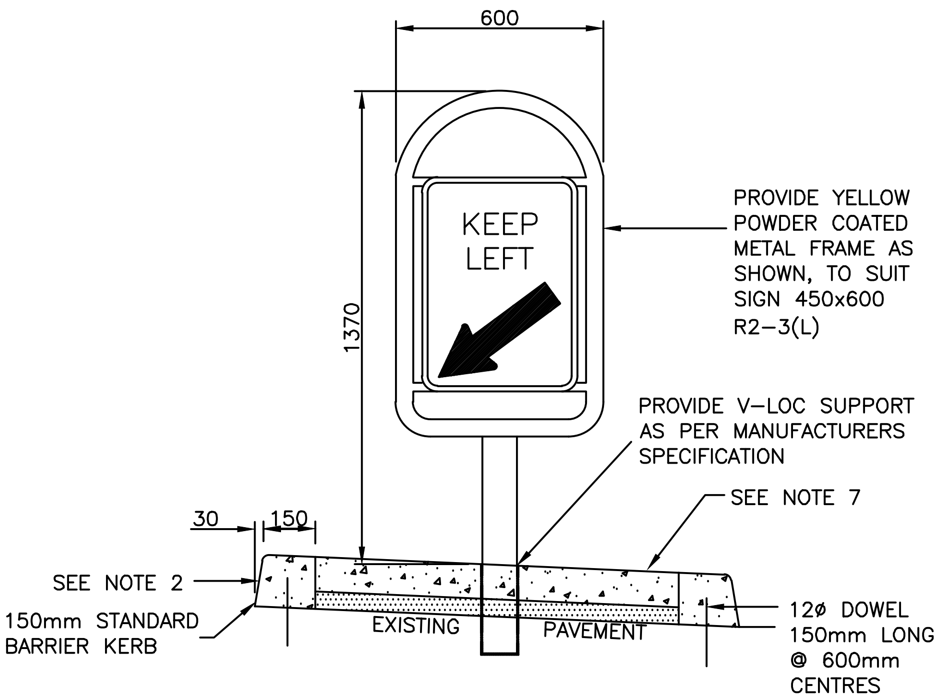
PROJECT TITLE:
WSPP STANDARD DRAWINGS

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
PEDESTRIAN REFUGE	SD-R39	N.T.S	1 OF 3	01	APR'21



DETAIL 1
NTS



BARRIER KERB, ISLAND &
BOLLARD DETAIL – SECTION
NTS

X
–

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
PEDESTRIAN REFUGE	SD-R39	N.T.S	2 OF 3	01	APR'21

NOTES:

1. ALL LINEMARKING AND SIGNPOSTING TO COMPLY WITH THE REQUIREMENTS OF A.S.1742 & A.S.1743
2. REFUGE ISLAND MINIMUM 2.0m WIDE AT CROSSING. TO BE CONSTRUCTED WITH 150mm BARRIER KERB PAINTED WITH RETRO–REFLECTIVE WHITE PAINT.
3. CROSSING GAP MINIMUM 3.0 METRES, WHERE PEDESTRIAN CROSSING USED 3.6m.
4. MINIMUM W_1 = 3.7m (MAY NEED WIDENING FOR HORIZONTAL CURVE).
5. INCORPORATE A SPLAYED APPROACH WITH PAINTED CHEVRONS ON BOTH APPROACHES TO CENTRAL ISLAND. PAINTED CHEVRONS – 4.5m SPACING, 1.5m WIDTH, 45° ANGLE. RAISED PAVEMENT MARKERS AT 6.0m SPACING, FROM COMMENCEMENT OF SPLAY.
6. CONSTRUCT PRAM RAMP AND CONCRETE FOOTPATH UP TO EXISTING FOOTPATH.
7. 100mm THICK CONCRETE INFILL ON 50mm THICK SAND BED. CONCRETE INFILL COLOUR AND STENCIL PATTERN TO COUNCILS SPECIFICATION.
8. PAINTED MEDIAN IS PRECEDED BY A DOUBLE BARRIER (BB) LINE EXTENDING FOR 30m MINIMUM.
9. PROVIDE GALVINISED STEEL PIPE AND CAP, POWDER COATED YELLOW AND SPACED TO SUIT THE CHEVRON ALIGNMENT MARKER (D4–6A) AND TO FACE THE DIRECTION OF TRAVEL.

D–WIDTH OF EXTENSIONS (m)	X	Y
0	20	3.0

NO STOPPING SIGNS

ROAD	2 LANE	4 LANE
L	6000	10000
R	13000	35000

ISLAND SETOUT DETAILS

V_{85} (km\hr)	T (m)	A (m)	W6–1 W6–3
40	17	80	A
50	20	95	B
60	25	115	C

WARNING SIGN AND TAPER DETAILS

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS
DATE: OCT 2020

APPROVED: SAG
DATE: 14.04.21

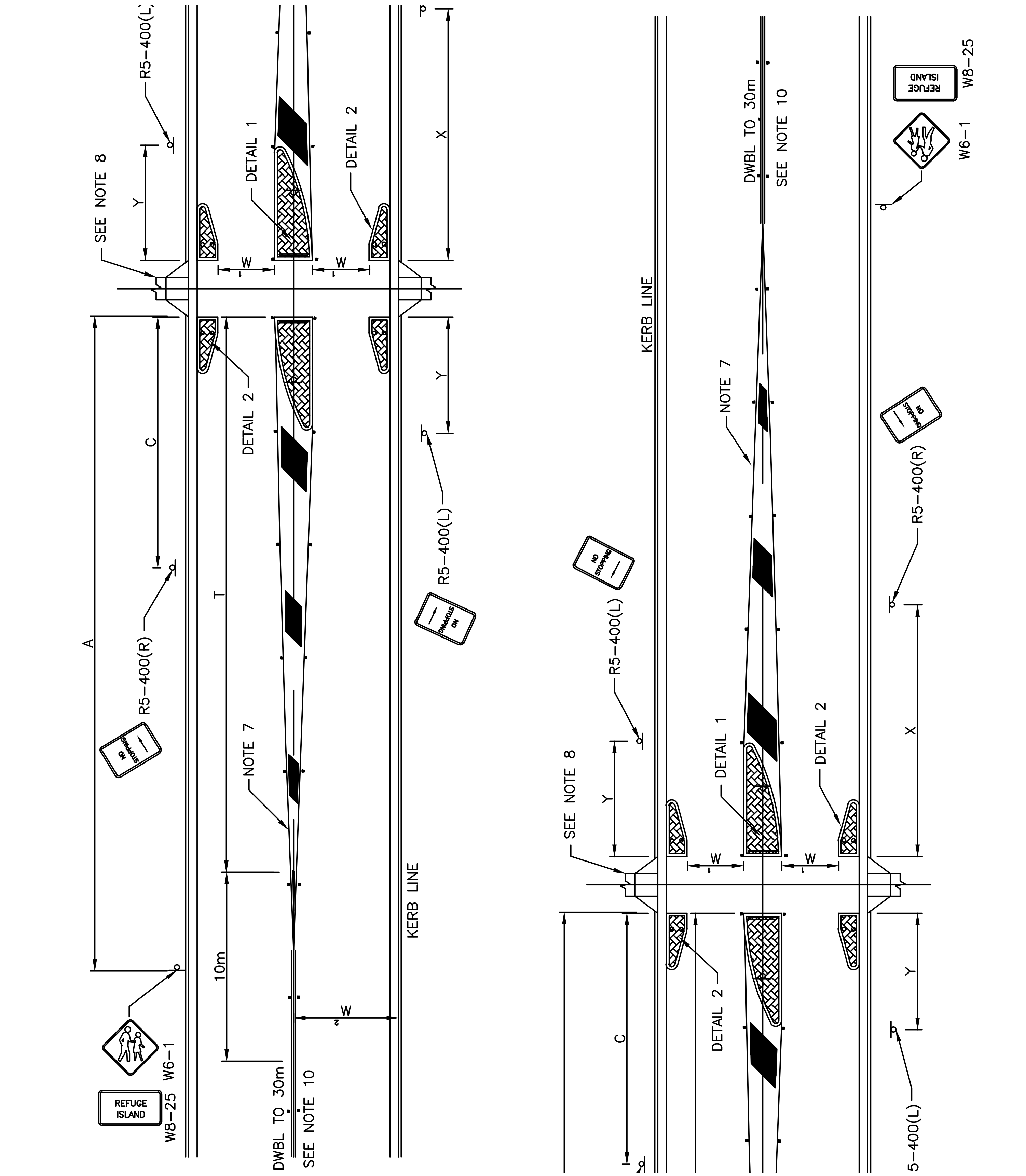
SHEET TITLE: PEDESTRIAN REFUGE

STD DWG No. SD-R39

SCALE: N.T.S

SHEET 3 OF 3

VERSION 01 DATE APR'21



PLAN
NTS

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

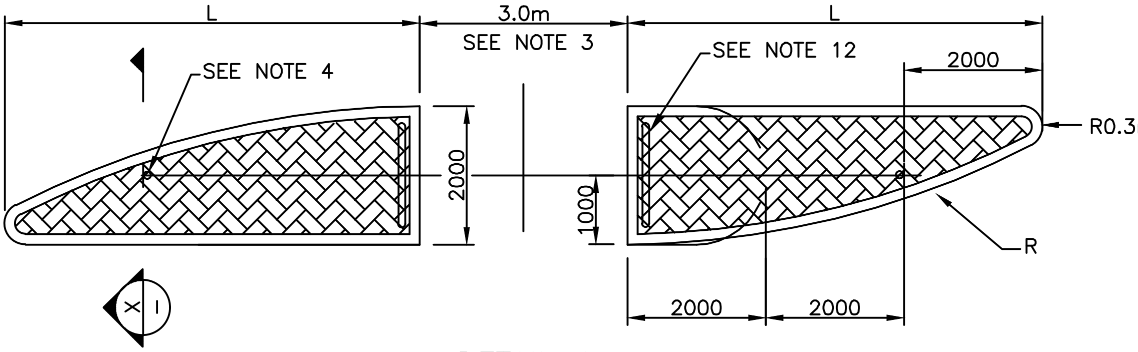
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

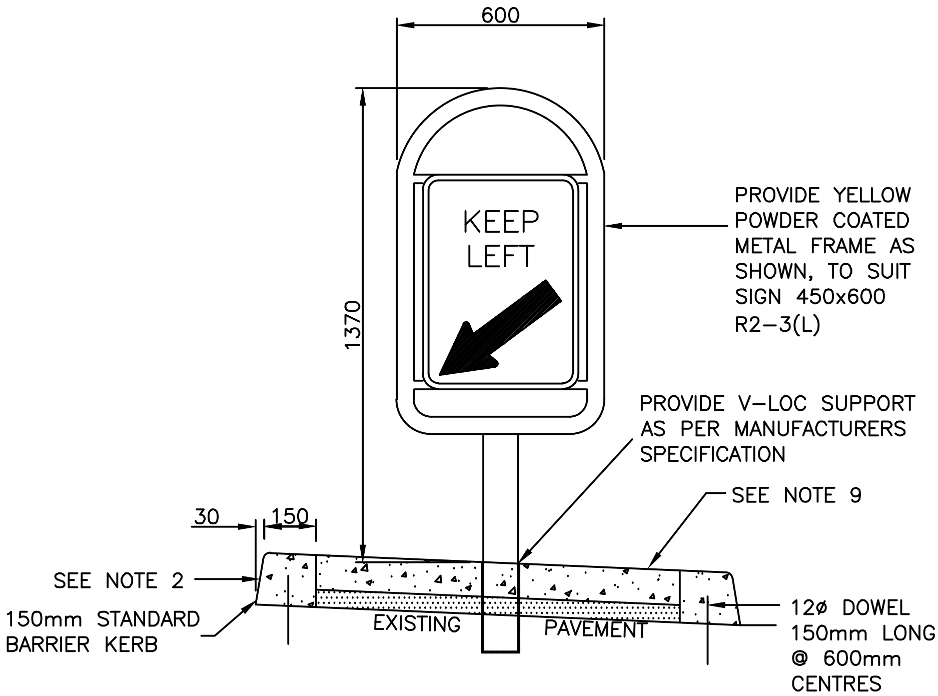
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
PEDESTRIAN REFUGE AND NECKING

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R40	N.T.S	1 OF 3	01	APR'21



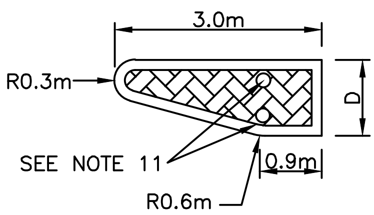
DETAIL 1
NTS



BARRIER KERB, ISLAND &
BOLLARD DETAIL – SECTION

X
–

NTS



DETAIL 2
NTS

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
PEDESTRIAN REFUGE AND NECKING

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R40	N.T.S	2 OF 3	01	APR'21

Apr 15, 2021 - 11:09am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R40.dwg

NOTES:

1. ALL LINEMARKING AND SIGNPOSTING TO COMPLY WITH THE REQUIREMENTS OF A.S.1742 & A.S.1743
2. REFUGE ISLAND MINIMUM 2.0m WIDE AT CROSSING. TO BE CONSTRUCTED WITH 150mm BARRIER KERB PAINTED WITH RETRO-REFLECTIVE WHITE PAINT.
3. CROSSING GAP MINIMUM 3.0 METRES, WHERE PEDESTRIAN CROSSING USED 3.6m.
4. MINIMUM W_1 = 3.7m (MAY NEED WIDENING FOR HORIZONTAL CURVE).
5. ROAD WIDENING REQUIRED WHERE $W_2 < W_1$ + 1/2 ISLAND WIDTH.
6. KERB EXTENSIONS REQUIRED WHERE $W_2 > W_1$ + 1/2 ISLAND WIDTH
7. INCORPORATE A SPLAYED APPROACH WITH PAINTED CHEVRONS ON BOTH APPROACHES TO CENTRAL ISLAND. PAINTED CHEVRONS – 4.5m SPACING, 1.5m WIDTH, 45° ANGLE. RAISED PAVEMENT MARKERS AT 6.0m SPACING, FROM COMMENCEMENT OF SPLAY.
8. CONSTRUCT PRAM RAMP AND CONCRETE FOOTPATH UP TO EXISTING FOOTPATH.
9. 100mm THICK CONCRETE INFILL ON 50mm THICK SAND BED. CONCRETE INFILL COLOUR AND STENCIL PATTERN TO COUNCIL SPECIFICATION.
10. PAINTED MEDIAN IS PRECEDED BY A DOUBLE BARRIER (BB) LINE EXTENDING FOR 30m MINIMUM.
11. PROVIDE GALVINISED STEEL PIPE AND CAP, POWDER COATED YELLOW AND SPACED TO SUIT THE CHEVRON ALIGNMENT MARKER (D4–6A) AND TO FACE THE DIRECTION OF TRAVEL.
12. BICYCLE ISLAND HOLD RAIL TO RMS DETAIL.

D-WIDTH OF EXTENSIONS (m)	X	Y
0	20	3.0
1.5	15	6.5
2.0	10	9.0

NO STOPPING SIGNS

ROAD	2 LANE	4 LANE
L	6000	10000
R	13000	35000

ISLAND SETOUT DETAILS

V_{85} (km\hr)	T (m)	A (m)	W6-1 W6-3
40	17	80	A
50	20	95	B
60	25	115	C

WARNING SIGN AND TAPER DETAILS

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

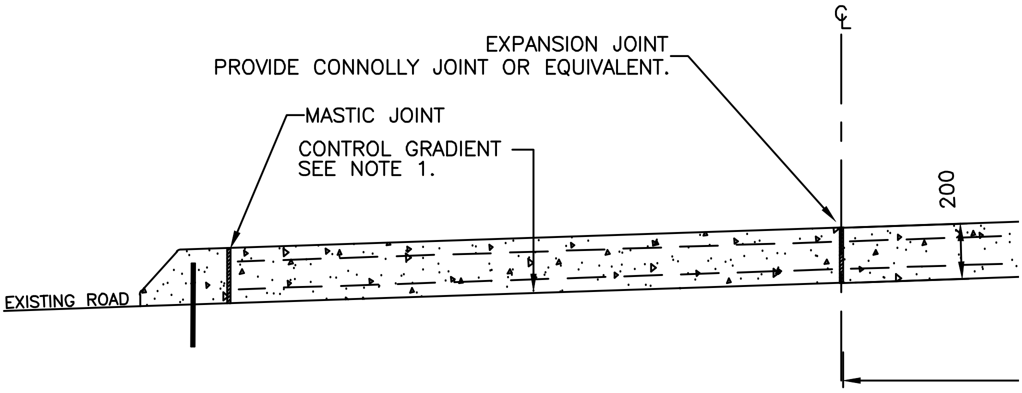
WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

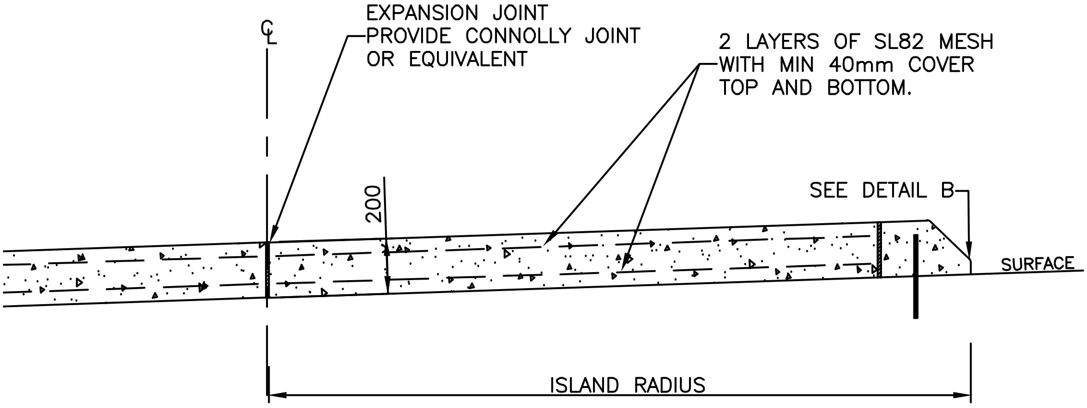
CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: PEDESTRIAN REFUGE AND NECKING

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R40	N.T.S	3 OF 3	01	APR'21



SECTION A
NOT TO SCALE



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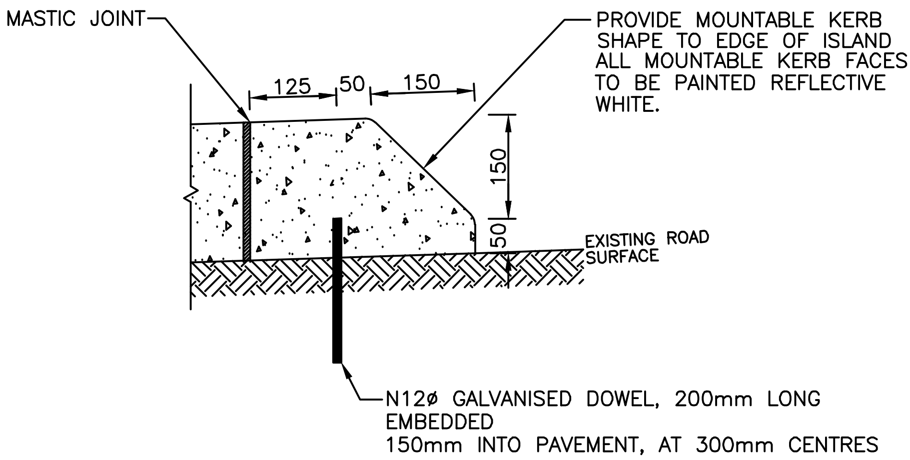


DETAIL B
NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

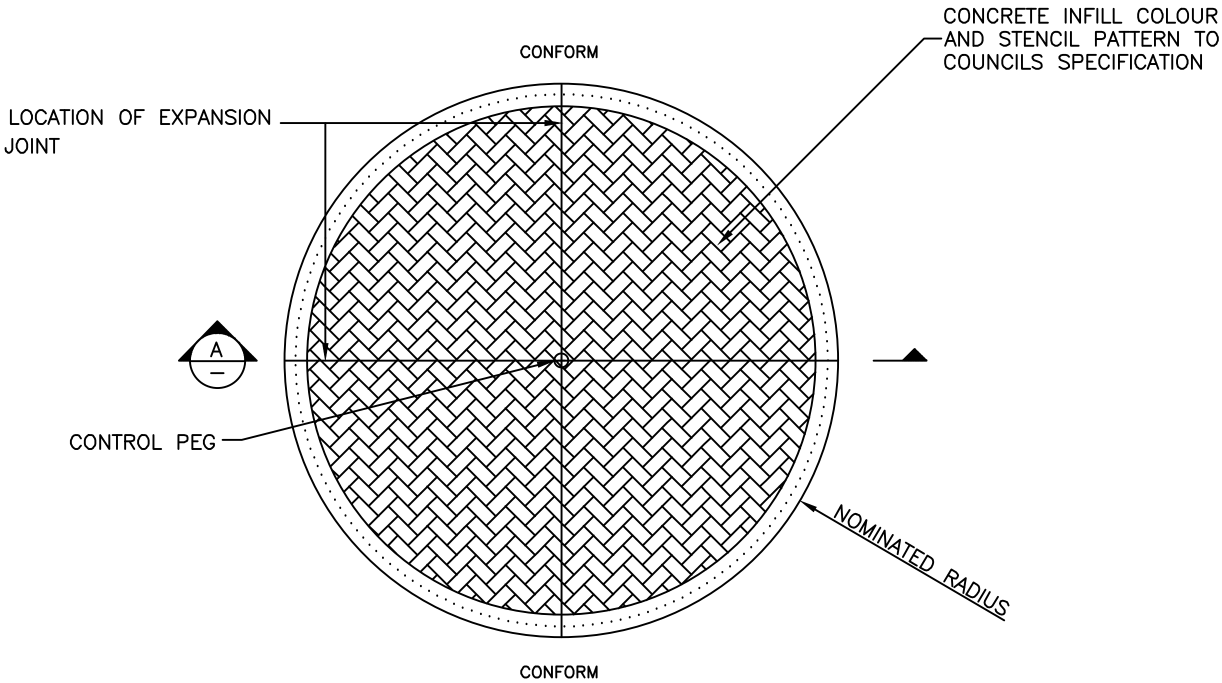
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: ROUNDABOUT CENTRAL ISLAND ON EXISTING PAVEMENT

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R42	N.T.S	1 OF 2	01	APR'21



CENTRAL ISLAND PLAN DETAIL

NOT TO SCALE

NOTES:

1. GRADIENT TO BE CONTROLLED BY EXISTING PAVEMENT.
2. ALL DIMENSIONS IN MILLIMETRES.
3. CONCRETE TO HAVE 32MPa COMPRESSIVE STRENGTH (F'c) AT 28 DAYS AND SLUMP OF 60mm.
4. MESH TO HAVE A MIN. 300 LAP LENGTH & MIN 40 COVER UNLESS SHOWN OTHERWISE.
5. FIBRE REINFORCMENT TO BE GRADE F6/75 (6MPa 90 DAY FLEXURAL STRENGTH USING 75Kg/CU.M OF TYPE EE STEEL FIBRES).
6. ALL MOUNTABLE KERB FACES TO BE PAINTED REFLECTIVE WHITE.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

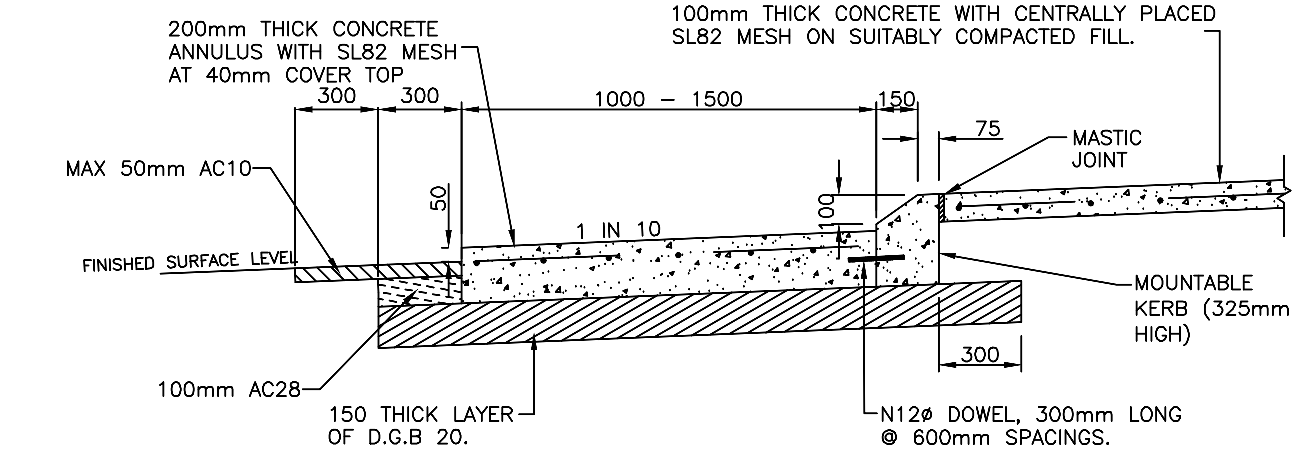
WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS DATE: OCT 2020

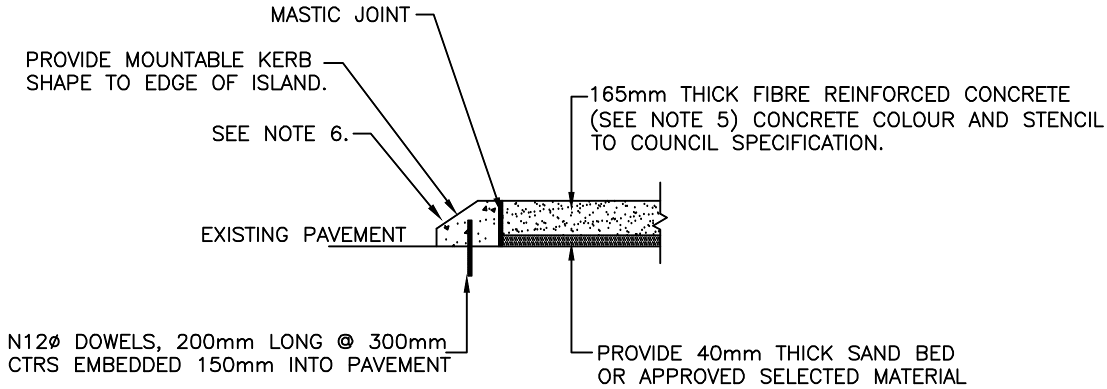
APPROVED: SAG DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
ROUNDABOUT CENTRAL ISLAND ON EXISTING PAVEMENT	SD-R42	N.T.S	2 OF 2	01	APR'21



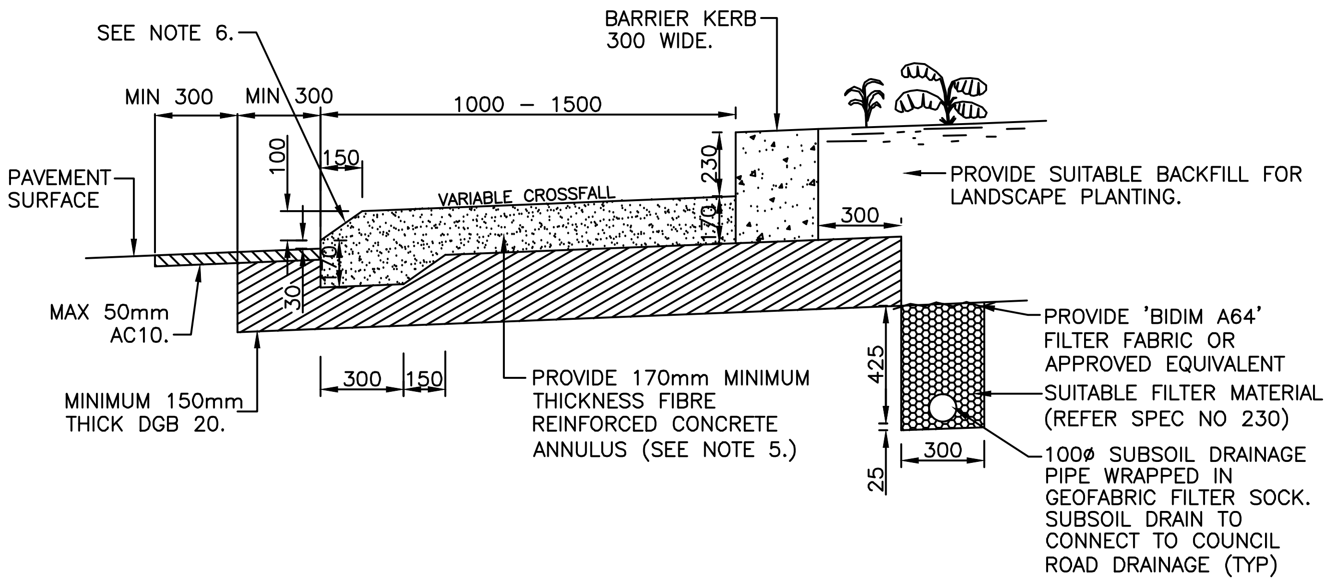
CENTRAL ISLAND DETAIL – TYPE A

NOT TO SCALE



CENTRAL ISLAND DETAIL – TYPE C

NOT TO SCALE



CENTRAL ISLAND DETAIL – TYPE E

NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: ROUNDABOUT CENTRAL ISLAND EDGE DETAIL

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R43	N.T.S	1 OF 3	01	APR'21

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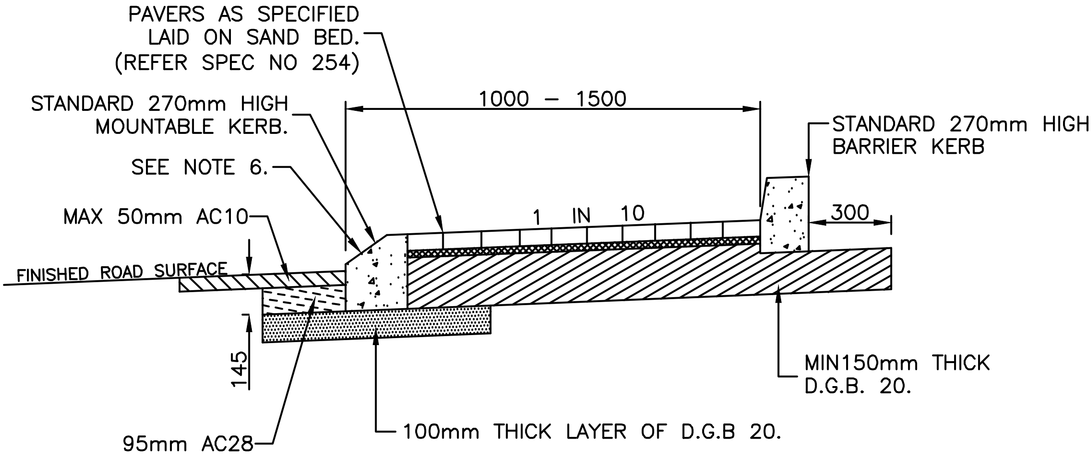

CENTRAL ISLAND DETAIL – TYPE B

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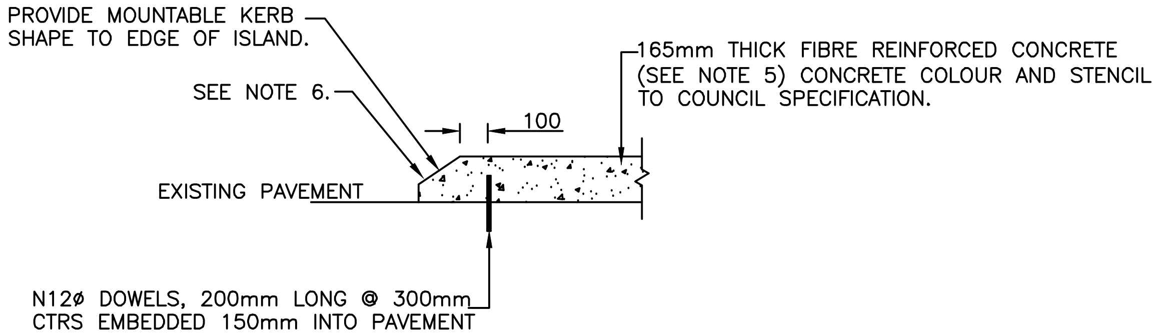


CENTRAL ISLAND DETAIL – TYPE D

NOT TO SCALE

NOTES:

1. GRADIENT TO BE CONTROLLED BY EXISTING PAVEMENT.
2. ALL DIMENSIONS IN MILLIMETRES.
3. CONCRETE TO HAVE 32MPa COMPRESSIVE STRENGTH (F'c) AT 28 DAYS AND SLUMP OF 60mm.
4. MESH TO HAVE A MIN. 300 LAP LENGTH & MIN 50 COVER UNLESS SHOWN OTHERWISE.
5. FIBRE REINFORCMENT TO BE GRADE F6/75 (6MPa 90 DAY FLEXURAL STRENGTH USING 75Kg/CU.M OF TYPE EE STEEL FIBRES).
6. ALL MOUNTABLE KERB FACES TO BE PAINTED REFLECTIVE WHITE.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

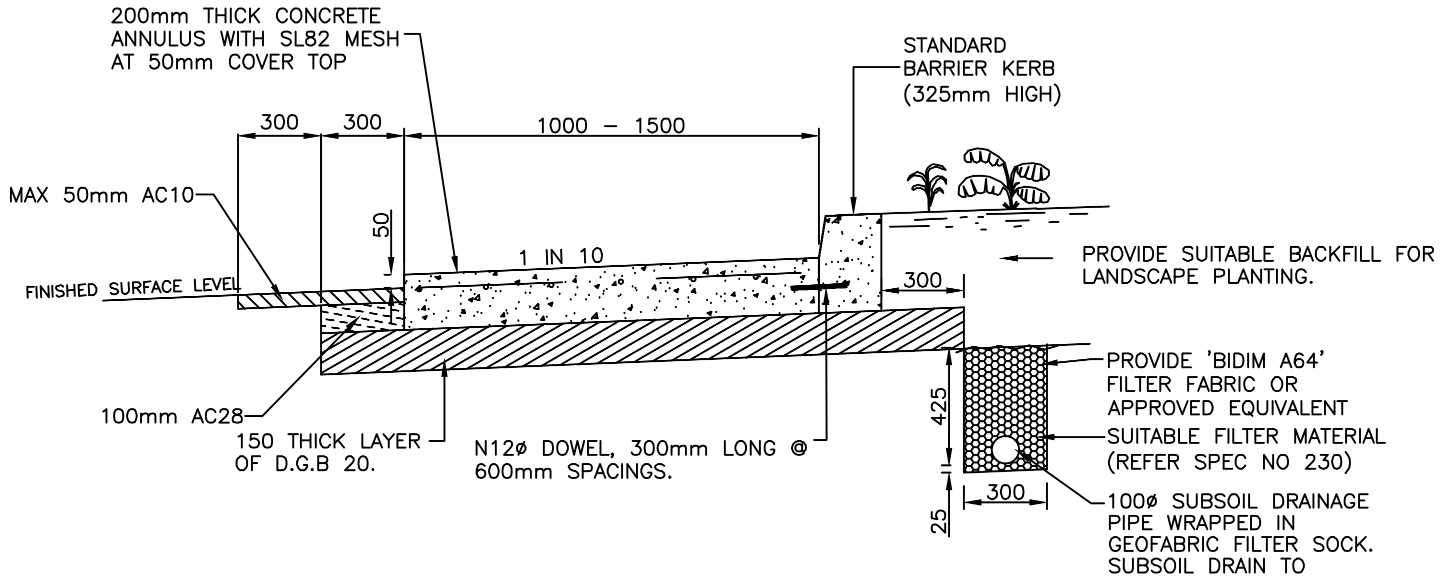
WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: ROUNDABOUT CENTRAL ISLAND EDGE DETAIL

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R43	N.T.S	2 OF 3	01	APR'21



CENTRAL ISLAND DETAIL – TYPE F

NOTES:

1. GRADIENT TO BE CONTROLLED BY EXISTING PAVEMENT.
2. ALL DIMENSIONS IN MILLIMETRES.
3. CONCRETE TO HAVE 32MPa COMPRESSIVE STRENGTH (F'c) AT 28 DAYS AND SLUMP OF 60mm.
4. MESH TO HAVE A MIN. 300 LAP LENGTH & MIN 50 COVER UNLESS SHOWN OTHERWISE.
5. FIBRE REINFORCEMENT TO BE GRADE F6/75 (6MPa 90 DAY FLEXURAL STRENGTH USING 75Kg/CU.M OF TYPE EE STEEL FIBRES).
6. ALL MOUNTABLE KERB FACES TO BE PAINTED REFLECTIVE WHITE.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

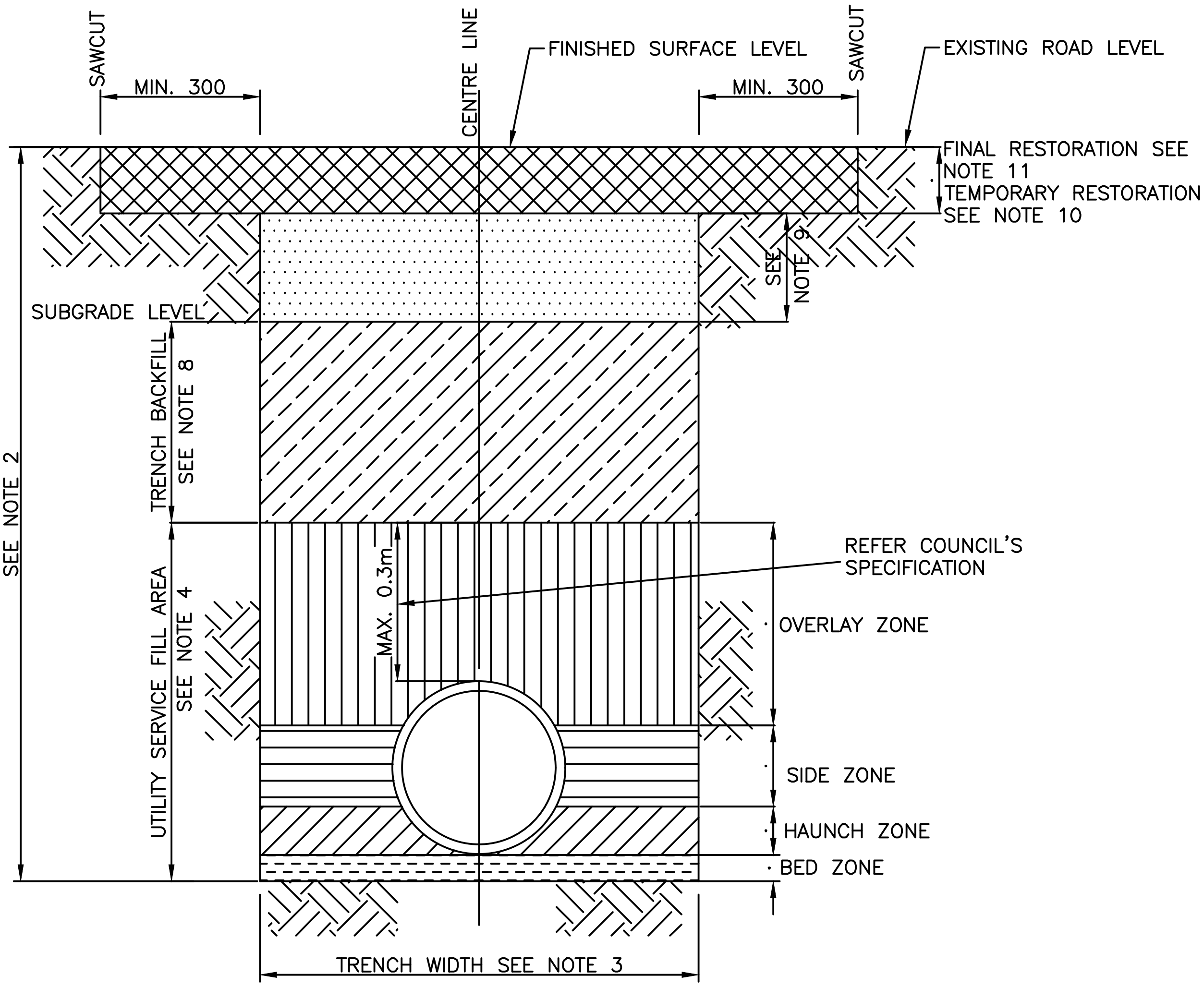
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: ROUNDABOUT CENTRAL ISLAND EDGE DETAIL

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R43	N.T.S	3 OF 3	01	APR'21



NOTES:

1. THIS PLAN MUST BE READ IN CONJUNCTION WITH COUNCIL'S SPECIFICATION.
2. IN UNDERTAKING TRENCH EXCAVATION, THE CONTRACTOR SHALL PROVIDE ANY SHORING, SHEET PILING OR OTHER STABILISATION OF THE TRENCH NECESSARY TO COMPLY WITH STATUTORY REQUIREMENTS. THE SIDES ARE NOT TO BE LOADED & SHALL BE KEPT CLEAR OF LOOSE MATERIAL ETC. SAFE ACCESS & EGRESS SHALL BE PROVIDED AT ALL TIMES.
3. TRENCH WIDTH MUST BE MINIMUM OF 300mm FOR SERVICE CONDUITS UP TO 80mm IN DIAMETER. FOR SERVICE CONDUITS GREATER THAN 80mm THE TRENCH WIDTH WILL BE DETERMINED BY THE EXTERNAL DIAMETER OF CONDUIT + 600mm.
4. BEDDING MATERIAL FOR THE BED, HAUNCH, SIDE AND OVERLAY ZONE SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATION FOR THE PARTICULAR UTILITY SERVICE BEING INSTALLED.
5. ALL WORKS ARE TO BE CONDUCTED IN A SAFE MANNER WITH THE LEAST POSSIBLE OBSTRUCTION TO BOTH VEHICULAR & PEDESTRIAN TRAFFIC. A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO COUNCIL INDICATING ALL ACTIVITIES FOR CONTROLLING BOTH VEHICULAR & PEDESTRIAN MOVEMENTS & SHALL BE IN ACCORDANCE WITH AS1742.3 AND THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES.
6. THE CONTRACTOR SHALL ENSURE THAT ALL NECESSARY SEDIMENT, NOISE AND DUST CONTROL MEASURES ARE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES. ALL SEDIMENT & EROSION CONTROLS SHALL BE MAINTAINED THROUGHOUT THE PERIOD OF WORKS, INCLUDING REPAIR AND/OR REPLACEMENT OF DAMAGED SECTIONS. INSPECTIONS ARE TO BE MADE PERIODICALLY AND AFTER STORM EVENTS FOR DAMAGE.
7. ALL LINEMARKING & SIGNPOSTING AFFECTED BY WORKS IS TO BE REPLACED IN ACCORDANCE WITH AS1742 & THE RTA INTERIM GUIDE TO SIGNS & MARKINGS.
8. REFER TO COUNCIL'S SPECIFICATION FOR TRENCH BACKFILL AND FOR COMPACTION OF TRENCH BACKFILL.
9. REFER TO COUNCIL'S SPECIFICATION FOR FINAL RESTORATION OF CARRIAGEWAY SUBBASE AND BASE (FLEXIBLE)
10. REFER TO COUNCIL'S SPECIFICATION FOR TEMPORARY PAVEMENT RESTORATION.
11. REFER TO COUNCIL'S SPECIFICATION FOR FINAL RESTORATION OF CARRIAGEWAY WEARING SURFACE (COURSE).

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

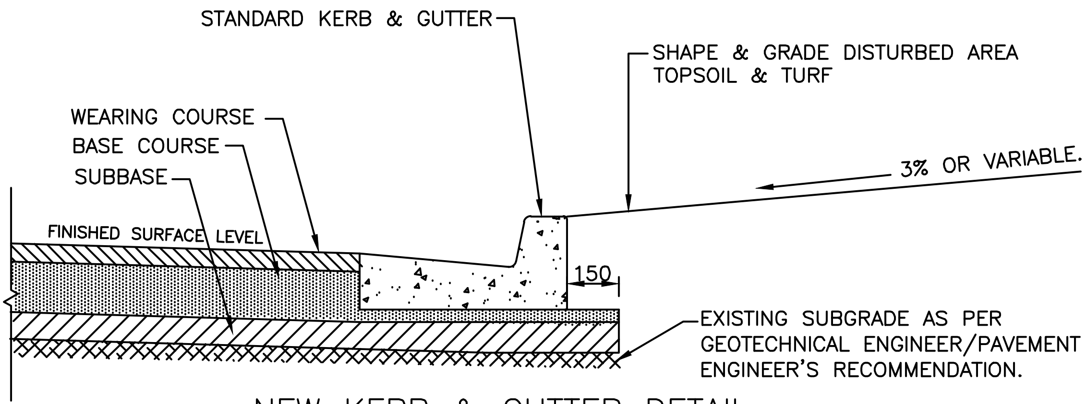
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: ROAD OPENING RESTORATION

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R44	N.T.S	1 OF 1	01	APR'21

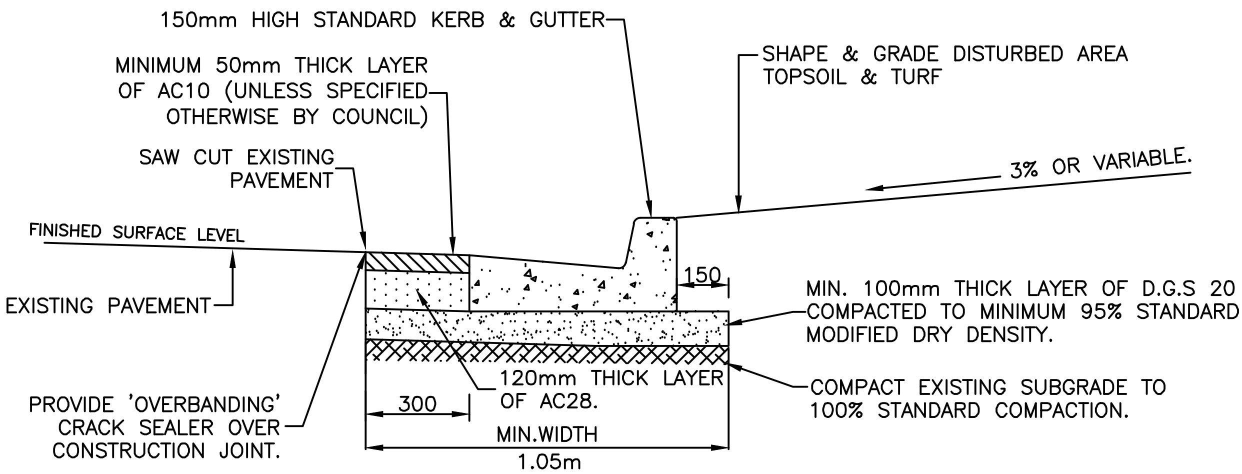
NOTES FOR FOOTPATH CONSTRUCTION

1. FOOTPATH PAVING TO BE 100mm THICK LAID ON A MINIMUM 25mm THICK SAND BASE ON SUITABLE COMPACTED SUBGRADE. AT VEHICLE CROSSINGS THE PAVING TO BE THICKENED IN ACCORDANCE WITH COUNCIL'S DRIVEWAY STANDARD AND SPECIFICATION. REFER TO STANDARD DRAWING NO SD–R08, SD–R09 AND SD–R10
2. CONCRETE TO BE MINIMUM COMPRESSIVE STRENGTH F'c 25MPa AT 28 DAYS.
3. PROVIDE MASTIC JOINTS (MJ) 10mm IN WIDTH FOR THE FULL DEPTH OF FOOTPATH AT INTERVALS NOT EXCEEDING 6m AND GROOVED JOINTS (GJ) NARROW VERTICAL 20mm DEEP NOT EXCEEDING 2m INTERVALS.
4. IN HIGHLY REACTIVE SUBGRADE AREAS FOOTPATH AND PAVING TO BE LAID ON A MINIMUM OF 100mm THICK DGS20 ON A SUITABLE COMPACTED SUBGRADE
5. INSTALL TRIP STOP (IF REQUIRED) IN ACCORDANCE WITH MANUFACTURE'S SPECIFICATION.
6. IF THE DISTURBED AREA WIDTH IS GREATER THAN 0.5m PLACE TOP SOIL OF MINIMUM 50mm DEPTH AND TURF AREA.
7. THE CROSSFALL ON A PEDESTRIAN PATH MAY VARY FROM 1% TO 2.5%. PROVIDING DRAINAGE IS ADEQUATE, A LESSER CROSSFALL IS PREFERRED (I.E 1%).
8. TRANSITION PROPOSED FOOTPATH WIDTH TO EXISTING FOOTPATH WIDTH AT 10° OR 3m (WHICHEVER IS GREATER).



NEW KERB & GUTTER DETAIL

NOT TO SCALE



KERB & GUTTER RECONSTRUCTION DETAIL

NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

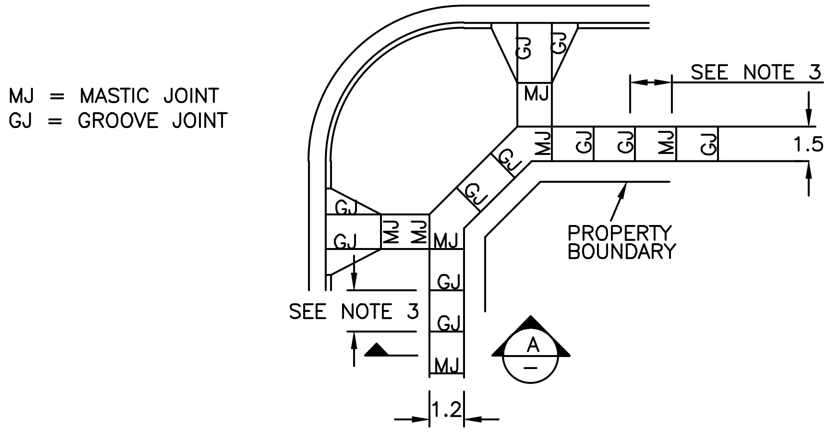
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

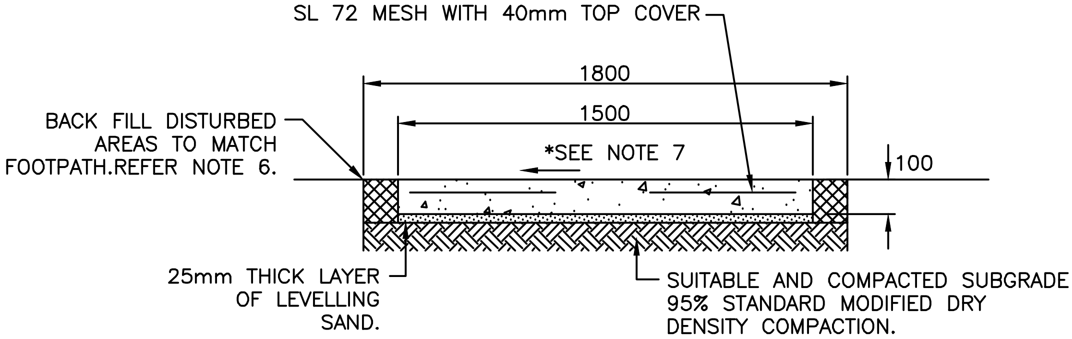
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
FOOTPATH CYCLEWAY AND KERB RECONSTRUCTION	SD-R45	N.T.S	1 OF 4	01	APR'21



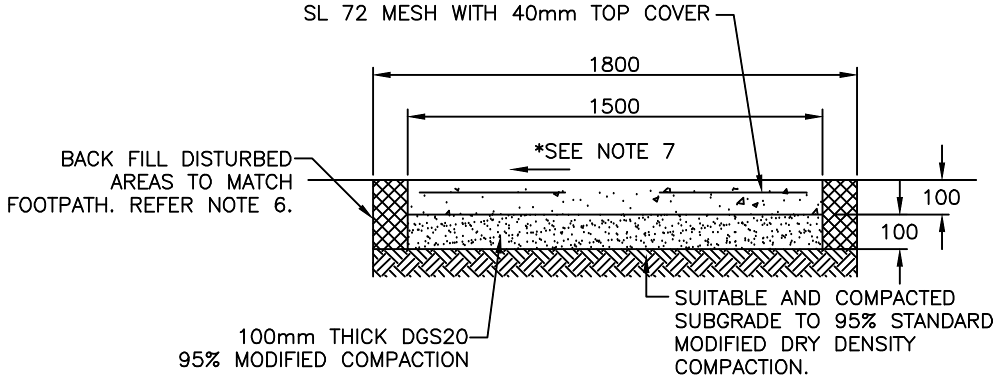
FOOTPATH JOINTING PLAN

NOT TO SCALE



SECTION A

NOT TO SCALE



SECTION A

NOT TO SCALE

(ALTERNATIVE DETAIL FOR HIGHLY REACTIVE SUBGRADE AREA ONLY)

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

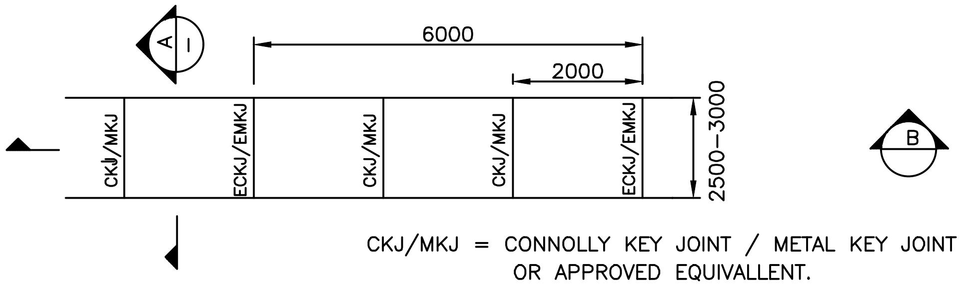
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: FOOTPATH CYCLEWAY AND KERB RECONSTRUCTION

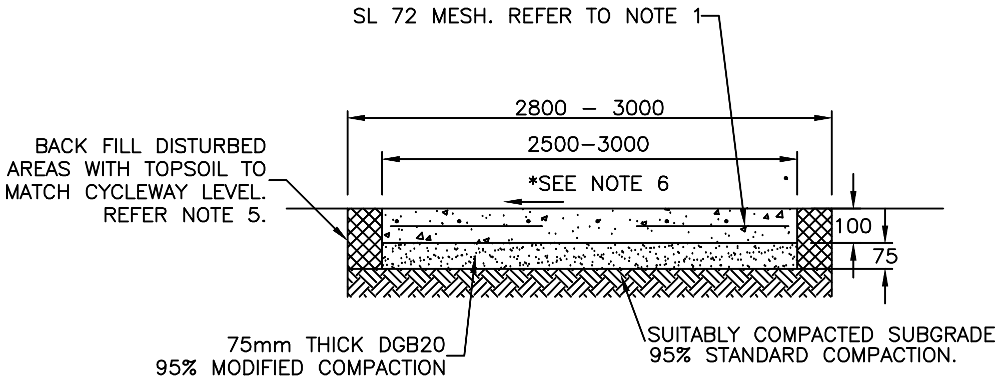
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R45	N.T.S	2 OF 4	01	APR'21



CKJ/MKJ = CONNOLLY KEY JOINT / METAL KEY JOINT OR APPROVED EQUIVALLENT.

EMKJ/ECKJ = EXPANSION CONNOLLY KEY JOINT OR APPROVED EQUIVALLENT.

CYCLEWAY PLAN
NOT TO SCALE



SECTION A
NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
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WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: FOOTPATH CYCLEWAY AND KERB RECONSTRUCTION

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R45	N.T.S	3 OF 4	01	APR'21

NOTES FOR CYCLEWAY CONSTRUCTION

1. CYCLEWAY PAVING TO BE MINIMUM 100mm THICKNESS WITH;

   (a) SL72 MESH AT 40mm TOP COVER
   OR
   (b) 100mm THICK POLYCRETE(@900g/m^3) CONCRETE

   CONSTRUCTION METHOD (a) OR (b) TO BE ADVISED BY COUNCIL PRIOR TO PROJECT COMMENCEMENT.

2. CONCRETE TO BE MINIMUM COMPRESSIVE STRENGTH F'c 25MPa AT 28 DAYS.

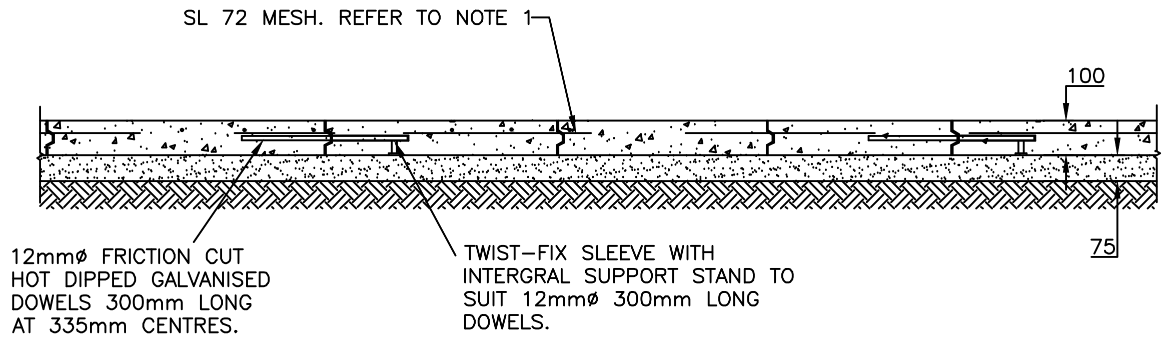
3. USE CONNOLLY KEY JOINT AS SHOWN ON THIS SHEET. OR AS DIRECTED BY COUNCIL.

4. INSTALL TRIP STOP (IF REQUIRED) IN ACCORDANCE WITH MANUFACTURE'S SPECIFICATION.

5. IF THE DISTURBED AREA WIDTH IS GREATER THAN 0.5m, PLACE TOP SOIL AT MIN 50mm DEPTH AND TURF THIS AREA.

6. THE CROSSFALL ON A SEALED CYCLIST PATH MAY VARY FROM 2% TO 4%. UNSEALED SURFACES MAY REQUIRE A CROSSFALL OF 5% TO PREVENT PUDDLES FROM FORMING.

7. IF THE WIDTH OF NATURE STRIP BETWEEN SHARED PATH AND THE FACE OF KERB ON A REGIONAL ROAD IS LESS THAN 1m, EXTEND CONCRETE TO BACK OF KERB



SECTION B / —
NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

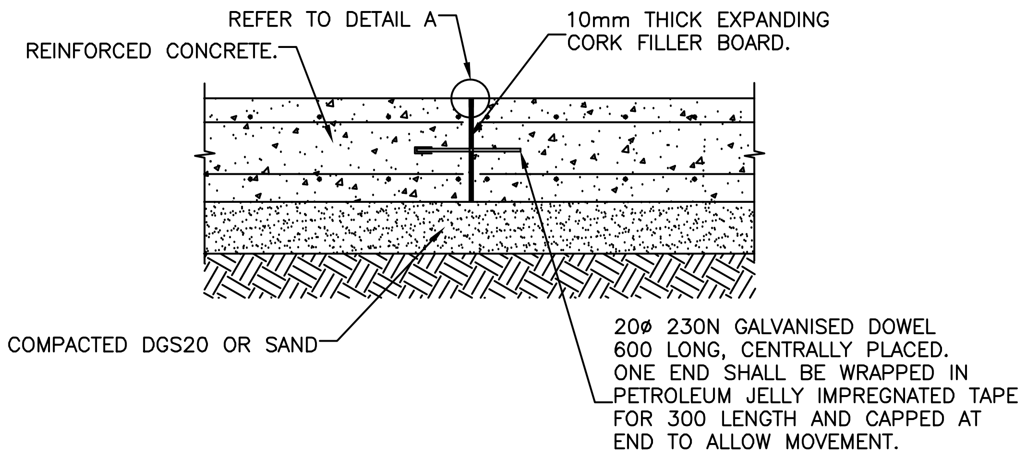
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

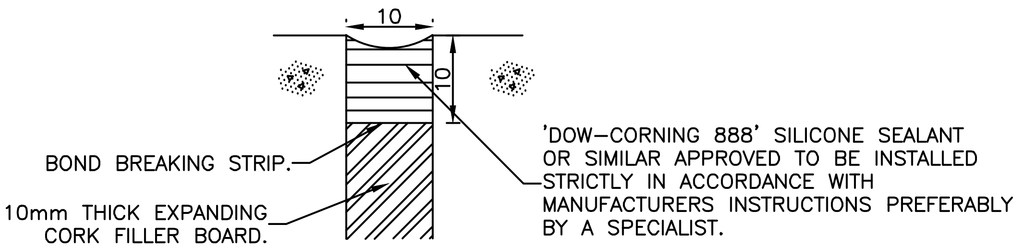
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
FOOTPATH CYCLEWAY AND KERB RECONSTRUCTION	SD-R45	N.T.S	4 OF 4	01	APR'21



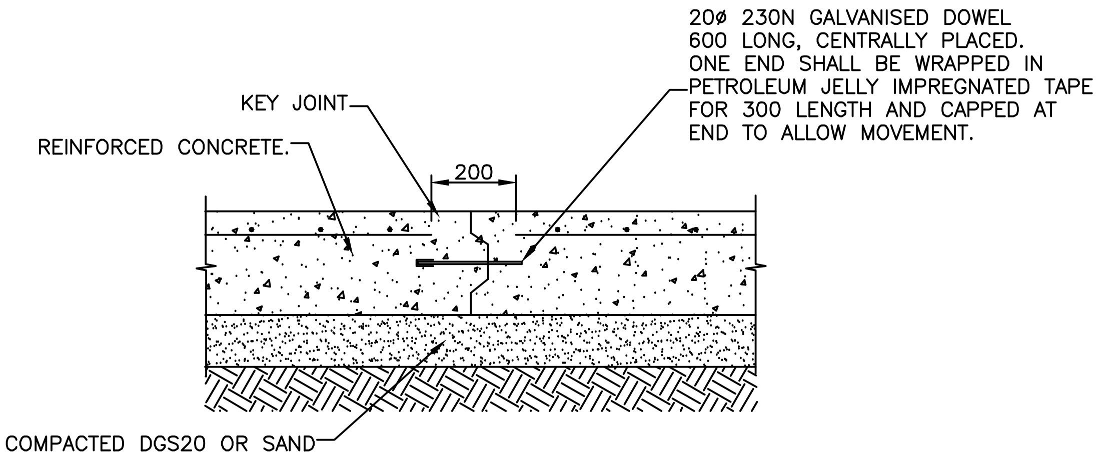
EXPANSION JOINT DETAIL

NOT TO SCALE



DETAIL A

NOT TO SCALE



METAL KEY JOINT DETAIL

NOT TO SCALE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

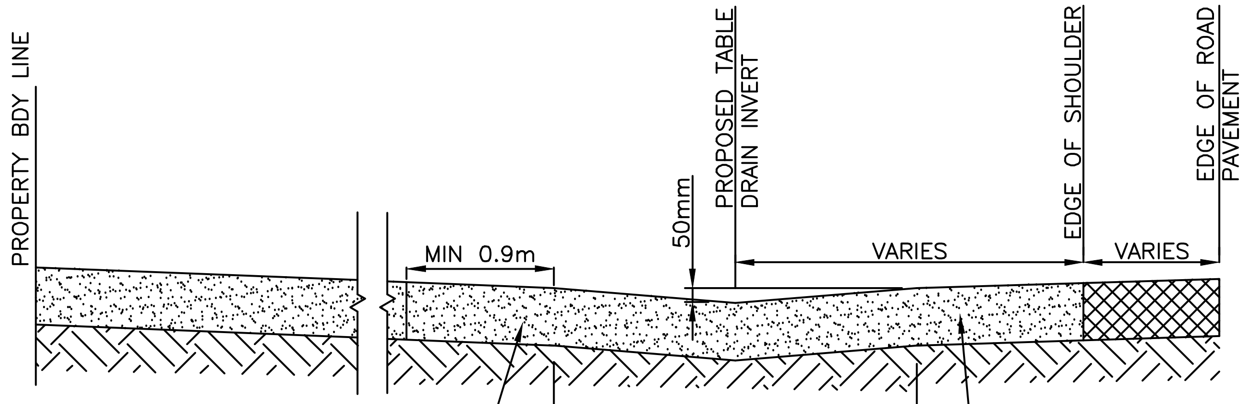
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

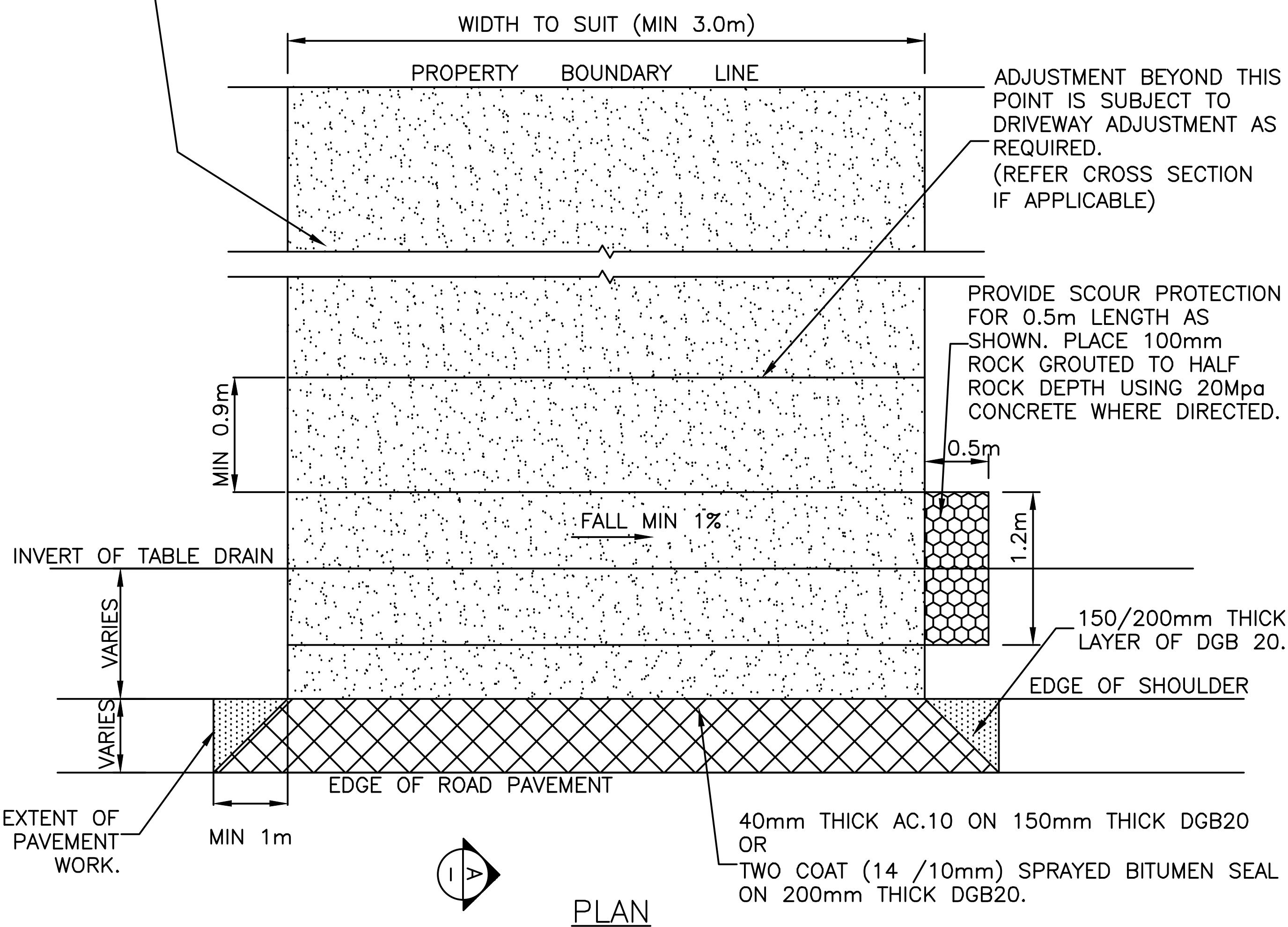
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: EXPANSION JOINT DETAIL

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R46	N.T.S	1 OF 1	01	APR'21



CROSS SECTION A
NOT TO SCALE



PLAN
NOT TO SCALE

NOTE:
1. THE SUB BASE MATERIAL SHALL BE COMPACTED TO PROVIDE A MINIMUM RELATIVE COMPACTION AS DETERMINED BY AS1289.5.4.1 OF 95% MODIFIED DRY DENSITY.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

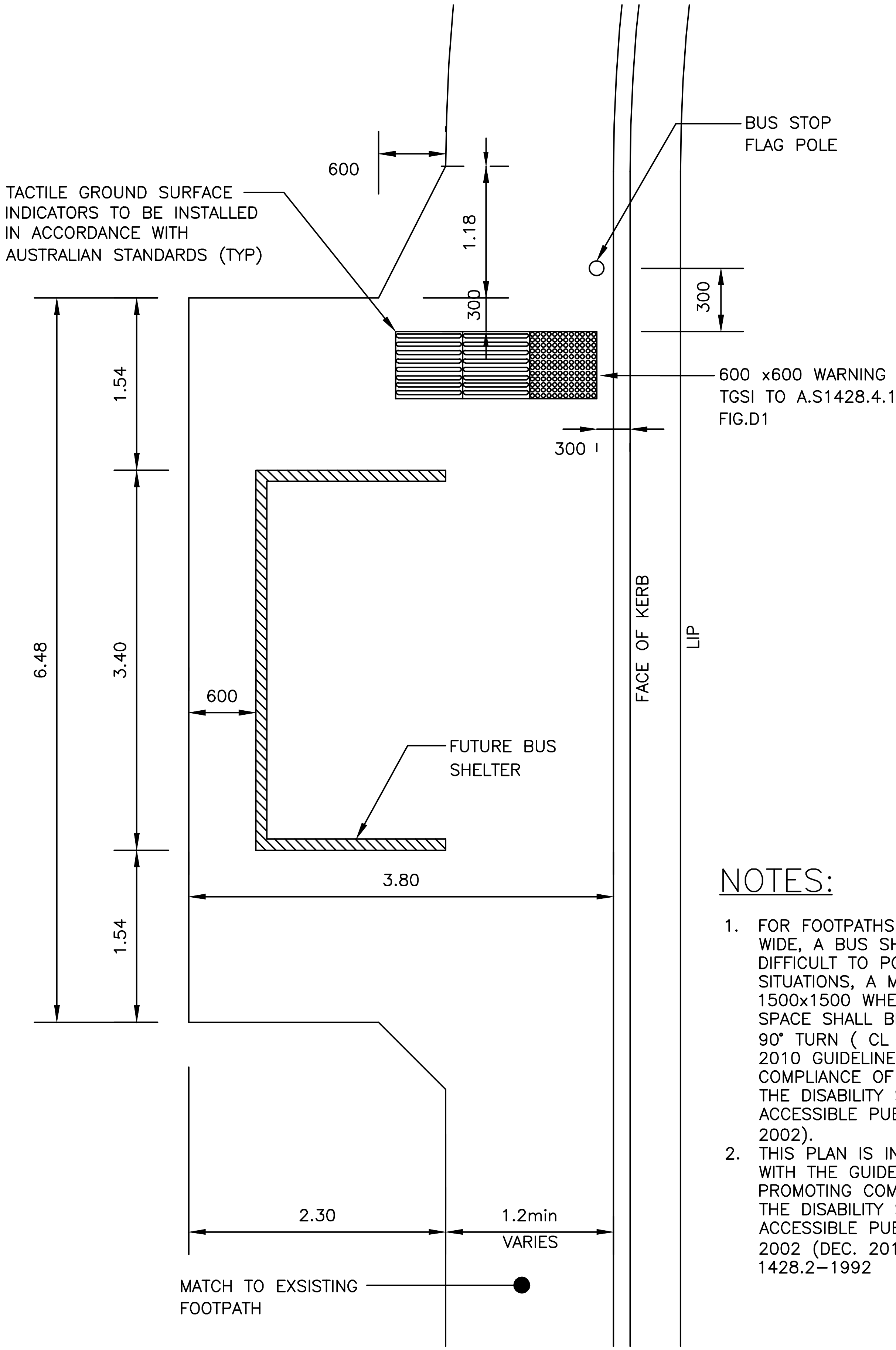
WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: VEHICULAR DISH CROSSING INTERNAL USE

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R48	N.T.S	1 OF 1	01	APR'21



NOTES:

1. FOR FOOTPATHS LESS THAN 3.3m WIDE, A BUS SHELTER MAY BE DIFFICULT TO POSITION. IN SUCH SITUATIONS, A MINIMUM 1500x1500 WHEELCHAIR TURNING SPACE SHALL BE PROVIDED FOR 90° TURN (CL 4.3 OF DEC 2010 GUIDELINE FOR PROMOTING COMPLIANCE OF BUS STOPS WITH THE DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT 2002).
2. THIS PLAN IS IN ACCORDANCE WITH THE GUIDELINE FOR PROMOTING COMPLIANCE WITH THE DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT 2002 (DEC. 2010) AND AS 1428.2–1992

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

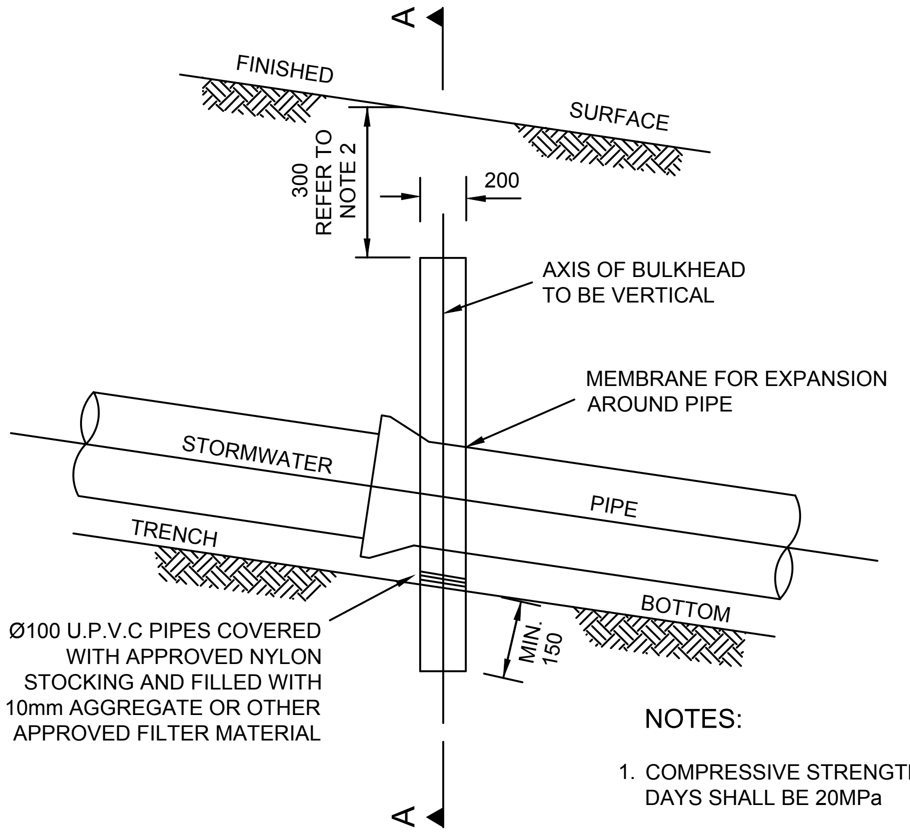
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: BUS STOP WITH PROPOSED SHELTER

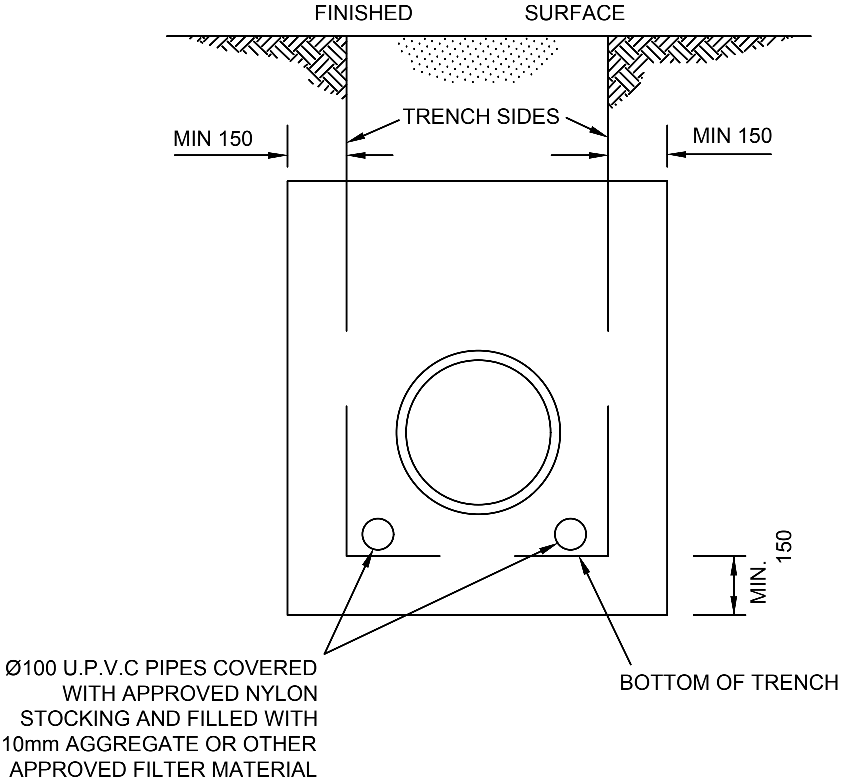
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R49	N.T.S	1 OF 1	01	APR'21



ELEVATION

NOTES:

1. COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS SHALL BE 20MPa
2. WHERE THE PIPELINE IS UNDER A ROAD PAVEMENT, THE TOP OF THE BULKHEAD SHALL EXTEND TO SUBGRADE



SECTION A - A

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

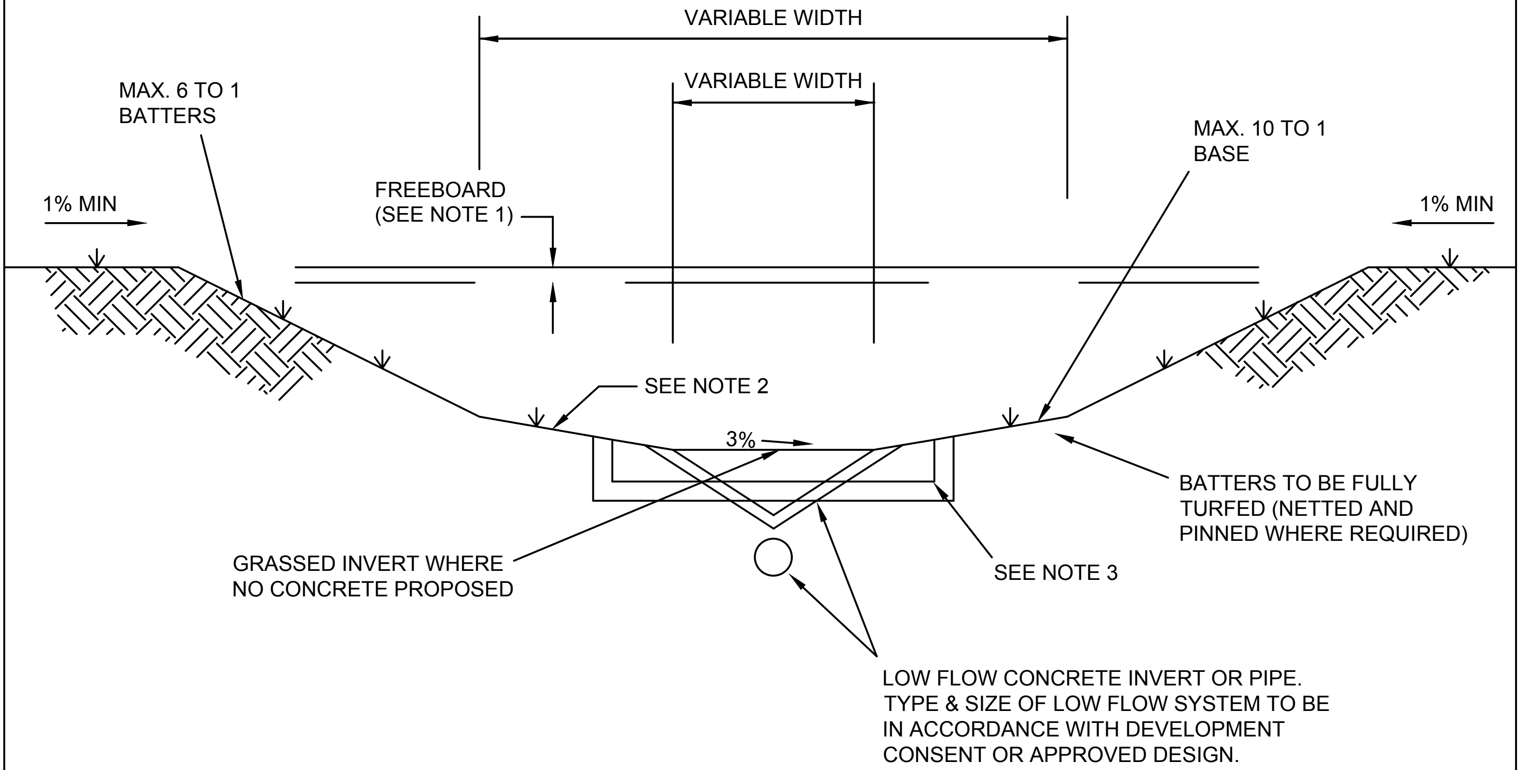
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: BULKHEAD DETAIL

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R50	N.T.S	1 OF 1	01	APR'21



NOTES:

1. FREEBOARD REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE COUNCIL REQUIREMENTS.
2. ADEQUATE SCOUR PROTECTION/VEGETATION STABILISING TREATMENT ADJACENT TO CONCRETE LOW FLOW.
3. SUBSOIL DRAINAGE FOR CHANNEL BASE AND ADJACENT TO DROP STRUCTURES.
4. THIS DRAWING TO BE USED AS A GUIDE ONLY FOR THE PREPARATION OF DETAIL DESIGNS.

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

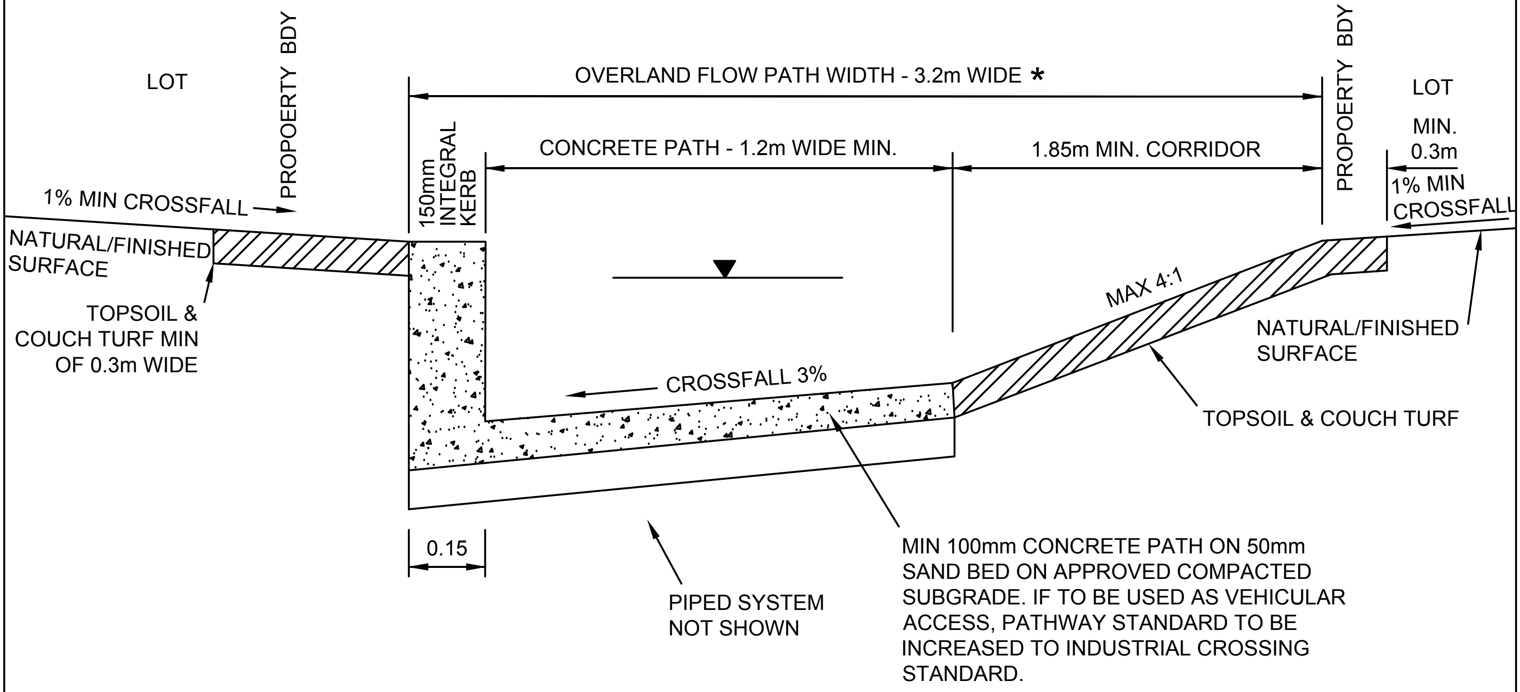
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
OPEN DRAINAGE CHANNEL	SD-R51	N.T.S	1 OF 1	01	APR'21



NOTES:

1. ADJACENT STREET LIGHTING TO BE LOCATED TO PROVIDE ADEQUATE LIGHTING FOR PEDESTRIANS BUT NOT TO HINDER ADJACENT PROPERTY OWNERS.
2. IF PATHWAYS ARE LONG ENOUGH TO WARRANT ADDITIONAL LIGHTING ENERGY AUSTRALIA TO BE CONSULTED REGARDING LOCATION AND TYPE.
3. CONTRACTION JOINTS IN CONCRETE PATH TO BE 15mm DEEP AND PLACED AT SPACINGS EQUAL TO THE PATHWAY WIDTH.
4. EXPANSION JOINTS TO BE PLACED AT MAXIMUM 6m INTERVALS.
5. JOINTING MATERIAL TO BE APPROVED 10mm THICK BITUMINOUS MATERIAL TO THE FULL DEPTH OF THE PATHWAY.
6. GENERALLY A 300mm FREEBOARD TO FLOOR LEVEL WILL BE REQUIRED (REFER TO SPECIFICATIONS).
7. REFER TO SD-R23 FOR PATHWAY BARRIER DETAILS.

LEGEND:

▼ DENOTES REQUIRED CAPACITY OF OVERLAND FLOW PATH TO BE SHOWN ON DETAIL DESIGN SUPPORTED BY ALL RELEVANT CALCUALTIONS. IF CAPACITY INSUFFICIENT, OVERALL WIDTH TO BE INCREASED OR PROVIDE TYPE 2 PEDESTRIAN PATHWAY - OVERLAND FLOW PATH, SHOWN IN SD 44 SHEET 2.

* WIDTH MAY BE INCREASED. LANDSCAPING MAY BE PROVIDED OUTSIDE OF THE PROPOSED FLOW AREA.

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

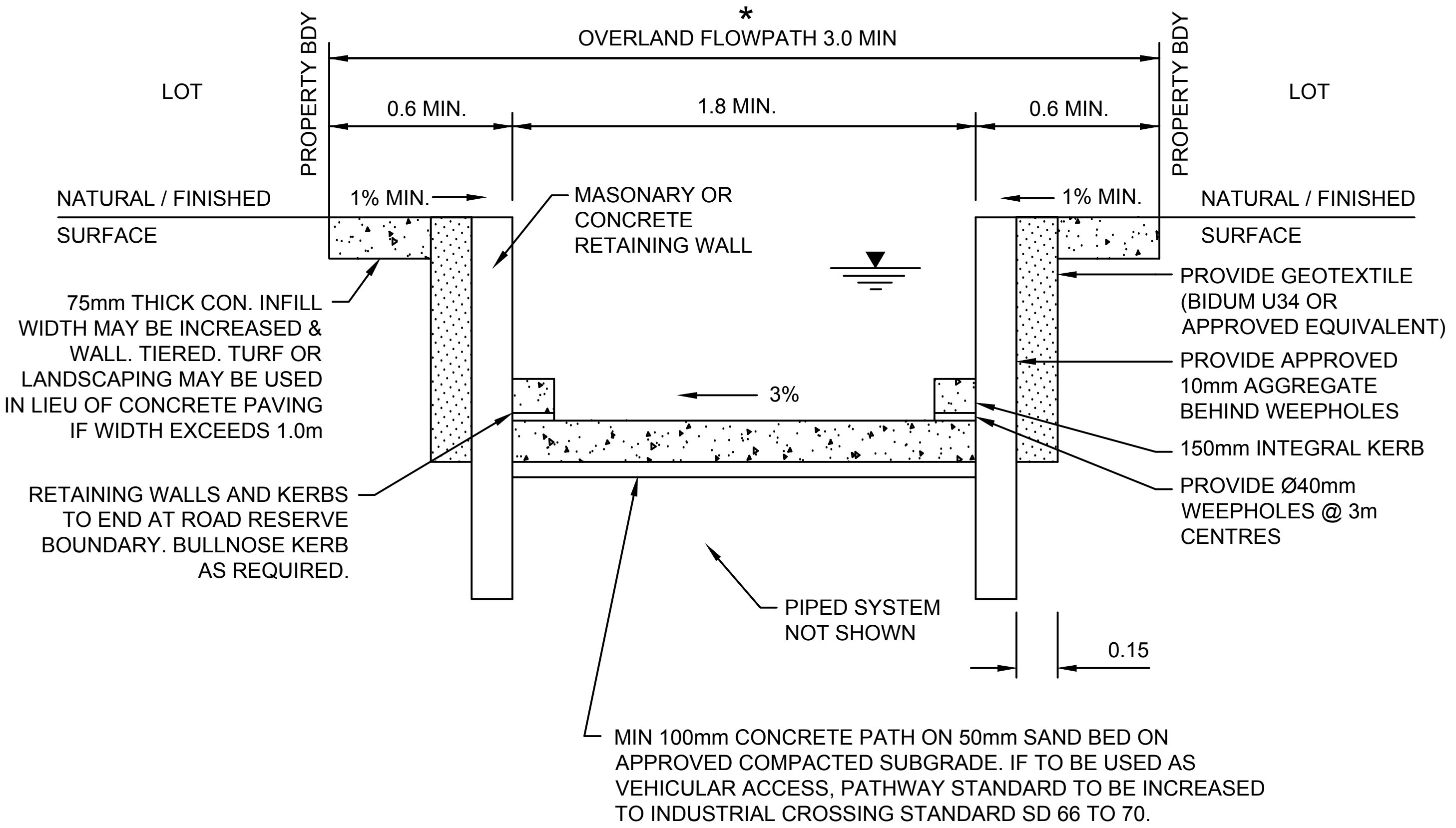
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: PEDESTRIAN PATHWAY OVERLAND FLOW PATH TYPE 1

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R52	N.T.S	1 OF 1	01	APR'21



NOTES:

1. ADJACENT STREET LIGHTING TO BE LOCATED TO PROVIDE ADEQUATE LIGHTING FOR PEDESTRIANS BUT NOT TO HINDER ADJACENT PROPERTY OWNERS.
2. IF PATHWAYS ARE LONG ENOUGH TO WARRANT EXTRA LIGHTING ENERGY AUTHORITYTO BE CONSULTED REGARDING LOCATION & TYPE.
3. CONTRACTION JOINTS IN CONCRETE PATH TO BE 15mm DEEP AND PLACED AT SPACINGS EQUAL TO THE PATHWAY WIDTH. EXPANSION JOINTS TO BE PLACED AT MAXIMUM 6m INTERVALS. JOINTING MATERIAL TO BE APPROVED 10mm THICK BITUMINOUS MATERIAL TO THE FULL DEPTH OF THE PATHWAY.
4. GENERALLY A FREEBOARD IN ACCORDANCE WITH THE COUNCIL REQUIREMENTS WILL BE NEEDED.

LEGEND

▼ DENOTES REQUIRED CAPACITY OF OVERLAND FLOWPATH. TO BE SHOWN ON DETAIL DESIGN SUPPORTED BY ALL RELEVANT CALCULATIONS.

* WIDTH MAY BE INCREASED

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

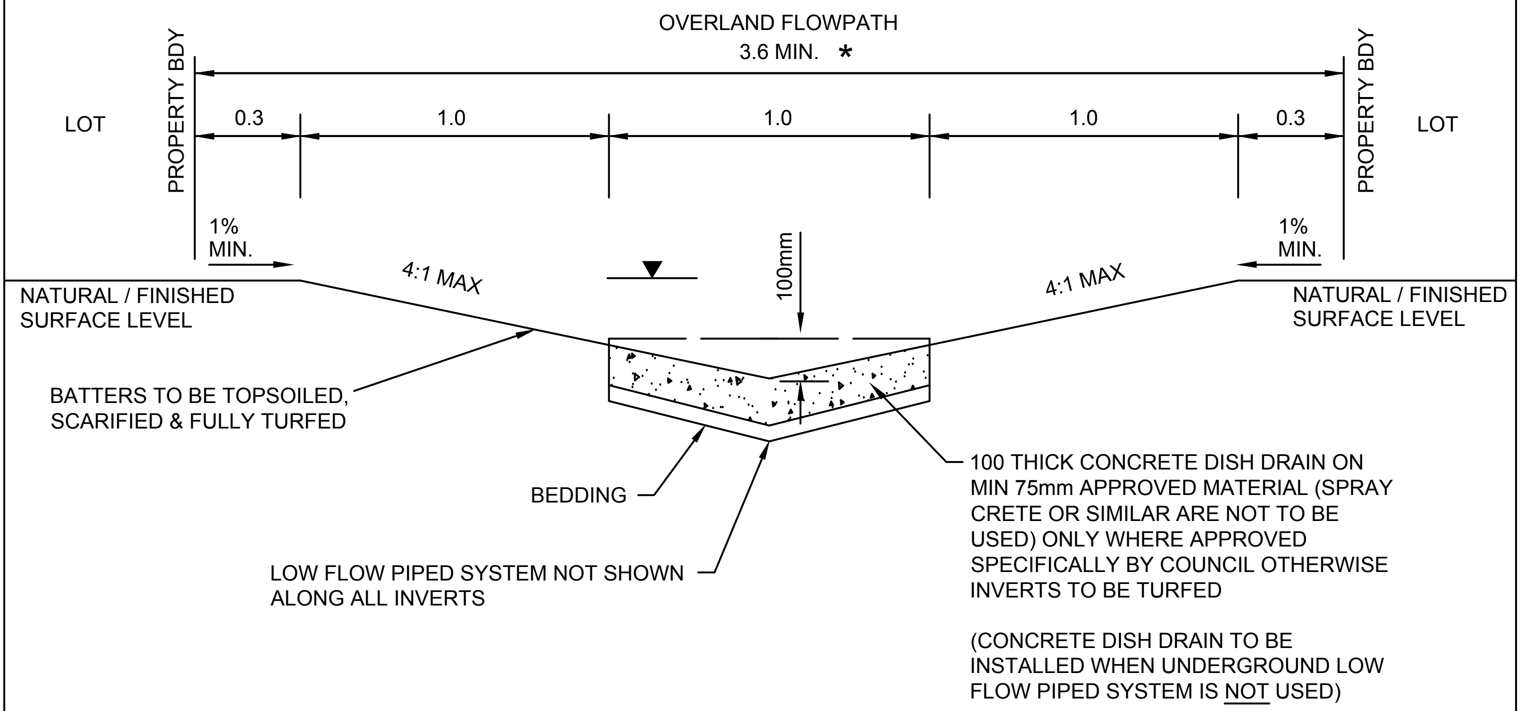
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: PEDESTRIAN PATHWAY OVERLAND FLOW PATH TYPE 2

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R53	N.T.S	1 OF 1	01	APR'21



NOTES:

1. INSTALL COUNCIL'S STANDARD FLOODWARNING SIGN WHERE DIRECTED.
2. OVERLAND FLOWPATH TO BE ADEQUATELY FENCED.
3. ACCESS FOR MAINTENANCE TO BE PROVIDED.
4. CONTRACTION JOINTS IN DISH DRAIN TO BE 20mm DEEP AND PLACED AT NO MORE THAN 5m INTERVALS. EXPANSION JOINTS TO BE PLACED AT NO MORE THAN 15m INTERVALS. JOINTING MATERIAL TO BE APPROVED 10mm THICK BITUMUNOUS MATERIAL TO THE FULL DEPTH OF THE CONCRETE OR AS DIRECTED BY THE ENGINEER.
5. FREEBOARD TO COUNCIL REQUIREMENTS

LEGEND

* WIDTH MAY BE INCREASED. LANDSCAPING MAY BE PROVIDED OUTSIDE OF THE PROPOSED FLOW AREA.

▼ DENOTES REQUIRED CAPACITY OF OVERLAND FLOWPATH. TO BE SHOWN ON DETAIL DESIGN PLANS SUPPORTED BY ALL RELEVANT CALCULATIONS. IF CAPACITY IS INSUFFICIENT OVERALL WIDTH TO BE INCREASED OR PROVIDE TYPE 2 PLAN REFER SD-R55

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

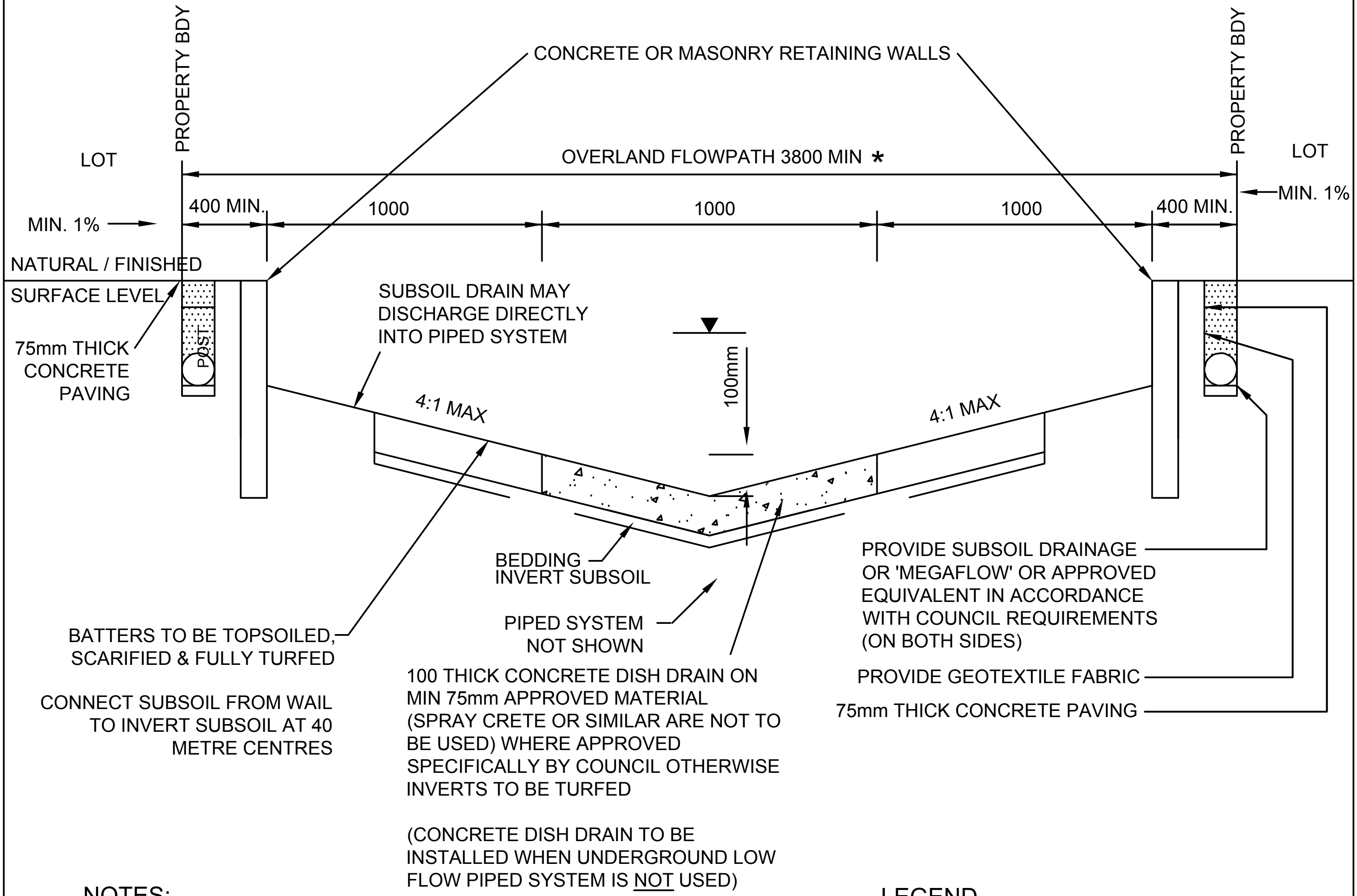
WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: NON-PEDESTRIAN PATHWAY OVERLAND FLOW PATH TYPE 1

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R54	N.T.S	1 OF 1	01	APR'21



NOTES:

1. INSTALL COUNCIL'S STANDARD FLOOD WARNING SIGNS WHERE DIRECTED. REFER TO SD-S03.
2. DRAINAGE RESERVE / OVERLAND FLOWPATH TO BE ADEQUATELY FENCED.
3. ACCESS FOR MAINTENANCE TO BE PROVIDED.
4. CONTRACTION JOINTS IN DISH DRAIN TO BE 20mm DEEP AND PLACED AT NO MORE THAN 5m INTERVALS. EXPANSION JOINTS TO BE PLACED AT NO MORE THAN 15m INTERVALS. JOINTING MATERIAL TO BE APPROVED 10mm THICK BITUMUNOUS MATERIAL TO THE FULL DEPTH OF THE CONCRETE OR AS DIRECTED BY THE ENGINEER.
5. FREEBOARD TO COUNCIL REQUIREMENTS

LEGEND

* WIDTH MAY BE INCREASED

▼ DENOTES REQUIRED CAPACITY OF OVERLAND FLOWPATH. TO BE SHOWN ON DETAIL DESIGN SUPPORTED BY ALL RELEVANT CALCULATIONS.

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

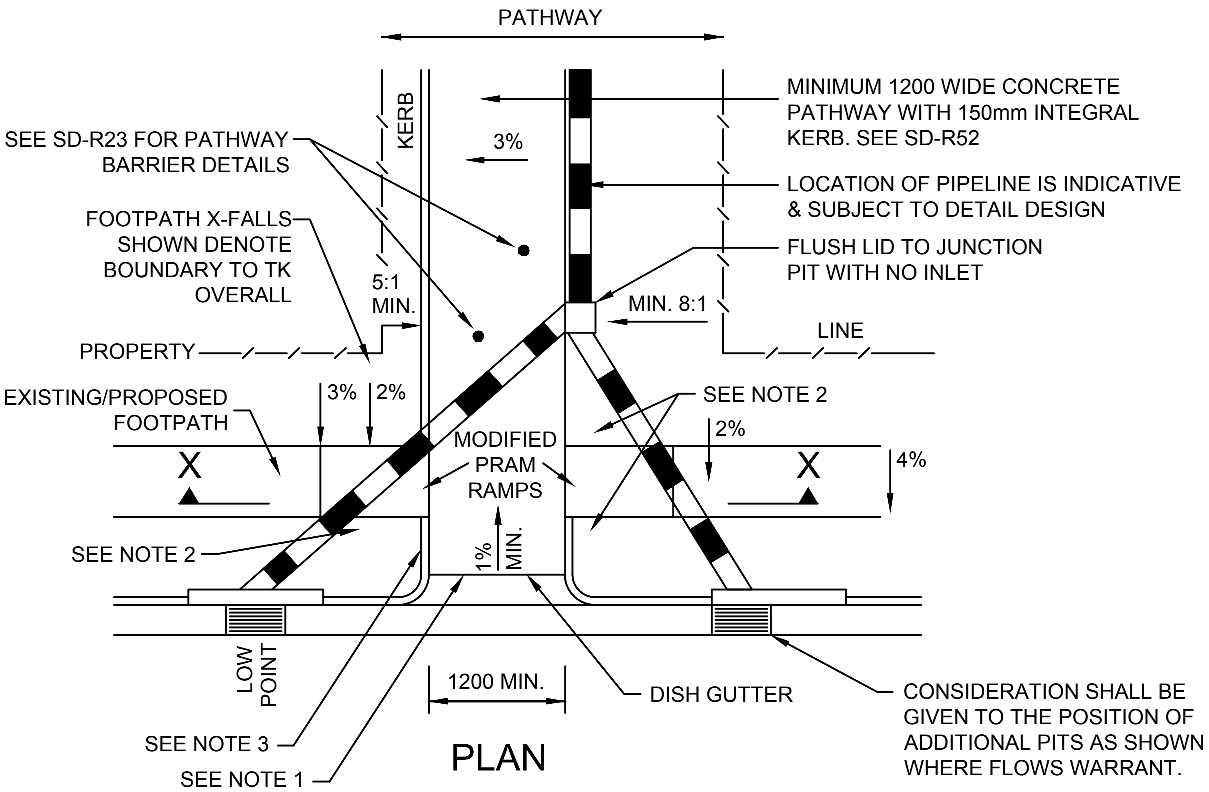
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

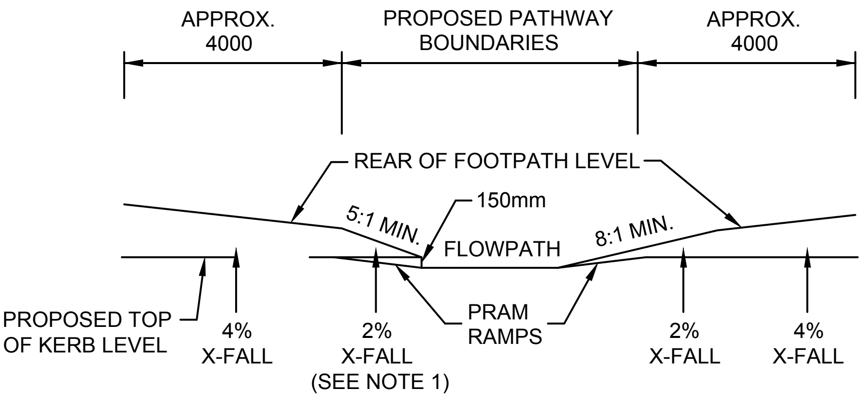
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: NON-PEDESTRIAN PATHWAY OVERLAND FLOW PATH TYPE 2

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R55	N.T.S	1 OF 1	01	APR'21



PLAN



SECTION X - X

NOTES:

1. CROSSFALL TRANSITIONS, 1% ENTRY TO FLOWPATH ETC. ARE APPLICABLE AT UPSTREAM ENTRIES TO FLOWPATHS ONLY. SUCH GRADES & CROSSFALLS SHALL BE ADJUSTED TO SUIT STANDARD PROFILES AT THE DOWNSTREAM END OF OVERLAND FLOWPATHS.
2. SHAPE, GRADE & COUCH TURF GENERALLY WHERE NO CONCRETE
3. TRANSITION 150mm INTEGRAL KERB TO SUIT MODIFIED PRAM RAMP LEVELS OVER MINIMUM 600mm. (TYPICAL)
4. JOINTING TO SD-R11
5. MINIMUM 1.0m WIDE COUCH TURF SURROUND TO BE PROVIDED TO KERB & GUTTER, FLOWPATH & RAMP AREAS.

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

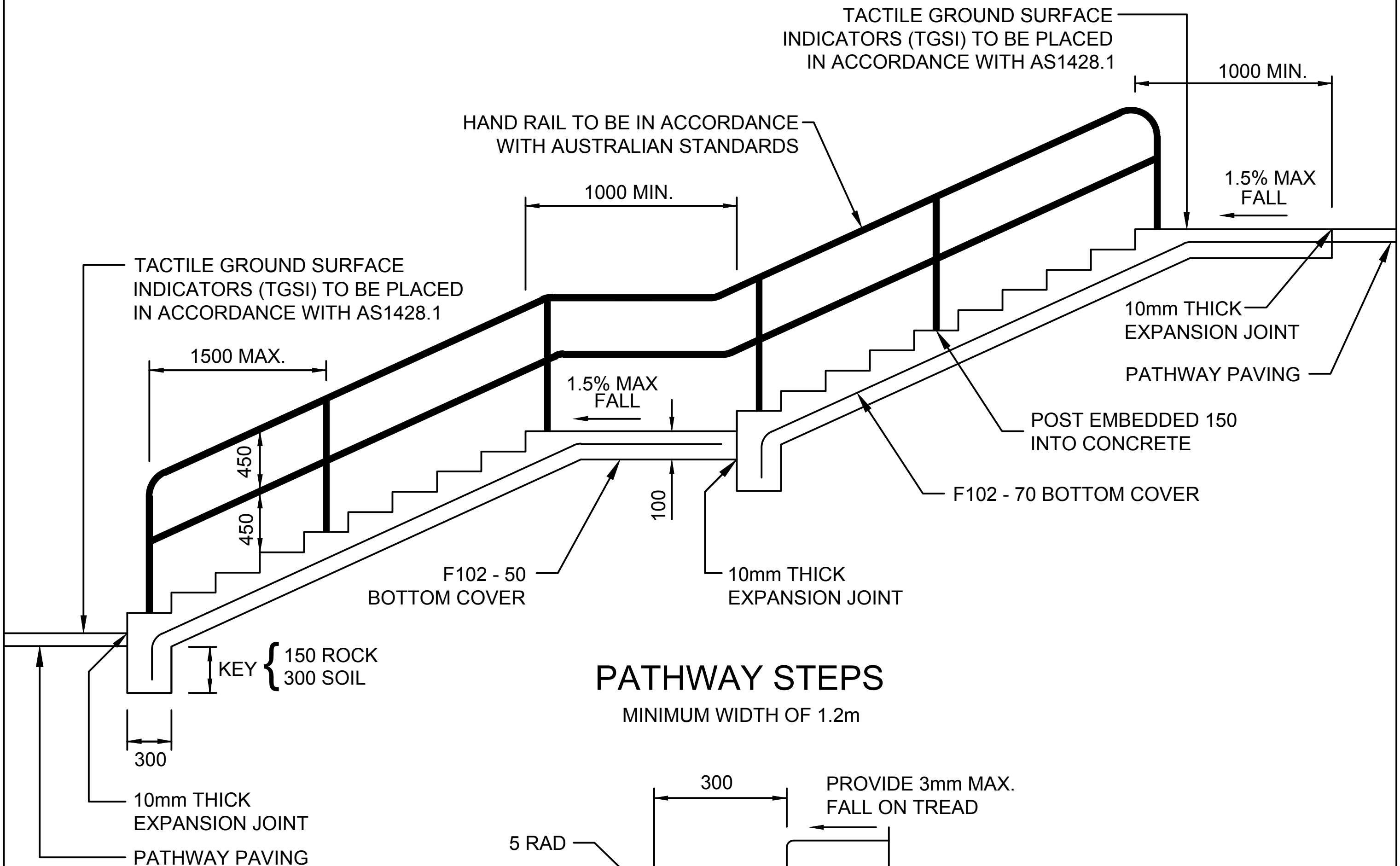
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

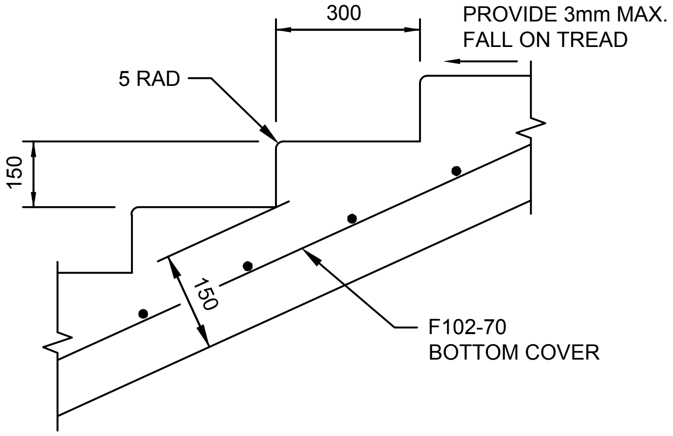
SHEET TITLE: FOOTPATH TREATMENT FOR OVERLAND FLOW PATHS TYPE 1

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R56	N.T.S	1 OF 1	01	APR'21



PATHWAY STEPS

MINIMUM WIDTH OF 1.2m



STEP DETAILS

NOTES:

1. MAXIMUM NUMBER OF STEPS PER FLIGHT = 10
2. MINIMUM NUMBER OF STEPS PER FLIGHT = 2
3. HANDRAILS TO BE INSTALLED AS PER AS1428.1 AND AS1428.2
4. HANDRAILING SHALL BE PROVIDED WHERE THERE ARE MORE THAN 5 RISERS IN ONE FLIGHT AND LOCATED ON ONE SIDE AS A MINIMUM OR AS SHOWN ON THE ENGINEERING PLANS.
5. HANDRAILING SHALL BE DIPPED GALVANISED AFTER FABRICATION IN ACCORDANCE WITH AS/NZS 4792:1999
6. COMPRESSIVE STRENGTH OF CONCRETE (Fc) AT 28 DAYS SHALL BE 25MPa.
7. STAIRS TO HAVE LIGHT BROOMED FINISH
8. THIS DRAWING IS A GENERAL GUIDE. DESIGN MUST BE CERTIFIED BY ACCREDITED PROFESSIONAL STRUCTURAL ENGINEER

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

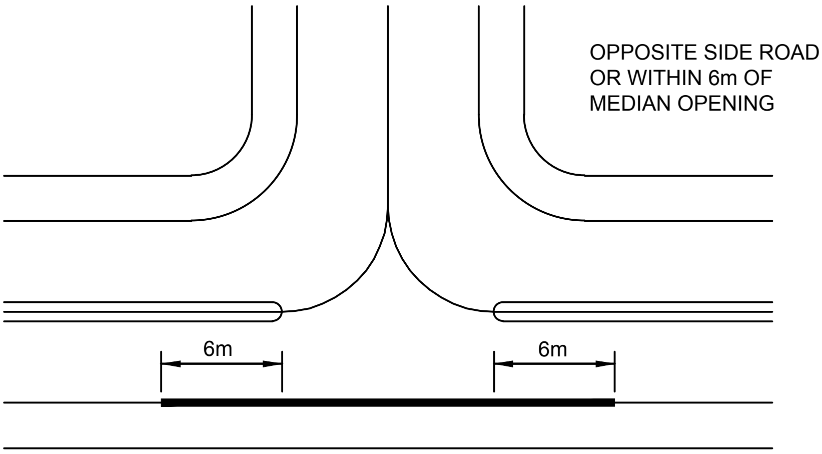
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

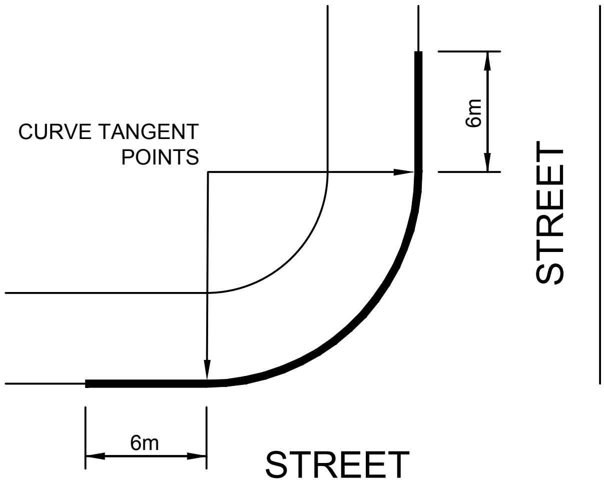
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
PATHWAY STEPS	SD-R57	N.T.S	1 OF 1	01	APR'21

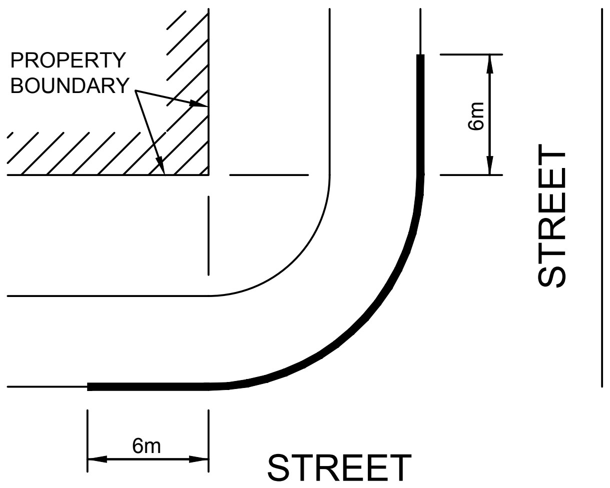
Apr 15, 2021 - 11:10am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R57.dwg



(A)



(B)



(C)

NOTE:

PROHIBITED LOCATION OF
DRIVEWAYS SHOWN BY HEAVY LINES

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

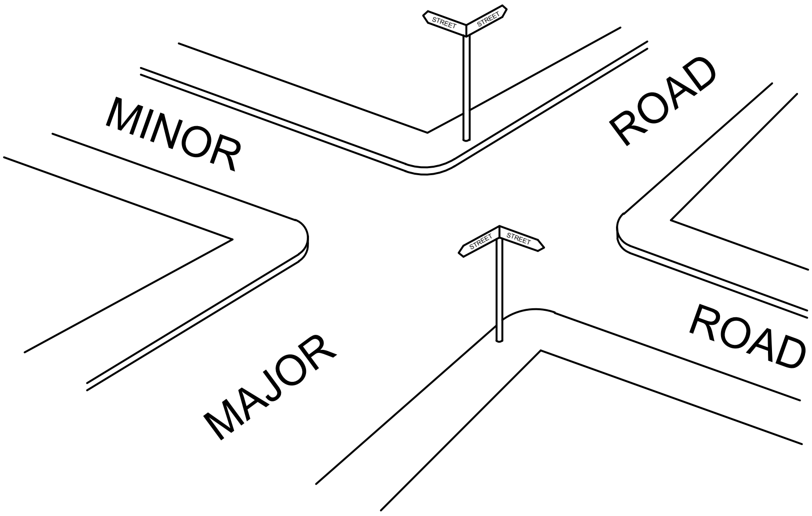
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

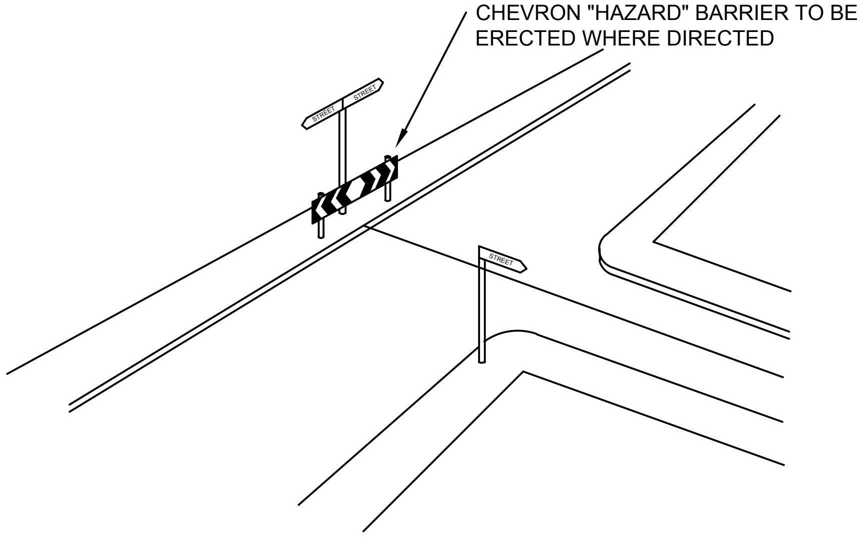
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
PROHIBITED LOCATION OF DRIVEWAYS	SD-R58	N.T.S	1 OF 1	01	APR'21



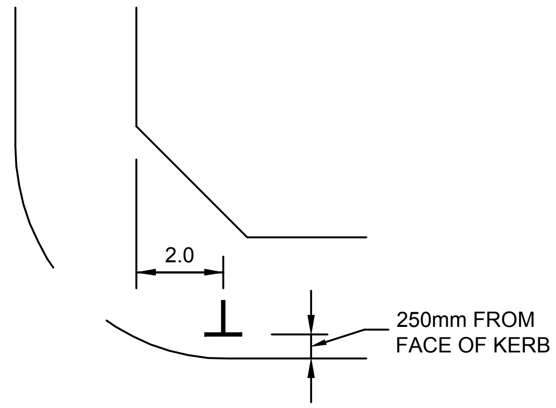
STREET SIGNS AT INTERSECTION



STREET SIGNS AT JUNCTIONS

NOTE:

STREET SIGNS TO BE PROVIDED AT ROUNDABOUTS AND MAJOR INTERSECTIONS WHERE SHOWN ON THE APPROVED ENGINEERING PLANS.



POST LOCATION

DIAGRAM 1

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

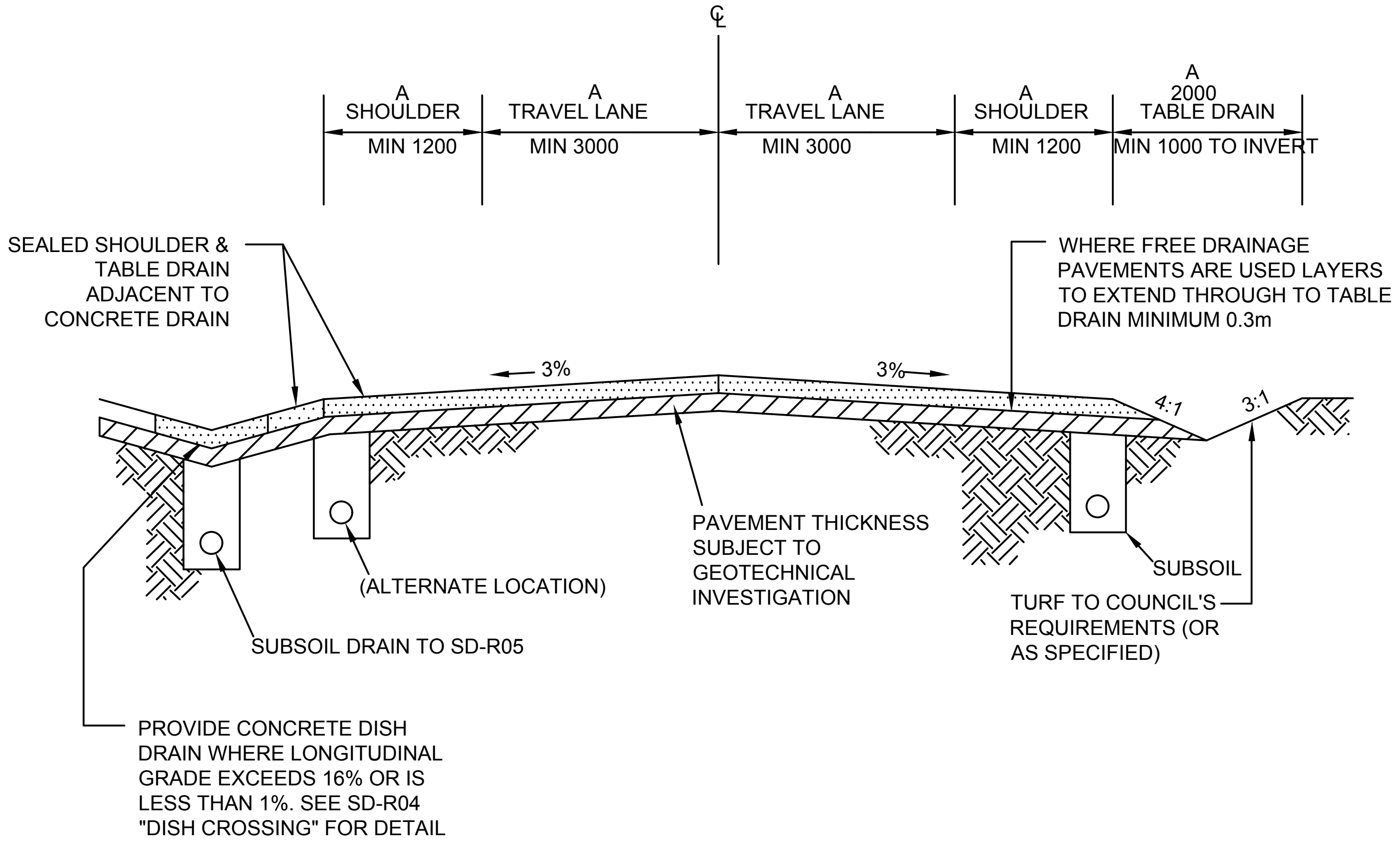
PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
STREET SIGN LOCATIONS	SD-R59	N.T.S	1 OF 1	01	APR'21

Apr 15, 2021 - 11:10am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R59.dwg

NOTES:

1. WIDTHS AS PER DEVELOPMENT CONSENT
2. ALTERNATIVE SCOUR PROTECTION (OTHER THAN CONCRETE) TO TABLE DRAIN TO BE AGREED WITH COUNCIL



ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

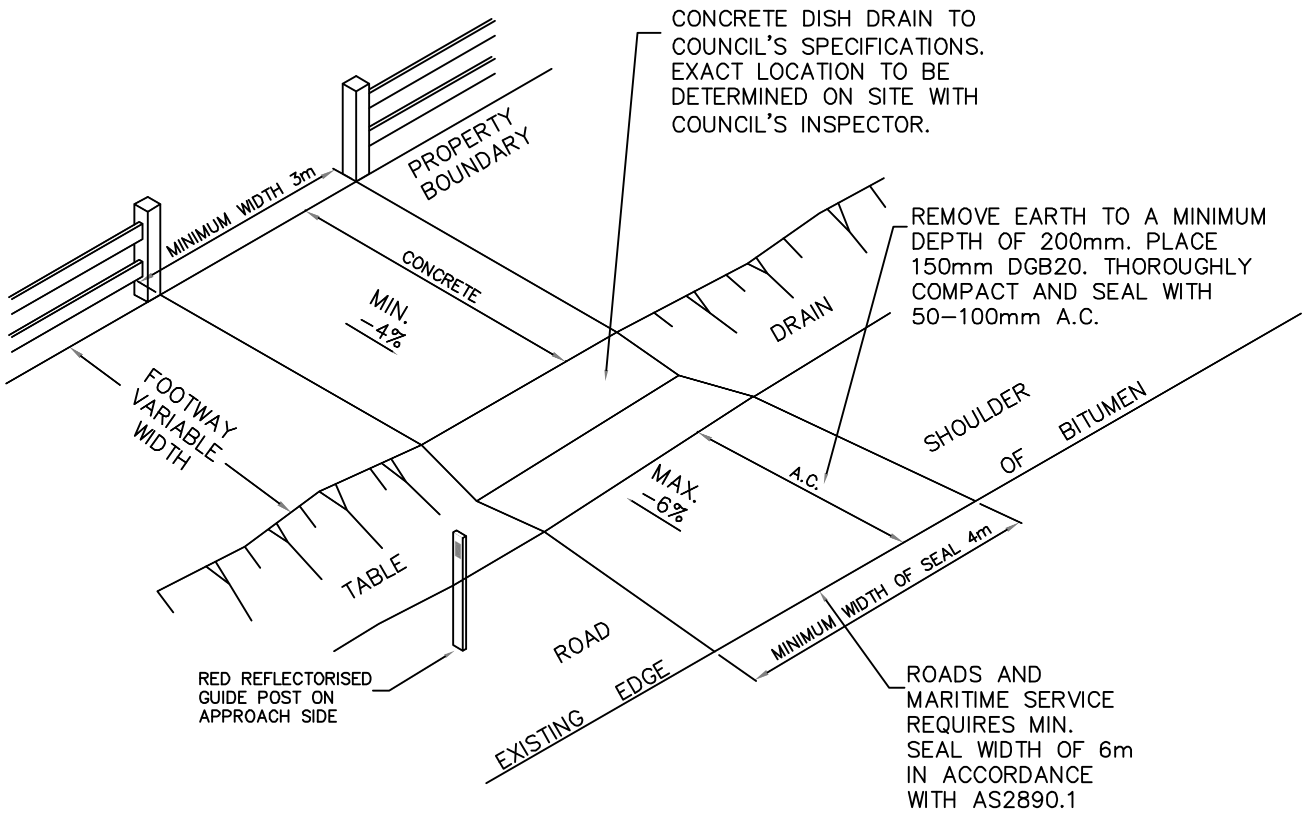
WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

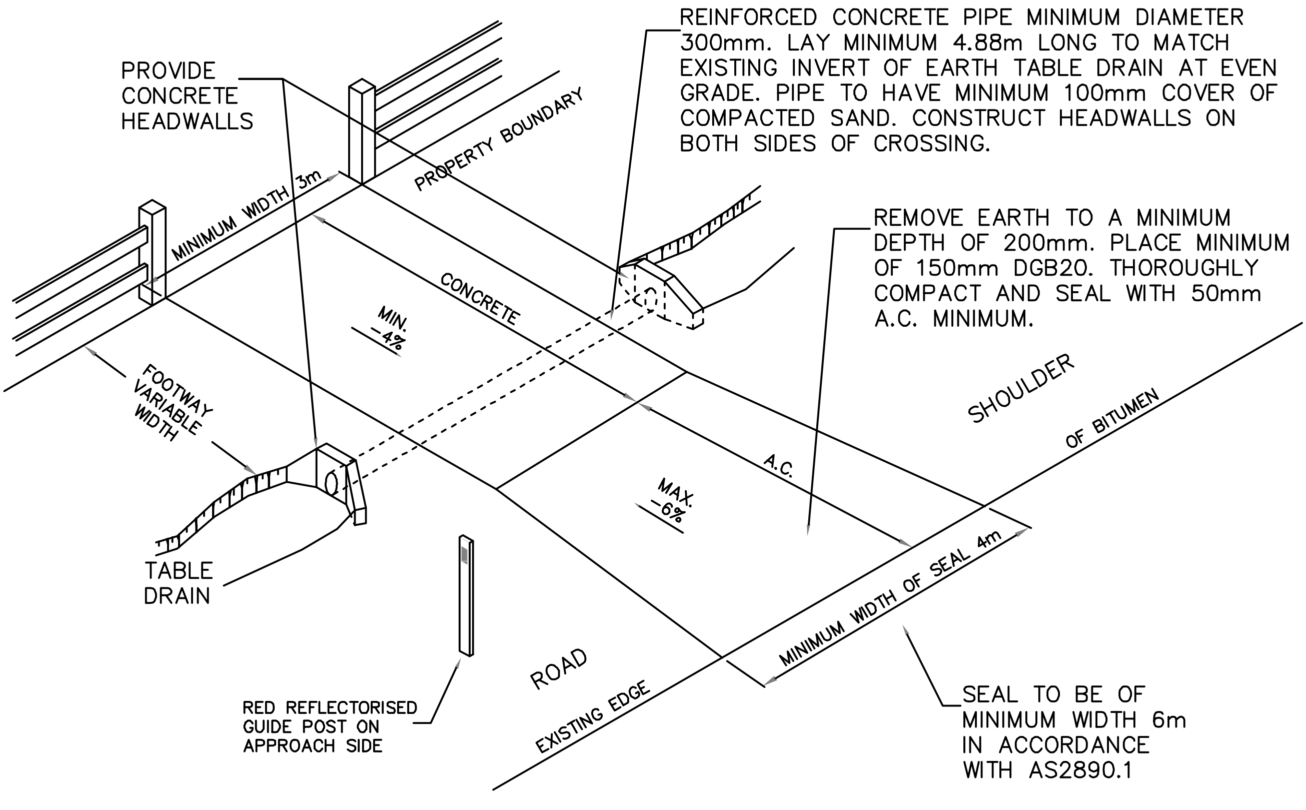
CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: TYPICAL RURAL ROAD CROSS SECTION

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R60	N.T.S	1 OF 1	01	APR'21



RURAL VEHICULAR CROSSING – TYPE 1



RURAL PIPED VEHICULAR CROSSING – TYPE 2

ORIGINAL SOURCE FROM PENRITH CITY COUNCIL STANDARDS

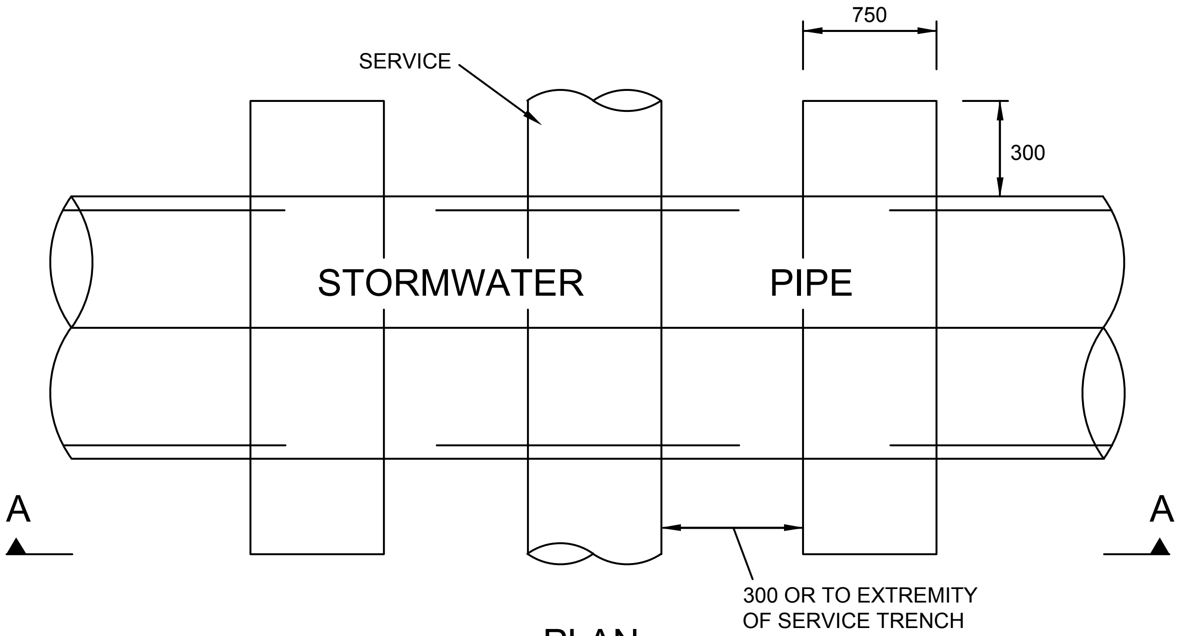
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

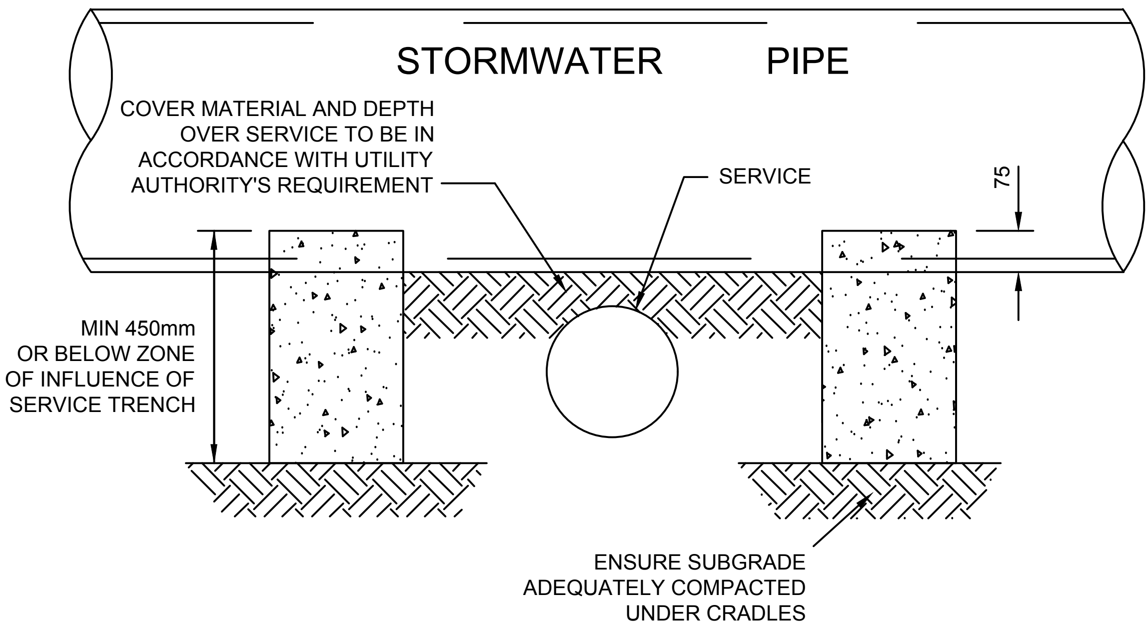
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
RURAL VEHICULAR CROSSING	SD-R61	N.T.S	1 OF 1	01	APR'21



PLAN



SECTION A - A

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

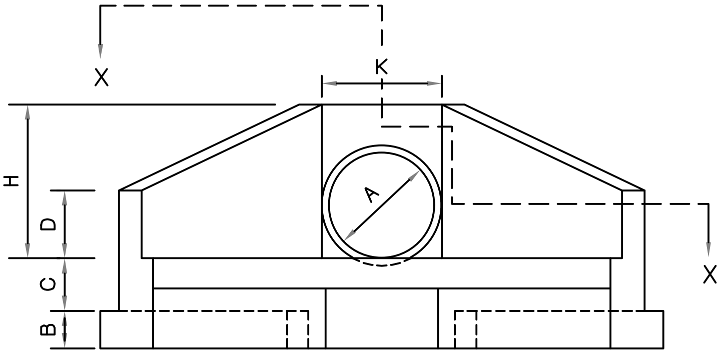
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

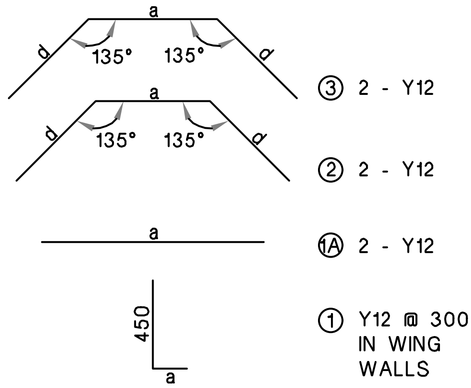
APPROVED: SAG
DATE: 14.04.21

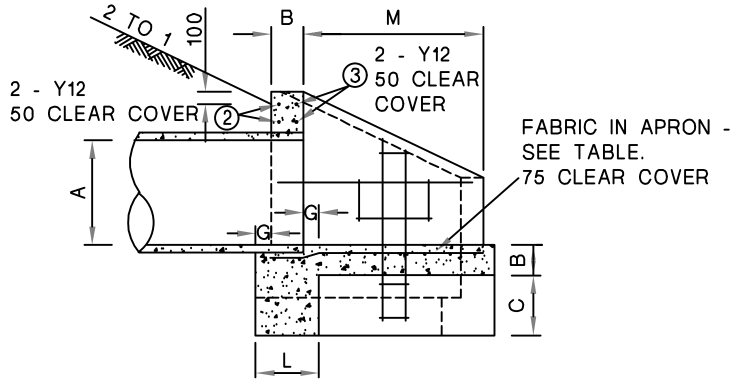
SHEET TITLE:
CONCRETE CRADLE SUPPORT

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R62	N.T.S	1 OF 1	01	APR'21

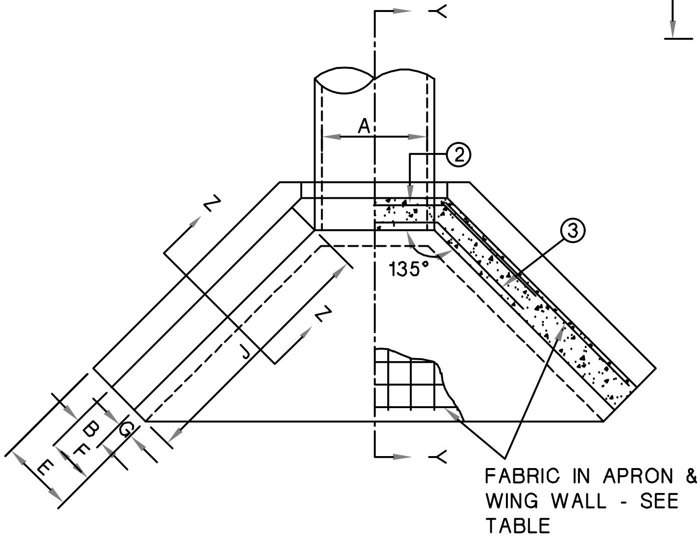


ELEVATION

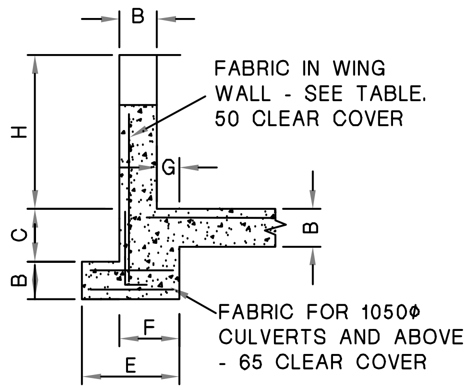




SECTION Y-Y



PLAN X-X



SECTION Z-Z

PIPE SIZE	HEADWALL DIMENSIONS											REINFORCEMENT					
A	B	C	D	E	F	G	H	J	K	L	M	FABRIC No.	a	b	c	d	e
300	150	230	300	300	225	75	550	710	370	300	500	F82	100	630	450	650	410
375	150	230	300	300	225	75	630	930	450	300	660	"	100	850	530	750	490
450	150	230	300	300	225	75	700	1130	540	300	800	"	100	1050	620	750	580
525	150	230	300	300	225	75	780	1360	620	300	960	"	100	1280	700	750	660
600	180	350	380	450	290	110	930	1560	700	400	1100	F92	160	1480	800	750	740
675	205	325	380	450	315	110	1010	1780	790	425	1260	"	190	1700	910	750	830
750	205	325	380	450	315	110	1060	1980	870	425	1400	"	190	1900	990	750	910
825	230	300	380	450	340	110	1160	2210	950	450	1560	F102	210	2130	1090	750	990
900	230	300	380	450	340	110	1230	2400	1030	450	1700	"	210	2320	1170	750	1070
1050	260	340	450	700	390	130	1380	2630	1200	520	1860	"	260	2550	1370	750	1240
1200	260	340	450	700	390	130	1550	3110	1360	520	2200	"	260	3030	1530	750	1400
1350	260	440	530	700	390	130	1700	3310	1530	520	2340	"	260	3230	1700	750	1570
1500	260	440	530	900	390	130	1880	3820	1680	520	2700	"	260	3740	1850	750	1720
1650	260	490	600	900	390	130	2050	4100	1850	520	2900	"	260	4020	2020	750	1890
1800	260	490	600	900	390	130	2210	4550	2010	520	3220		260	4470	2180	750	2050

NOTES:

1. COMPRESSIVE STRENGTH OF CONCRETE TO BE F'c 25MPa AT 28 DAYS.
2. ALL EXPOSED CORNERS TO HAVE 12mm CHAMFER.
3. ALL QUANTITIES ARE FOR ONE HEADWALL ONLY.
4. REINFORCEMENT BARS TO BE TEMPCORE BARS IN ACCORDANCE WITH AS/NZS 4671.
5. ALL DIMENSIONS ARE IN MILLIMETRES.

ORIGINAL SOURCE FROM THE HILLS SHIRE COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

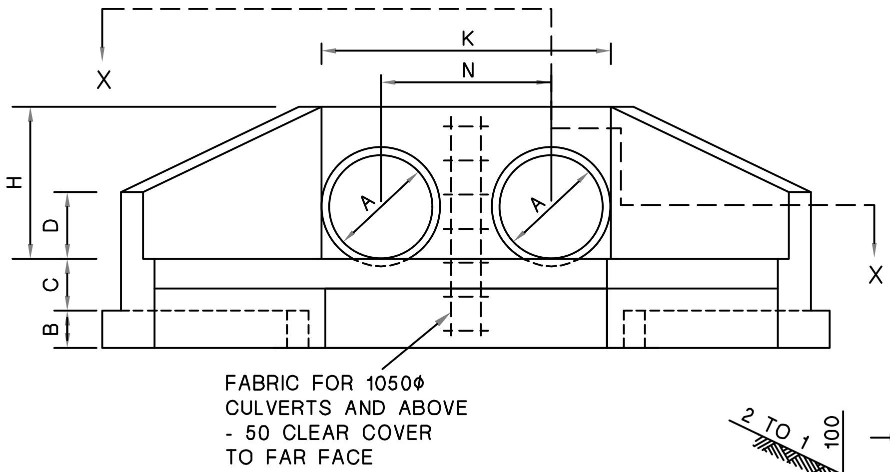
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

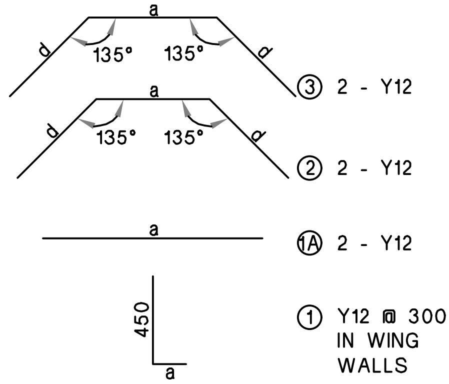
APPROVED: SAG
DATE: 14.04.21

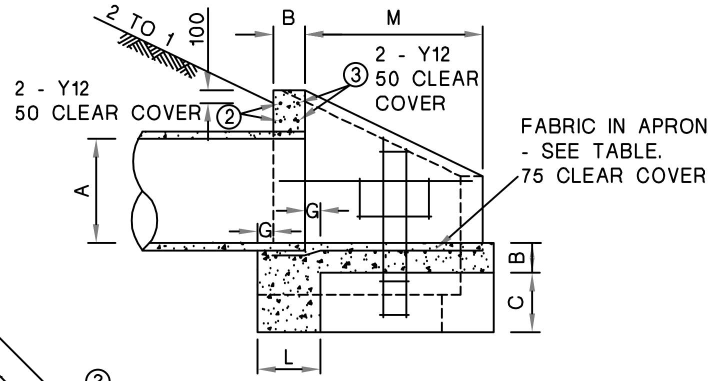
SHEET TITLE:
CONCRETE HEADWALLS FOR SINGLE PIPE CULVERTS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R63	N.T.S	1 OF 1	01	APR'21

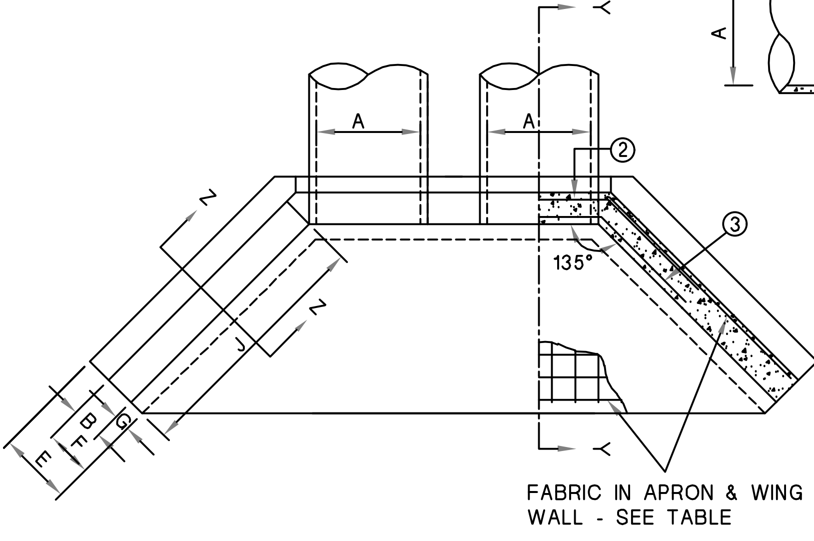


ELEVATION

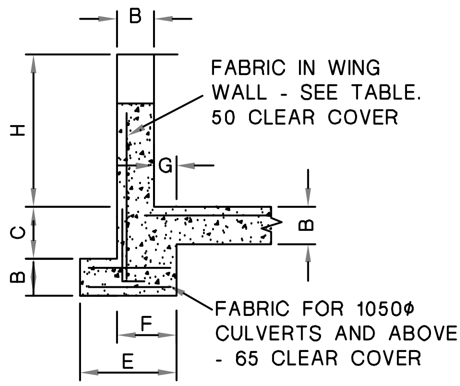




SECTION Y-Y



PLAN X-X



SECTION Z-Z

NOTES:

1. COMPRESSIVE STRENGTH OF CONCRETE TO BE F'c 25MPa. AT 28 DAYS.
2. ALL EXPOSED CORNERS TO HAVE A 12mm CHAMFER.
3. ALL QUANTITIES ARE FOE ONE HEADWALL ONLY.
4. REINFORCING BARS TO BE TEMPCORE BARS IN ACCORDANCE WITH AS/NZS 4671.
5. ALL DIMENSIONS ARE IN MILLIMETRES.

PIPE SIZE	HEADWALL DIMENSIONS												REINFORCEMENT					
A	B	C	D	E	F	G	H	J	K	L	M	N	FABRIC No.	a	b	c	d	e
300	150	230	300	300	225	75	550	710	1040	300	500	670	F82	100	630	1120	650	1080
375	150	230	300	300	225	75	630	930	1200	300	660	750	"	100	850	1280	750	1240
450	150	230	300	300	225	75	700	1130	1380	300	800	840	"	100	1050	1460	750	1420
525	150	230	300	300	225	75	780	1360	1540	300	960	920	"	100	1280	1620	750	1580
600	180	350	380	450	290	110	930	1560	1700	400	1100	1000	F92	160	1480	1800	750	1740
675	205	325	380	450	315	110	1010	1780	1880	425	1260	1090	"	190	1700	2000	750	1920
750	205	325	380	450	315	110	1080	1980	2040	425	1400	1170	"	190	1900	2160	750	2080
825	230	300	380	450	340	110	1160	2210	2200	450	1560	1250	F102	210	2130	2340	750	2240
900	230	300	380	450	340	110	1230	2400	2360	450	1700	1330	"	210	2320	2500	750	2400
1050	260	340	450	700	390	130	1380	2630	2750	520	1860	1550	"	260	2550	2920	750	2790
1200	260	340	450	700	390	130	1550	3110	3120	520	2200	1760	"	260	3030	3290	750	3160
1350	260	440	530	700	390	130	1700	3310	3510	520	2340	1980	"	260	3230	3680	750	3550
1500	260	440	530	900	390	130	1880	3820	3860	520	2700	2180	"	260	3740	4030	750	3900
1650	260	490	600	900	390	130	2050	4100	4250	520	2900	2400	"	260	4020	4420	750	4290
1800	260	490	600	900	390	130	2210	4550	4620	520	3220	2610		260	4470	4790	750	4660

ORIGINAL SOURCE FROM THE HILLS SHIRE COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: CONCRETE HEADWALLS FOR DOUBLE PIPE CULVERTS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R64	N.T.S	1 OF 1	01	APR'21

REFER COUNCILS'S
SPECIFICATION

REFER COUNCILS'S
SPECIFICATION

REFER COUNCILS'S
SPECIFICATION

NOTES:

1. THIS PLAN MUST BE READ IN CONJUNCTION WITH COUNCILS'S SPECIFICATION.
2. IN UNDERTAKING TRENCHING EXCAVATION, THE CONTRACTOR SHALL PROVIDE ANY SHORING, SHEET PILING OR OTHER STABILISATION OF THE TRENCH NECESSARY TO COMPLY WITH STATUTORY REQUIREMENTS. THE SIDES ARE NOT TO BE LOADED AND SHALL BE KEPT CLEAR OF LOOSE MATERIAL ETC. SAFE ACCESS AND EGRESS SHALL BE PROVIDED AT ALL TIMES.
3. TRENCH WIDTH MUST BE MINIMUM OF 300mm FOR SERVICE CONDUITS UP TO 80mm IN DIAMETER. FOR SERVICE CONDUITS GRATER THAN 80MM THE TRENCH WIDTH WILL BE DETERMINED BY THE EXTERNAL DIAMETER OF THE CONDUIT + 600mm.
4. BEDDING MATERIAL FOR THE BE, HAUNCH, SIDE AND OVERALL ZONE SHALL BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATION FOR THE PARTICULAR UTILITY SERVICE BEING INSTALLED.
5. ALL WORKS ARE TO BE CONDUCTED IN A SAFE MANNER WITH THE LEAST POSSIBLE OBSTRUCTION TO BOTH VEHICULAR AND PEDESTRIAN TRAFFIC. A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO COUNCIL INDICATING ALL ACTIVITIES FOR CONTROLLING BOTH VEHICULAR AND PEDESTRIAN MOVEMENT AND SHALL BE IN ACCORDANCE WITH AS1742.3 AND THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES.
6. THE CONTRACTOR SHALL ENSURE THAT ALL NECESSARY SEDIMENT, NOISE AND DUST CONTROL MEASURES ARE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES. ALL SEDIMENT AND EROSION CONTROLS SHALL BE MAINTAINED THROUGHOUT THE PERIOD OR WORKS, INCLUDING REPAIR AND/OR REPLACEMENT OF DAMAGED SECTIONS, INSPECTIONS ARE TO BE MADE PERIODICALLY AND AFTER STORM EVENTS FOR DAMAGE.
7. ALL LINEMARKING AND SIGNPOSTING AFFECTED BY WORKS IS TO BE REPLACED IN ACCORDANCE WITH AS1742 AND THE RTA INTERIM GUIDE TO SIGNS AND MARKINGS.
8. REFER TO COUNCIL'S SPECIFICATION FOR TRENCHING BACKFILL AND FOR COMPACTION OF THE TRENCH BACKFILL.
9. REFER TO COUNCIL'S SPECIFICATION FOR FINAL RESTORATION OF CARRIAGEWAY SUBBASE AND BASE (FLEXIBLE)
10. REFER TO COUNCILS SPECIFICATION FOR TEMPORARY PAVEMENT RESTORATION.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

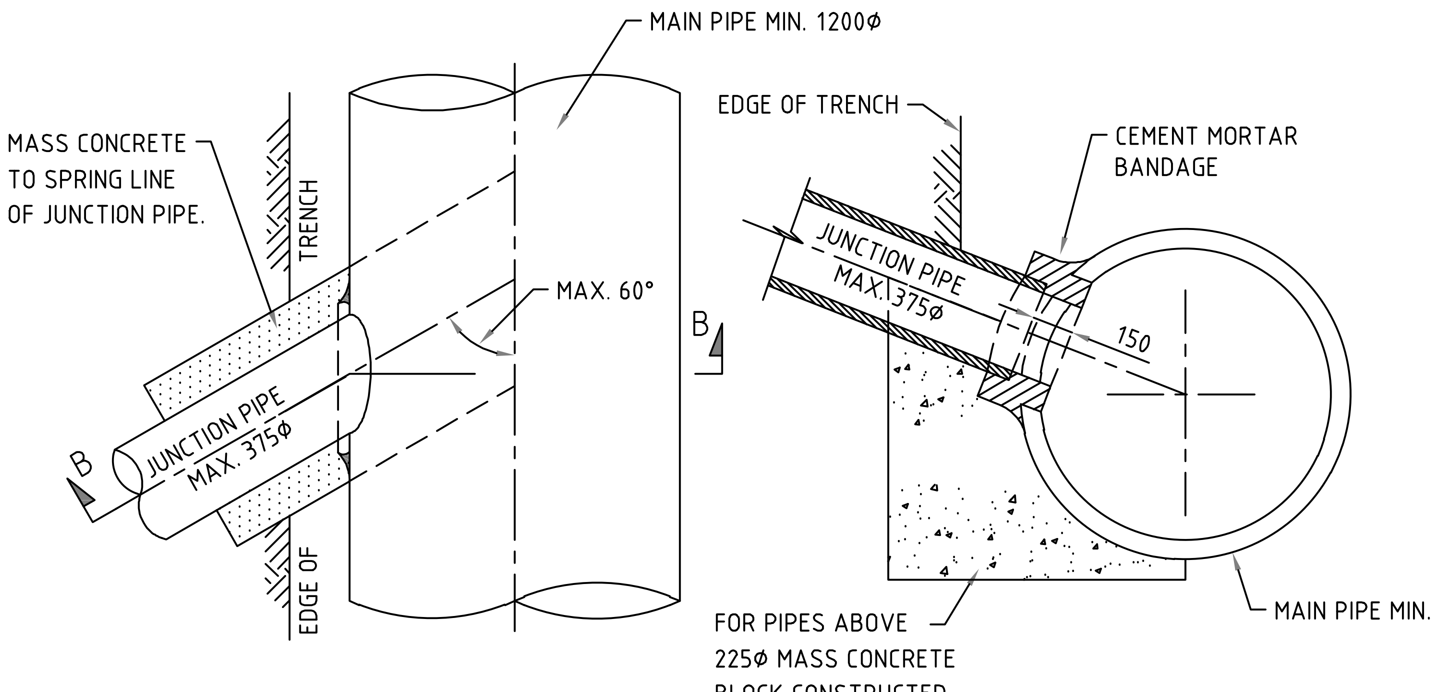
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
ROAD OPENING AND RESTORATION DETAIL
TEMPORARY TREATMENT

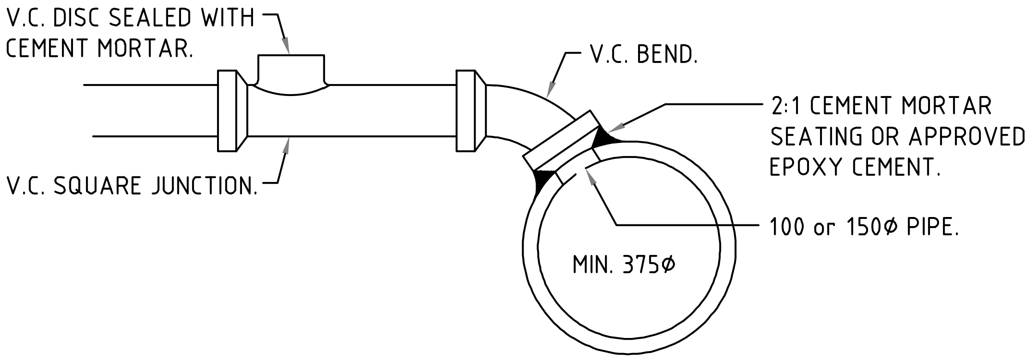
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R66	N.T.S	1 OF 1	01	APR'21



PLAN

SECTION B - B

TYPICAL DIRECT CONNECTION OF SMALL PIPE AND LARGE PIPE



THE R.C. STORMWATER PIPE SHALL BE PIERCED BY A NEAT OPENING AS SHOWN, TO ALLOW THE CONNECTION OF A VITRIFIED CLAY SQUARE, SLOPED JUNCTION OR BEND WHICH SHALL NOT PROTRUDE BEYOND THE INNER SURFACE OF THE R.C. STORMWATER PIPE.
THE INTERNAL JUNCTION SHALL BE SMOOTHLY FINISHED WITH 2:1 CEMENT MORTAR SO AS TO PRESENT NO OBSTRUCTION WITHIN THE INTERNAL CHANNEL OF THE R.C. STORMWATER PIPE.

CONNECTION OF DRAINAGE LINES TO R.C.PIPE

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

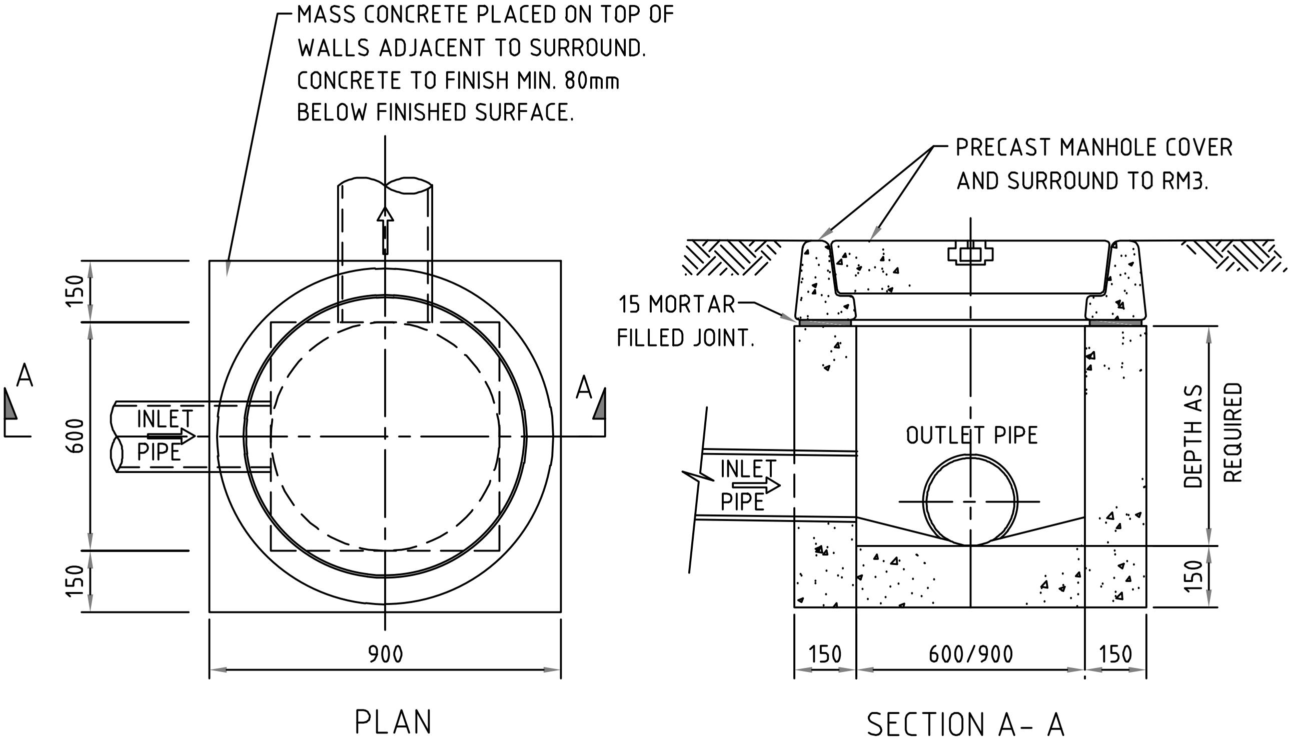
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

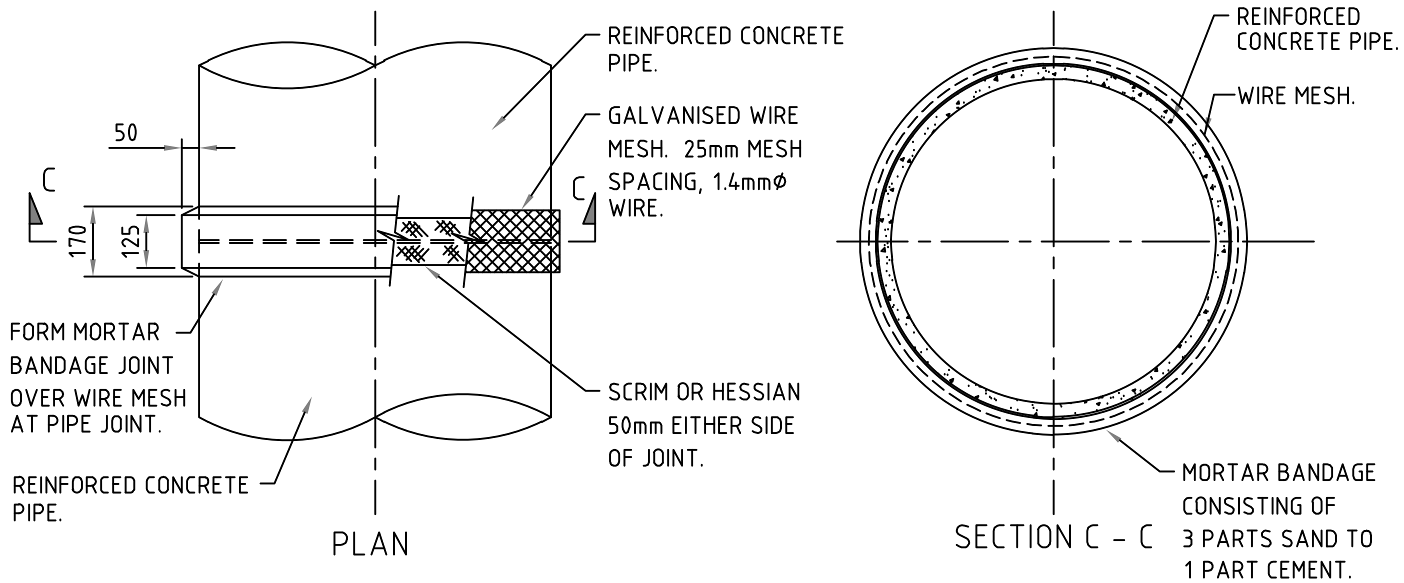
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
MINOR DRAINAGE CONNECTIONS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R67	N.T.S	1 OF 2	01	APR'21



CONCRETE INSPECTION PIT



BANDAGE JOINT DETAILS

NOTE: COMPRESSIVE STRENGTH F'c FOR CAST IN SITU CONCRETE TO BE A MIN. 20 MPa AT 28 DAYS.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

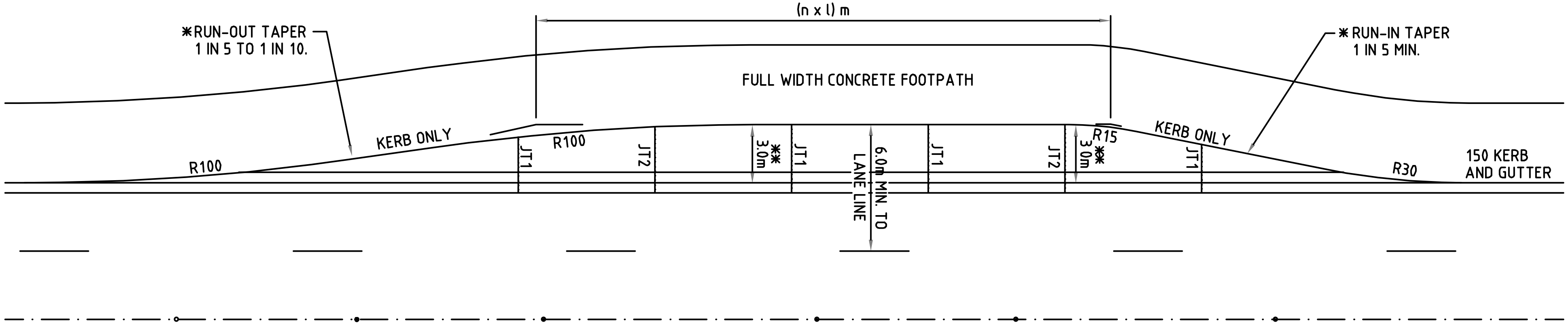
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
MINOR DRAINAGE CONNECTIONS	SD-R67	N.T.S	2 OF 2	01	APR'21

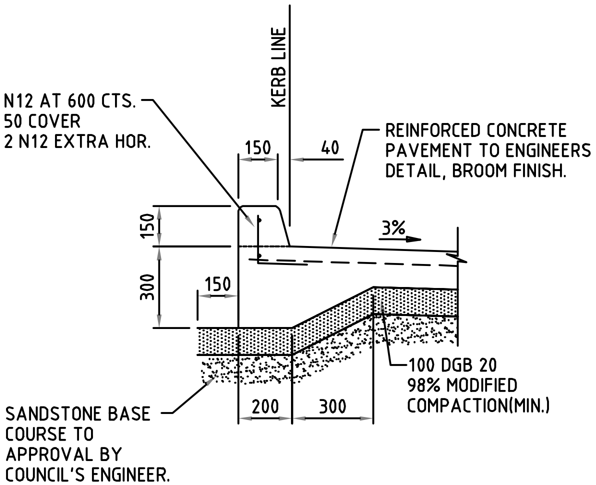


PLAN

NOTE:
✱RUN-IN AND RUN-OUT TAPERS MAY NEED TO BE VARIED ACCORDING TO SITE CONDITIONS, TRAFFIC SPEED AND VOLUME ETC.
RUN-IN TAPERS SHOULD NOT BE LESS THAN 1 IN 10.
RUN-OUT TAPERS SHOULD BE AS LONG AS PRACTICABLE.

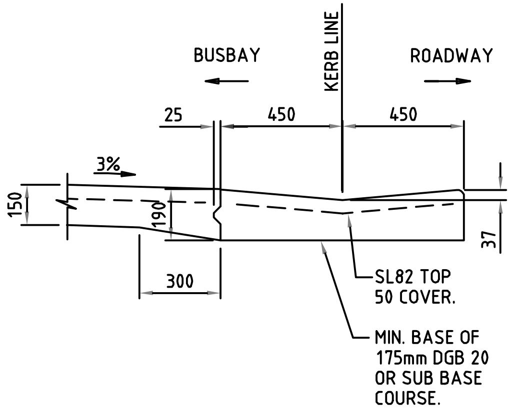
✱✱WIDTH (INCLUDING CLEARANCES) MAY NEED TO BE INCREASED WHERE LARGE/WIDE BUSES ARE INVOLVED.

n = NUMBER OF BUSES USING THE STOP SIMULTANEOUSLY.
l = LENGTH OF BUS (INCLIDING CLEARANCES IF DESIRED).



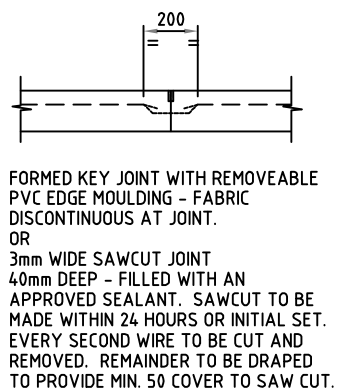
INTEGRAL STD. 150 KERB

DETAIL



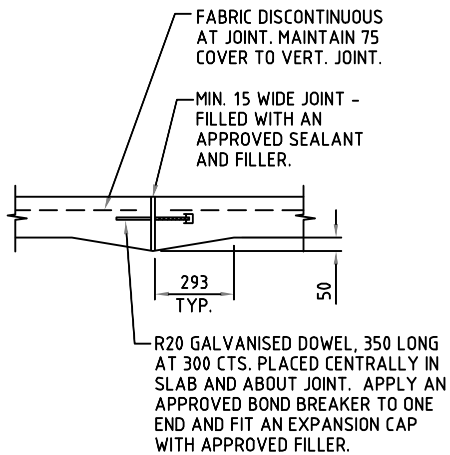
JOINT TYPE 3 (JT3) AND DISH DRAIN

ISOLATION JOINT - EDGE THICKENING



JOINT TYPE 1 (JT1)

SAW CUT / FORMED JOINT



JOINT TYPE 2 (JT2)

EXPANSION JOINT

ORIGINAL SOURCE FROM LIVERPOOL COUNCIL

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

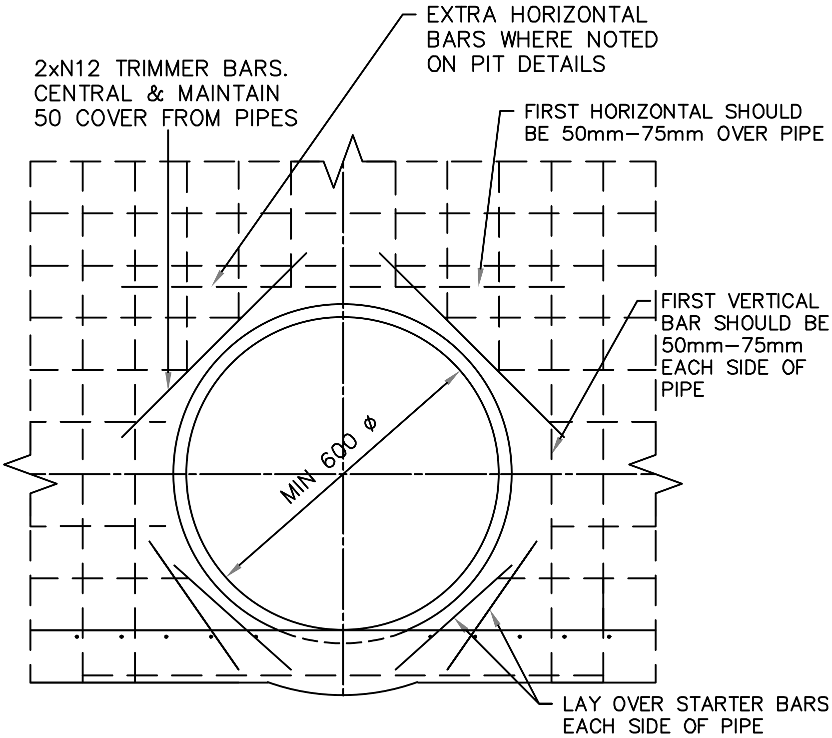
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

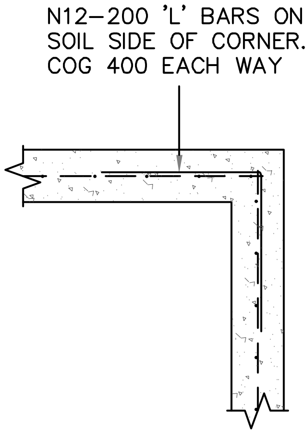
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: STANDARD INDENTED BUSBAY PLAN AND SECTION

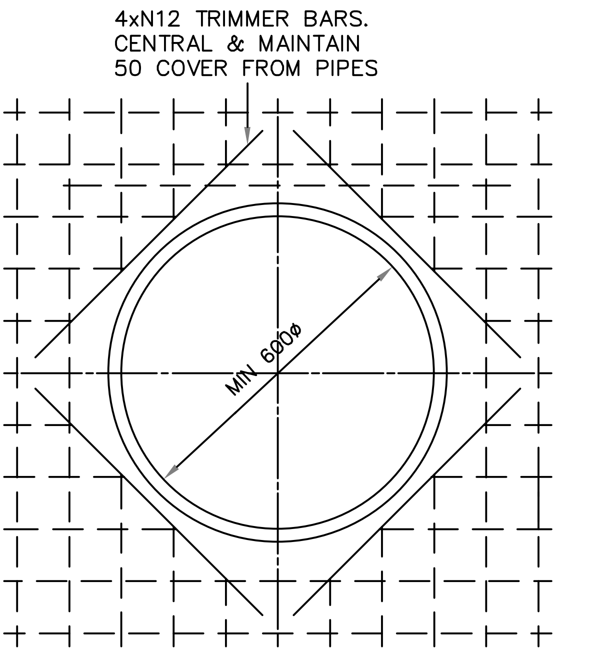
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-68	N.T.S	1 OF 1	01	APR'21



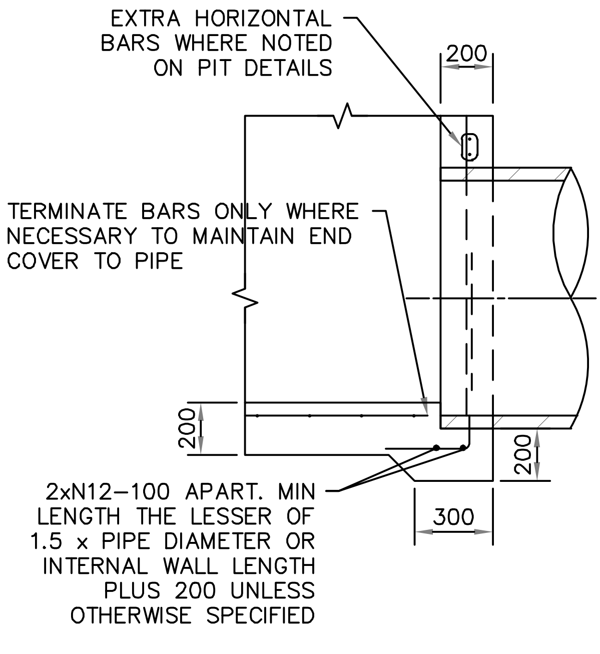
TYPICAL TRIMMER BARS
DETAIL AT BASE



TYPICAL CORNER
TREATMENT DETAIL–
PLAN (90° CORNER)



TYPICAL TRIMMER BARS DETAIL



TYPICAL REINFORCEMENT
TREATMENT AT PIPE
PENETRATION

NOTE:
WHERE EXTRA REINFORCEMENT BARS SPECIFIED IMMEDIATELY ABOVE PIPES, TOP HORIZONTAL N16 BARS AS INDICATED HERE ARE NOT REQUIRED.

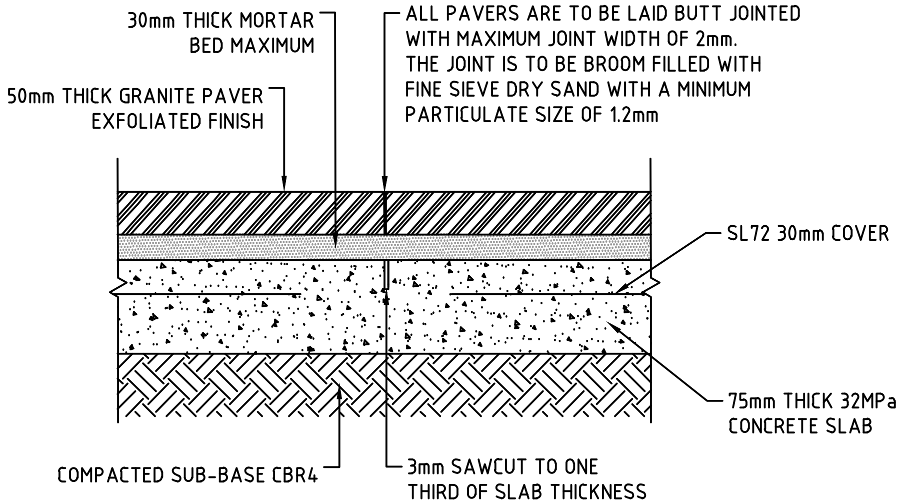
ORIGINAL SOURCE FROM PENRITH CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

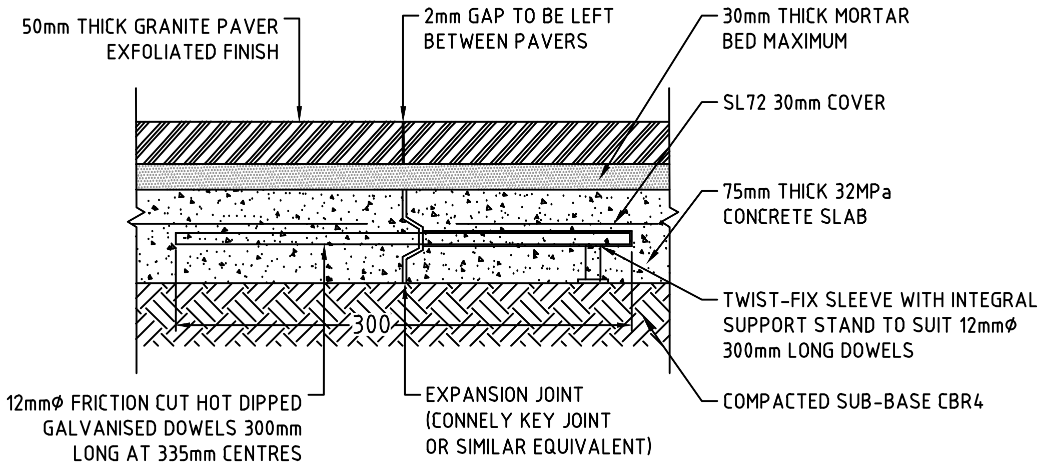
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
PROJECT TITLE:	WSPP STANDARD DRAWINGS
APPROVED:	SAG
DATE:	14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
TRIMMER BARS AROUND PIPE PENETRATIONS INTO PITS	SD-R69	N.T.S	1 OF 1	01	APR'21



CONTRACTION JOINT

N.T.S



EXPANSION JOINT

N.T.S

NOTE: USE CONNOLLY KEY JOINT OR SIMILAR EQUIVALENT AS SHOWN.

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

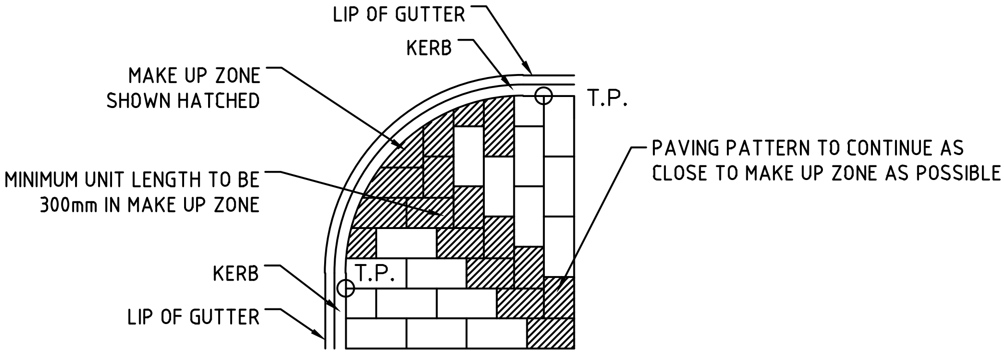
REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
GRANITE PAVERS DETAIL	SD-R70	N.T.S	1 OF 2	01	APR'21

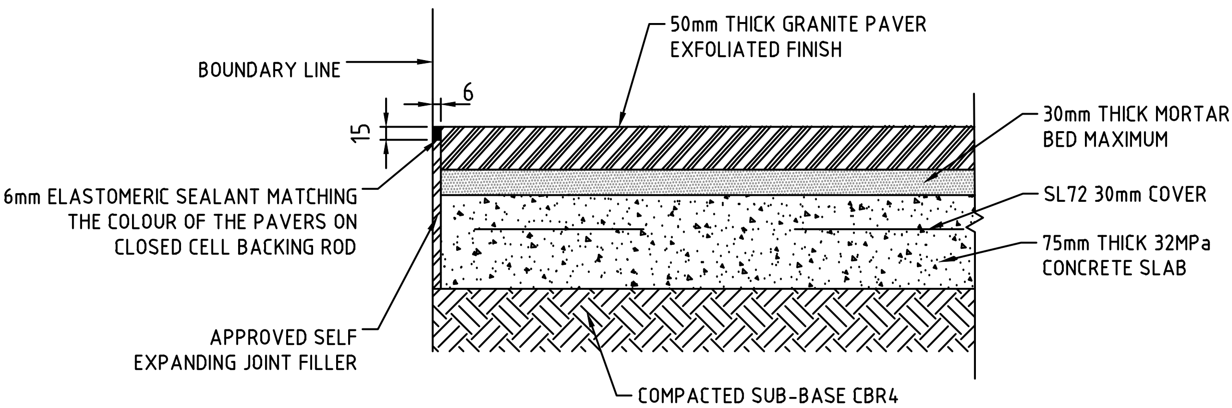


GENERAL ARRANGEMENT PLAN CORNER

N.T.S

GROUTING:

CEMENTITIOUS GROUT SHALL NOT BE USED.
ALL PAVERS ARE TO BE LAID BUTT JOINTED
WITH MAXIMUM JOINT WIDTH OF 2mm.
THE JOINT IS TO BE BROOM FINISH WITH FINE SIEVE DRY
SAND WITH A MAXIMUM PARTICULATE SIZE OF 1.2mm.



JUNCTION WITH BOUNDARY LINE

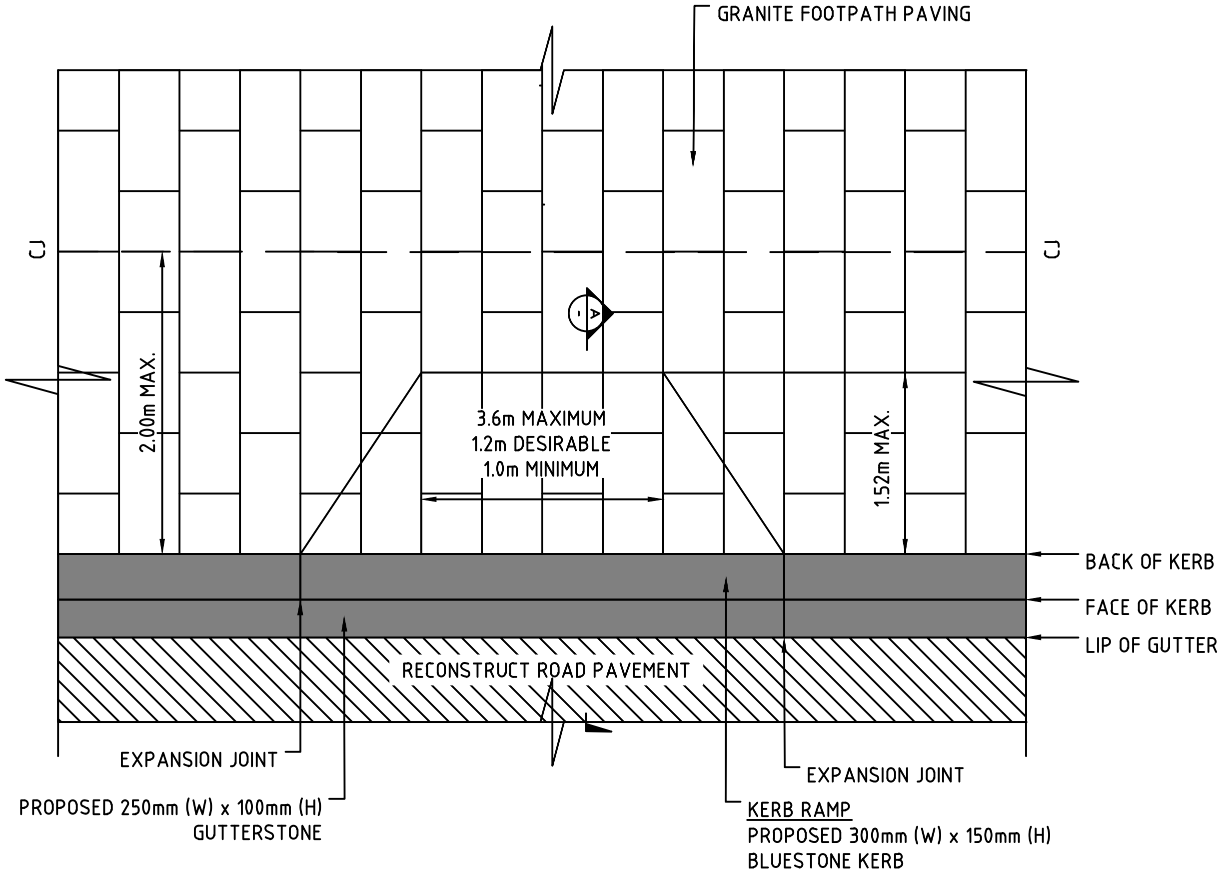
N.T.S

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

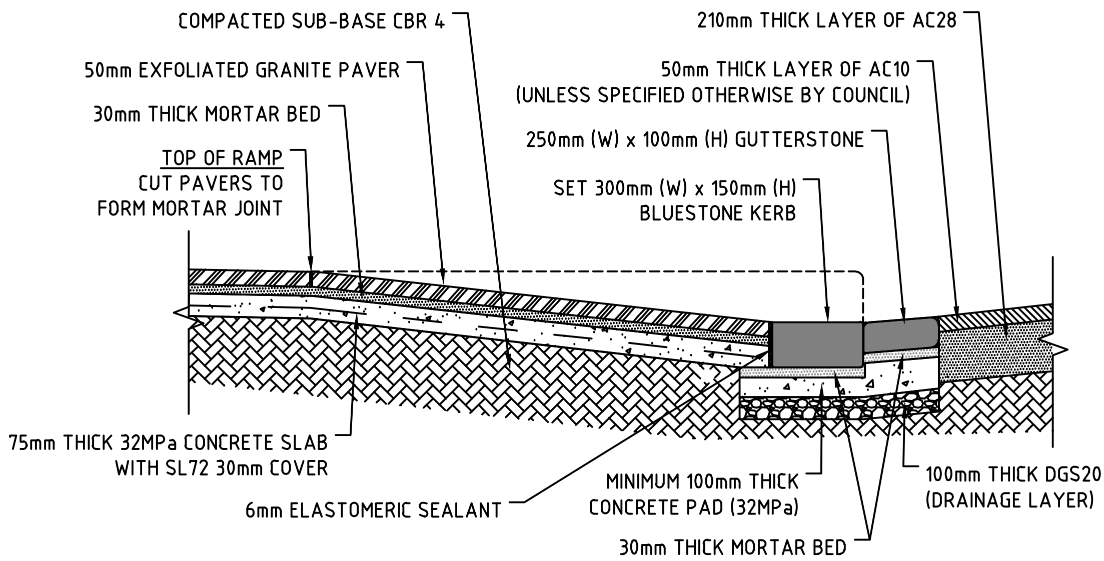
CHECKED: PWG COUNCILS	DATE: OCT 2020	APPROVED: SAG	DATE: 14.04.21
PROJECT TITLE: WSPP STANDARD DRAWINGS			
SHEET TITLE: GRANITE PAVERS DETAIL	STD DWG No. SD-R70	SCALE: N.T.S	SHEET 2 OF 2
VERSION 01	DATE APR'21		



KERB RAMP DETAIL PLAN

N.T.S

NOTE: CONTRACTION JOINT (CJ) IS FOR 75mm THICK CONCRETE SLAB



SECTION A –

SECTION THROUGH KERB RAMP

N.T.S

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

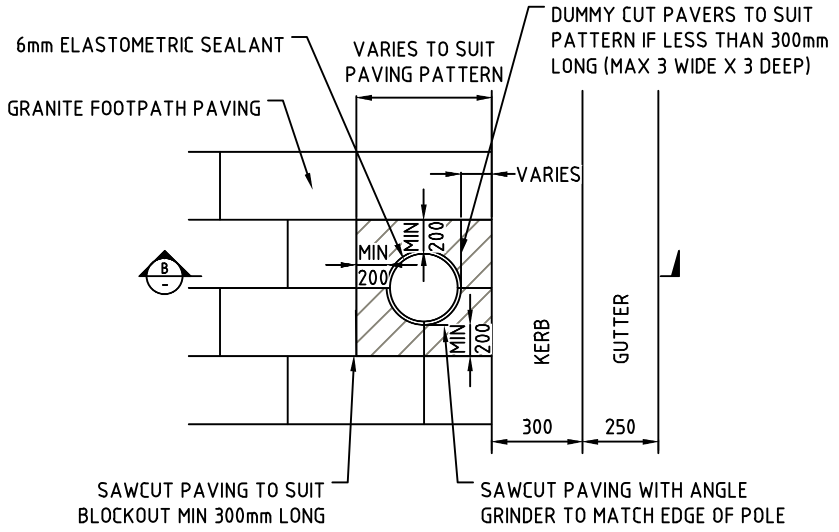
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
GRANITE PAVERS AND BLUESTONE KERB AND GUTTER DETAILS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R71	N.T.S	1 OF 4	01	APR'21

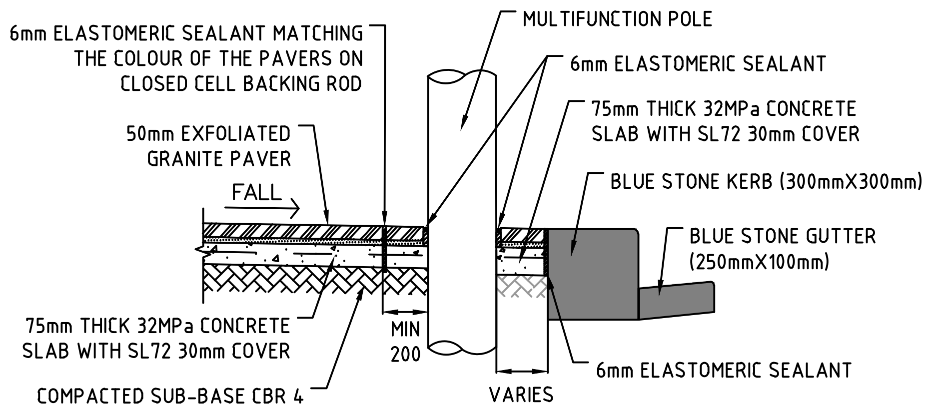


PLAN AROUND MULTIFUNCTION POLE

N.T.S

KERB RAMP NOTES:

1. ALL DIMENSIONS ARE AS SPECIFIED.
2. ALL KERB RAMPS ARE TO BE ALIGNED WITH THE DESIRED DIRECTION OF PEDESTRIAN TRAVEL, AND BE A MINIMUM WIDTH OF 1000mm.
3. PROVIDE METAL KEY JOINTS OR EQUIVALENT AT SHARP TRANSITIONS.
4. THE NEED FOR SHARP TRANSITION IS CRITICAL IN GUIDING PEDESTRIANS WITH IMPAIRMENT.



SECTION B / –

MULTIFUNCTION POLE

N.T.S

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

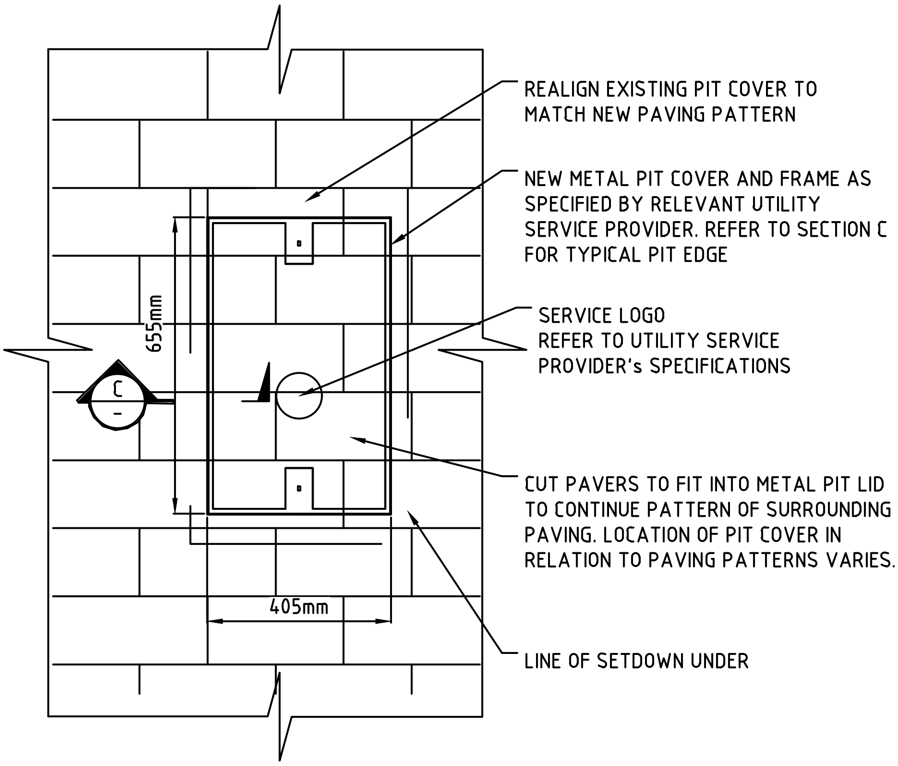
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

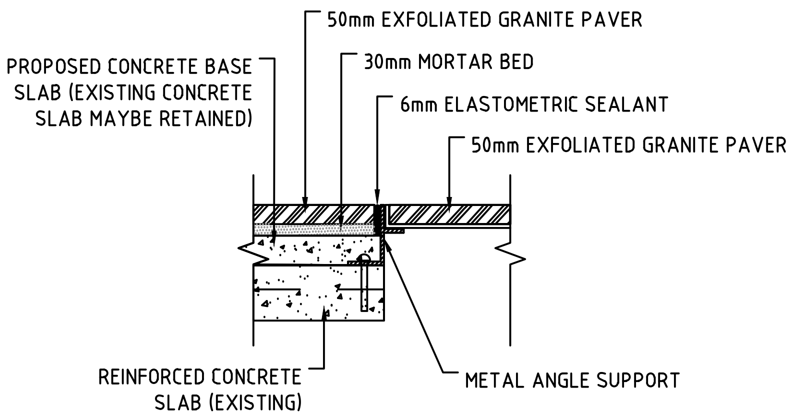
SHEET TITLE: GRANITE PAVERS AND BLUESTONE KERB AND GUTTER DETAILS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R71	N.T.S	2 OF 4	01	APR'21



TYPICAL GRANITE INFILL UTILITY SERVICE PIT

N.T.S



SECTION C –

TYPICAL SECTION – UTILITY SERVICE PIT

N.T.S

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS

DATE: OCT 2020

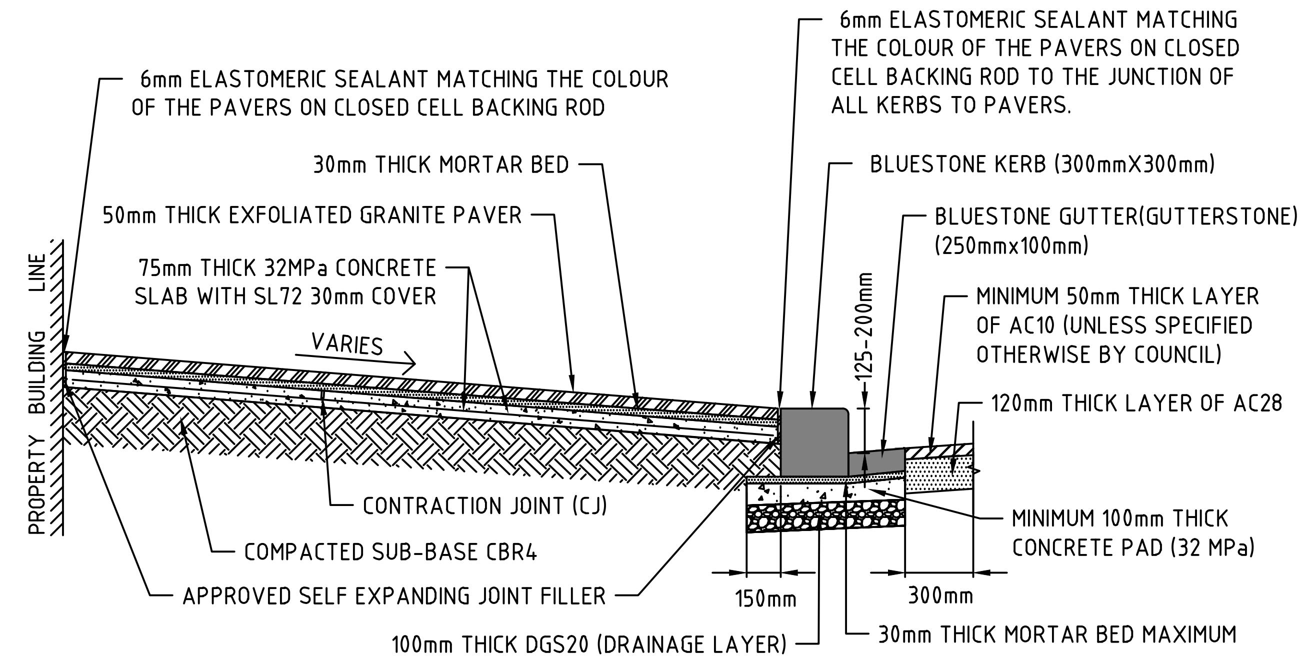
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG

DATE: 14.04.21

SHEET TITLE: GRANITE PAVERS AND BLUESTONE KERB AND GUTTER DETAILS

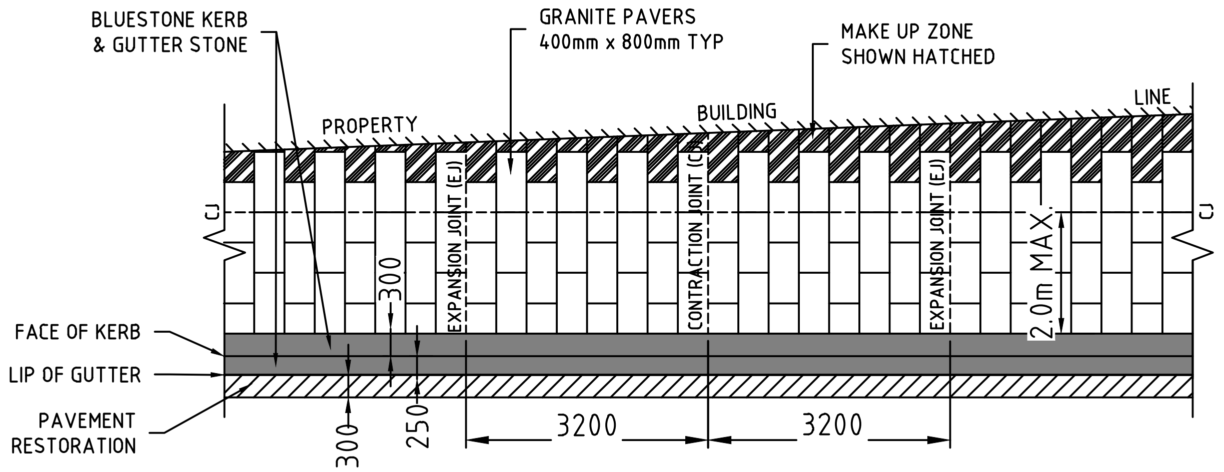
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R71	N.T.S	3 OF 4	01	APR'21



SECTION A

BLUESTONE KERB AND GUTTER WITH GRANITE FOOTPATH PAVING SECTION

N.T.S



GRANITE PAVERS FOOTPATH ARRANGEMENT PLAN

N.T.S

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

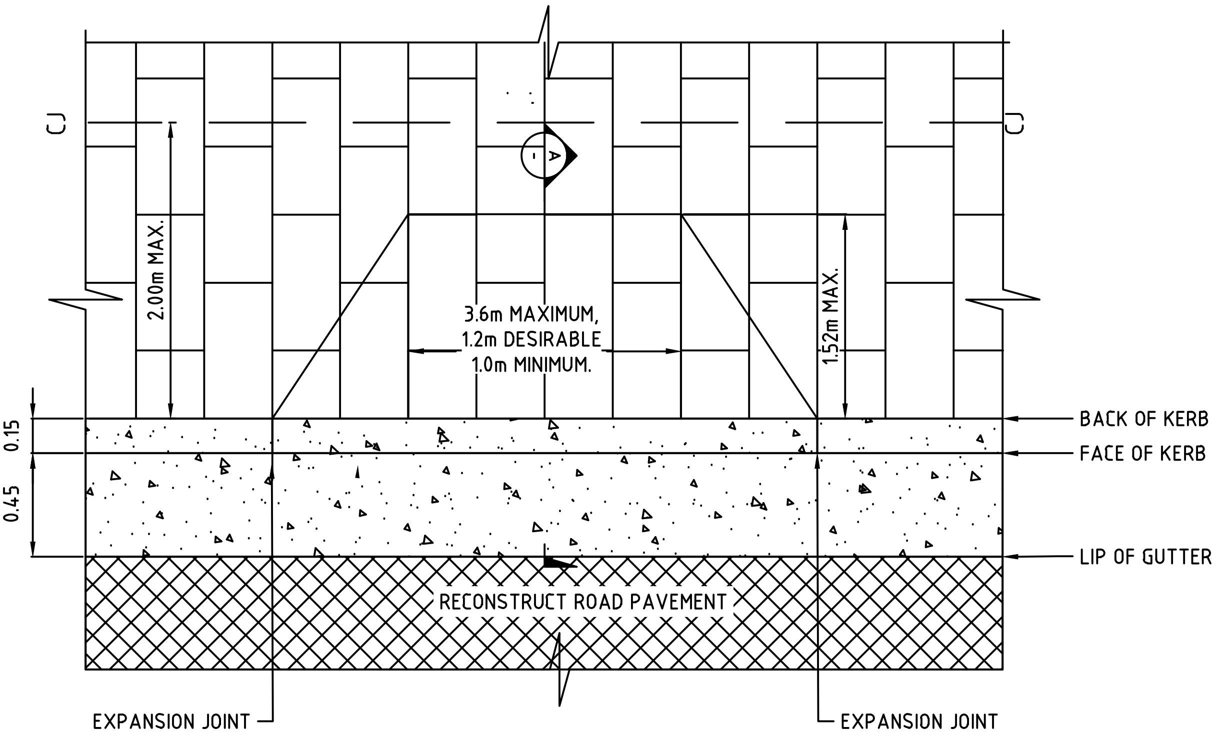
CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: GRANITE PAVERS AND BLUESTONE KERB AND GUTTER DETAILS

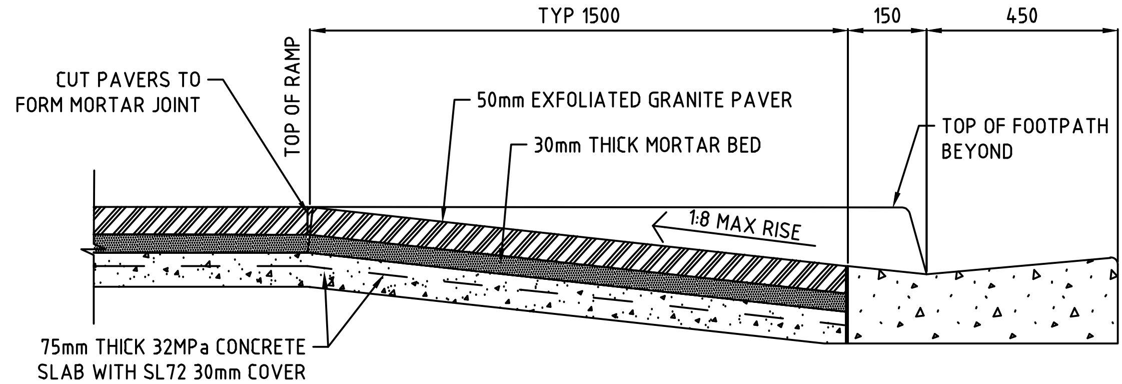
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R71	N.T.S	4 OF 4	01	APR'21

Apr 15, 2021 - 11:10am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R71.dwg



KERB RAMP DETAIL PLAN

N.T.S



SECTION A

SECTION THROUGH KERB RAMP

N.T.S

NOTES:

1. ALL DIMENSIONS ARE AS SPECIFIED.
2. ALL KERB RAMPS ARE TO BE ALIGNED WITH THE DESIRED DIRECTION OF PEDESTRIAN TRAVEL, AND BE A MINIMUM WIDTH OF 1000mm.
3. PROVIDE METAL KEY JOINTS OR EQUIVALENT AT SHARP TRANSITIONS.
4. THE NEED FOR SHARP TRANSITION IS CRITICAL IN GUIDING PEDESTRIANS WITH IMPAIRMENT.
5. THERE MUST BE A SHARP TRANSITION AND NO LIP BETWEEN EDGE OF RAMP AND THE GUTTER.
6. FOR KERB AND GUTTER DETAILS AND DRIVEWAY LAYBACK DETAILS REFER SD-R04, SD-R08, SD-R09, SD-R10

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

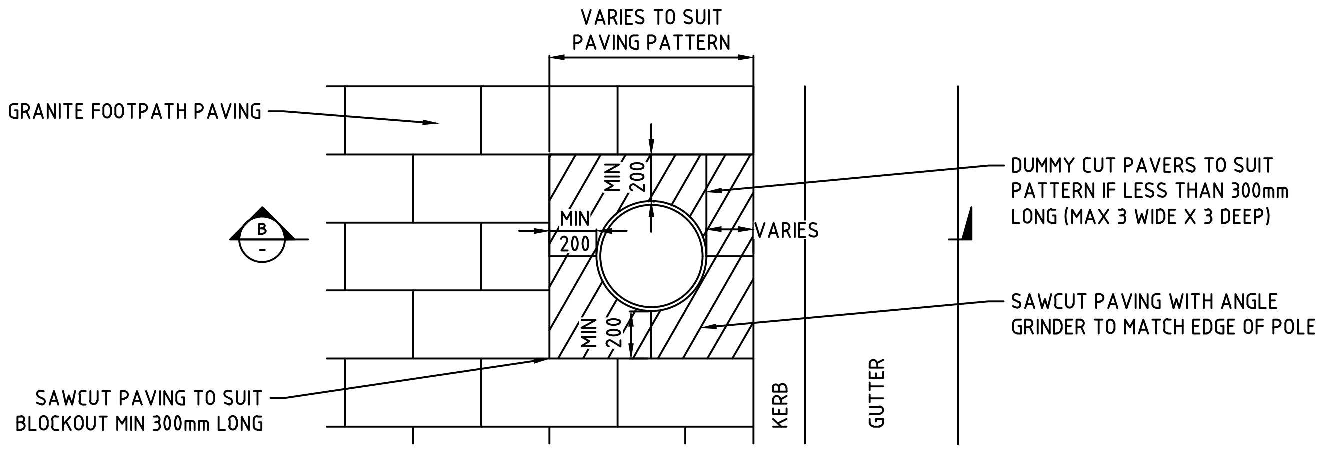
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

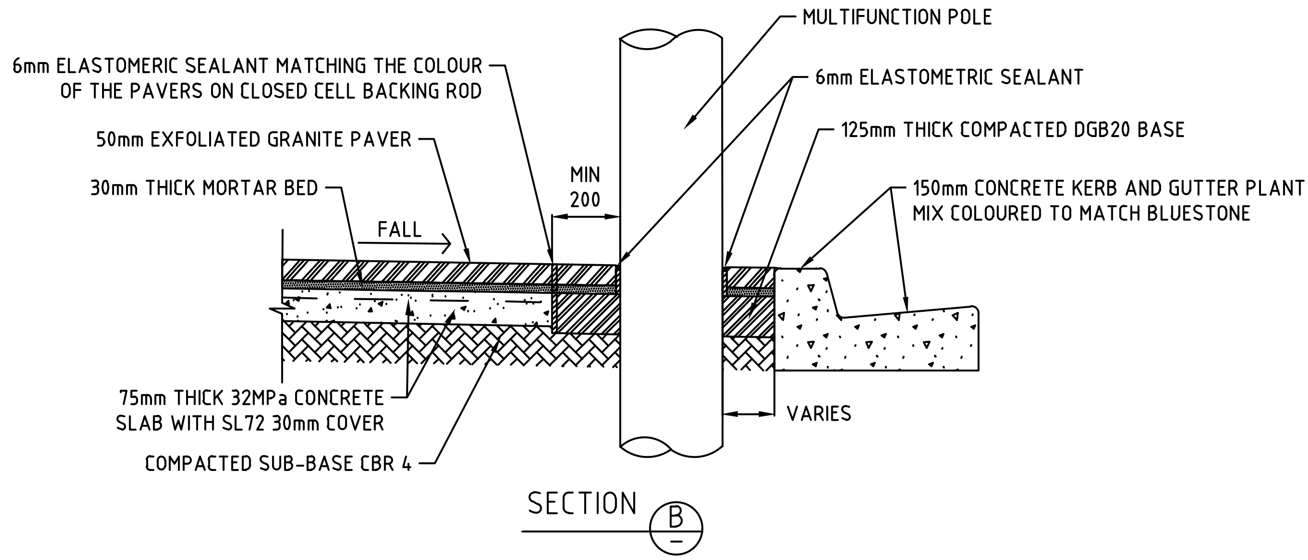
SHEET TITLE:
GRANITE PAVERS AND CONCRETE KERB AND GUTTER DETAILS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R72	N.T.S	1 OF 2	01	APR'21



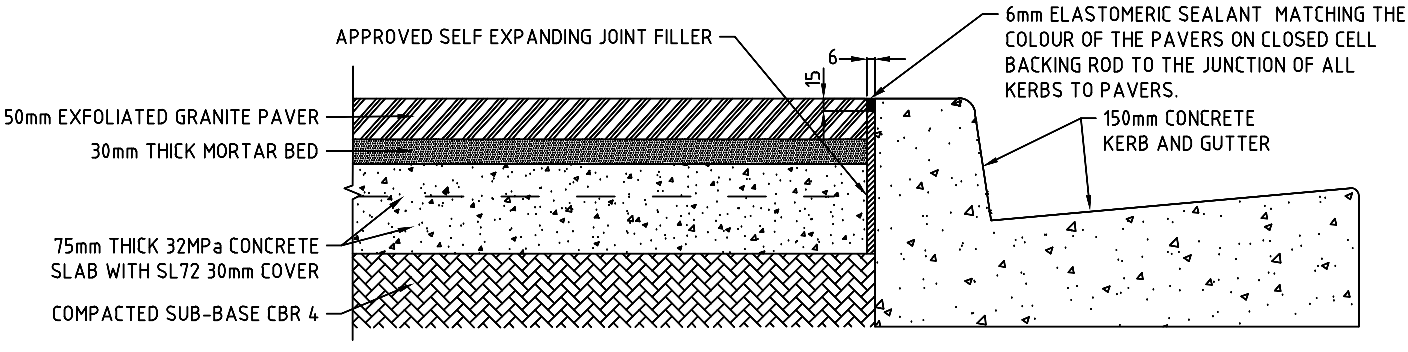
PLAN AROUND MULTIFUNCTION POLES

N.T.S



MULTIFUNCTION POLE CONCRETE KERB AND GUTTER

N.T.S



JUNCTION WITH BACK OF CONCRETE KERB AND GUTTER

N.T.S

ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

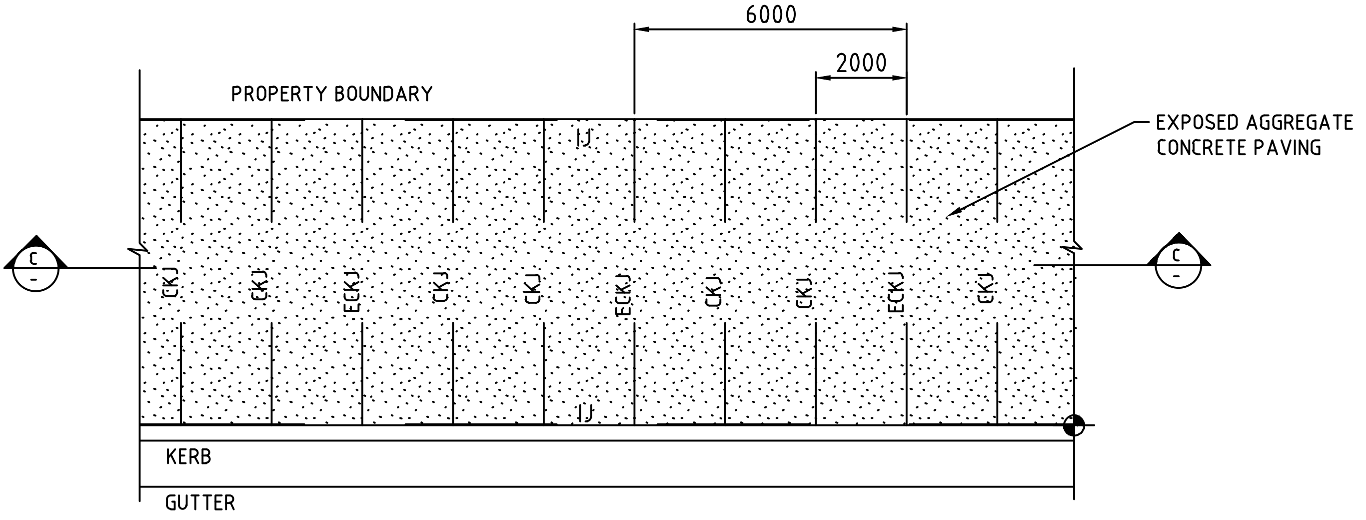
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

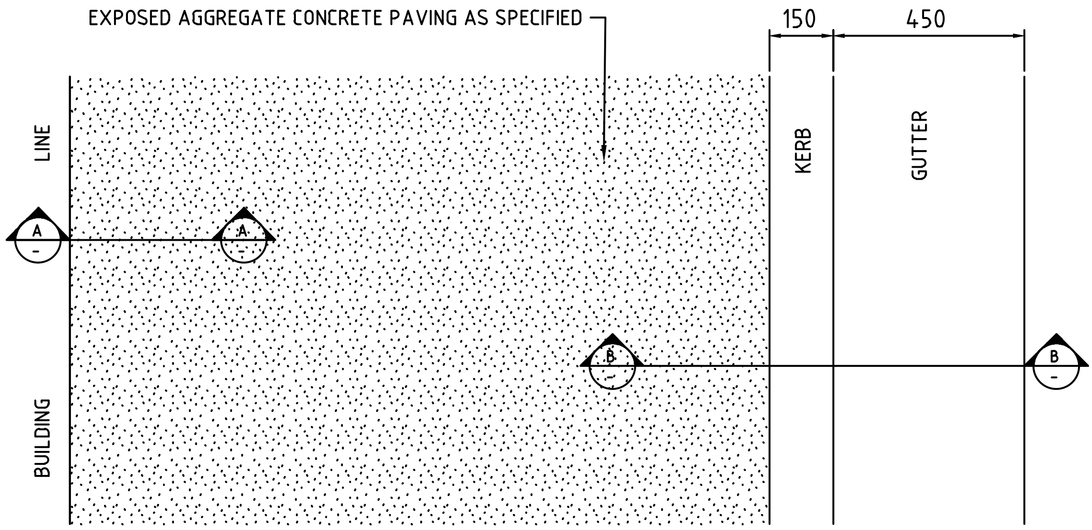
SHEET TITLE: GRANITE PAVERS AND CONCRETE KERB AND GUTTER DETAILS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R72	N.T.S	2 OF 2	01	APR'21



TYPICAL PLAN (JOINT DETAIL)

N.T.S



TYPICAL PLAN

N.T.S

SHARED PATH GENERAL LAYOUT

NOTES:

CKJ = CONNOLLY KEY JOINT OR SIMILAR EQUIVALENT APPROVED BY COUNCIL

ECKJ = EXPANSION CONNOLLY KEY JOINT OR APPROVED EQUIVALENT

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

PROJECT TITLE: WSPP STANDARD DRAWINGS

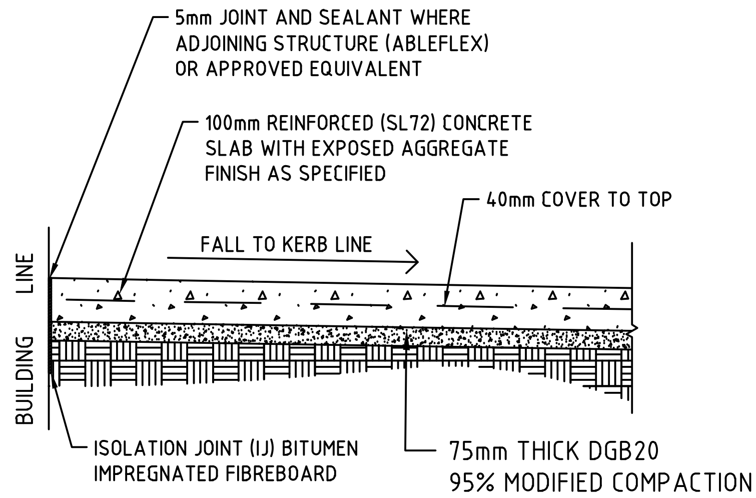
CHECKED: PWG COUNCILS
DATE: OCT 2020

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: PERIPHERY PAVING DETIALS

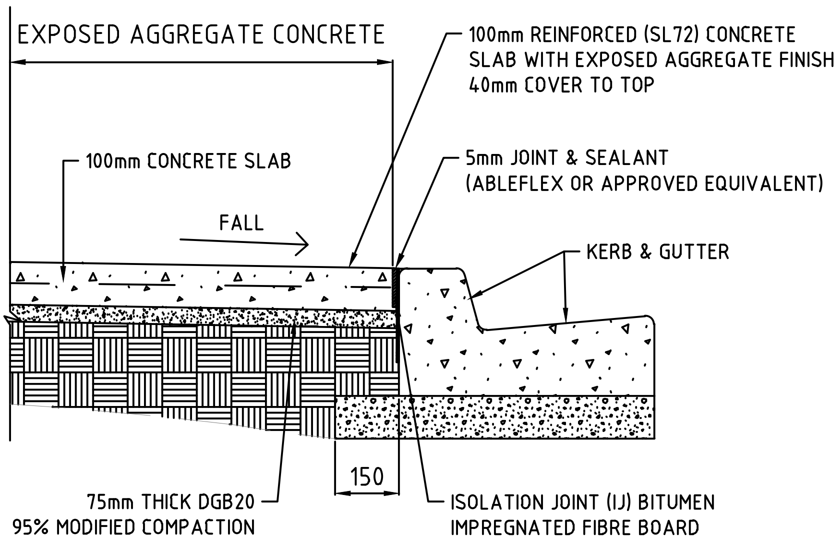
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R73	N.T.S	1 OF 2	01	APR'21

Apr 15, 2021 - 11:10am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R73.dwg



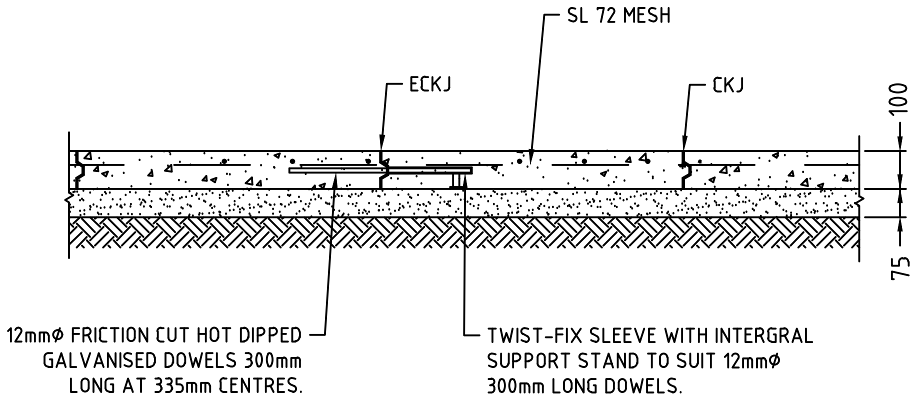
TYPICAL SECTION A-A

N.T.S



TYPICAL SECTION B-B

N.T.S



TYPICAL SECTION C-C

N.T.S

ORIGINAL SOURCE FROM HAWKESBURY CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: PERIPHERY PAVING DETIALS

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-R73	N.T.S	2 OF 2	01	APR'21

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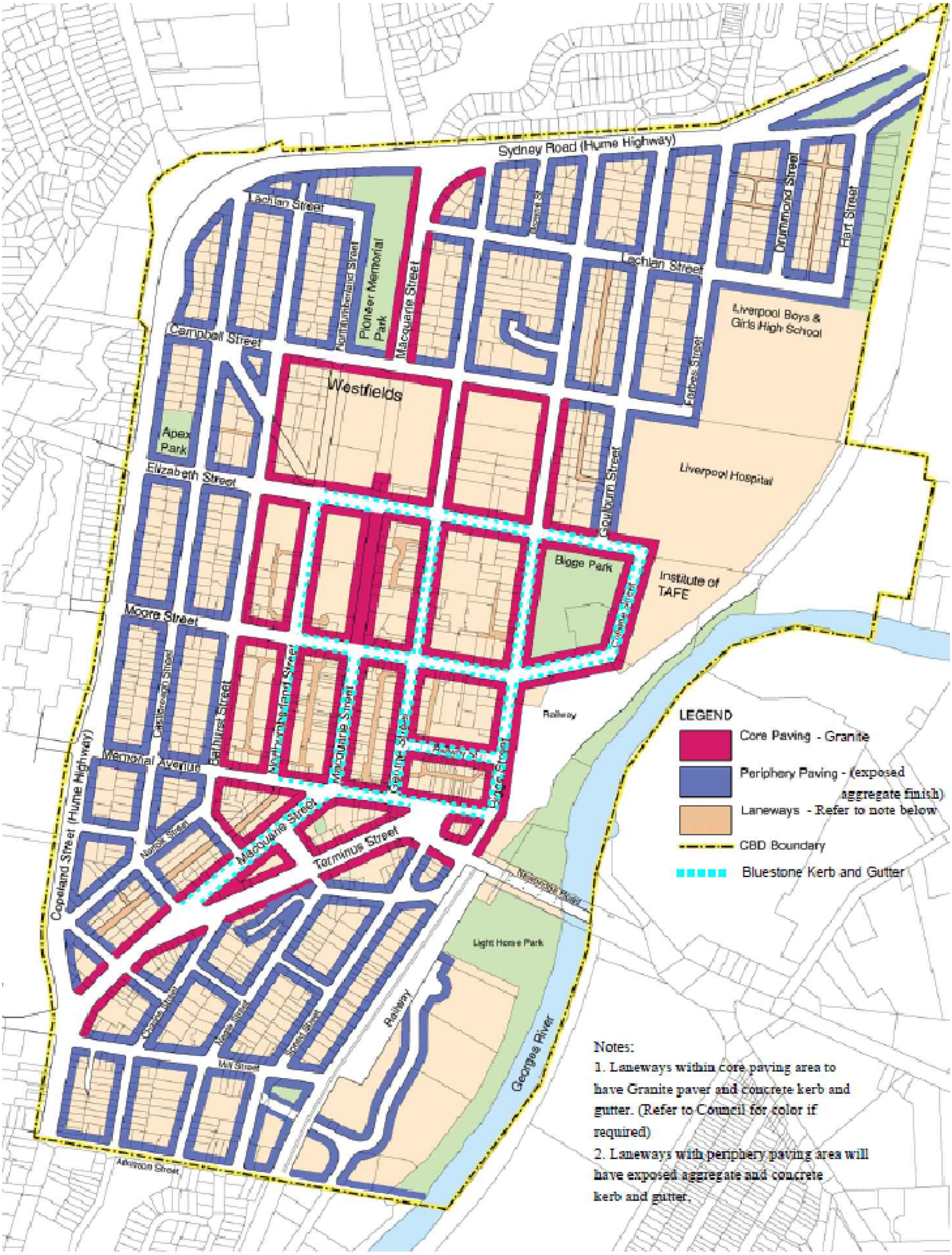


ORIGINAL SOURCE FROM LIVERPOOL CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
STREET PAVING TYPOLOGY MAP (LOCAL VARIATION LIVERPOOL)	SD-R74	N.T.S	1 OF 1	01	APR'21

Apr 15, 2021 - 11:11am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\Civil\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-R74.dwg

NOTES:

1. SIGN TO CONSIST OF 3mm THICK ALUMINUM & TO BE IN CORPORATE COLOURS ON A DIAMOND GRADE, WHITE REFLECTIVE PLATE, UV TREATED COVERED IN ANTI-GRAFFITI FILM AND COMPLY WITH AS.1743
2. LETTERING "WARNING" TO BE RED AND OTHERS IN BLACK
3. THE GRAPHIC CONSISTS OF AN OUTLINE SKETCH OF THE PEDESTRIAN AND A RED SYMBOLIC SIGN "PROHIBITED ENTRY" OVER THE SKETCH.
4. COLOUR OF GRAPHIC SHALL BE BLACK.
5. THE SIGN SHALL BE 900 HIGH BY 600 WIDE WITH CORNER RADII OF 60
6. SIGN POST SHALL BE HOTDIPPED GALVANISED, 101.6 x 5.0 CHS, 3100 LONG WITH HOTDIPPED GALVANISED TOP END CAP. POST TO BE SET 600 DEEP INTO Ø300 MASS CONCRETE GROUND CLEARANCE TO SIGN TO BE MINIMUM 2000.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
TRASH RACK WARNING SIGN	SD-S01	N.T.S	1 OF 1	01	APR'21

Apr 15, 2021 - 11:11am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-S01.dwg

NOTES:

1. SIGN TO CONSIST OF 3mm THICK ALUMINUM & TO BE IN CORPORATE COLOURS ON A DIAMOND GRADE, WHITE REFLECTIVE PLATE, UV TREATED COVERED IN ANTI-GRAFFITI FILM AND COMPLY WITH AS.1743
2. LETTERING "WARNING" TO BE RED AND OTHERS IN BLACK
3. THE GRAPHIC CONSISTS OF AN OUTLINE SKETCH OF THE PEDESTRIAN AND A RED SYMBOLIC SIGN "PROHIBITED ENTRY" OVER THE SKETCH.
4. COLOUR OF GRAPHIC SHALL BE BLACK.
5. THE SIGN SHALL BE 900 HIGH BY 600 WIDE WITH CORNER RADII OF 60
6. SIGN POST SHALL BE HOTDIPPED GALVANISED, 101.6 x 5.0 CHS, 3100 LONG WITH HOTDIPPED GALVANISED TOP END CAP. POST TO BE SET 600 DEEP INTO Ø300 MASS CONCRETE GROUND CLEARANCE TO SIGN TO BE MINIMUM 2000.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX
REV.	DATE.	DESCRIPTION	CHK'D	APP'D

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

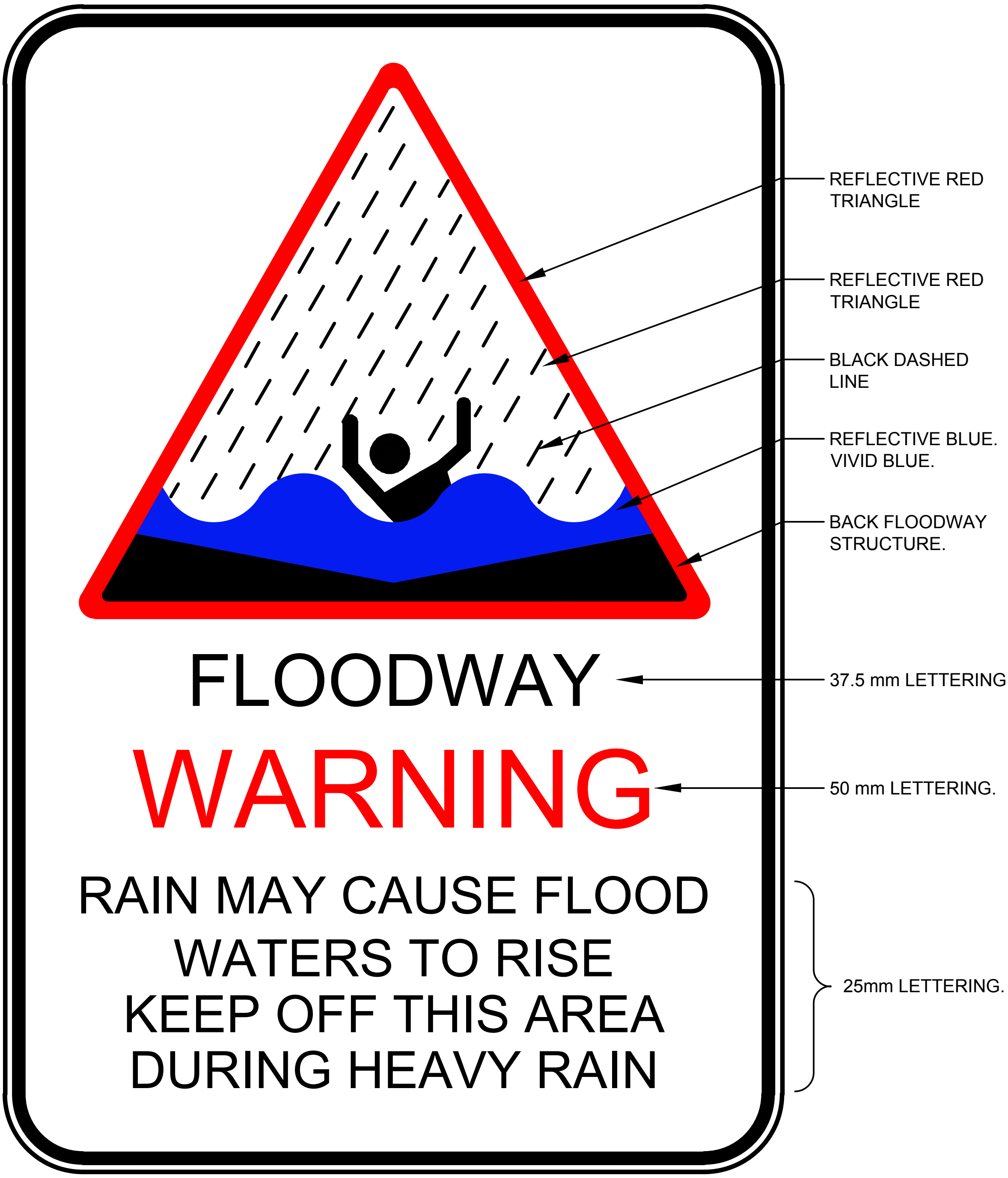
PROJECT TITLE:
WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
PIPE FLOOD WARNING SIGN

STD DWG No.: SD-S02
SCALE: N.T.S
SHEET: 1 OF 1
VERSION: 01
DATE: APR'21

Apr 15, 2021 - 11:11am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIVI\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-S02.dwg



NOTES:

1. SIGN TO CONSIST OF 3mm THICK ALUMINUM & TO BE IN CORPORATE COLOURS ON A DIAMOND GRADE, WHITE REFLECTIVE PLATE, UV TREATED COVERED IN ANTI-GRAFFITI FILM AND COMPLY WITH AS.1743
2. LETTERING "WARNING" TO BE RED AND OTHERS IN BLACK
3. THE SIGN SHALL BE 900 HIGH BY 600 WIDE WITH CORNER RADII OF 60
4. SIGN POST SHALL BE HOTDIPPED GALVANISED, 101.6 x 5.0 CHS, 3100 LONG WITH HOTDIPPED GALVANISED TOP END CAP. POST TO BE SET 600 DEEP INTO Ø300 MASS CONCRETE GROUND CLEARANCE TO SIGN TO BE MINIMUM 2000.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

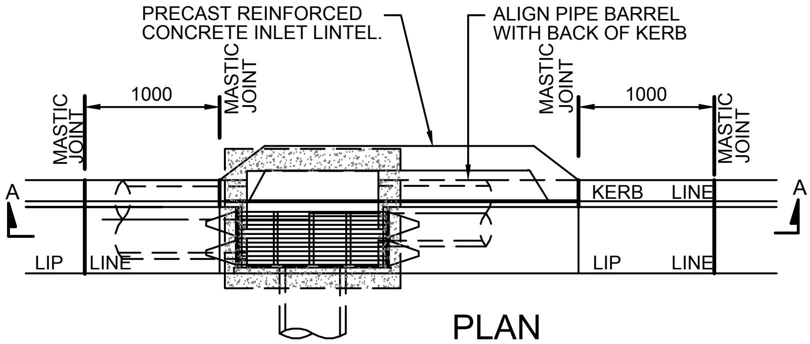
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
APPROVED: SAG
DATE: 14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE: FLOODWAY WARNING SIGN

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-S03	N.T.S	1 OF 1	01	APR'21



PLAN

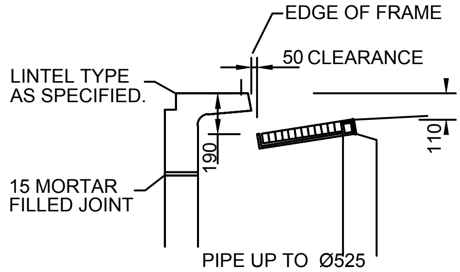
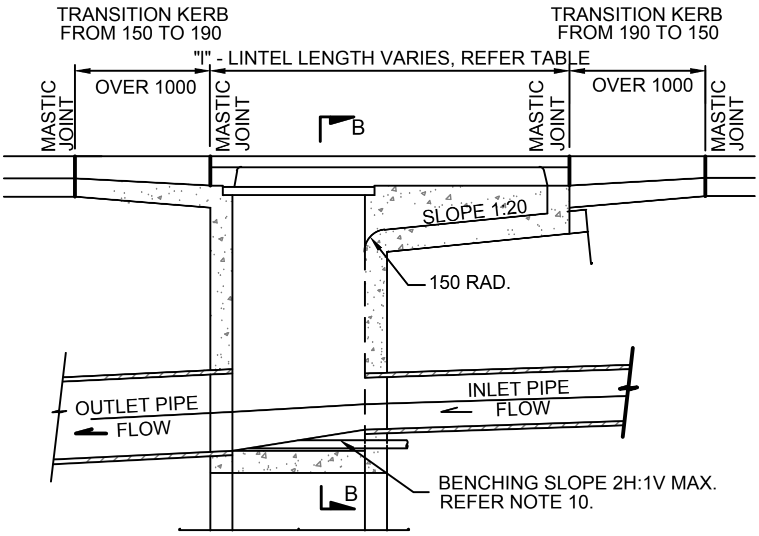
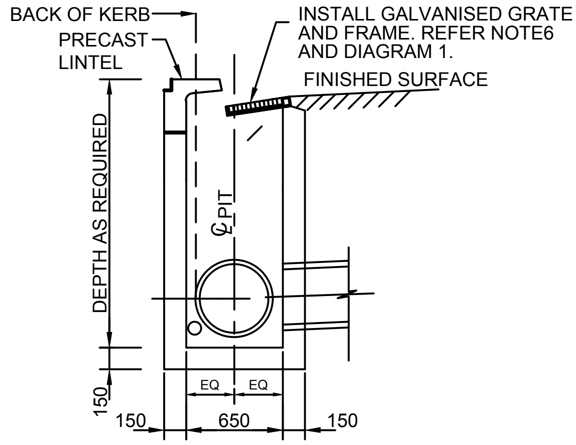


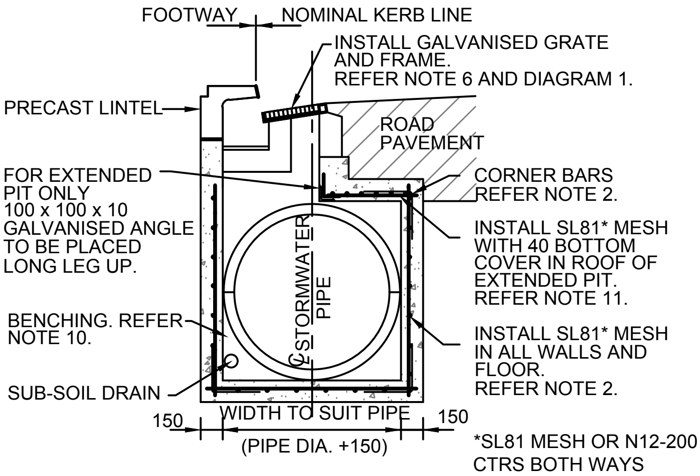
DIAGRAM 1



SECTION A - A



SECTION B - B
STANDARD PIT
REFER NOTE 9 & 15.



SECTION B - B
EXTENDED PIT CHAMBER
REFER NOTE 9.

PRECAST LINTEL SIZES.	
NOMINAL OPENING SIZE METRES	OVERALL LENGTH "l" mm
0.9	1825
1.2	1825
1.8	2438
2.4	3048
3.0	3657
3.6	4267
4.2	4877
4.8	5486

NOTES:

1. CONCRETE TO BE 25MPa MINIMUM AT 28 DAYS
2. CONCRETE WALLS AND BOTTOM TO BE REINFORCED IN ALL DIRECTIONS WITH SL81 MESH AT 40 COVER TO INSIDE FACE WITH 12 CORNER BARS 300 LEGS AT 200 CTRS. PITS DEEPER THAN 1500 SHALL BE DESIGNED BY A PROFESSIONAL STRUCTURAL ENGINEER.
3. SAG PITS TO HAVE LINTEL LOCATED CENTRALLY OVER PIT.
4. BACKFILL ADJACENT TO PITS TO BE APPROVED AND CONNECTED TO THE UPSTREAM PIT WALL.
5. A 3m LENGTH OF APPROVED "FILTER FABRIC" WRAPPED 100mm SUB-SOIL DRAIN OR EQUIVALENT IS TO BE PROVIDED AND CONNECTED TO THE UPSTREAM PIT WALL.
6. PIT GRATE AND FRAME TO BE EQUIVALENT "WELDLOK" GG-50D FOR RESIDENTIAL ROADS AND GG-42D FOR INDUSTRIAL ROADS OR EQUIVALENT, FITTED WITH A LOCKABLE "J" BOLT.
7. STEP IRONS PROVIDED WHERE THE PIT EXCEEDS 1200 IN DEPTH AS PER SD-S09.
8. THE CENTRE LINES OF INTERSECTING PIPES ARE TO MEET AT THE DOWNSTREAM FACE OF THE PIT WHERE POSSIBLE.
9. WHERE ENTERING PIPE EXCEEDS Ø525, EXTEND PIT CHAMBER AS SHOWN IN SECTION B-B EXTENDED PIT CHAMBER.
10. FLOOR OF PIT TO BE BENCHED TO MID POINT OF OUTLET PIPE WHERE OUTLET PIPE IS >Ø600.
11. WHERE EXTENDED CHAMBER WIDTH EXCEEDS 1200, ROOF REINFORCEMENT IS TO BE DESIGNED BY A PROFESSIONAL STRUCTURAL ENGINEER.
12. CONTRACTOR TO ENSURE SPECIFIED CLEARANCE BETWEEN LINTEL AND OPEN GRATE SEE DIAGRAM 1.
13. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
14. PITS IN AREAS OF SALINITY HAZARD SHALL BE APPROPRIATELY DESIGNED.
15. PITS >1200 DEEP TO BE MINIMUM 900 WIDE x 900 LONG.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

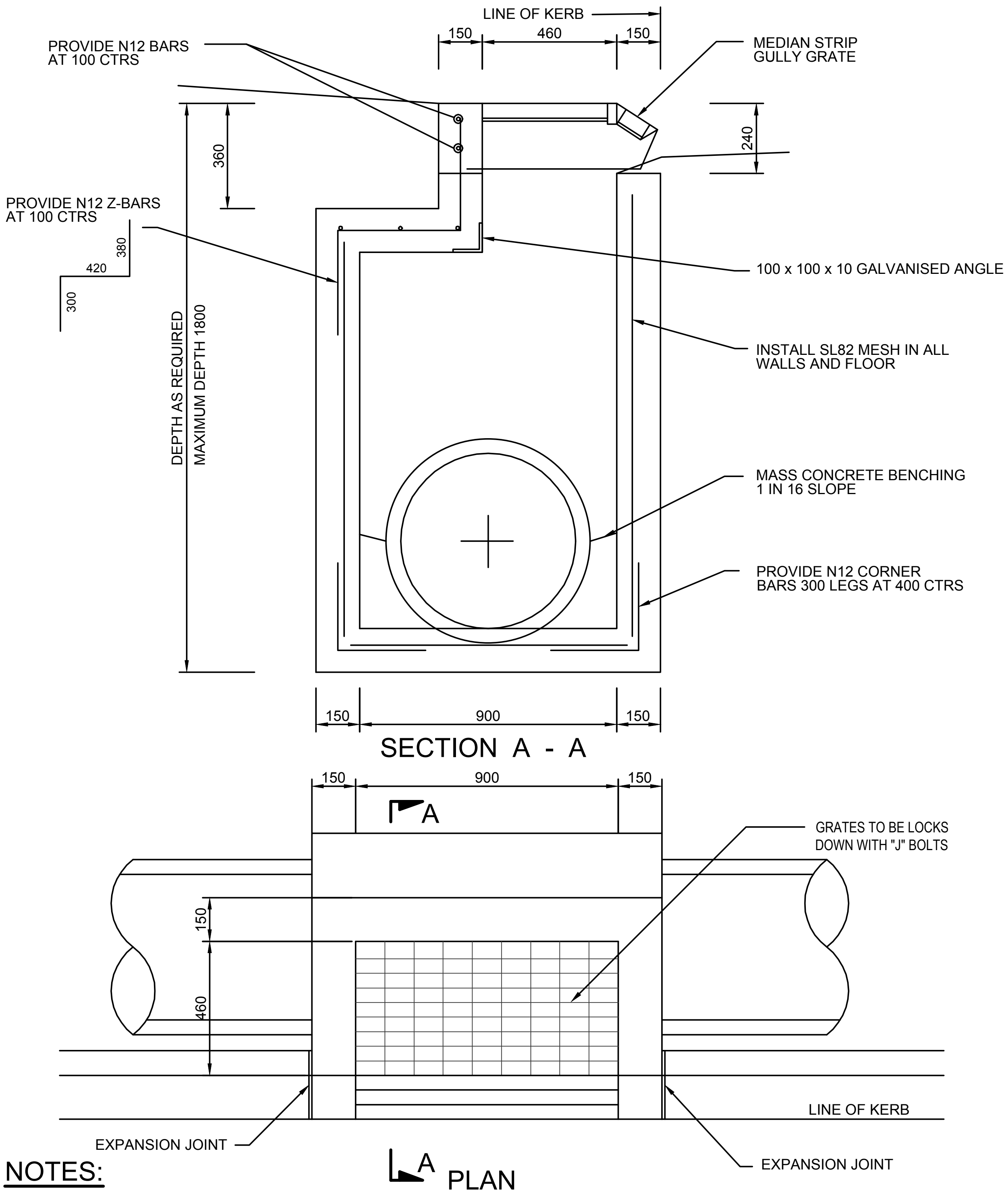
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020
PROJECT TITLE: WSPP STANDARD DRAWINGS
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:
GRATED GULLY PIT
WITH EXTENDED KERB INLET PIT

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-S06	N.T.S	1 OF 1	01	APR'21

\\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-S06.dwg
Apr 15, 2021 - 11:11am



NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. CONCRETE TO BE 25MPa @ 28 DAYS/
3. ALL REINFORCEMENT TO BE CENTRALLY LOCATED.
4. PITS GREATER THAN 2000 IN DEPTH SHALL BE DESIGNED BY A PROFESSIONAL STRUCTURAL ENGINEER.
5. WHERE DIRECTED PROVIDE 2000 OF 100Ø CORRUGATED P.V.C SUBSOIL DRAIN ON INLET SIDE OF PIT. SUBSOIL DRAIN TO BE SURROUNDED BY A MIN 300 OF 5mm AGGREGATE.
6. PROVIDE STEP IRONS AS PER SD-S09 FOR PITS DEEPER THAN 1200.
7. PITS IN AREAS OF SALINITY HAZARDS SHALL BE APPROPRIATELY DESIGNED.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

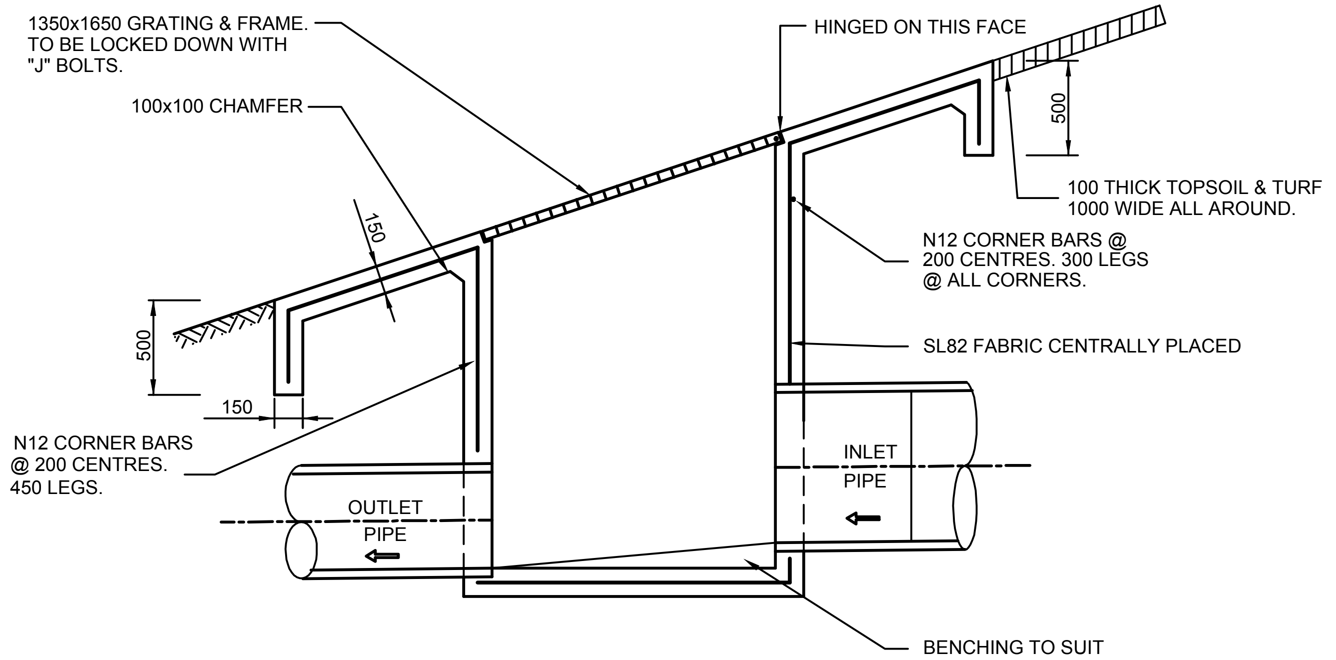
CHECKED: PWG COUNCILS
DATE: OCT 2020

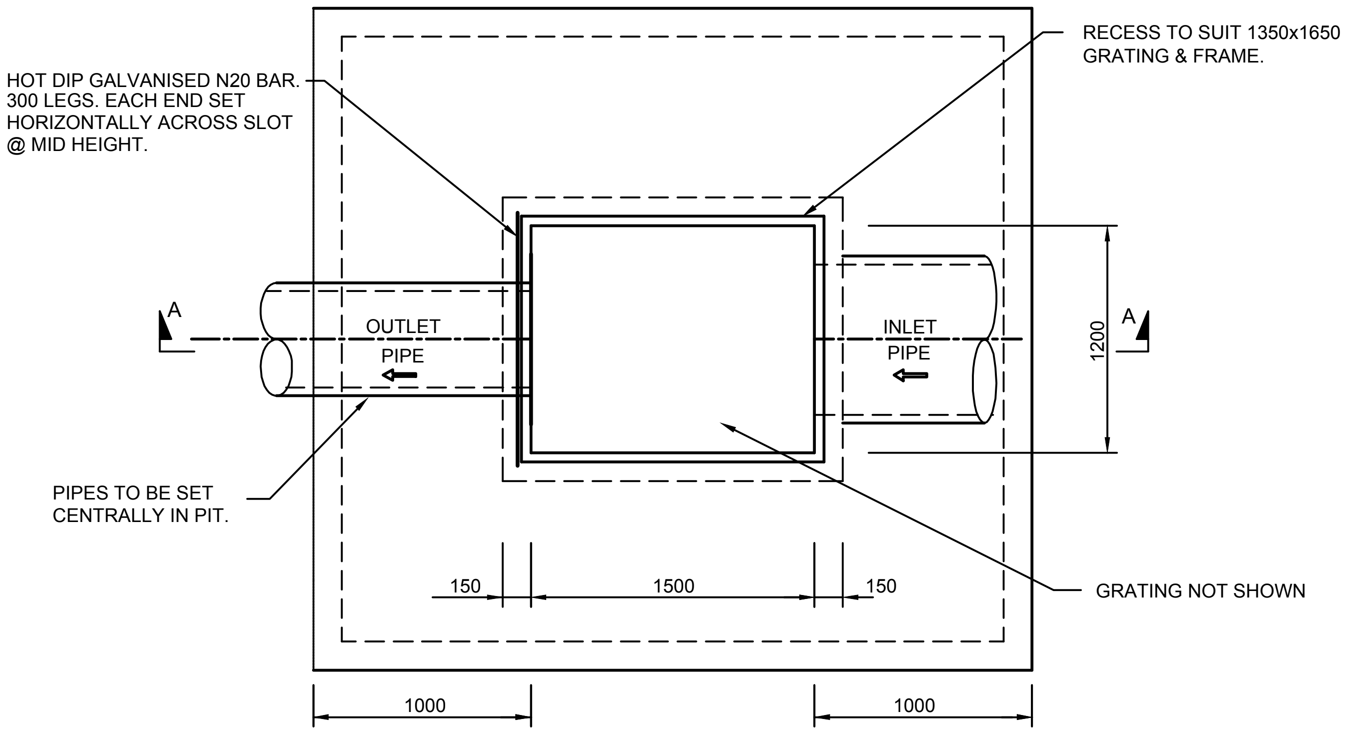
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
KERB INLET MEDIAN PIT	SD-S07	N.T.S	1 OF 1	01	APR'21

Apr 15, 2021 - 11:11am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-S07.dwg





PLAN

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. CONCRETE TO BE 25MPa @ 28 DAYS/
3. ALL REINFORCEMENT TO BE CENTRALLY LOCATED.
4. PITS GREATER THAN 2000 IN DEPTH SHALL BE DESIGNED BY A PROFESSIONAL STRUCTURAL ENGINEER.
5. WHERE DIRECTED PROVIDE 2000 OF 100Ø CORRUGATED P.V.C SUBSOIL DRAIN ON INLET SIDE OF PIT. SUBSOIL DRAIN TO BE SURROUNDED BY A MIN 300 OF 5mm AGGREGATE.
6. PROVIDE STEP IRONS AS PER SD-09 FOR PITS DEEPER THAN 1200.
7. PITS IN AREAS OF SALINITY HAZARDS SHALL BE APPROPRIATELY DESIGNED.
8. PROVIDE STEP IRONS AS PER SD-S09 FOR PITS DEEPER THAN 1200.
9. PITS IN AREAS OF SALINITY HAZARDS SHALL BE APPROPRIATELY DESIGNED.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
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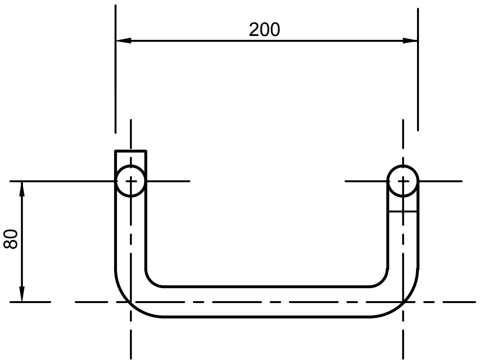
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

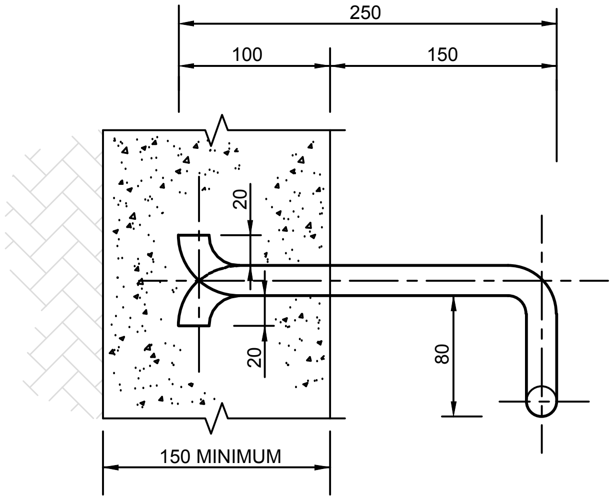
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

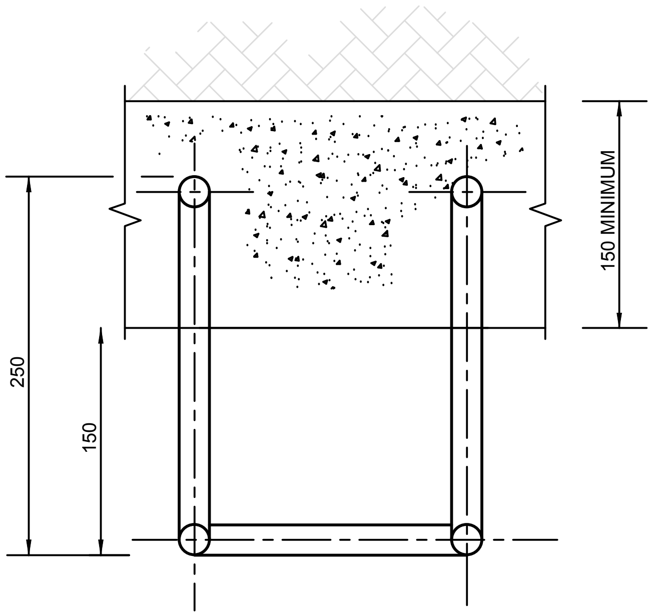
SHEET TITLE	STD DWG No.	SCALE	SHEET	VERSION	DATE
SURCHARGE PIT	SD-S08	N.T.S	1 OF 1	01	APR'21



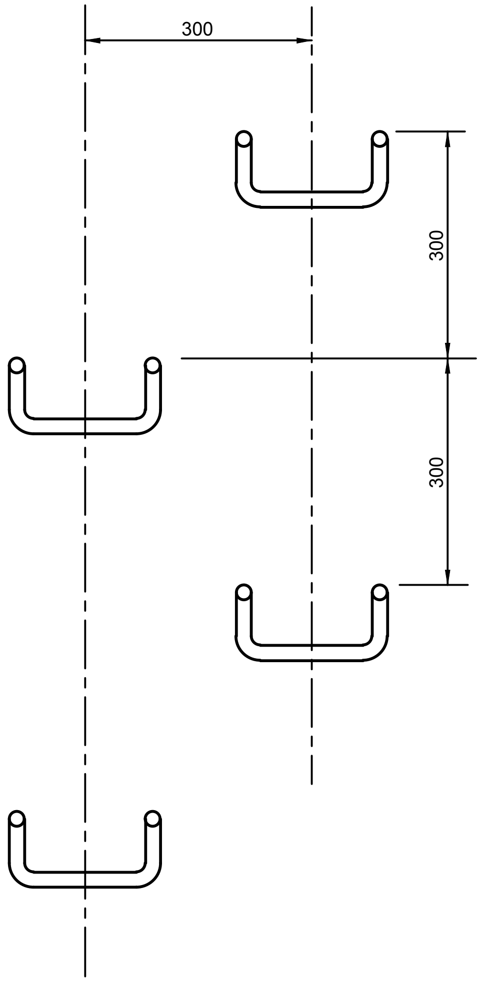
FRONT ELEVATION



SIDE ELEVATION



PLAN



STEP IRON PLACEMENT DIAGRAM

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. STEP IRONS TO BE FABRICATED FROM Ø20 M.S. BARS
3. ALL BENDS TO BE FORMED AROUND Ø12 PIN
4. STEP IRONS TO BE HOT DIPPED GALVANIZED.
5. FIRST STEP IRON 300 FROM TOP OF PIT

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

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00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

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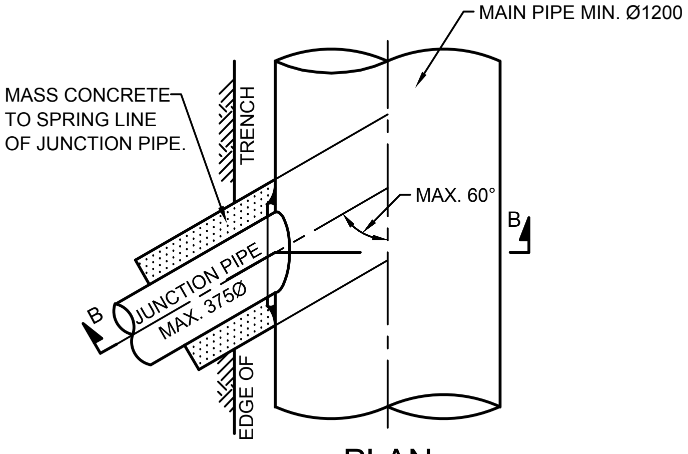
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

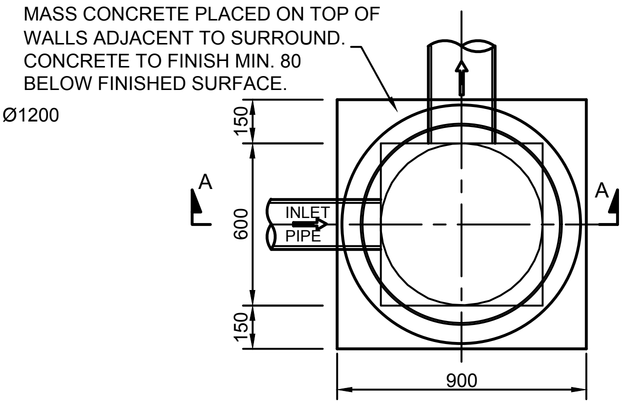
SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
STEP IRONS	SD-S09	N.T.S	1 OF 1	01	APR'21

TYPICAL DIRECT CONNECTION OF SMALL PIPE AND LARGE PIPE

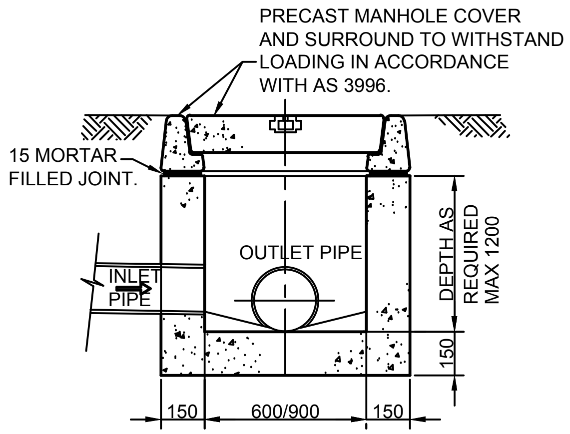


PLAN

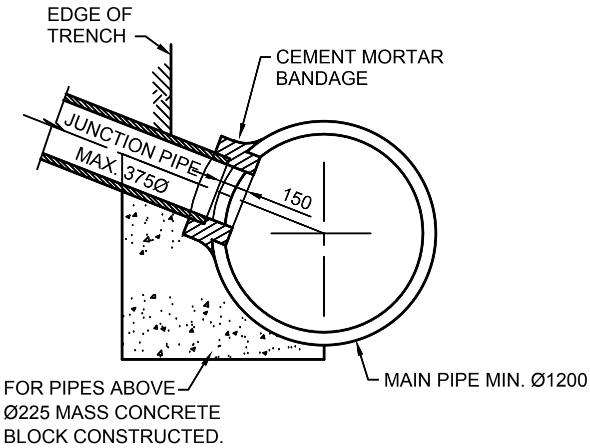
CONCRETE INSPECTION PIT



PLAN

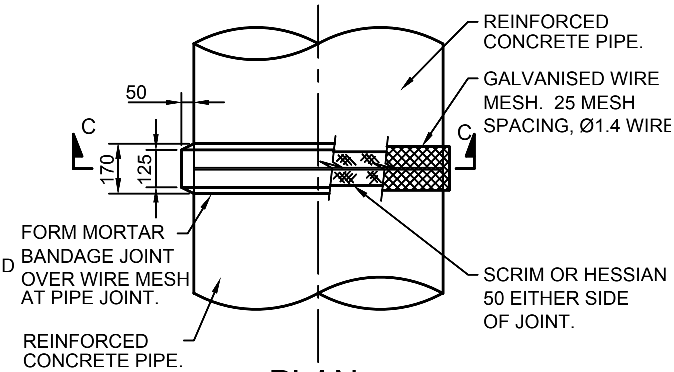


SECTION A- A

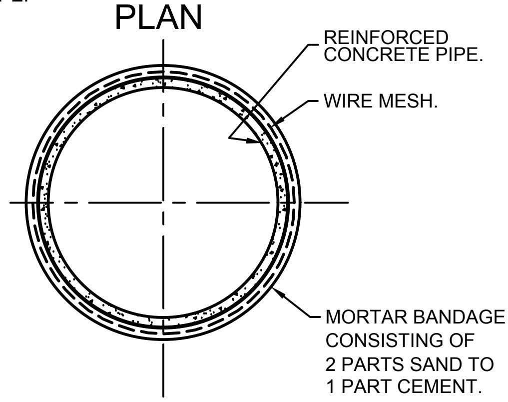


SECTION B - B

BANDAGE JOINT DETAILS

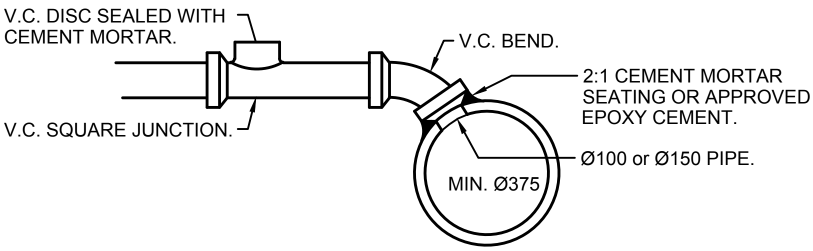


PLAN



SECTION C - C

CONNECTION OF DRAINAGE LINES TO R.C.PIPE



THE R.C. STORMWATER PIPE SHALL BE PIERCED BY A NEAT OPENING AS SHOWN, TO ALLOW THE CONNECTION OF A VITRIFIED CLAY SQUARE, SLOPED JUNCTION OR BEND WHICH SHALL NOT PROTRUDE BEYOND THE INNER SURFACE OF THE R.C. STORMWATER PIPE.
THE INTERNAL JUNCTION SHALL BE SMOOTHLY FINISHED WITH 2:1 CEMENT MORTAR SO AS TO PRESENT NO OBSTRUCTION WITHIN THE INTERNAL CHANNEL OF THE R.C. STORMWATER PIPE.

NOTES:

1. COMPRESSIVE STRENGTH F'c FOR CAST IN SITU CONCRETE TO BE A MIN. 25 MPa AT 28 DAYS.
2. ALL DIMENSION ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

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WESTERN SYDNEY PLANNING PARTNERSHIP

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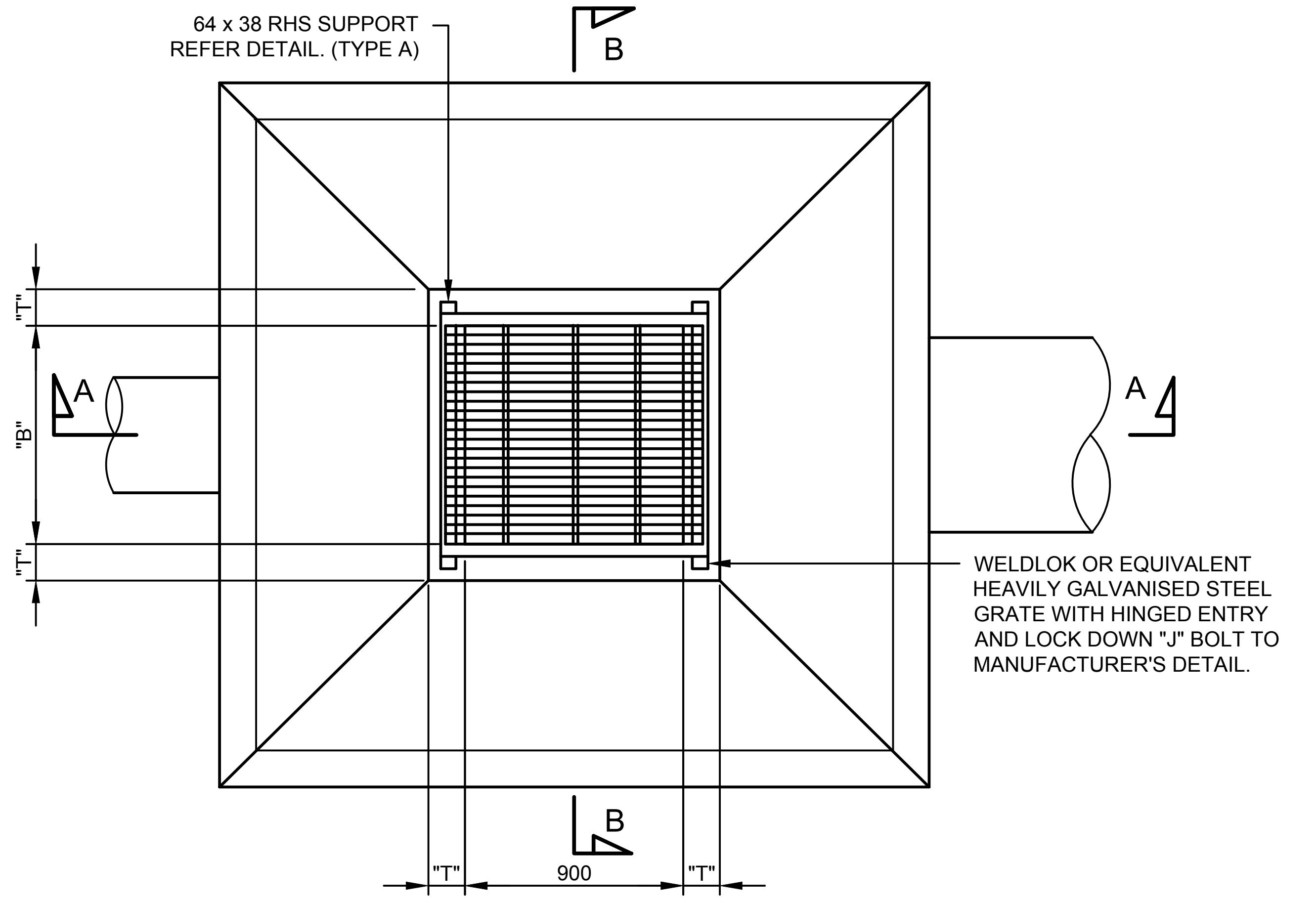
DATE: OCT 2020

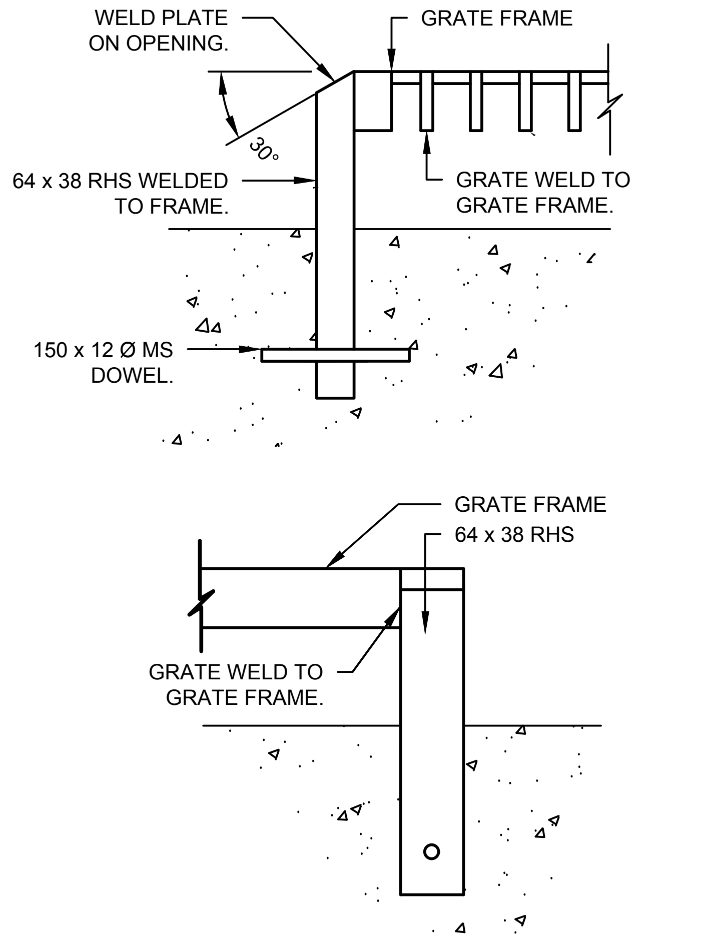
PROJECT TITLE: WSPP STANDARD DRAWINGS

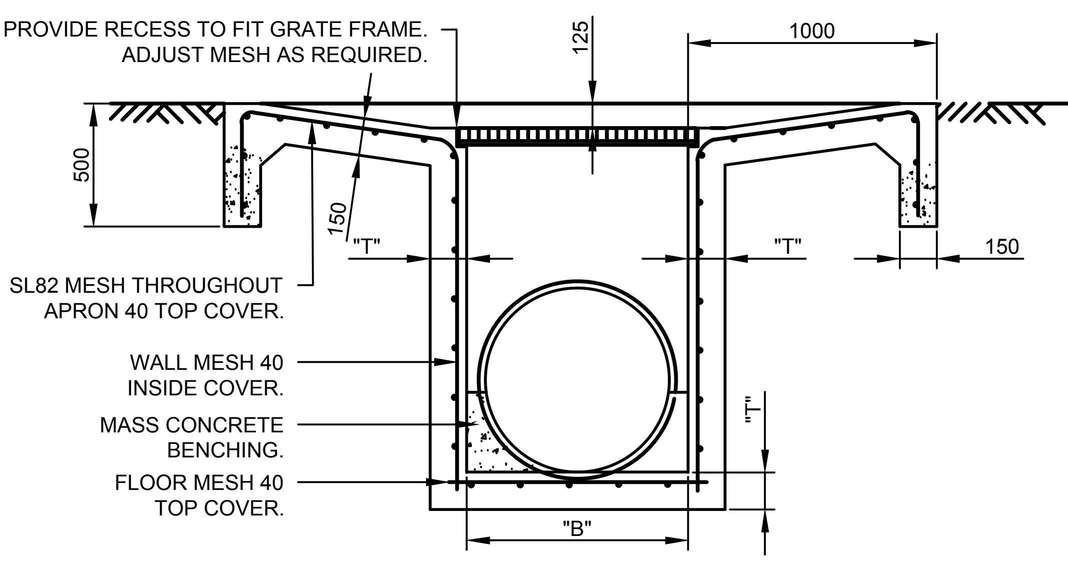
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
MINOR DRAINAGE CONNECTIONS	SD-S10	N.T.S	1 OF 1	01	APR'21



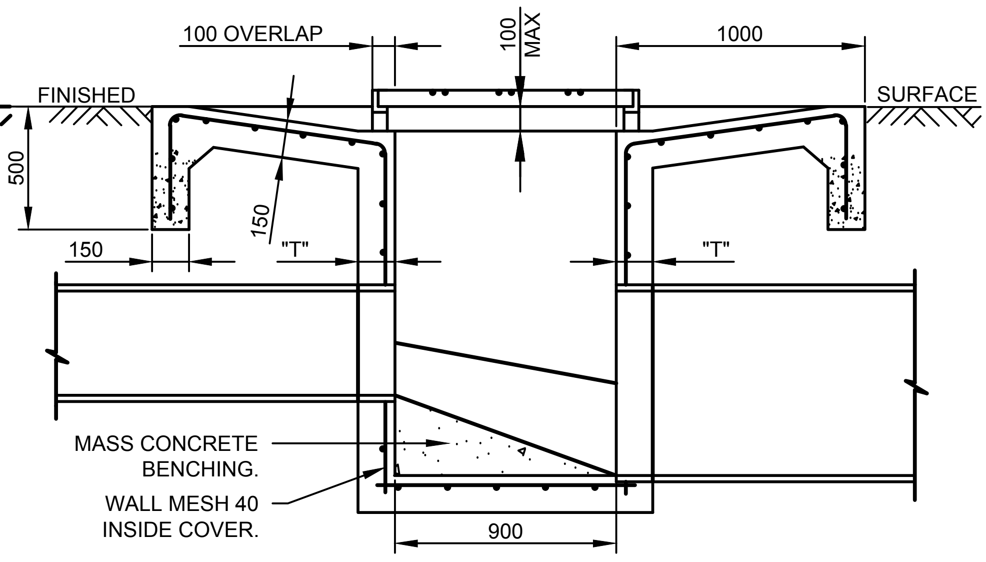
PLAN - PIT TYPE A and B TYPICAL
DETAIL SURFACE INLET TO SUIT
PIPES UP TO 1500mm DIA.





SECTION B - B

PIT TYPE B - FLUSH GRATE



SECTION A - A

PIT TYPE A - RAISED GRATE

NOTES:

1. ALL CONCRETE TO HAVE A MINIMUM STRENGTH OF N25 UNLESS OTHERWISE NOTED.
2. APPROVED STEP IRONS SHALL BE PROVIDED
   WHERE THE PIT EXCEEDS 1200 IN DEPTH. REFER TO SD-S09.
3. GRATES MUST BE CLASS C FOR NON-ROAD INSTALLATION AND CLASS D FOR ROAD INSTALLATION. CLASSES AS DEFINED A.S.3996.
4. GRATE LEGS TO BE WELDED TO FRAME PRIOR TO GALVANISING. (TYPE A)
5. ALL CONCRETE WORK TO BE A MINIMUM OF 150 THICK.
6. MASS CONCRETE BENCHING TO PIPE CENTRELINE MUST BE PROVIDED AS INDICATED.
7. WHERE SITE CONDITIONS DICTATE, THE SUPERVISING ENGINEER MAY INCLINE THE PIT TOPS TO AN UPPER LIMIT OF 1 VERT. IN 4 HORIZ. NO ALTERNATION TO EINFORCEMENT IS REQUIRED, HOWEVER, THE ENTIRE PIT ROOF (AND ACCOMPANYING APRONS) ARE TO REMAIN PLANAR.
8. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
9. PITS IN AREAS OF SALINITY HAZARD SHALL BE APPROPRIATELY DESIGNED.

DETAIL SHOWING CONNECTION OF RAISED GRATE TO PIT. (TYPE A)

PIT DIMENSIONS and MESH			
LARGEST PIPE CONNECTED TO PIT	DIMENSION "B"	DIMENSION "T"	MESH (WALLS and FLOOR ONLY)
UP TO 525	600	150	SL82
UP TO 750	900	150	SL82
825 - 900	1000	150	SL82
1050 - 1200	1400	150	SL82
1350	1550	200	SL82
1500	1700	200	SL102

NOTWITHSTANDING THE ABOVE TABLE, PITS DEEPER THAN 2000 TO INVERT SHALL BE STRUCTURALLY DESIGNED.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

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01	14.04.21	POST PCG AMENDMENTS	XX	XX
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WESTERN SYDNEY PLANNING PARTNERSHIP

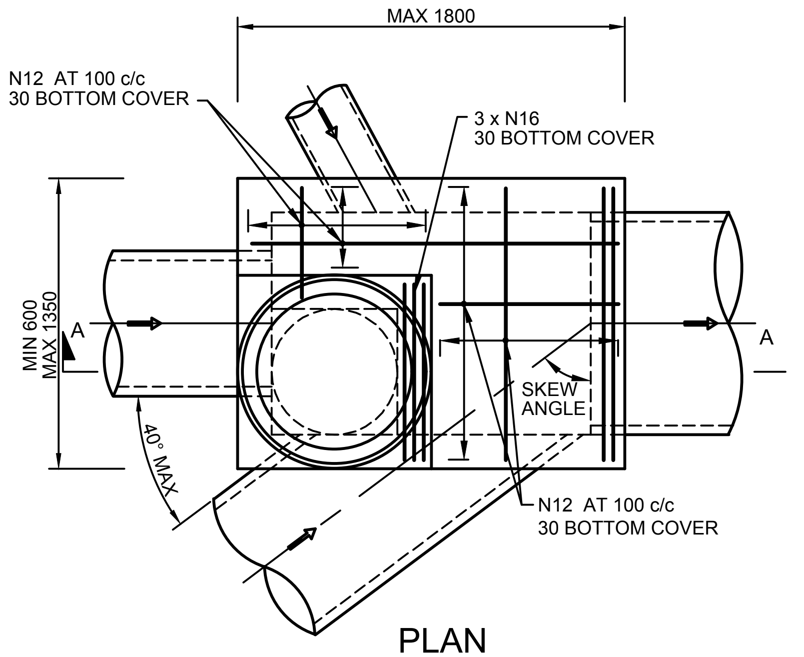
CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

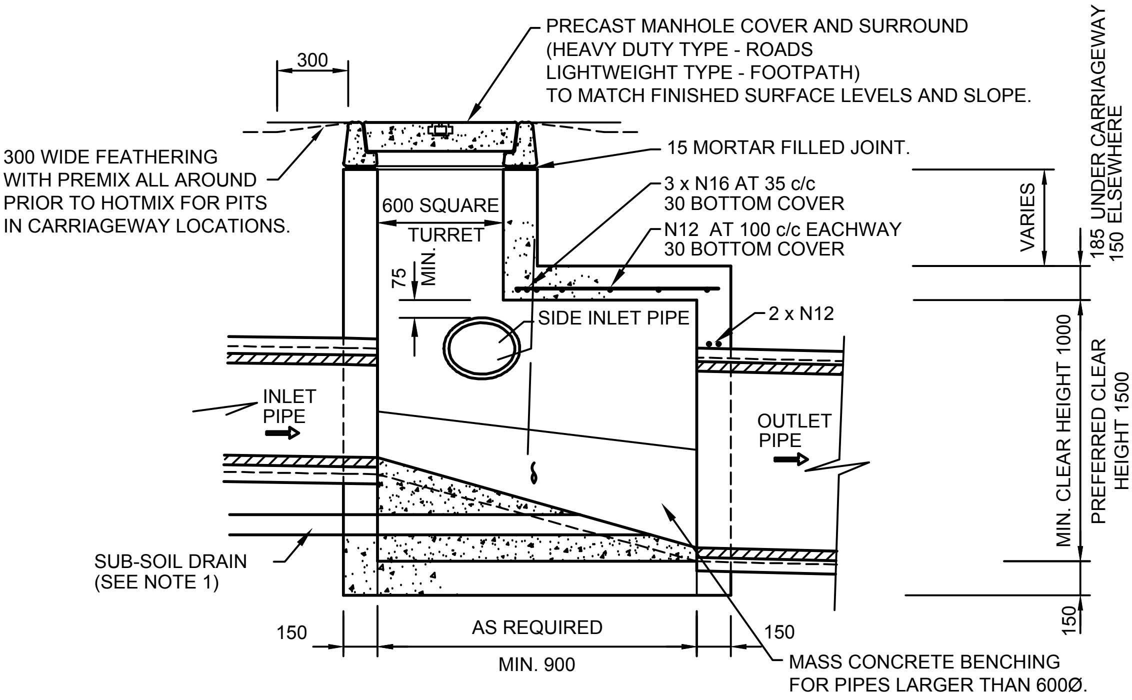
APPROVED: SAG
DATE: 14.04.21

SHEET TITLE: SURFACE INLET & LETTER BOX PIT

STD DWG No.: SD-S11
SCALE: N.T.S
SHEET: 1 OF 1
VERSION: 01
DATE: APR'21



PLAN



SECTION A - A

NOTES:

1. PROVIDE Ø100 SUB-SOIL DRAINAGE PIPE, 2000 LONG, WRAPPED IN FABRIC SOCK ADJACENT TO INLET PIPES.
2. MAXIMUM OULET PIPE ON STRAIGHT Ø900
3. MAXIMUM OUTLET PIPE ON SKEW Ø825
4. MAXIMUM SIDE ENTRY PIPW Ø825 AT APPROX. 40° SKEW.
5. MINIMUM INTERNAL DIMENSIONS:
   - LENGTH 900
   - WIDTH 700
   - HEIGHT 1000
6. CAST IN SITU CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa AT 28 DAYS.
7. WHERE PITS ARE DEEPER THAN 1200 PROVIDE STEP IRONS. REFER TO SD-S09
8. PITS DEEPER THAN 1500 SHALL BE REINFORCED WITH ONE LAYER OF SL82 TO FLOOR AND WALLS FOR THE FULL DEPTH. PITS DEEPER THAN 2000 SHALL BE STRUCTURALLY DESIGNED.
9. PITS IN AREAS OF SALINITY HAZARD SHALL BE APPROPRIATELY DESIGNED.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
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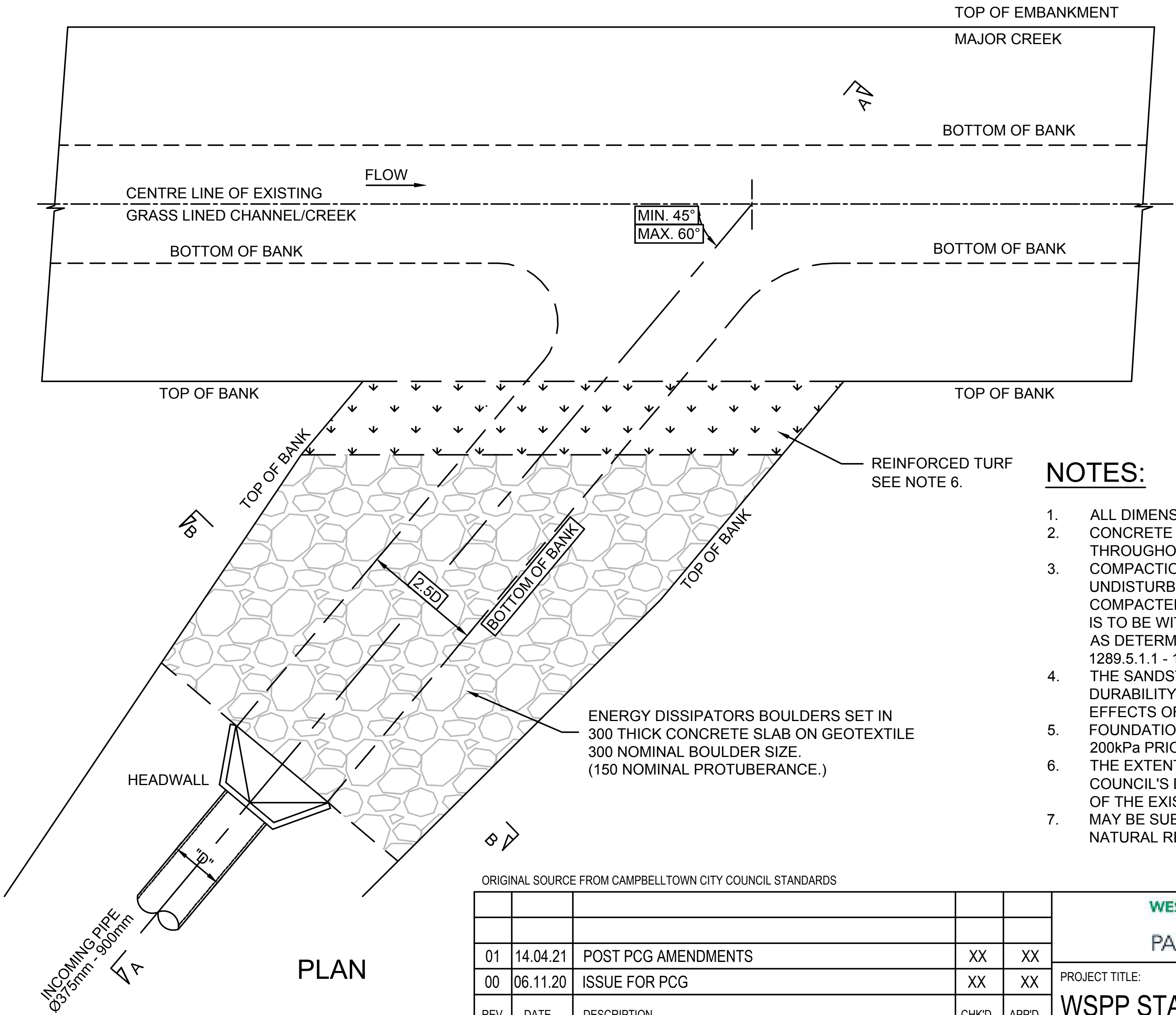
PROJECT TITLE: WSPP STANDARD DRAWINGS		CHECKED: PWG COUNCILS DATE: OCT 2020	
		APPROVED: SAG DATE: 14.04.21	
STD DWG No. SD-S12	SCALE: N.T.S	SHEET 1 OF 1	VERSION 01 DATE APR'21

SHEET TITLE:
JUNCTION PIT



PLAN

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. CONCRETE STRENGTH TO BE GRADE N32, A.S 3600 (32MPa_ THROUGHOUT UNLESS NOTED OTHERWISE.
3. COMPACTION AROUND STRUCTURES, UNDER APRONS ETC: UNDISTURBED SUBGRADE OR APPROVED MATERIAL TO BE COMPACTED TO 98% OF THE STANDARD MAXIMUM DRY DENSITY & IS TO BE WITHIN -1 TO +2% OF THE OPTIMUM MOISTURE CONTENT AS DETERMINED BY THE STANDARD COMPACTION TEST (AS 1289.5.1.1 - 1993)
4. THE SANDSTONE ROCKS TO BE USED ARE TO BE ADEQUATE DURABILITY, SO AS TO BE MINIMALLY AFFECTED BY THE ERODING EFFECTS OF WATER AND BY CHANGES IN TEMPERATURE.
5. FOUNDATION TO BE APPROVED FOR A SAFE BEARING CAPACITY OF 200kPa PRIOR TO CONSTRUCTION.
6. THE EXTENT OF REINFORCED TURF MAY BE EXTENDED AT COUNCIL'S DISCRETION GIVING CONSIDERATION TO THE STABILITY OF THE EXISTING CREEK.
7. MAY BE SUBJECT TO CONTROLLED ACTIVITY AUTHORITY FROM NATURAL RESOURCES ACCESS REGULATOR.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
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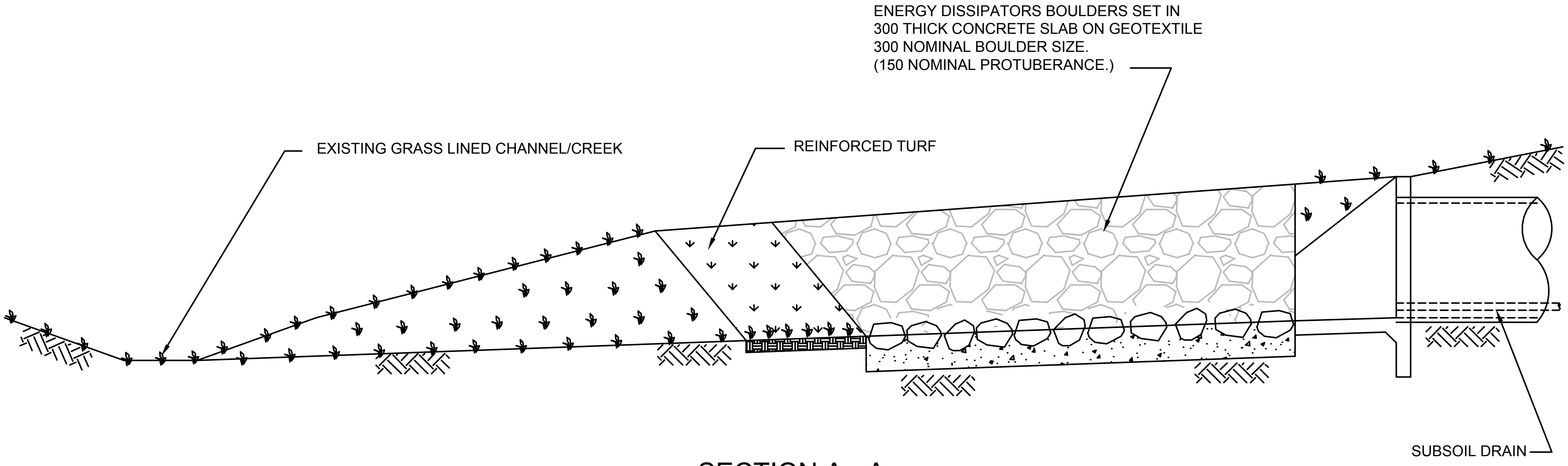
WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

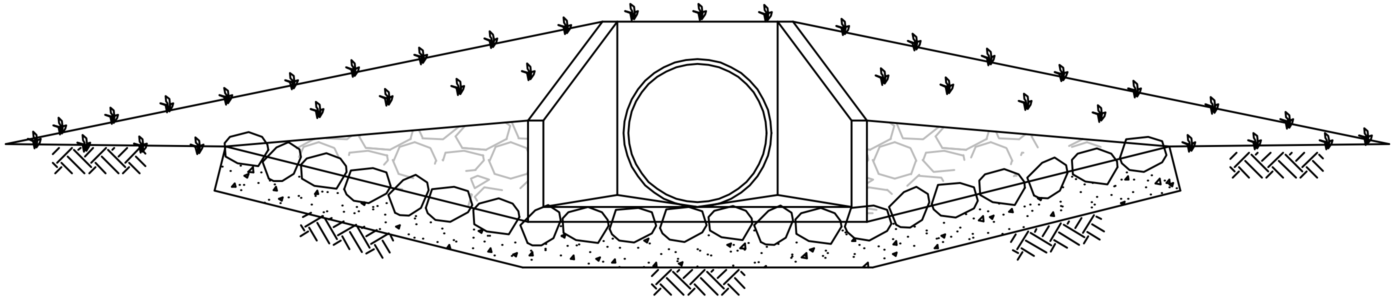
PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
OUTLET DETAILS GRASS LINED CHANNEL / CREEK	SD-S13	N.T.S	1 OF 2	01	APR'21



SECTION A - A



SECTION B - B

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

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01	14.04.21	POST PCG AMENDMENTS	XX	XX
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WESTERN SYDNEY PLANNING PARTNERSHIP

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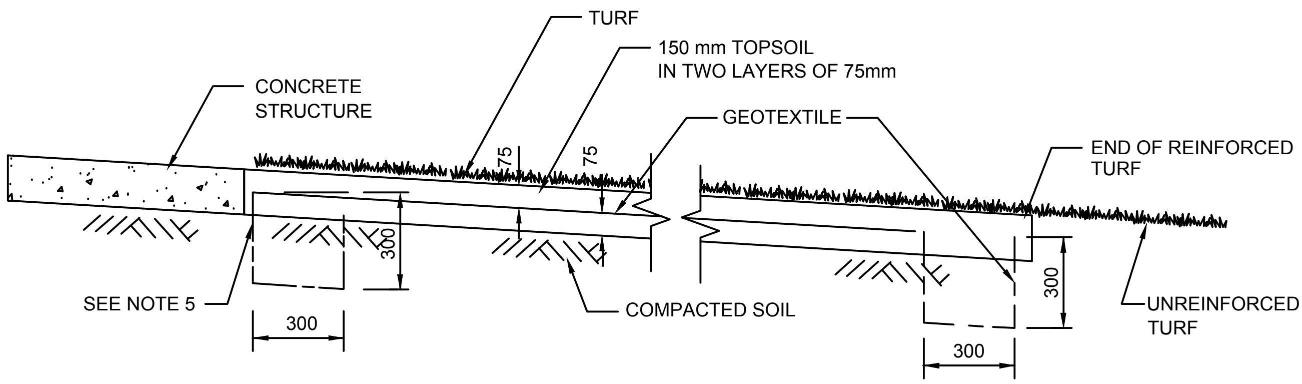
DATE:	14.04.21

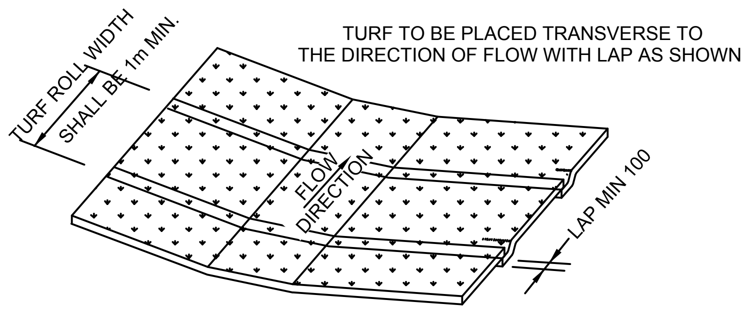
PROJECT TITLE:
WSPP STANDARD DRAWINGS

SHEET TITLE:
OUTLET DETAILS
GRASS LINED CHANNEL / CREEK

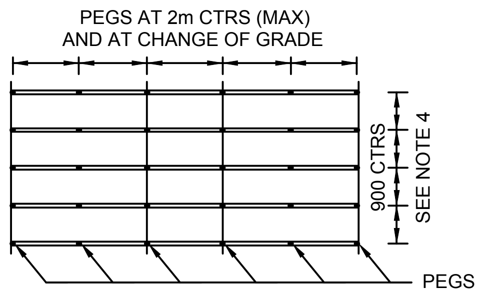
STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-S13	N.T.S	2 OF 2	01	APR'21



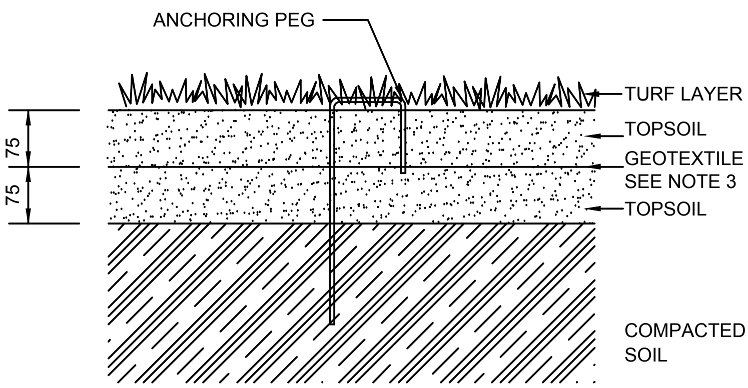
PLACEMENT OF GEOTEXTILE AT TERMINATIONS



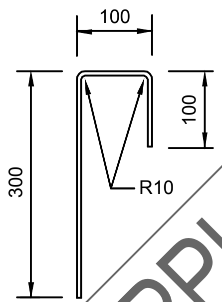
TURF LAPPING ORDER



POSITIONING OF ANCHORING PEG



ANCHORING DETAIL



DETAIL OF ANCHORING PEG

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. PEGS SHALL BE GALVANIZED Ø6 ROUND STEEL BARS.
3. GEOTEXTILE SHALL BE ENKAMAT 7018 OR SIMILAR UNLESS NOTED OTHERWISE
4. SPACING OF PEGS TO VARY DEPENDING ON WIDTH OF GRASS STRIP UP TO 2m MAXIMUM.
5. INSTALLATION OF GEOTEXTILE MUST COMMENCE AT JUNCTION WITH CONCRETE

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

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01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED: PWG COUNCILS
DATE: OCT 2020

PROJECT TITLE: WSPP STANDARD DRAWINGS

APPROVED: SAG
DATE: 14.04.21

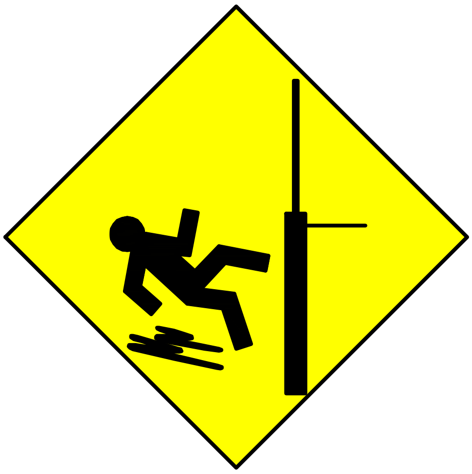
SHEET TITLE: REINFORCED TURF DETAIL

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-S14	N.T.S	1 OF 1	01	APR'21

campbelltown
city council

WARNING

FALL DANGER



CLIMBING OR
WALKING ALONG
THE WALL
IS NOT ALLOWED

30 mm LETTERING.

20 mm LETTERING.

15mm LETTERING.

NOT STANDARD

NOTES:

1. SIGN TO CONSIST OF 3mm THICK ALUMINUM & TO BE IN CORPORATE COLOURS ON A DIAMOND GRADE, WHITE REFLECTIVE
   PLATE, UV TREATED COVERED IN ANTI-GRAFFITI FILM AND COMPLY WITH A.S.1743.
2. LETTERING "WARNING" TO BE RED AND OTHERS IN BLACK.
3. THE SIGN SHALL BE 450 HIGH BY 300 WIDE WITH CORNER RADII OF 60.
4. SIGN POST SHALL BE HOT DIPPED GALVANISED, 101.6 x 5.0 CHS, 3100 LONG WITH HOT DIPPED GLAVANISED TOP END CAP. POST TO BE SET 600 DEEP INTO Ø300 MASS CONCRETE, GROUND CLEARANCE TO SIGN TO BE MINIMUM 2000.

ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE: WSPP STANDARD DRAWINGS

SHEET TITLE:	STD DWG No.	SCALE:	SHEET	VERSION	DATE
'NO CLIMBING' WARNING SIGN	SD-S16	N.T.S	1 OF 1	01	APR'21

Apr 15, 2021 - 11:11am \\192.168.5.2\synergy\Projects\WS19\WS190098\Drawings\CIV\Drawings\200825_std_drawings_rev_01\cad files\WS190098_WSPP_Campbelltown_SD-S16.dwg

30 mm LETTERING.

15mm LETTERING.

NOTES:

1. SIGN TO CONSIST OF 3mm THICK ALUMINUM & TO BE IN CORPORATE COLOURS ON A DIAMOND GRADE, WHITE REFLECTIVE
PLATE, UV TREATED COVERED IN ANTI-GRAFFITI FILM AND COMPLY WITH A.S.1743.
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ORIGINAL SOURCE FROM CAMPBELLTOWN CITY COUNCIL STANDARDS

REV.	DATE.	DESCRIPTION	CHK'D	APP'D
01	14.04.21	POST PCG AMENDMENTS	XX	XX
00	06.11.20	ISSUE FOR PCG	XX	XX

WESTERN SYDNEY PLANNING PARTNERSHIP

CHECKED:	PWG COUNCILS
DATE:	OCT 2020
APPROVED:	SAG
DATE:	14.04.21

PROJECT TITLE:
WSPP STANDARD DRAWINGS

SHEET TITLE:
'NO PLANTING' WARNING SIGN

STD DWG No.	SCALE:	SHEET	VERSION	DATE
SD-S17	N.T.S	1 OF 1	01	APR'21

WATER SENSITIVE URBAN DESIGN (WSUD) STANDARD DRAWINGS

DRAWING SCHEDULE

GENERAL NOTES

A. THE PURPOSE OF THESE DRAWINGS IS TO PROVIDE GENERAL DESIGN GUIDANCE ON KEY DETAILS HOWEVER THEY ARE NOT A STAND ALONE DESIGN RESOURCE. THEY SHOULD BE READ IN CONJUNCTION WITH OTHER DESIGN GUIDELINES INCLUDING:
- WSUD HANDBOOK
- BLACKTOWN CITY COUNCIL'S ENGINEERING GUIDE FOR DEVELOPMENT
- BLACKTOWN CITY COUNCIL'S WORKS SPECIFICATIONS CIVIL
- BLACKTOWN CITY COUNCIL BIORETENTION SPECIFICATION (DRAFT)
- OTHER RELEVANT GUIDELINES AS REFERENCED.

B. THESE DRAWINGS ARE INTENDED TO PROVIDE A LIST OF COMPLYING SOLUTIONS THAT COUNCIL ACCEPTS. THEY SHALL NOT BE USED TO STIFLE INNOVATION OR REPLACE SOUND ENGINEERING JUDGEMENT. ALTERNATIVE SOLUTIONS WILL BE ADDRESSED BY COUNCIL ON A MERITS BASED APPROACHED.

C. THE OSD DRAWINGS INCLUDED IN THIS SET ARE TO BE USED IN CONJUNCTION WITH COUNCIL'S ONLINE DEEMED TO COMPLY TOOL. WHILE THE ONLINE DEEMED TO COMPLY TOOL WILL HELP SIZE OSD SYSTEMS, THESE SYSTEMS WILL NEED TO BE CONSTRUCTED AND DESIGNED IN ACCORDANCE WITH THESE DRAWINGS.

D. THE BIORENTENTION DRAWINGS IN THIS SET MAY BE USED IN CONJUNCTION WITH COUNCIL'S ONLINE DEEMED TO COMPLY TOOL. THE TOOL IS APPLICABLE TO DEVELOPMENTS UP TO 4ha.

E. WHERE THERE IS A CLASH BETWEEN THESE DRAWINGS AND COUNCIL'S BIORETENTION SPECIFICATION, THE CONTRACTOR SHALL SEEK CLARIFICATION FROM COUNCIL.

F. THE STANDARD DRAWINGS SHOWN HEREIN MAY REQUIRE MODIFICATION TO SUIT LOCAL TOPOGRAPHY, SOILS, LANDSCAPE, SERVICES & SITE CONDITIONS. DESIGNS SHOULD INTEGRATE TREATMENT SYSTEMS INTO THE SURROUNDING LANDSCAPE.

G. WSUD SYSTEMS WITH STRUCTURAL ELEMENTS (e.g. RETAINING WALLS) REQUIRE SITE SPECIFIC STRUCTURAL DESIGN INPUT.

H. ALL WATER QUALITY AND QUANTITY MANAGEMENT MEASURES SHALL BE DESIGNED TO ENSURE:
- EASE OF MAINTENANCE
- ACCESS FOR MAINTENANCE
- SAFE WORK PRACTICES
- PUBLIC SAFETY AND HEALTH
- COMPLIANCE WITH DESIGN CRITERIA

REFERENCES

- ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS (CRCWSC, 2015)
- WATER BY DESIGN 2014 "BIORETENTION TECHNICAL DESIGN GUIDE"
- CATCHMENTS & CREEKS, FACT SHEETS (VARIOUS)

ABBREVIATIONS

NSL	- NATURAL SURFACE LEVEL	CL	- COVER LEVEL
FSL	- FINISHED SURFACE LEVEL	RL	- REDUCED LEVEL
U/S	- UPSTREAM	RCP	- REINFORCED CONCRETE PIPE
D/S	- DOWNSTREAM	NTS	- NOT TO SCALE
IL	- INVERT LEVEL	EDD	- EXTENDED DETENTION DEPTH
RRJ	- RUBBER RING JOINT	HGL	- HYDRAULIC GRADE LINE
UNO	- UNLESS NOTED OTHERWISE	NOM	- NOMINAL
TYP	- TYPICAL	TWL	- TOP WATER LEVEL
EY	- EXCEEDANCES PER YEAR	K_{SAT}	- SATURATED HYDRAULIC CONDUCTIVITY RATE
HDPE	- HIGH DENSITY POLYETHYLENE		
PSD	- PARTICLE SIZE DISTRIBUTION		

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

1cm at full size 0 10cm 20cm

North

Client: WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: COVER SHEET, GENERAL NOTES & LEGEND

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 1	01

Apr 15, 2021 - 11:12am

BIORETENTION SYSTEMS ARE FULLY VEGETATED FILTERS. THE ABILITY OF A BIORETENTION SYSTEM TO DETAIN AND INFILTRATE INCOMING STORMWATER IS A FUNCTION OF THE FILTER SURFACE AREA, EXTENDED DETENTION (PONDING) DEPTH, INFILTRATION RATE OF THE SURFACE AND THE HYDRAULIC CONDUCTIVITY OF THE FILTER MEDIA.

BLACKTOWN CITY COUNCIL REQUIRES **'SATURATED SYSTEMS'**. THE CONFIGURATION OF THE OUTLET IS SUCH THAT THE SYSTEM RETAINS WATER IN A 'SATURATED' ZONE. THIS IMPROVES WATER TREATMENT THROUGH BETTER PLANT SURVIVAL. THE RECOMMENDED MINIMUM DEPTH OF THIS ZONE IS 400mm, IN LARGE SYSTEMS THE TOP OF THE SATURATED ZONE SHOULD BE 200mm BELOW THE BOTTOM OF THE FILTER MEDIA LAYER, WITHIN THE TRANSITION LAYER. THIS MAY BE REDUCED IN SMALL SYSTEMS SUBJECT TO HGL CALCULATIONS.

SATURATED SYSTEMS MUST BE LINED TO PREVENT EXFILTRATION & RETAIN WATER.

MEDIA PROPERTIES

A TYPICAL BIORETENTION SYSTEM HAS 3 LAYERS; A DRAINAGE LAYER, A TRANSITION LAYER AND THE FILTER MEDIA LAYER. GEOFABRIC IS **NOT** TO BE PLACED BETWEEN THE LAYERS OF MEDIA, OR SOCKS PLACED ON SUB-SOIL DRAINAGE.

THE MEDIA SHOULD BE PLACED IN LIFTS NO DEEPER THAN 250mm THICK AND LIGHTLY COMPACTED. A MAXIMUM OF ONE PASS WITH A SMALL VIBRATING COMPACTOR OR EQUIVALENT. EQUIPMENT SHOULD NOT BE USED FOR MEDIA PLACEMENT THAT WOULD INADVERTANTLY COMPACT THE LAYERS AND AFFECT THE INFILTRATION RATES OF WATER THROUGH THE MEDIA.

FILTER MEDIA SPECIFICATIONS

THE FILTER MEDIA IS THE TOP LAYER AND THE GROWING MEDIUM. MEDIA SHALL BE IN ACCORDANCE WITH THE PROPERTIES LISTED IN TABLE 3 *ADOPTION GUIDELINES FOR STORMWATER BIOFILTRATION SYSTEMS* (CRC FOR WSC, 2015). AS MODIFIED BELOW:

DEPTH	500mm TYP BUT VARIES DEPENDING ON SYSTEM SCALE AND SIZE
MATERIAL	EITHER AN ENGINEERED MATERIAL - A WASHED, WELL GRADED SAND - OR NATURALLY OCCURRING SAND, A MIXTURE IS PERMITTED. IT SHOULD BE FREE OF RUBBISH AND WEEDS AND NOT BE HYDROPHOBIC. AN APPROVED FILTER MEDIA IS THE (M165) MEDIA FROM BENEDICT SAND AND GRAVEL OR APPROVED EQUIVALENT.
HYDRAULIC CONDUCTIVITY	HYDRAULIC CONDUCTIVITY: A TARGET, AS BUILT OR IN-SITU SATURATED HYDRAULIC CONDUCTIVITY RATE OF THE FILTER MEDIA SHALL BE A MINIMUM OF 100mm/Hr. THE EX-SITU (EX BIN) RATE SHALL BE A MINIMUM OF 250mm/Hr AND VERIFIED, WITH INDEPENDENT NATA REGISTERED LABORATORY TEST DATA NO LONGER THAN ONE MONTH OLD. FOR ALL MUSIC MODELS ADOPT THE IN-SITU RATE OF 100mm/Hr. TESTING OF MEDIA SHALL CONFORM TO ASTM-F1815-11. EVERY 100m^3 OF MEDIA SHALL BE TESTED FOR COMPLIANCE WITH ALL SPECIFIED CRITERIA IN THIS TABLE.
PH	5.5 - 7 AS SPECIFIED FOR "NATURAL SOILS AND BLENDS" (PH : IN WATER)
ELECTRICAL CONDUCTIVITY	<1.2 DS/M AS SPECIFIED FOR "NATURAL SOILS AND BLENDS"
NUTRIENT CONTENT	LOW NUTRIENT CONTENT TOTAL NITROGEN (TN) < 1000 mg/kg NITROGEN DRAWDOWN > 0.5 (NDI) AVAILABLE PHOSPHATE (COLWELL) < 80mg/kg ORTHOPHOSPHATE < 40 mg/kg (IN BOTH STANDARD OR SATURATED SYSTEMS)
GRADING OF PARTICLES	SMOOTH GRADING - ALL PARTICLE SIZE CLASSES SHOULD BE REPRESENTED ACROSS SIEVE SIZES FROM THE 0.05mm TO THE 3.4mm SIEVE AS PER ASTM F 1632-03 (2010). ACCEPTABLE RANGE (%W/W) / RETAINED CLAY & SILT < 3% (< 0.05 mm) VERY FINE SAND 5-30% (0.05 - 0.15 mm) FINE SAND 10-30% (0.15 - 0.25 mm) MEDIUM SAND 40-60% (0.25 - 0.5 mm) COARSE SAND < 25% (0.5 - 1.0 mm) VERY COARSE SAND 0-10% (1.0 - 2.0 mm) FINE GRAVEL < 3% (2.0 - 3.4 mm) ORGANIC CONTENT ≤ 5% IMMIDIATELY PRIOR TO DELIVERY TO SITE A PSD TEST (AS1141) SHALL BE UNDERTAKEN. IF THE PSD DOES NOT COMPLY A HYDRAULIC CONDUCTIVITY TEST SHALL BE UNDERTAKEN. DELIVERY SHALL NOT BE APPROVED UNTIL THE MEDIA IS APPROVED. THERE SHOULD BE NO GAP IN THE PARTICLE SIZE GRADING AND THE COMPOSITION SHOULD NOT BE DOMINATED BY A SMALL PARTICLE SIZE RANGE. ORGANIC MATTER CONTENT SHALL BE 3% TO 5% TO SUPPORT VEGETATION.

TO AVOID MIGRATION OF THE FILTER MEDIA INTO THE TRANSITION LAYER THE PARTICLE SIZE DISTRIBUTION SHOULD BE ASSESSED TO MEET BRIDGING CRITERIA. THE SMALLEST 15% (D_{15}) OF THE TRANSITION LAYER PARTICLES MUST BE NO GREATER THAN 5 TIMES THE SIZE OF THE LARGEST 15% (D_{85}) OF THE FILTER MEDIA PARTICLES. THAT IS:

D_{15}(TRANSITION) ≤5 x D_{85}(FILTER)

ALTERNATIVE MEDIA MAY BE APPROVED AT THE DISCRETION OF COUNCIL. AS A MINIMUM DETAILED MATERIAL TESTING AND DEMONSTRATED PERFORMANCE WILL BE REQUIRED. IF ANY RECYCLED MATERIAL IS TO BE USED IT MUST BE DEMONSTRATED AT THE CONTRACTOR'S EXPENSE THAT THE MATERIAL IS BOTH INERT AND FREE OF CONTAMINANTS.

THE CONTRACTOR SHALL ARRANGE FOR IN-SITU TESTING OF THE SPECIFIED HYDRAULIC CONDUCTIVITY AT A RATE OF 2 TESTS PER 50m^2 OR PART OF & 1 TEST PER 200m^2 THEREAFTER OF FILTER MEDIA AREA FOR COMPLIANCE WITH THE ABOVE SPECIFICATION.

BATTERS:

BATTERS SHALL BE SCARIFIED WITH A ROTARY HOE. A SOIL FERTILITY REPORT SHALL BE UNDERTAKEN BY A NATA REGISTERED LAB AND QUALIFIED HORTICULTURIST / SOIL SCIENTIST. BATTERS SHALL BE AMELIORATED TO IMPROVE FERTILITY IN ACCORDANCE WITH SOIL FERTILITY REPORT. ALTERNATIVELY REMOVE TOP 200mm OF TOPSOIL AND REPLACE WITH AN IMPORTED TOPSOIL COMPLIANT WITH AS4419.

TRANSITION LAYER (MIDDLE) SPECIFICATION

THE PURPOSE OF THE TRANSITION LAYER IS TO PREVENT THE MIGRATION OF THE FILTER MEDIA INTO THE DRAINAGE LAYER. IT CREATES A LAYER BETWEEN THE FILTER MEDIA AND THE DRAINAGE LAYER. THE LAYER DEPTH IS TO BE A MIN OF 400mm THICK, IN A SATURATED SYSTEM.

THE MATERIAL MUST BE CLEAN, WELL GRADED SAND/COARSE MATERIAL CONTAINING LITTLE OR NO FINES. USE OF WELL WASHED RECYCLED GLASS IS ACCEPTABLE. AN INDICATIVE PARTICLE SIZE DISTRIBUTION IS BETWEEN 0.5mm AND 1.4mm. FINE PARTICLE CONTENT <2%. IN ADDITION TO BRIDGING CRITERIA, THE D_{15} (TRANSITION) ≥ D_{15} (FILTER) x 5, THIS CRITERIA ENSURES GREATER HYDRAULIC CONDUCTIVITY OF THE TRANSITION LAYER THAN THE MEDIA.

THE CONTRACTOR SHALL ARRANGE FOR TESTING OF THE PSD & COMPLIANCE WITH BRIDGING CRITERIA & HYDRAULIC CONDUCTIVITY OF A RATE OF 1 TEST PER 1000m^2 OF FILTER MEDIA AREA.

DRAINAGE LAYER SPECIFICATION

THIS LAYER COLLECTS STORES AND CONVEYS TREATED STORMWATER INTO A SLOTTED COLLECTION PIPE BEDDED INTO THE DRAINAGE LAYER. IT CONSISTS OF A CLEAN GRAVEL 5-7mm WASHED SCREENINGS (NOT SCORIA). THE LAYER DEPTH SHALL MAINTAIN A MINIMUM 50mm COVER OVER THE SUB SURFACE DRAINAGE PIPE. RECYCLED CONCRETE OR BRICK PRODUCTS WILL NOT BE ACCEPTED.

BRIDGING CRITERIA AS FOLLOWS APPLIES: THE D_{15} (DRAINAGE LAYER) ≤ 5 x D_{85} (TRANSITION LAYER)
HYDRAULIC CONDUCTIVITY CRITERIA APPLIES AS FOLLOWS: THE D_{15} (DRAINAGE LAYER) ≥ D_{15} (TRANSITION) x 5

THE CONTRACTOR SHALL ARRANGE FOR TESTING OF THE PSD & COMPLIANCE WITH BRIDGING CRITERIA & HYDRAULIC CONDUCTIVITY OF A RATE OF 1 TEST PER 1000m^2 OF FILTER MEDIA AREA & AND MINIMUM OF 1 TEST.

SUB SURFACE DRAINAGE PIPES

SYSTEMS > 60m LONG NEED INTERMEDIATE FLUSHING POINTS AND RISERS. THE PIPES WITHIN THE BIORETENTION SYSTEM SHOULD BE A MINIMUM 90mm (UNO) DIAMETER UPVC SLOTTED PIPE (CONSISTENT WITH AS/NZS 1254) WITH MINIMUM 1,500mm² OPENINGS/M. JOINTS TO BE RUBBER RING JOINT, BENDS SHOULD BE 45° TO ENSURE THAT THE PIPE CAN BE FLUSHED. SLOTS SHALL BE A MAXIMUM OF 4MM WIDE.

CORRUGATED PLASTIC PIPE (I.E. 'AG' PIPE) IS NOT ACCEPTABLE DUE TO THE RISK OF COMPRESSION FAILURE AND ROOT PENETRATION. THE PIPES SHALL BE:

1. SPACED AT A MAXIMUM OF 3m CENTRES.
2. DESIGNED TO CONVEY A MINIMUM FLOW OF 4.45L/S/100m^2 OF FILTER AREA. THIS WAS CALCULATED USING DARCY'S LAW AND ASSUMED EDD OF 0.3m AND FILTER MEDIA DEPTH OF 0.5m AND K_{SAT} OF 100mm/Hr.

FOR LARGE SYSTEMS, THE STANDARD DRAWINGS ADOPT DIA 150mm PIPES SPACED AT 3m CENTRES WHICH MEETS THIS CRITERIA. FOR SMALLER SYSTEMS DIA 90mm PIPES MY BE USED SUBJECT TO CONFIRMATION THE HGL REMAINS BELOW THE FILTER MEDIA (AT MAXIMUM DESIGN FLOW). HGL CALCULATIONS SHALL CONSIDER DEPTH OF WEIR FLOW (REFER DETAIL 11 &13 DRAWING WSUD 9), FRICTION & FITTING LOSSES ALONG THE LENGTH OF THE SUBSOIL DRAINAGE PIPE. ASSUME 50% OF THE DESIGN FLOW CONVEYED AT MID POINT OF PIPE.

LINERS

ALL BIORETENTION SYSTEMS ARE TO BE LINED TO RETAIN WATER. LINING CAN INCLUDE CLAY LINING (MIN. 300mm COMPACTED THICKNESS), HDPE WATERTIGHT MEMBRANE 1.5mm THICK, GEOSYNTHETIC CLAY LINERS (I.E. BENTOFIX). THE LINER IS TO EXTEND TO THE SURFACE OF THE MEDIA LAYER WHERE NO BUILDINGS ARE LOCATED NEXT TO THE SYSTEM. IF BUILDINGS ARE LOCATED NEXT TO THE SYSTEM THE LINER IS TO BE ATTACHED 100mm ABOVE THE EXTENDED DETENTION DEPTH TO THE SIDE OF THE BUILDING.

INSTALL A LAYER OF NON-WOVEN NEEDLE PUNCHED GEOFABRIC, SUCH AS BIDIM A34 OR APPROVED EQUIVALENT, UNDER AND OVER HDPE LINERS, TO MINIMISE THE RISK OF DAMAGE CAUSED BY ROCKS IN THE SUBSOIL. ALL HDPE LINERS SHALL HAVE WELDED WATER TIGHT JOINTS.

GROSS POLLUTANT TRAPS (GPTs)

A GPT IS REQUIRED UPSTREAM OF ALL BIORETENTION BASINS WHERE THE UPSTREAM CATCHMENT >2000m^2. IT MUST BE LOCATED AWAY FROM UNDERGROUND SERVICES WITH MAINTENANCE ACCESS. IF LOCATED ON PRIVATE LAND AN EASEMENT OR COVENANT WILL BE REQUIRED.

GPTs SHALL HAVE CONCRETE SURROUNDS WITH CLEAR ACCESS FOR EDUCTOR TRUCKS. THE DIMENSIONS OF THE CONCRETE SURROUND SHALL BE DETERMINED IN CONSULTATION WITH COUNCIL.

SCOUR PROTECTION:

OUTLET PIPES FROM BIORETENTION BASINS WHICH DISCHARGE TO A WATERWAY SHALL HAVE OUTLET PROTECTION IN ACCORDANCE WITH THE DETAILS SHOWN IN THESE DRAWINGS.

BIORETENTION SIZES & DIMENSIONS:

MAX FILTER AREA TO BE 1000m². IF A FILTER > 1000m^2 IS REQUIRED , USE TWO OR MORE CELLS LINKED IN PARALLEL. CELLS SHALL NOT BE IN SERIES.

TYPICAL BIORETENTION SIZES

SCALE	AREA	TYP. MAXIMUM CATCHMENT SIZE	APPLICABLE SHEETS
RAINGARDENS	<30m^2	2000m^2	4, 10, 12
SMALL	30m^2 - 100m^2	6500m^2	4, 5, 6, 8, 12, 13, 14
LARGE	>100m^2	6.5ha PER 1000m^2 CELL	3, 4, 6, 7, 8, 12, 13, 14

THE MAX WIDTH OF LARGE BIORETENTION SYSTEMS IS TO BE 15m (IF ACCESS IS AVAILABLE FROM BOTH SIDES) OR A MAXIMUM 7.5m WIDTH IF ONLY ACCESSIBLE FROM ONE SIDE. DESIGN ACCESS TRACKS IN ACCORDANCE WITH AUSTROADS PUBLICATION (AP-G34-13) FOR A 9m SERVICE VEHICLE AND AN EXCAVATOR WITH 9m REACH. ALL PARTS OF THE BASIN MUST BE REACHABLE BY EXCAVATOR.

VEGETATION, SHADING AND MULCHING

PLANTS ARE AN ESSENTIAL COMPONENT OF THE BIORETENTION SYSTEM, REMOVING POLLUTANTS AND MAINTAINING THE HYDRAULIC CONDUCTIVITY OF THE FILTER MEDIA. PLANTS MUST BE CAPABLE OF SURVIVING IN THE FILTER MEDIA ENVIRONMENT (SANDY SOIL, DRY PERIODS WITH INTERMITTENT INUNDATION). A LIST OF SUITABLE SPECIES IS INCLUDED.

PLANTS IN 50mm TUBES OR HIKO CELLS ARE SUITABLE FOR PLANTING IN BIORETENTION SYSTEMS. ESTABLISHMENT WATERING WILL BE REQUIRED.

PLANTS WILL NEED TO BE PRE-ORDERED EARLY IN THE DESIGN PROCESS TO ENSURE THEY ARE AVAILABLE AT THE DESIRED TIME. ALL PLANTS SHALL BE VIGOROUS AND HEALTHY AND FREE FROM ROOT BALLING AND WEEDS. THE PLANTS SHALL BE POTTED ON IF A DELAY OCCURS.

DESIGNS MUST CONSIDER SUNLIGHT AVAILABILITY FOR THE PLANTS. THE ORIENTATION OR DEPTH OF THE SYSTEM CAN CAUSE EXCESSIVE PLANT SHADING, ESPECIALLY IN WINTER.

BIORETENTION SYSTEMS SHALL NOT BE MULCHED. IF MULCH IS USED ON ADJACENT BATTERS IT SHALL BE PLACED SO THAT IT WILL NOT BE WASHED INTO THE BIORETENTION SYSTEM.

DURING ESTABLISHMENT EROSION OF THE BOTTOM OF ACCESS RAMPS & AROUND ALL SURCHARGE PITS SHALL BE CONTROLLED USING JUTE.

ACCESS

ACCESS FOR MAINTENANCE IS AN ESSENTIAL PART OF SYSTEM DESIGN AND OPERATION. ALL DESIGNS SHALL ENSURE EASE OF ACCESS WITHOUT UNDUE RISK TO MAINTENANCE PERSONNEL. DEEP BIORETENTION SYSTEMS SHALL INCLUDE AN ACCESS SYSTEM THAT ENSURES MAINTENANCE CREWS CAN EASILY AND SAFELY CARRY OUT REMOVAL OF LITTER, DEBRIS, SEDIMENT, REPLANTING, WEEDING AND REPLACEMENT OF THE FILTER MEDIA.

ESTABLISHMENT / STAGING OF WORKS

IT IS RECOMMENDED THAT BIORETENTION SYSTEMS BE ESTABLISHED OFF-LINE WHEREVER POSSIBLE. THIS ALLOWS VEGETATION TO ESTABLISH WITHOUT BEING IMPACTED BY HIGH STORMWATER FLOWS. DESIGN DRAWINGS SHALL SHOW TEMPORARY WORKS FOR THE ESTABLISHMENT PHASE, SUCH AS A TEMPORARY COVER ON AN INLET, TEMPORARY IRRIGATION AND TEMPORARY EROSION CONTROL. REFER TO BLACKTOWN CITY COUNCIL BIORETENTION SPECIFICATION FOR FURTHER INFORMATION. STAGES AS FOLLOWS:

WHEN INCORPORATING WATER QUALITY CONTROLS IN A SUBDIVISION DEVELOPMENT, COUNCIL REQUIRES A STAGED IMPLEMENTATION. STAGES TYPICALLY INCLUDE:

1. DURING BULK EARTHWORKS PHASE A SEDIMENT BASIN IN PLACE OF THE FINAL BIORETENTION.
2. FOLLOWING COMPLETION OF BULK EARTHWORKS A SACRIFICIAL BASIN SHOULD BE CONSTRUCTED TO HAVE THE SUBDIVISION CERTIFICATE / LINEN PLANS RELEASED.
3. ONCE 90% OF CATCHMENT DEVELOPMENT IS COMPLETE A FULLY FUNCTIONAL BIORETENTION SYSTEM IS MADE OPERATIONAL. THIS IS AT THE DISCRETION OF COUNCIL WHO MAY VARY THIS REQUIREMENT.

INSPECTION/HOLD POINTS

DURING CONSTRUCTION, IT IS CRITICAL THAT THE DESIGNER UNDERTAKE INSPECTIONS AT KEY POINTS, TO ENSURE THAT BIORETENTION SYSTEMS ARE INSTALLED ACCORDING TO THEIR DESIGN INTENT. THE FOLLOWING MINIMUM HOLD POINTS ARE REQUIRED:

STAGE	INSPECTION AND HOLD POINTS
2	COMPLETION OF BASIN BULK EARTHWORKS AND INSPECTION OF SUBGRADE INCLUDING REMOVAL OF ALL SEDIMENT.
2	INSTALLATION OF GEOTEXTILE AND LINER AS APPROPRIATE.
2	INSTALLATION OF INLET PITS AND PIPES.
2	INSTALLATION OF OUTLET PIT AND PIPES.
2	INSTALLATION OF SLOTTED PIPES AND FLUSHING POINTS.
2	PRIOR TO PURCHASE OF BIORETENTION MEDIA, TRANSITION AND DRAINAGE LAYER, PROVIDE TEST RESULTS. INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
2	INSTALLATION OF DRAINAGE LAYER. INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF TRANSITION LAYER (250mm). INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF GEOTEXTILE A16 OR SIMILAR.
3	INSTALLATION OF SACRIFICIAL MEDIA LAYER & TURF.
3	REMOVAL OF SACRIFICIAL LAYER AND GEOTEXTILE.
3	INSTALLATION OF UPFLOW PITS.
3	INSTALLATION OF PERMEABLE CONCRETE PIPES.
3	INSTALLATION OF REMAINING 200mm OF TRANSITION LAYER. INCLUDING PSD IMMEDIATELY PRIOR TO DELIVERY.
3	INSTALLATION OF FILTER MEDIA.
3	COMPLETED WORKS, INCLUDING SCOUR PADS.
3	INSITU TESTING OF FILTER MEDIA HYDRAULIC CONDUCTIVITY USING DOUBLE RING INFILTROMETER BY NATA REGISTERED OR AN APPROVED TESTER.
3	PLACEMENT OF JUTE MAT AND PLANTING.
3	CERTIFICATION OF PLANT SPECIES AND DENSITY BY HORTICULTURIST / ECOLOGIST / LANDSCAPE ARCHITECT / ENVIRONMENTAL ENGINEER.

AT EACH STAGE, CHECK THE FINISHED LEVELS AS WELL AS THE QUALITY OF COMPLETED WORK. THE SUPERINTENDENT SHALL PROVIDE CERTIFICATION VERIFYING INSTALLATION AND COMPLIANCE AT EACH STAGE.

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

North

Client
WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - STANDARD NOTES
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn XX | Date APR' 2021 | Scale N.T.S A1 | Q.A. Check PWG COUNCILS | Date OCT'20
APPROVED FOR ISSUE | Project No. WS190098 | Dwg. No. WSUD 2 | Issue 01

DESIGN NOTES:

1) BIORETENTION SYSTEMS SHALL BE DESIGNED TO ACCEPT ONLY LOW FLOWS WITH A HIGH FLOW BYPASS DIVERTED AROUND THE BIORETENTION SYSTEM.
2) GENERALLY BIORETENTION SYSTEMS ARE DESIGNED TO TREAT THE 6 MONTH PEAK FLOW BEING APPROXIMATELY THE 0.75 x 1 YEAR ARI.
3) THE ACCESS TRACK SHALL BE 4m WIDE AND GRADED WITH A 3% CROSSFALL REFER DRAWING WSUD 5 DETAIL 5. ACCESS TRACKS SHALL BE DESIGNED FOR ACCESS BY A 9m SERVICE VEHICLE. EVERY PART OF THE BASIN SHALL BE REACHABLE BY AN EXCAVATOR WITH A 9m REACH. A FILTER MEDIA WIDTH OF 15m WILL ACHIEVE THIS OBJECTIVE.
4) SUBSOIL AND PERMEABLE CONCRETE PIPES SHALL BE LAID HORIZONTAL.
5) DESIGNERS SHALL CONSIDER DEPTH OF PIPES & SPECIFY APPROPRIATE PIPE CLASSES.
6) OUTLET PIPES SHALL BE DESIGNED TO HAVE THE SAME CAPACITY AS INLET PIPES.
7) THE OVERFLOW/OUTLET PIT SHALL BE SIZED TO CONVEY THE DESIGN INFLOW SUCH THAT THE DEPTH OF FLOW, H, ABOVE THE PIT INLET LEVEL IS LIMITED TO LESS THAN 100mm USING THE WEIR EQUATION. THE DESIGNER SHALL ASSUME THAT ONLY 50% OF THE WEIR LENGTH IS AVAILABLE AND THE REMAINING 50% IS BLOCKED.
8) FOR BIORETENTION SYSTEMS UP TO 600 m^2, 2 OFF UPFLOW PITS SHALL BE USED. FOR BIORETENTION SYSTEMS > 600 m^2, 4 OFF UPFLOW PITS SHALL BE PROVIDED WITH PERMEABLE CONCRETE PIPES AS SHOWN.
9) PERMEABLE CONCRETE PIPE WITH A MINIMUM IMPEDED EXFILTRATION RATE OF 0.6L/s/m OF PIPE SHALL BE PROVIDED AT A RATE OF 4m OF PIPE PER 100m^2 OF FILTER AREA. . CURRENTLY HYDROCON PIPES SATISFY THIS CRITERIA.
10) UPFLOW PITS SHALL BE LOCATED ON EDGE OF FILTER MEDIA AS SHOWN AND SPACED TO ALLOW AN EVEN DISTRIBUTION OF WATER INTO THE BIORETENTION SYSTEM WITH A MAXIMUM SPACING OF 20m.
11) LINER TO BE IN ACCORDANCE WITH DETAIL 6. DRAWING WSUD 5.

LEGEND

DISTRIBUTION PIPE Ø300mm, RCP RRJ

PERMEABLE CONCRETE PIPE. REFER NOTE 9

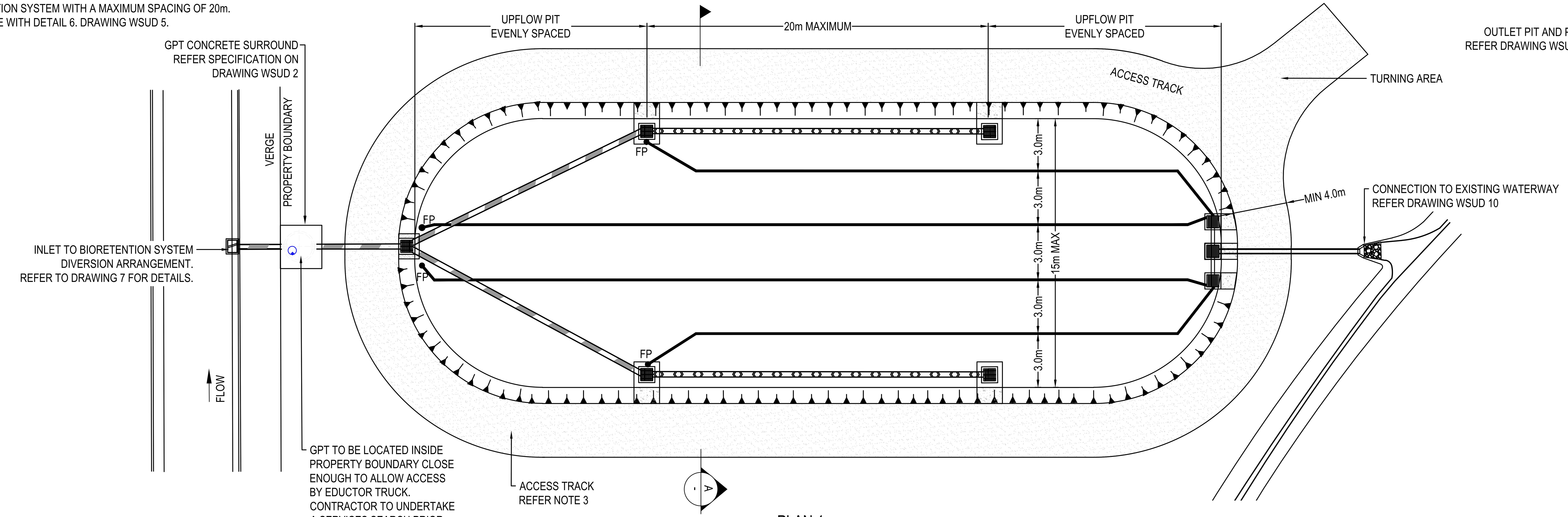
SUBSOIL DRAINAGE PIPE REFER DRAWING SWUD 5 DETAIL 4

SUBSOIL FLUSHING POINT REFER DRAWING WSUD 5 DETAIL 4 & 7 (FP)

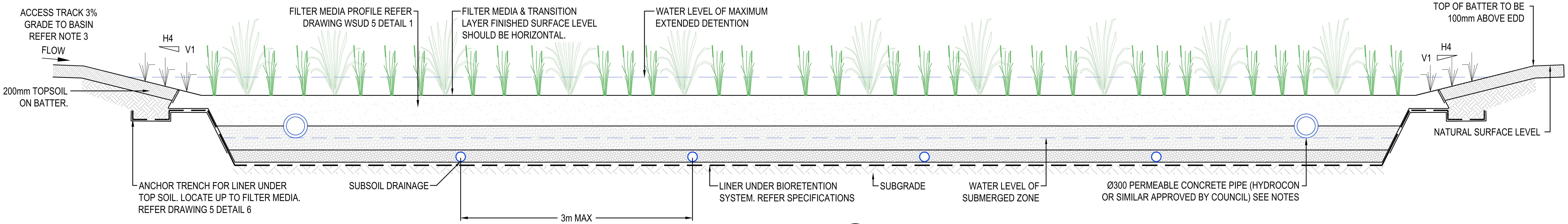
UPFLOW PIT TO BE IN ACCORDANCE WITH DRAWING WSUD 8 DETAIL 9

SYSTEM INLET PIT TO BE IN ACCORDANCE WITH DRAWING WSUD 8 DETAIL 10

OUTLET PIT AND PIPE REFER DRAWING WSUD 9



PLAN 1
TYPICAL BIORETENTION SYSTEM - SINGLE CELL
NTS



SECTION A
NTS

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00	ISSUE FOR PCG	06.11.20	XX	XX

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Client: WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: BIORETENTION - GENERAL ARRANGEMENT SHEET 1

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

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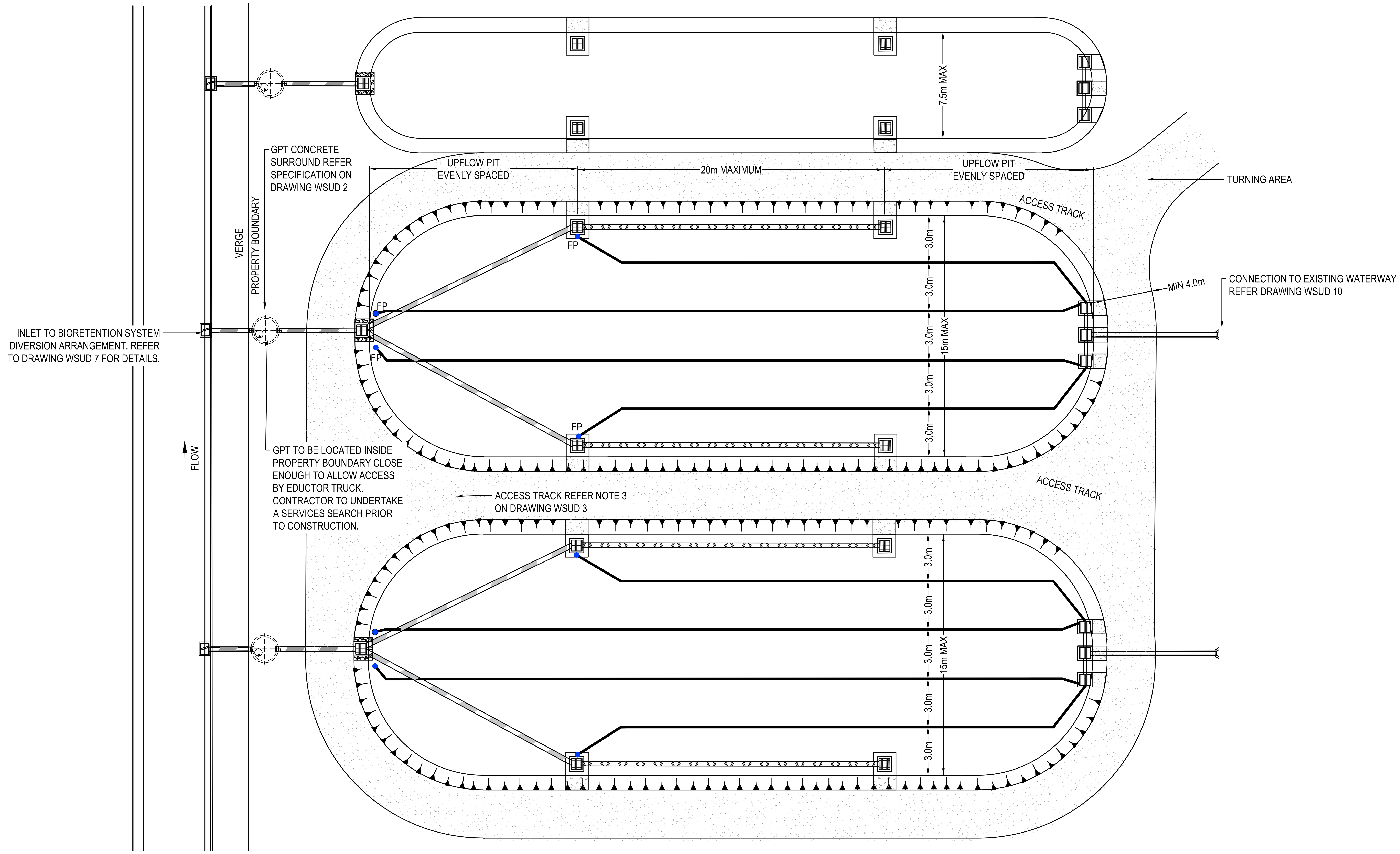

PLAN 2
TYPICAL BIORETENTION SYSTEM - MULTIPLE CELL
NTS

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-1 0 1cm at full size 10cm 20cm

North

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - GENERAL ARRANGEMENT SHEET 2

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

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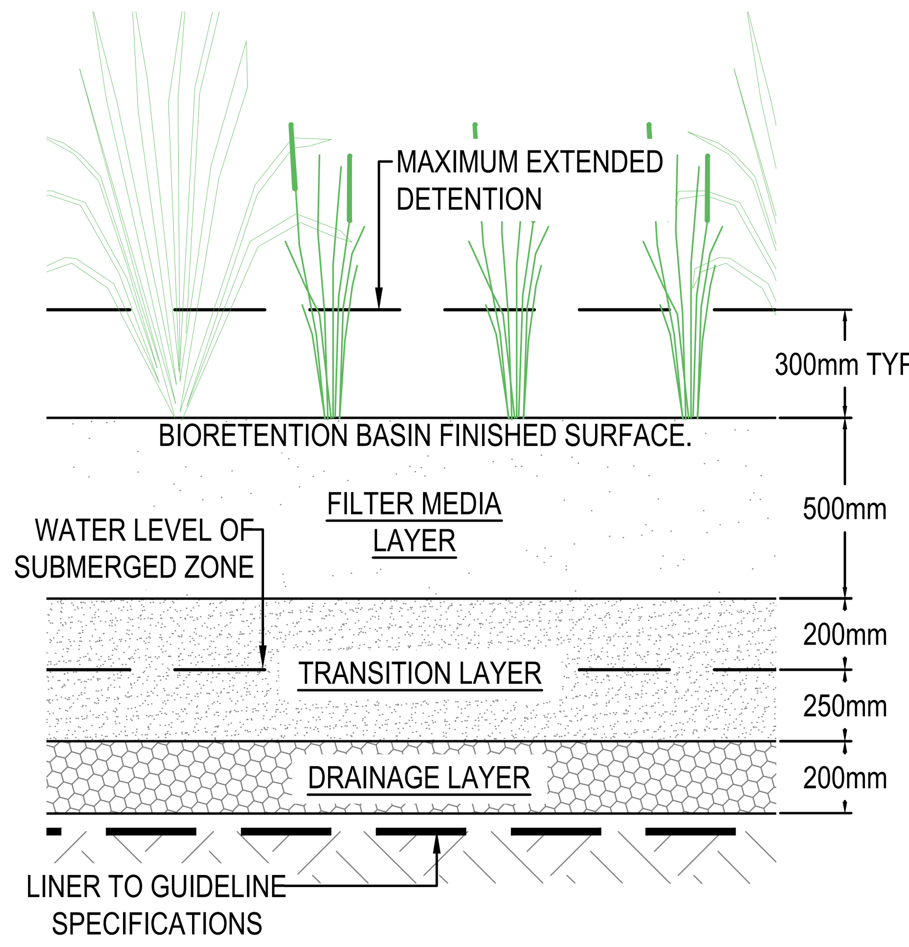
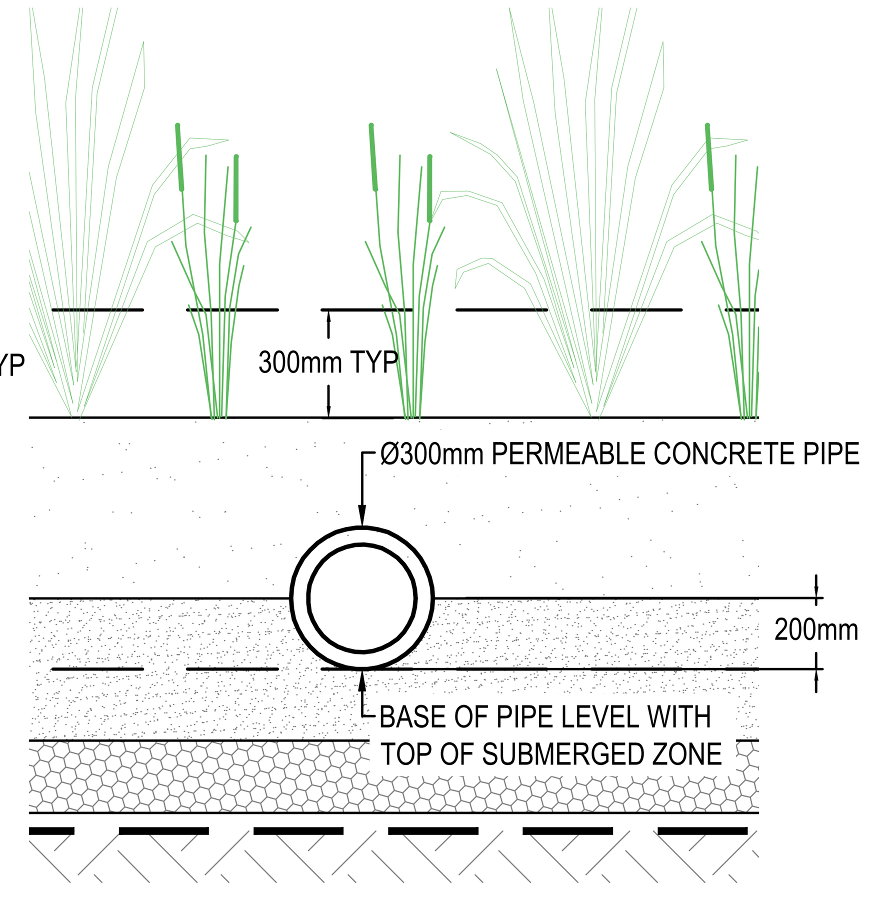
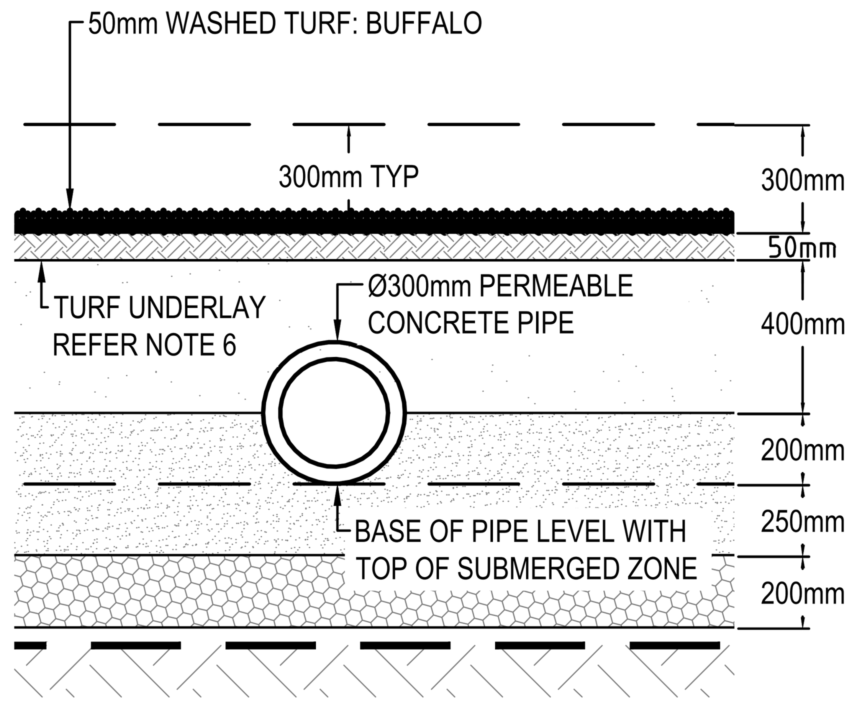


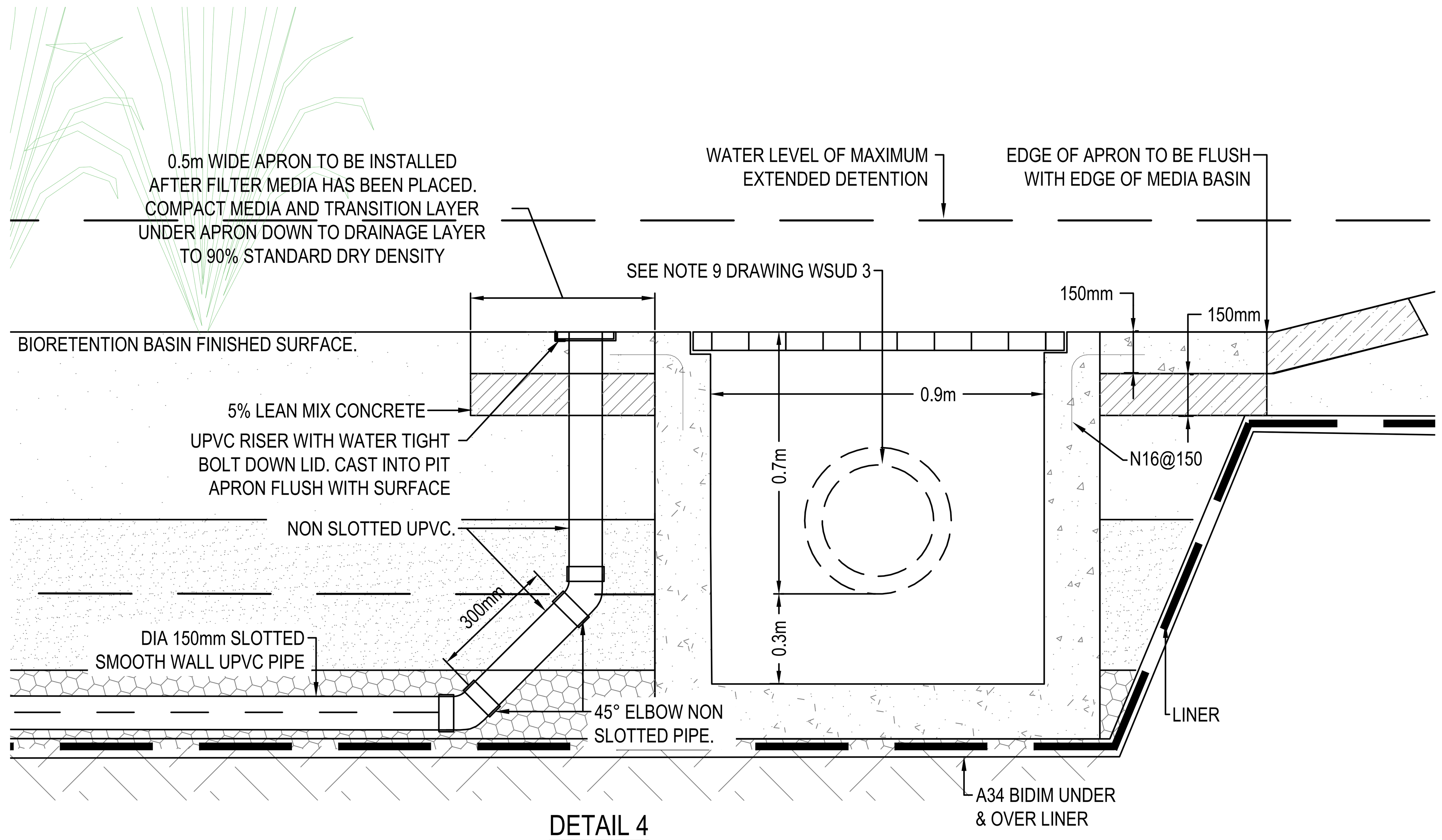
DETAIL 1
TYPICAL BIORETENTION FILTER PROFILE
NTS



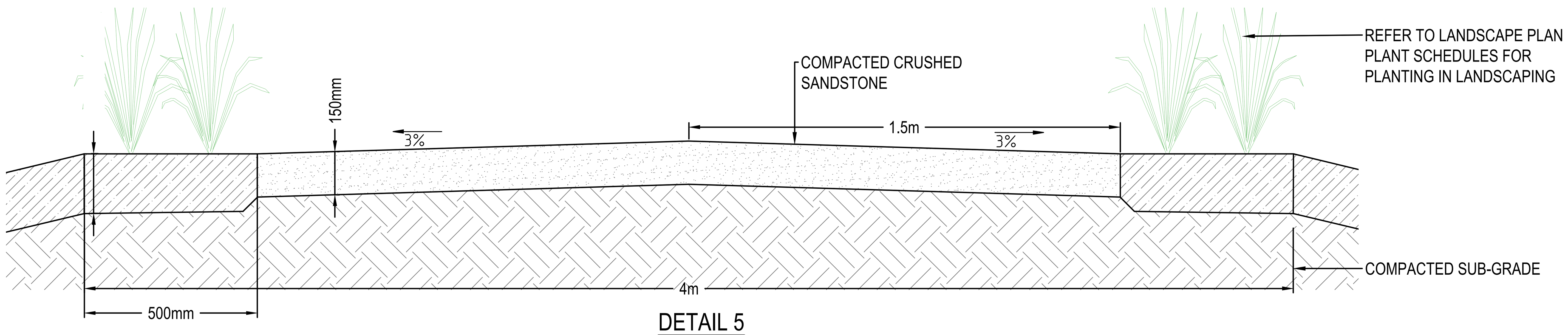
DETAIL 2
BIORETENTION FILTER PROFILE INCLUDING PERMEABLE CONCRETE PIPE
NTS



DETAIL 3
FILTER PROFILE FOR GRASSED SYSTEMS INCLUDING PERMEABLE CONCRETE PIPE
NTS



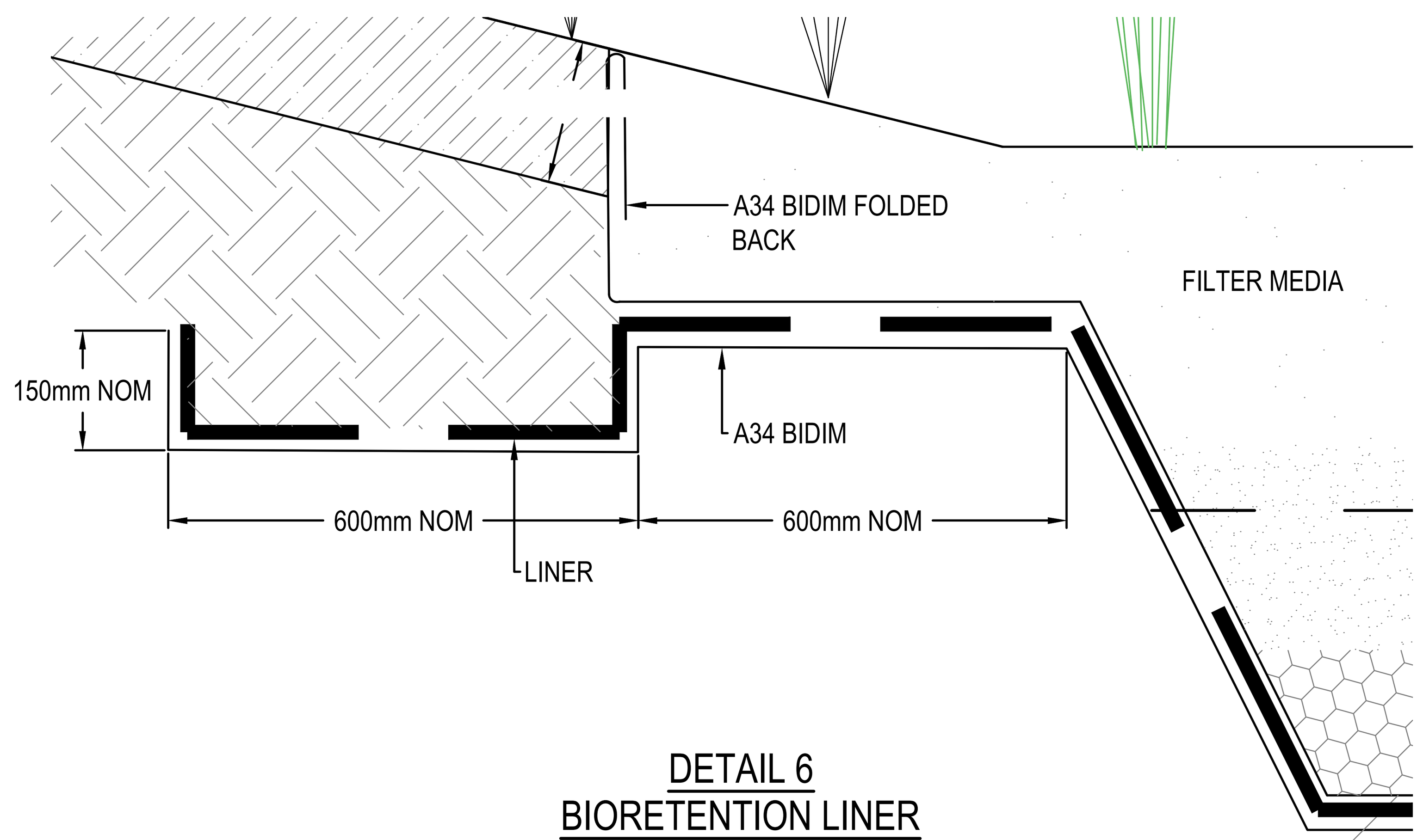
DETAIL 4
UPFLOW PIT, FLUSHING POINT AND DISTRIBUTION PIPE TYPICAL SECTION
NTS



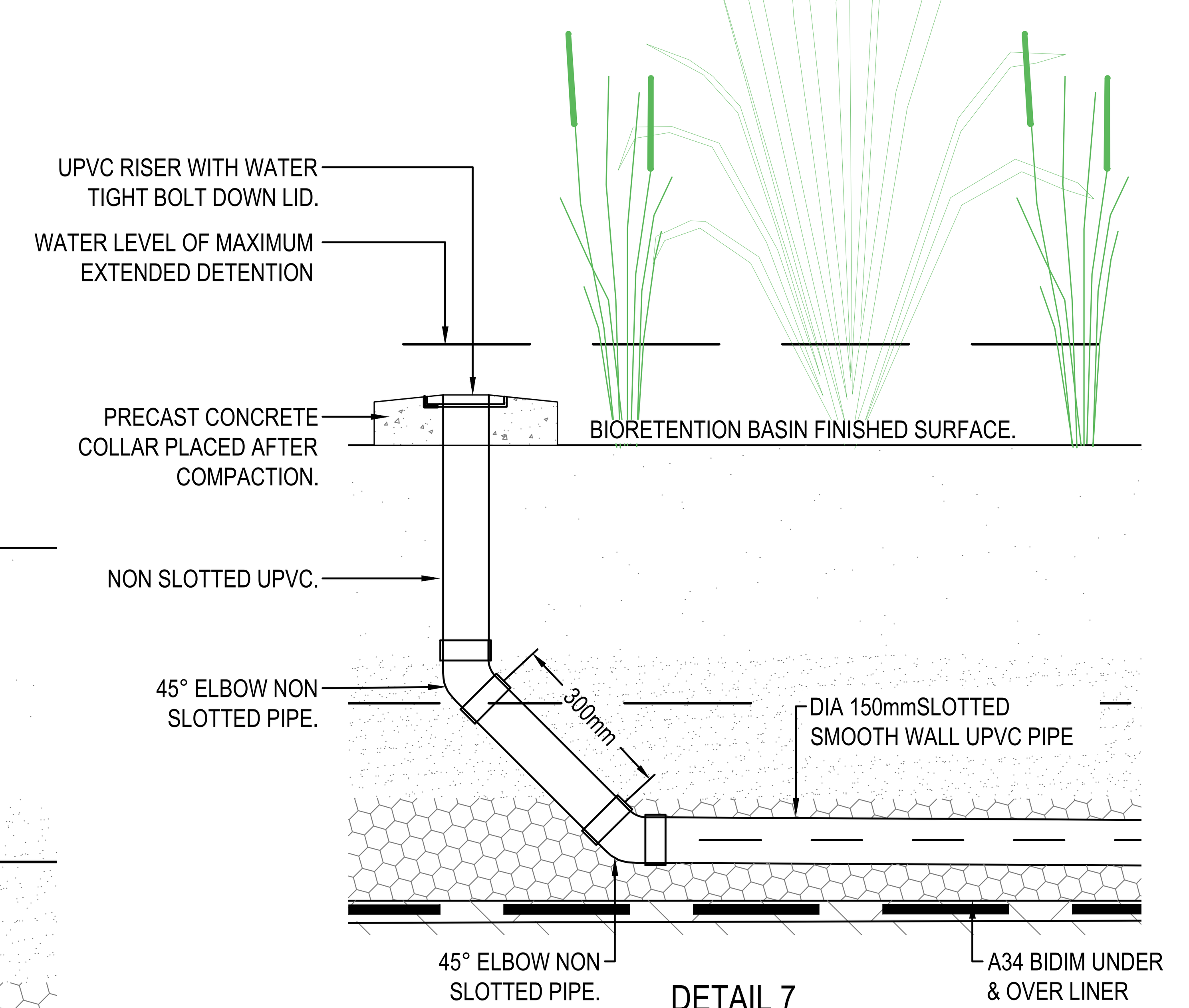
DETAIL 5
MAINTENANCE ACCESS TRACK
NTS

DESIGN NOTES:

1. EDD MAY BE INCREASED TO 500mm WHERE REQUIRED.
2. GEOTEXTILE FABRICS MUST NOT BE USED BETWEEN THE FILTER MEDIA, TRANSITION AND DRAINAGE LAYERS IN BIORETENTION SYSTEMS DUE TO THE RISK OF CLOGGING. THE SOIL SPECIFICATIONS ARE DESIGNED TO LIMIT THE MIGRATION OF PARTICLES THROUGH THE SYSTEM.
3. NO GEOTEXTILE SOCKS TO BE INSTALLED ON THE SLOTTED DRAINAGE PIPES.
4. THE TOP LEVEL OF THE SATURATED ZONE MUST BE LOCATED WITHIN THE TRANSITION LAYER 200mm BELOW THE FILTER MEDIA. THE HEIGHT OF THE SATURATED ZONE IS CONTROLLED BY THE OUTLET LEVEL. REFER DRAWING WSUD 9
5. FILTER MEDIA, TRANSITION AND DRAINAGE LAYERS SHALL BE PROVIDED IN ACCORDANCE WITH THE SPECIFICATION ON DRAWING WSUD 2.
6. TURF UNDERLAY SHALL BE A 70:30 SAND:TOPSOIL MIX. SAND SHALL COMPLY WITH THE TRANSITION LAYER SPECIFICATION ON DRAWING WSUD 2.
7. TOPSOIL SHALL COMPLY WITH AS4419. SITE TOPSOILS MAY BE REUSED PROVIDED THEY HAVE BEEN ASSESSED BY A QUALIFIED HORTICULTURIST OR SOIL SCIENTIST AND AMELIORATED ACCORDING TO THEIR RECOMMENDATIONS.
8. TURF SHALL BE WATERED IMMEDIATELY AFTER LAYING UNTIL UNDERLAY IS MOISTENED TO FULL DEPTH. CONTINUE WATERING AS REQUIRED TO MAINTAIN GROWTH RATES FREE OF STRESS FOR 6 WEEKS.
9. ONCE TURF HAS ESTABLISHED (4-6 WEEKS TYP.) TOP DRESS WITH FILTER MEDIA TO CREATE A LEVEL FINISH, TWO OR MORE ADDITIONAL TOP DRESSES MAY BE REQUIRED DEPENDING ON THE EXTENT OF SETTLEMENT.



DETAIL 6
BIORETENTION LINER
NTS



DETAIL 7
FLUSHING POINT
NTS

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: BIORETENTION BASIN - DRAINAGE CONFIGURATION

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale	A1	Q.A. Check	Date
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APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 5	01

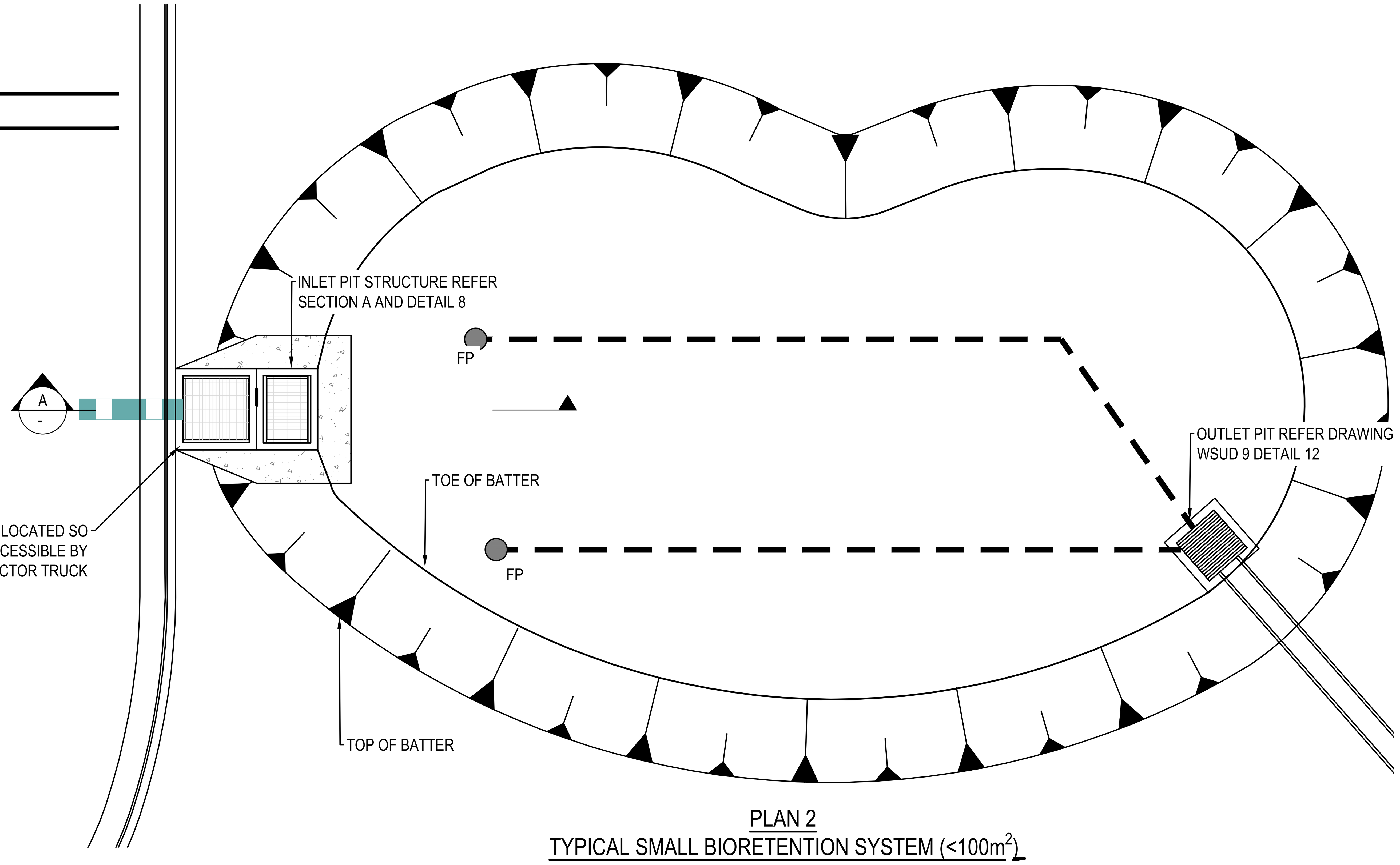
DESIGN NOTES:

1. THIS APPROACH IS TO BE USED FOR BIORETENTION SYSTEMS >30m^2 AND <100m^2. FOR SYSTEMS <30m^2 REFER TO DRAWING WSUD 11. FOR SYSTEMS LARGER THAN 100m^2 REFER TO LARGE SYSTEMS DETAILS SHOWN ON DRAWING WSUD 3 ONWARDS.
2. MAXIMUM LENGTH TO BE 20m.
3. FOR CATCHMENTS UP TO 2000m^2 THE MINIMUM REQUIREMENT IS FOR A RAINGARDEN SEDIMENT PIT.
4. FOR CATCHMENTS GREATER THAN 2000m^2; EITHER
   - 4.1. PROVIDE SYSTEM INLET WITH SEDIMENT PIT PLUS A PROPRIETARY GPT TARGETING 90% ANNUAL GROSS POLLUTANT AND HYDROCARBONS REMOVAL AND SIZED FOR 0.75 x 1YR ARI PEAK FLOWS. OR:
   - 4.2. PROVIDE A 200 MICRON ENVIROPOD OR STORMSACK OR APPROVED EQUIVALENT TO EVERY SURFACE INLET PIT OR TRENCH GRATE AND DESIGN THE BIORETENTION FOR 400mm EXTENDED DETENTION DEPTH. TO TREAT HYDROCARBONS.
5. ENSURE THE HGL IN ALL UPSTREAM PITS IS ABOVE THE EDD HEIGHT TO PREVENT UPWELLING ELSEWHERE IN THE SYSTEM & DIRECT ALL OVERLAND FLOWS TOWARDS THE BASIN
6. WHERE THE BIORETENTION FORMS PART OF A DETENTION SYSTEM THE SUBSOIL FLOWS ARE TO DISCHARGE DOWNSTREAM OF THE DISCHARGE CONTROL PIT.
7. AS AN ALTERNATIVE TO THE ARRANGEMENT SHOWN HERE, SMALL SYSTEMS MAY BE CONFIGURED AS LARGE SYSTEMS (REFER DRAWING WSUD 3 AND WSUD 4) USING PERMEABLE PIPES AND SURCHARGE PITS TO DISTRIBUTE THE FLOW.

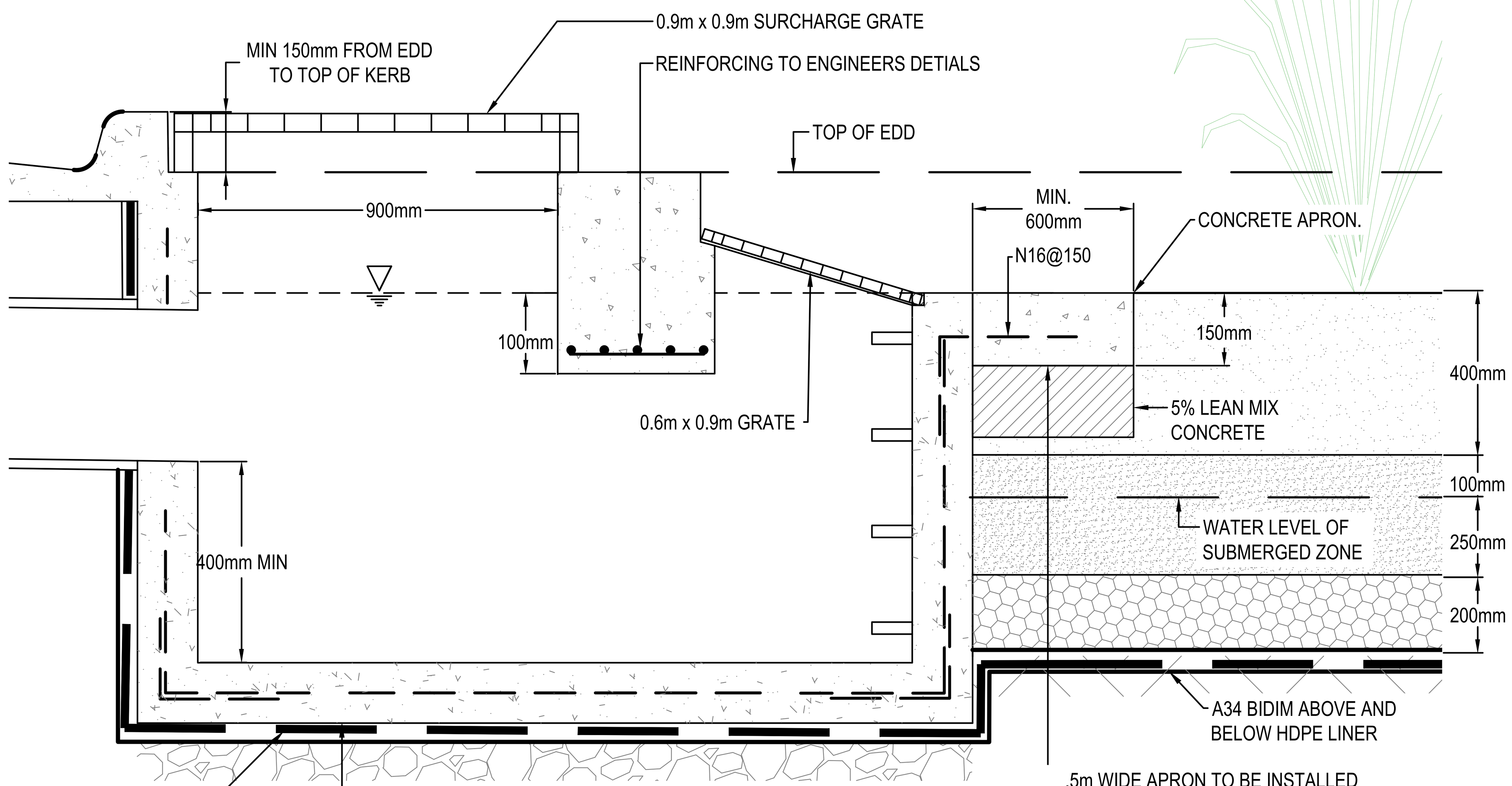
LEGEND

SUBSOIL DRAINAGE PIPE REFER DRAWING WSUD 5 DETAIL 7

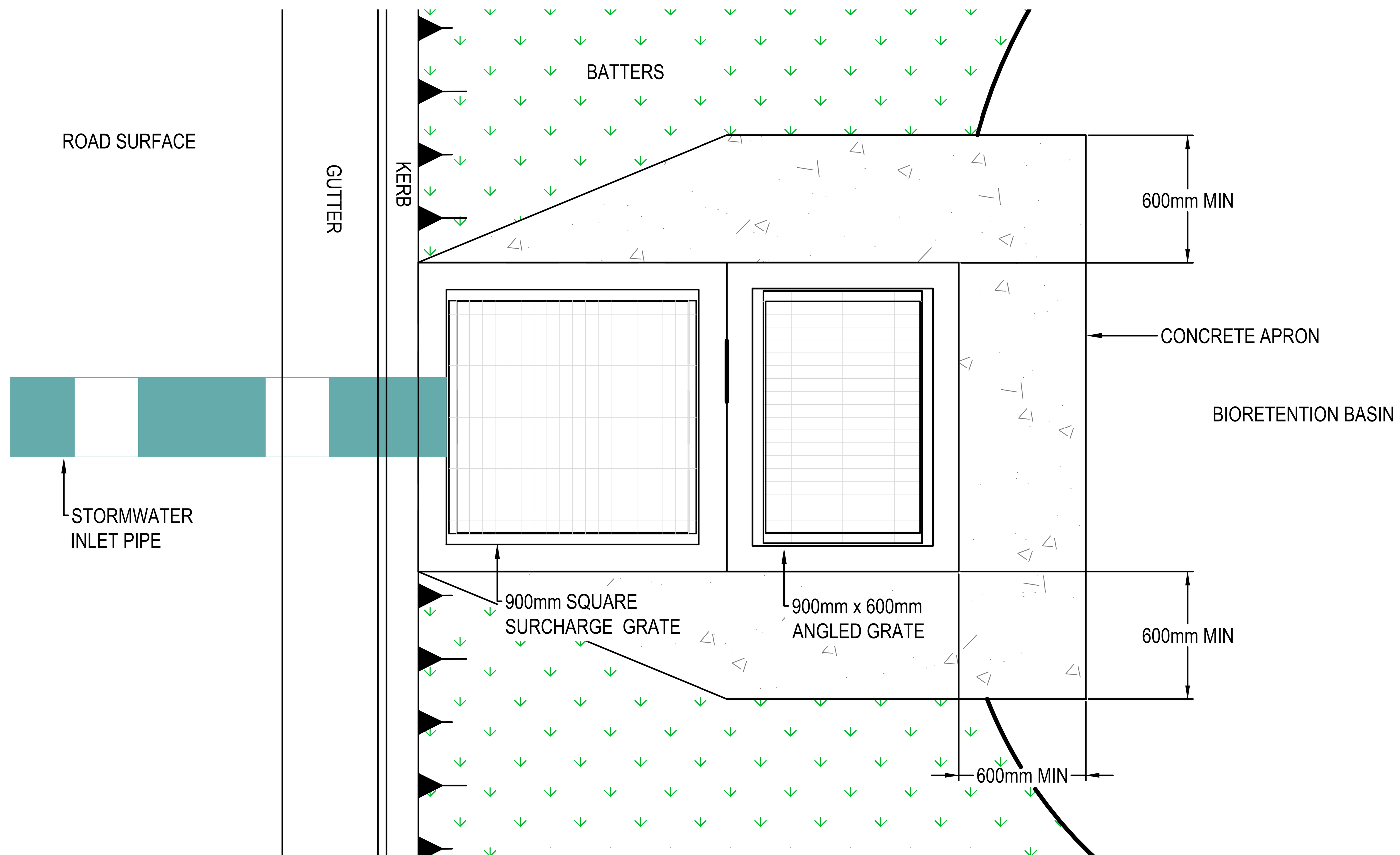
SUBSOIL FLUSHING POINT REFER DRAWING WSUD 5 DETAIL 7 — FP



PLAN 2
TYPICAL SMALL BIORETENTION SYSTEM (<100m^2)
NTS



SECTION A
SYSTEM INLET WITH SEDIMENT PIT
NTS



DETAIL 8
SYSTEM INLET WITH SEDIMENT PIT AND SCOUR PROTECTION
NTS

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: SMALL BIORETENTION SYSTEMS

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

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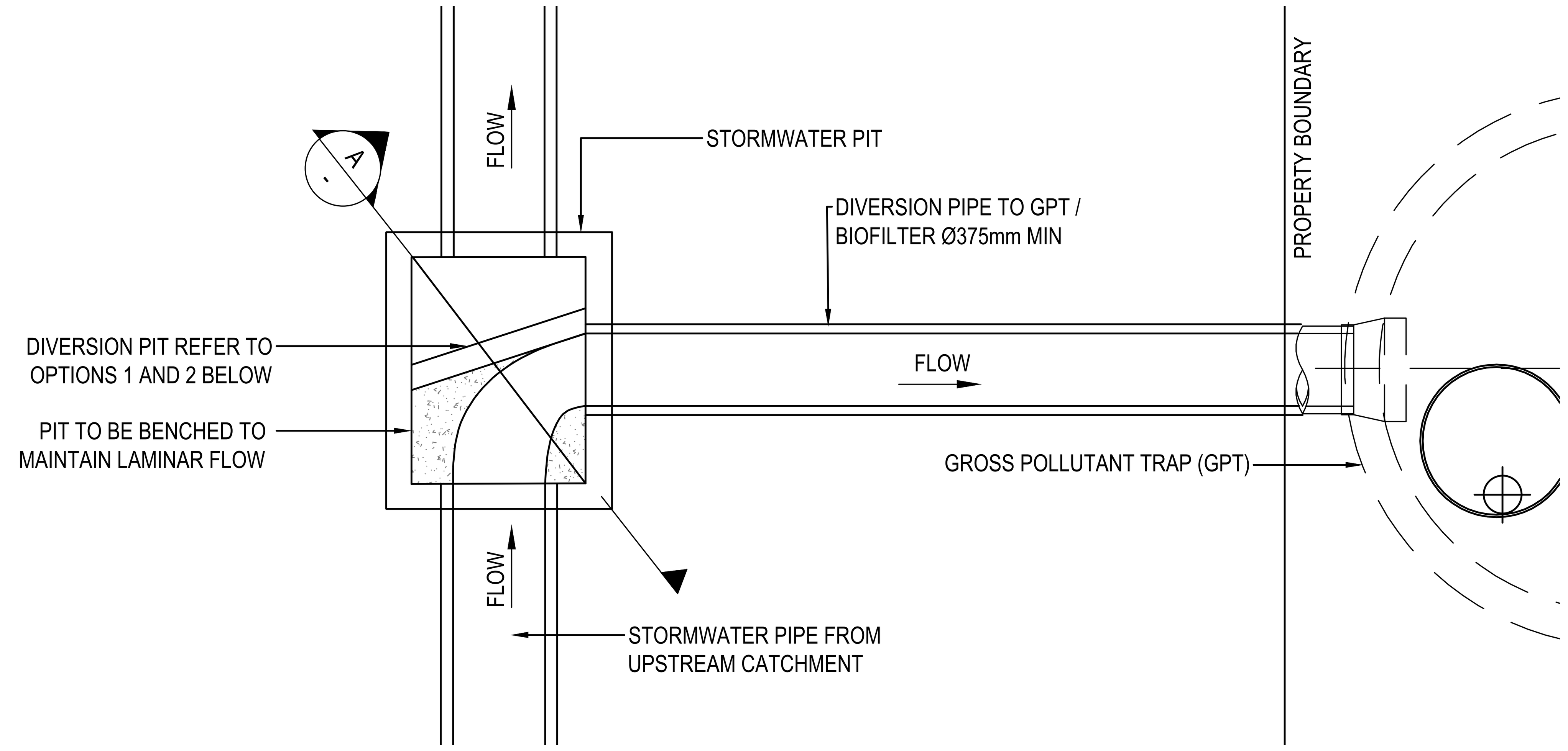
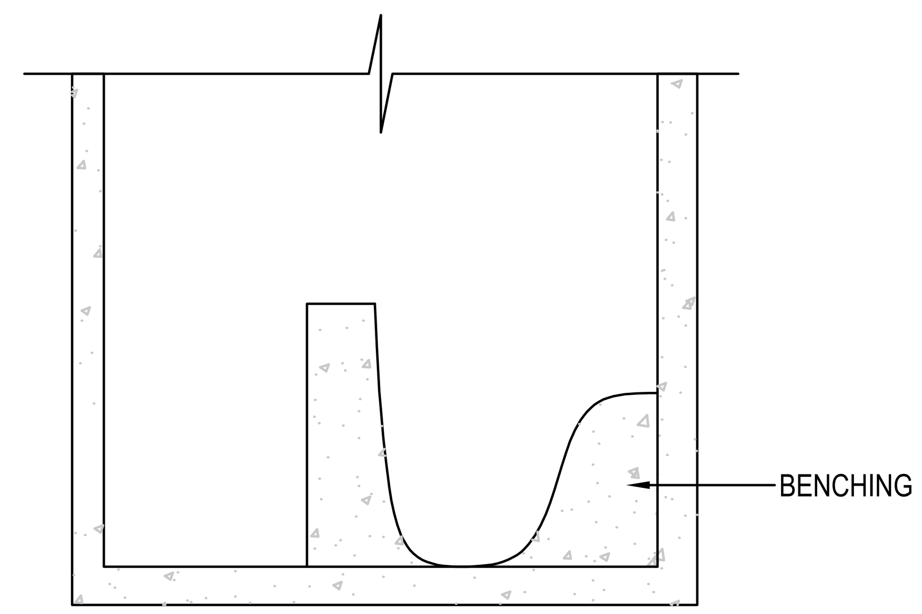
DESIGN NOTES:

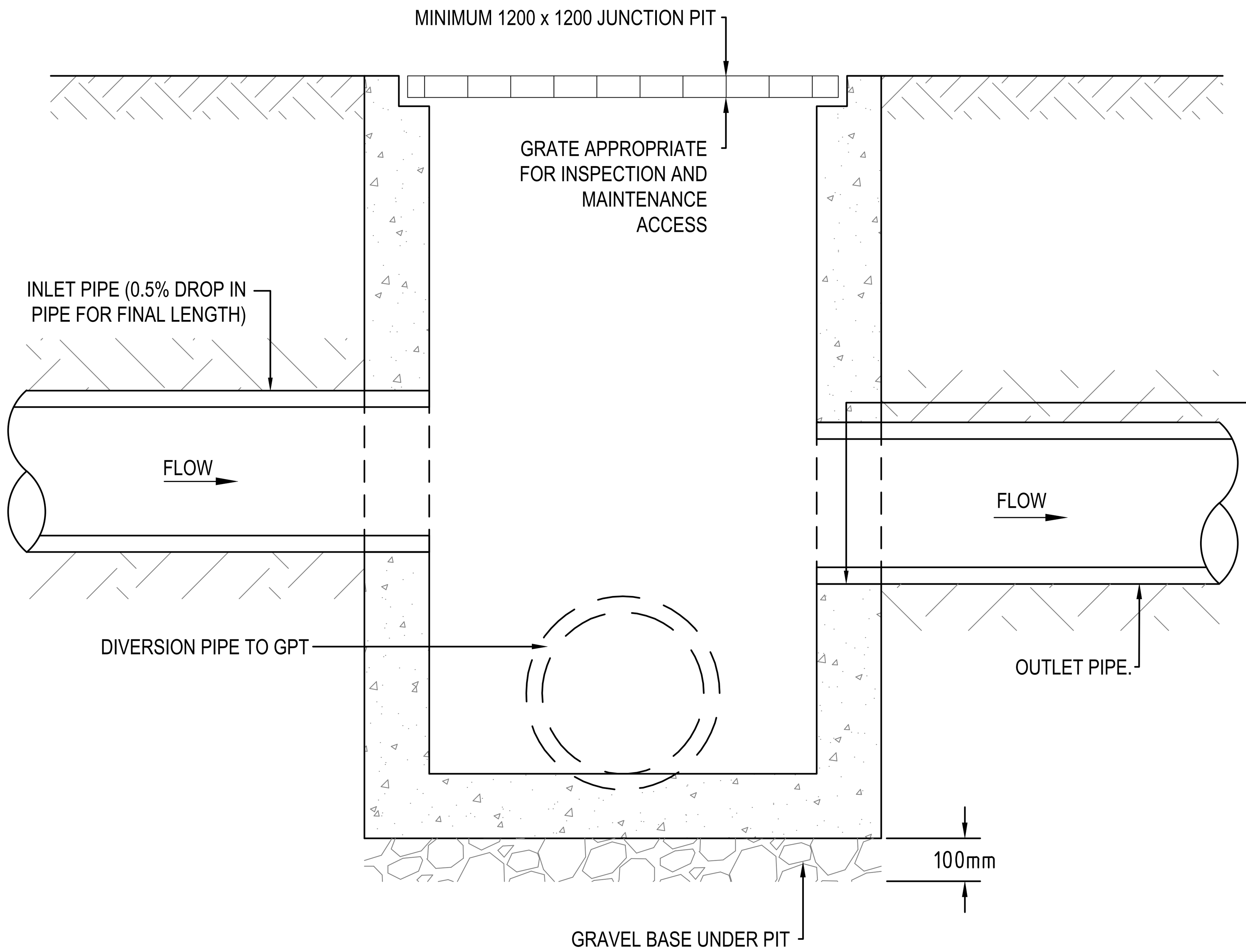
1. DIVERSION PITS ARE KEY POINTS WHERE MAINTENANCE IS OFTEN REQUIRED - CONSIDER ACCESS AND MAINTENANCE TECHNIQUES. SUMPS WILL REQUIRE PERIODIC MAINTENANCE TO REMOVE ACCUMULATED MATERIAL.
2. WEIRS CAN ALSO BE USED TO DIVERT FLOWS WITHIN STORMWATER PITS, HOWEVER CHECK THE HYDRAULIC GRADE LINE TO AVOID IMPACTS ON HYDRAULIC GRADES UPSTREAM.
3. THE MINIMUM SIZE OF DIVERSION PIPE SHALL BE Ø375mm TO REDUCE BLOCKAGE RISK.
4. THE GRADE AND LEVEL OF THE DIVERSION PIPE SHALL BE DETERMINED BY HYDRAULIC DESIGN. TYPICALLY SYSTEMS SHOULD BE DESIGNED FOR 6 MONTH PEAK FLOW BEING THE 0.75 x 1 YEAR ARI.
5. GPTs SHALL BE DESIGNED TO TREAT 0.75 x 1YR ARI PEAK FLOW & REMOVE 50% ANNUAL TSS LOAD



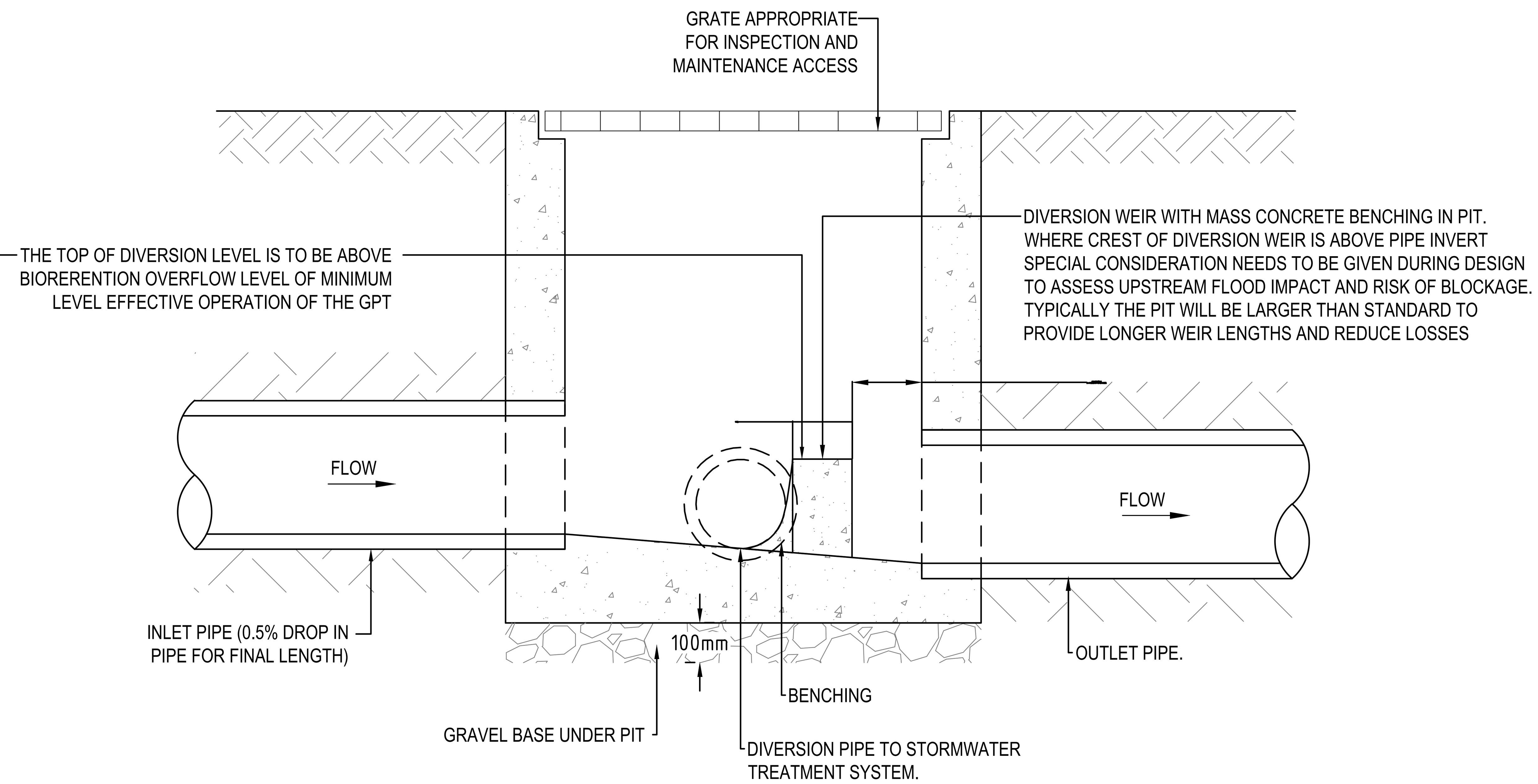
PLAN 3
TYPICAL DIVERSION STRUCTURE FOR PIPED FLOWS
NTS



SECTION A
OPTION 2 BENCHING DETAIL
NTS



DIVERSION PIT OPTION 1
NTS



DIVERSION PIT OPTION 2
NTS

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - INLET DIVERSION STRUCTURES

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

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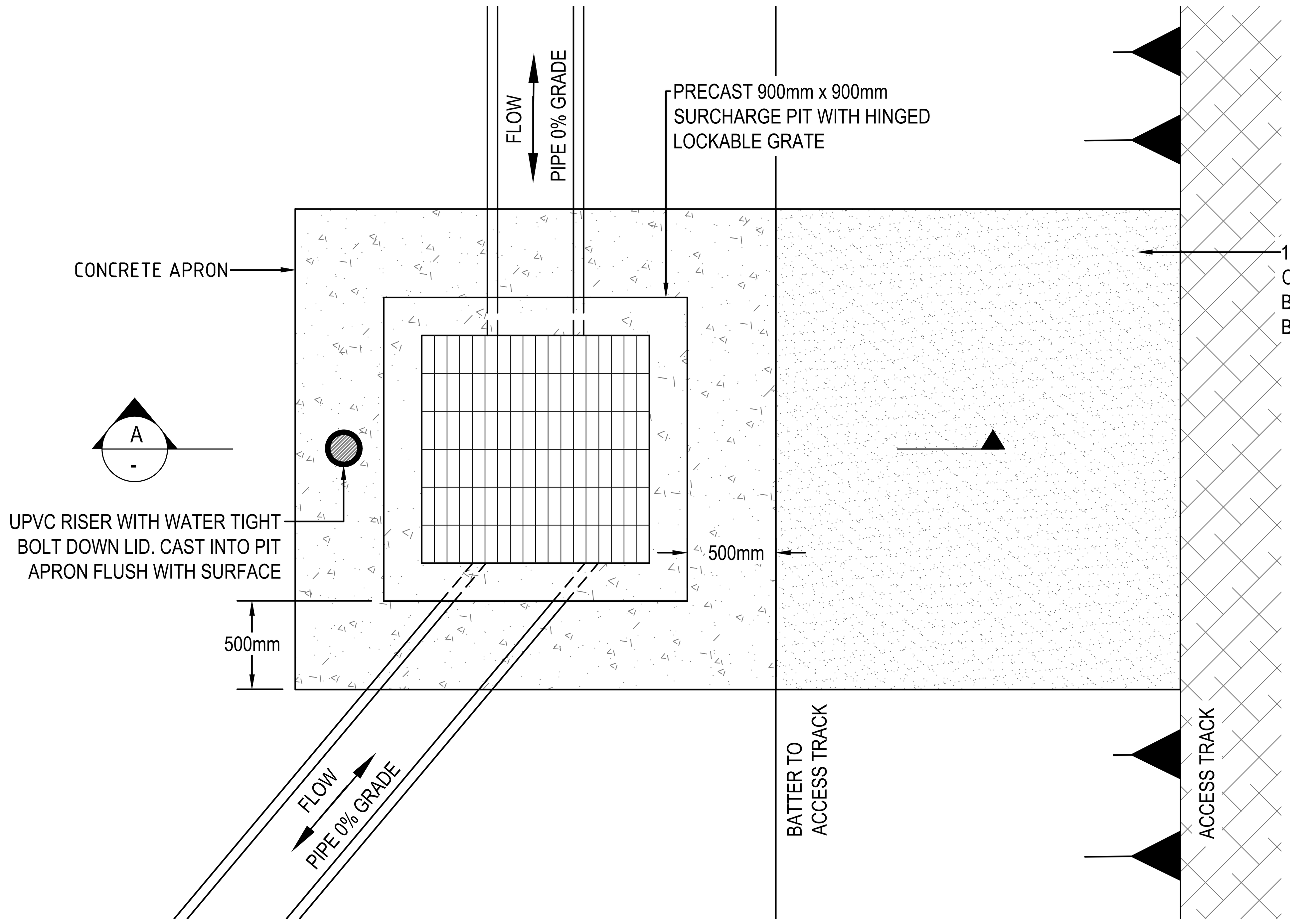
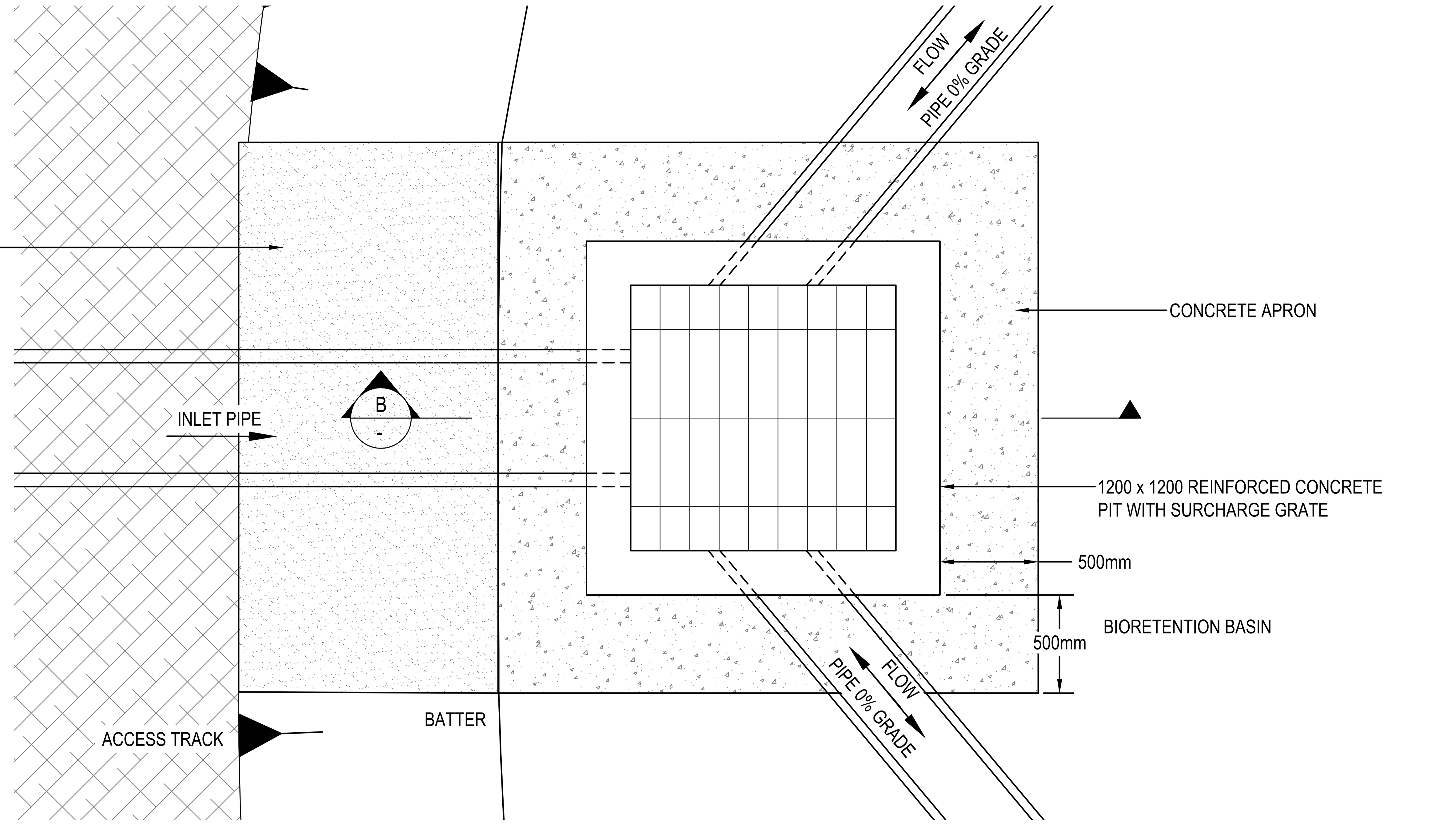
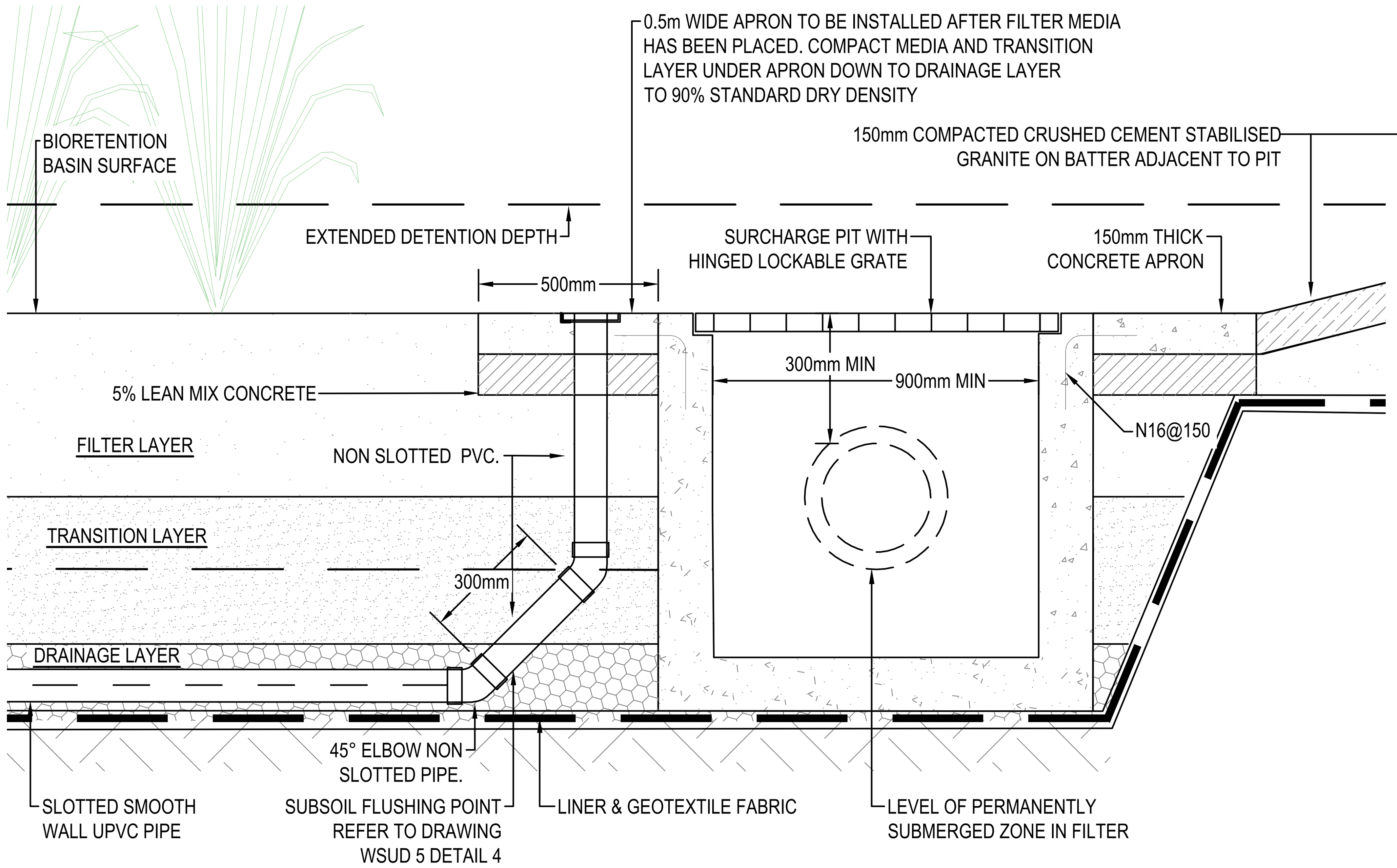


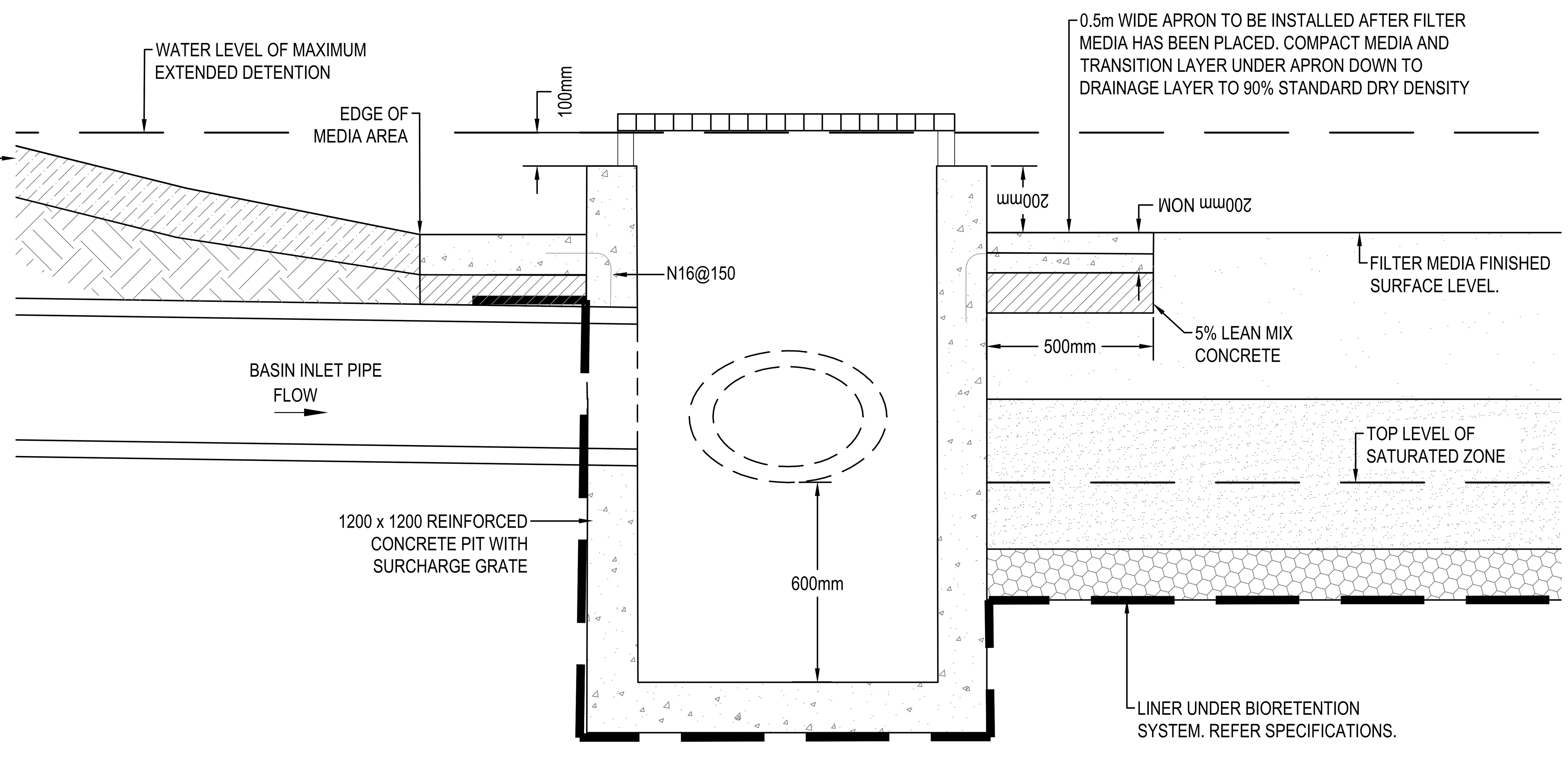
DETAIL 9
TYPICAL UPFLOW PIT OUTLET FOR INSIDE OF BIORETENTION BASIN
NTS



DETAIL 10
SYSTEM INLET PIT
NTS



SECTION A
NTS



SECTION B
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Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - INLET STRUCTURES

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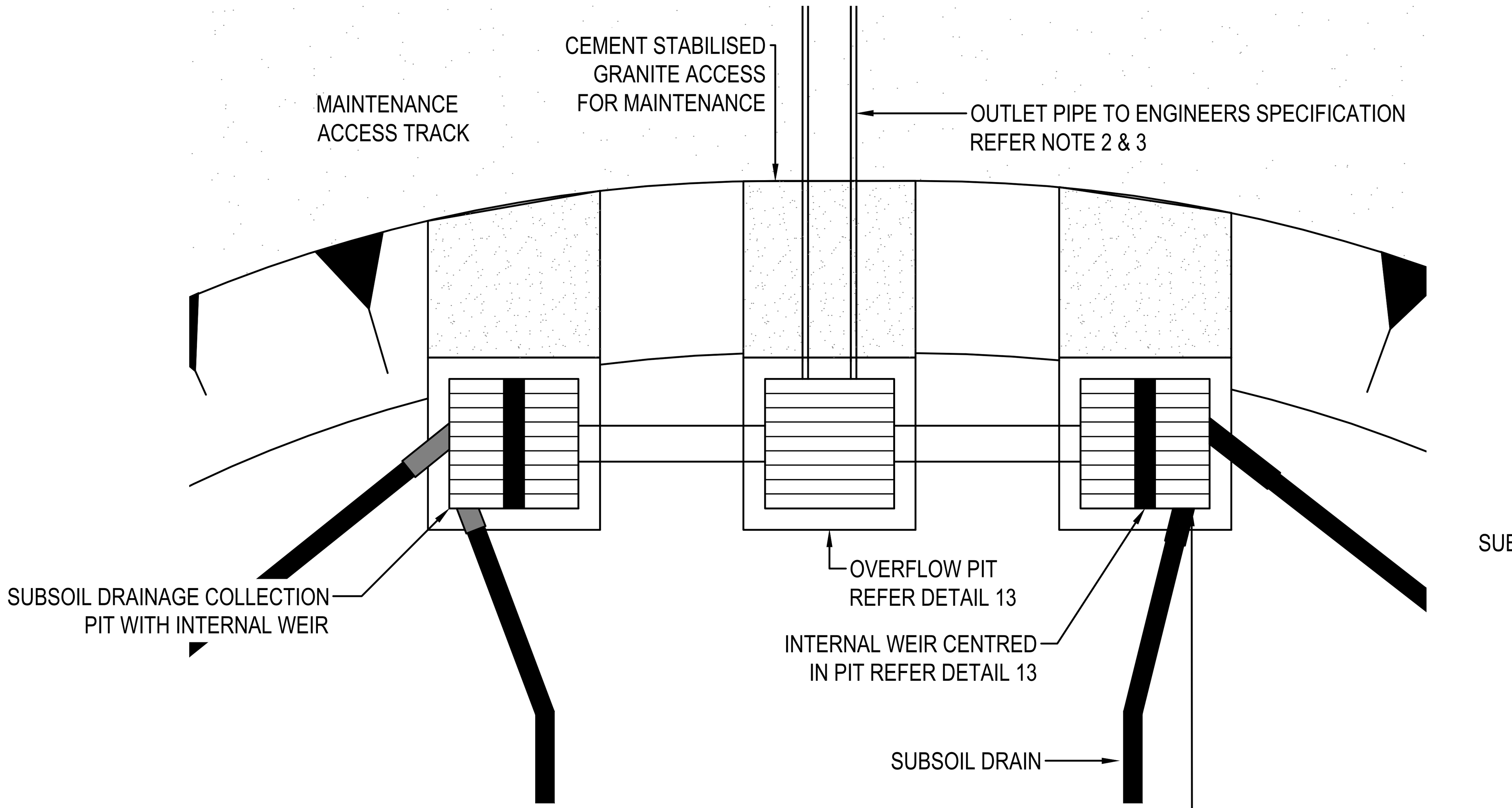
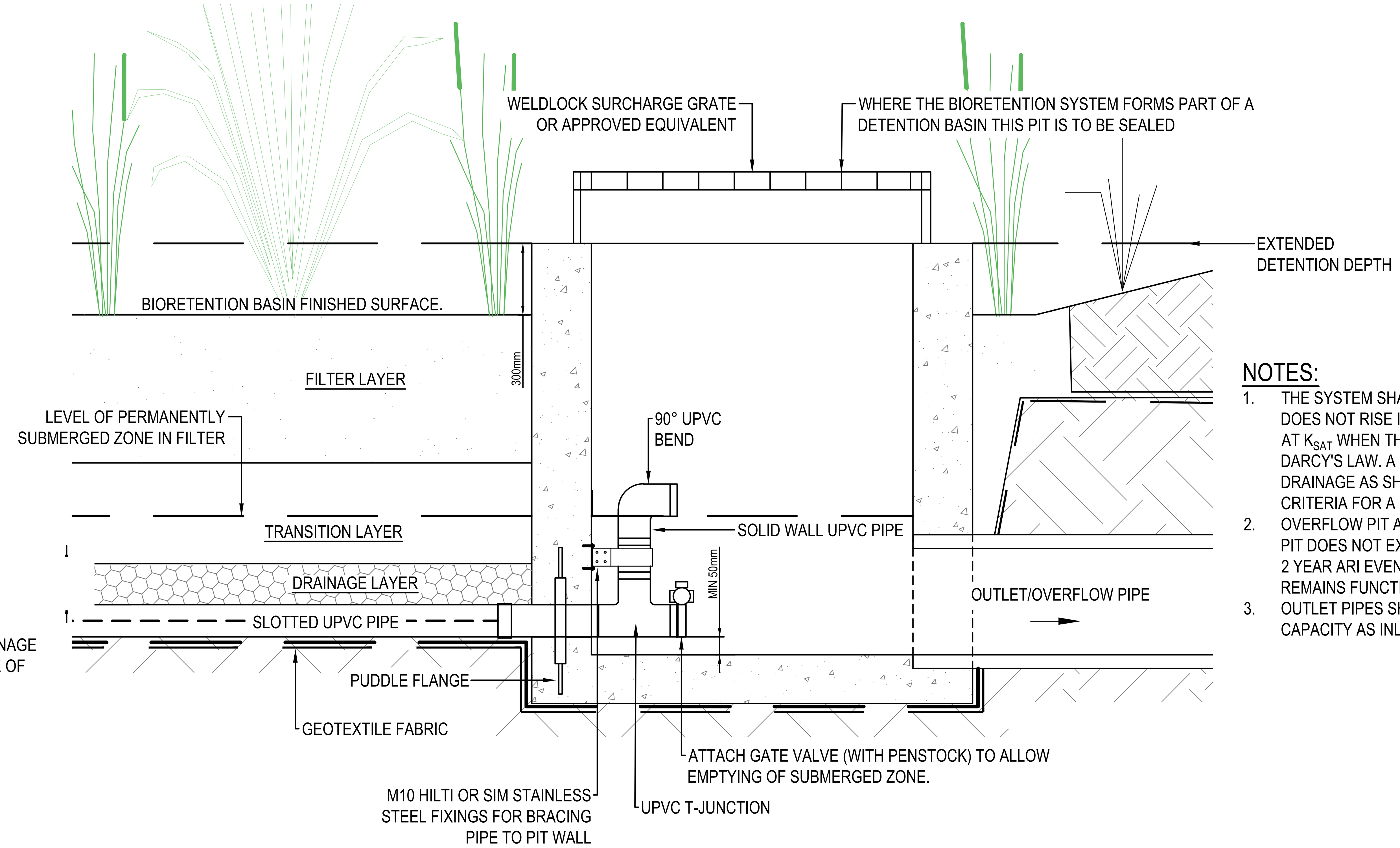


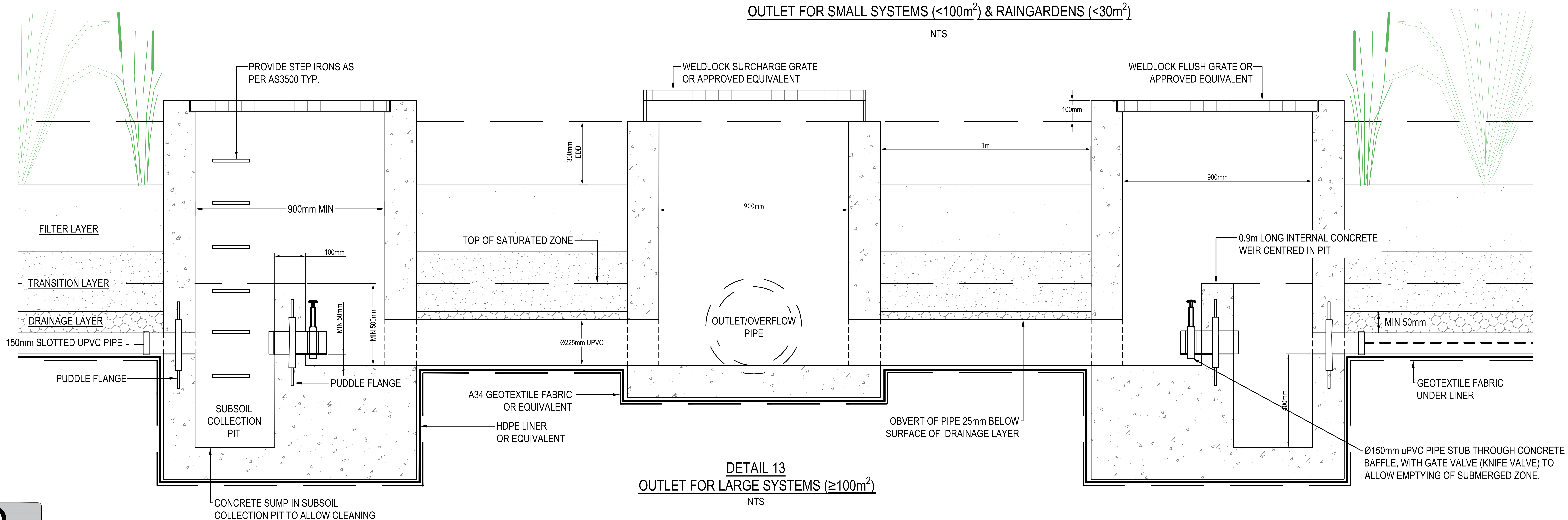
DETAIL 11
OUTLET FROM LARGE BIORETENTION SYSTEM
NTS



NOTES:

1. THE SYSTEM SHALL BE DESIGNED TO ENSURE THAT THE HGL DOES NOT RISE INTO THE MEDIA FOR A DESIGN FLOW ACHIEVED AT K_{SAT} WHEN THE DEPTH OF PONDING IS 300mm USING DARCY'S LAW. A 1.8m WIDE (2x900mm) WEIR AND SUBSOIL DRAINAGE AS SHOWN IN THESE DRAWINGS MEETS THIS CRITERIA FOR A 1000M^2 CELL.
2. OVERFLOW PIT AND PIPE TO BE SIZED SO THAT WATER LEVEL IN PIT DOES NOT EXCEED THE LEVEL OF THE SATURATED ZONE IN 2 YEAR ARI EVENT TO ENSURE THE BIORETENTION SYSTEM REMAINS FUNCTIONAL.
3. OUTLET PIPES SHALL BE DESIGNED TO HAVE THE SAME CAPACITY AS INLET PIPES.

DETAIL 12
OUTLET FOR SMALL SYSTEMS (<100m^2) & RAINGARDENS (<30m^2)
NTS



DETAIL 13
OUTLET FOR LARGE SYSTEMS (≥100m^2)
NTS

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - OUTLET STRUCTURES

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

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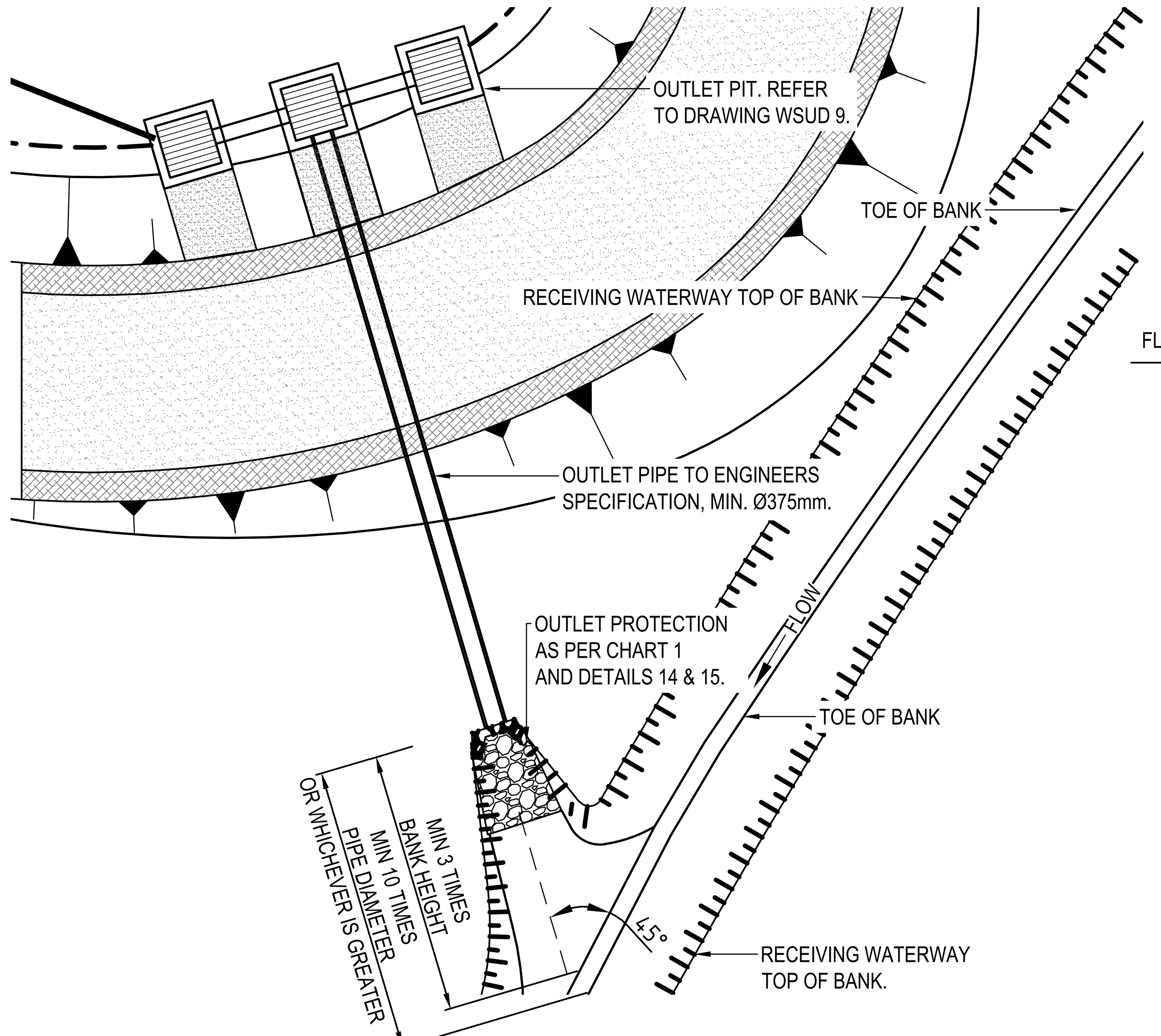
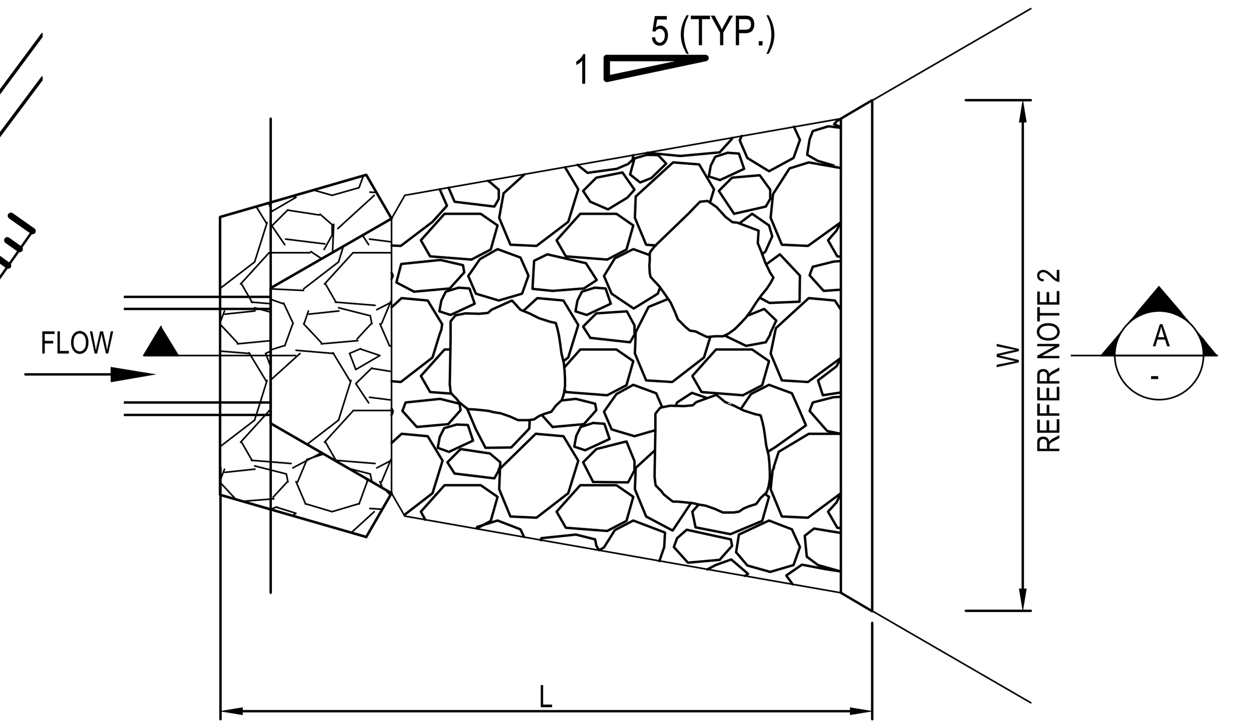
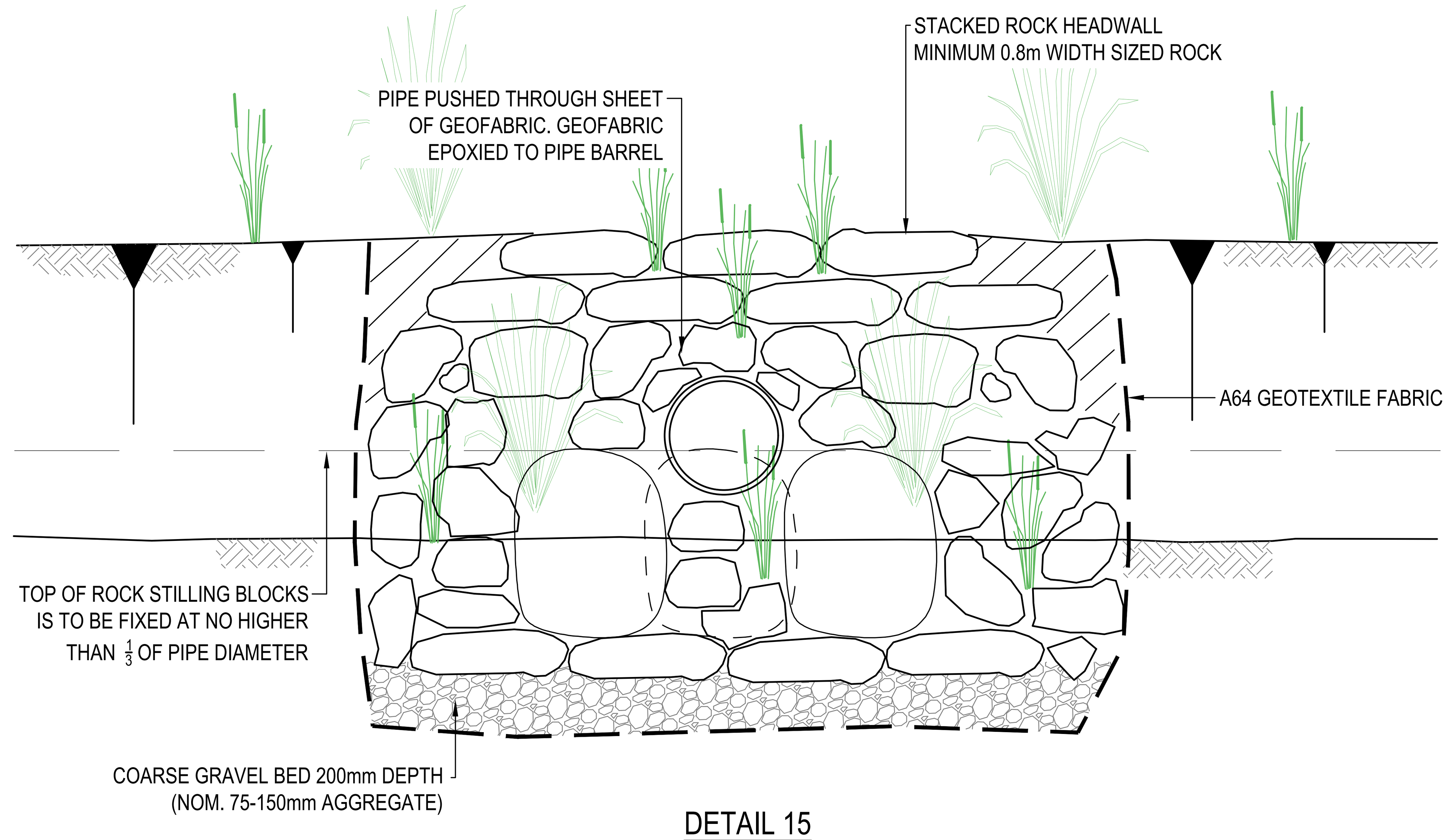


PLAN 4
OUTLET TO WATERWAYS
NTS



DETAIL 14
TYPICAL ROCK OUTLET PAD LAYOUT
NTS



DETAIL 15
TYPICAL ROCK HEADWALL TREATMENT FOR CHANNEL OUTLET WORKS
NTS

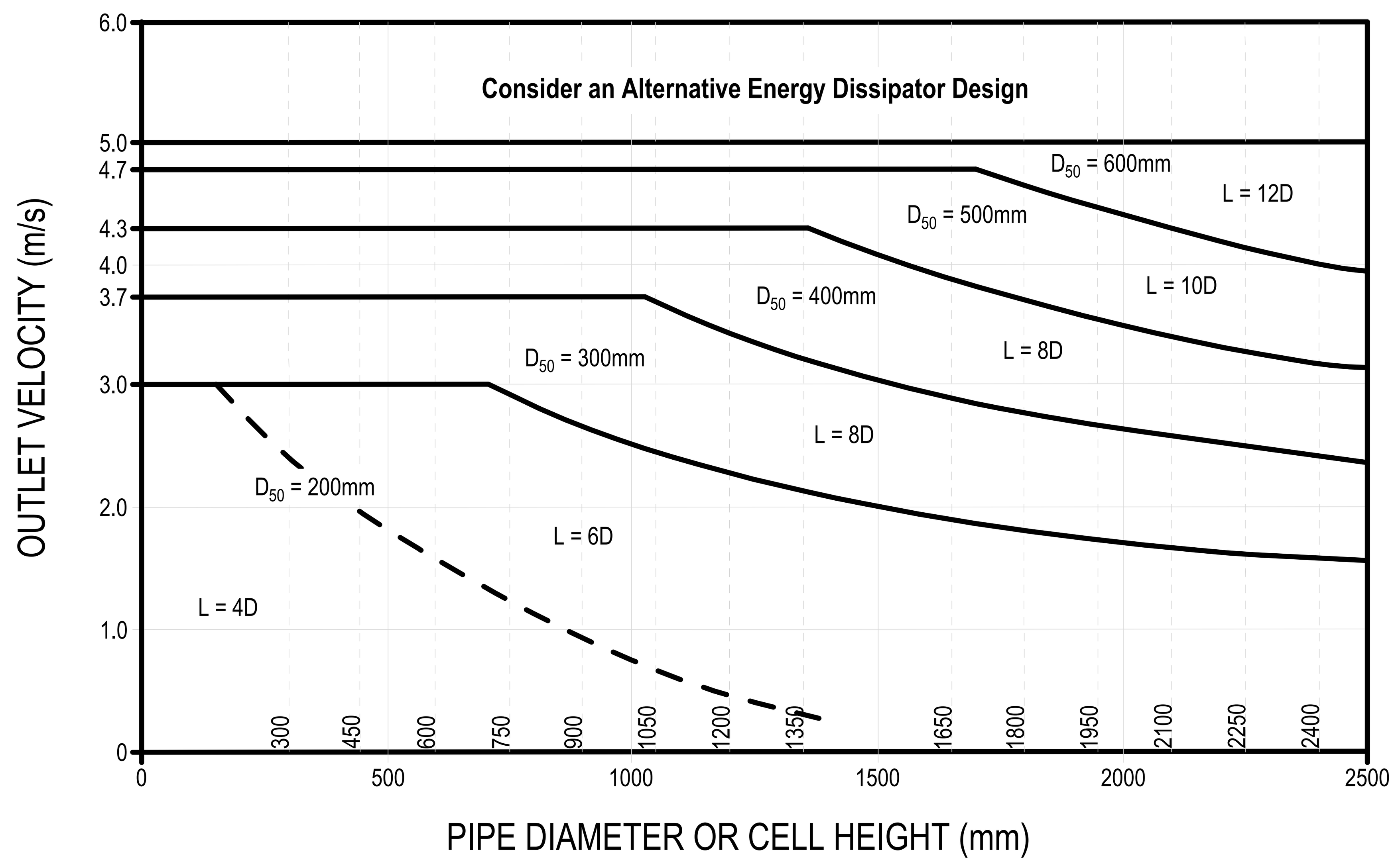


CHART 1
SIZING OF STORMWATER OUTLET
SCOUR PROTECTION
NTS

NOTES:

1. READ 'L' FROM CHART 1. LEFT.
2. W = 3 TIMES PIPE DIAMETER 'D'.
3. THE MEDIAN ROCK SIZE D_{50} AND LENGTH (L) OF ROCK SCOUR PROTECTION DOWNSTREAM OF STORMWATER OUTLETS IS TO BE DETERMINED USING CHART 1. MIN. D_{50} = 200mm
4. ROCK IS TO BE GRADED IN ACCORDANCE WITH THE ROCK SIZE DISTRIBUTION TABLE AS SHOWN BELOW
5. IN THE EVENT THE WIDTH OF THE OUTLET CHANNEL IS LESS THAN THE DESIGN WIDTH OF THE ROCK APRON, THE ROCK SCOUR PROTECTION SHALL EXTEND UP TO THE BANK TO EITHER THE HEIGHT OF THE OBVERT OF PIPE OR CULVERT OR TO THE DESIGN TAILWATER LEVEL.
6. REFER TO 'BCC ENGINEERING GUIDE FOR DEVELOPMENT' TO ASSESS CHANNEL HYDRAULICS.

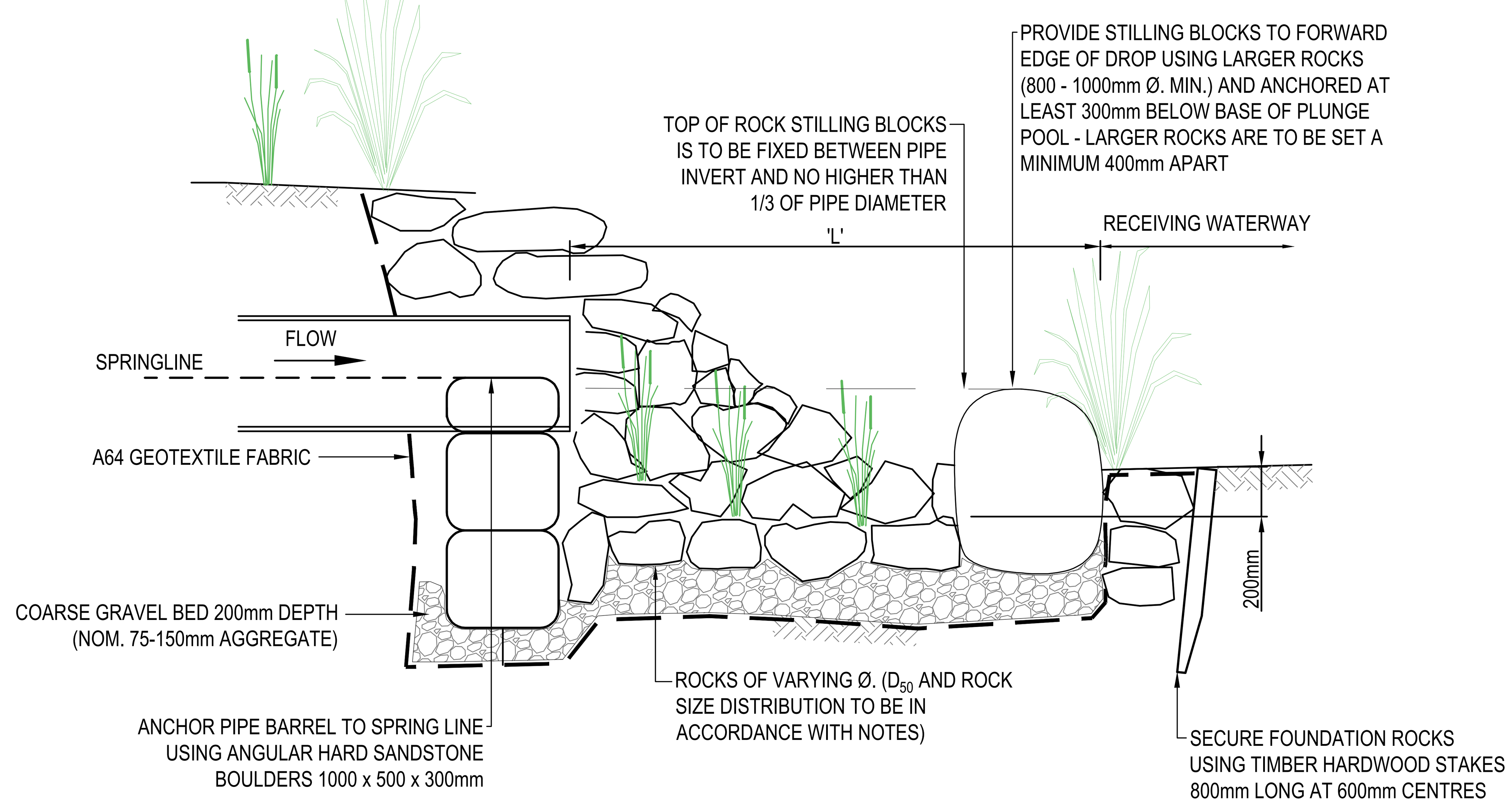
REFERENCES:

- BRISBANE CITY COUNCIL (BCC) 2003 "STORMWATER OUTLETS IN PARKS AND WATERWAYS"
- NSW OFFICE OF WATER: GUIDELINE FOR OUTLET STRUCTURES ON WATERFRONT LANDS.

ROCK SIZE DISTRIBUTION TABLE

D_{100}/D_{50} - 2.0	D_{33}/D_{50} - 0.50
D_{90}/D_{50} - 1.8	D_{25}/D_{50} - 0.45
D_{75}/D_{50} - 1.5	D_{10}/D_{50} - 0.20
D_{65}/D_{50} - 1.3	
D_{40}/D_{50} - 0.65	

D_x = NOMINAL ROCK DIAMETER OF WHICH x% OF THE ROCKS IS SMALLER



SECTION A
NTS

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01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

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Client: WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: BIORETENTION - OUTLET SCOUR PROTECTION & MUSIC MODELLING REQUIREMENTS
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
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APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
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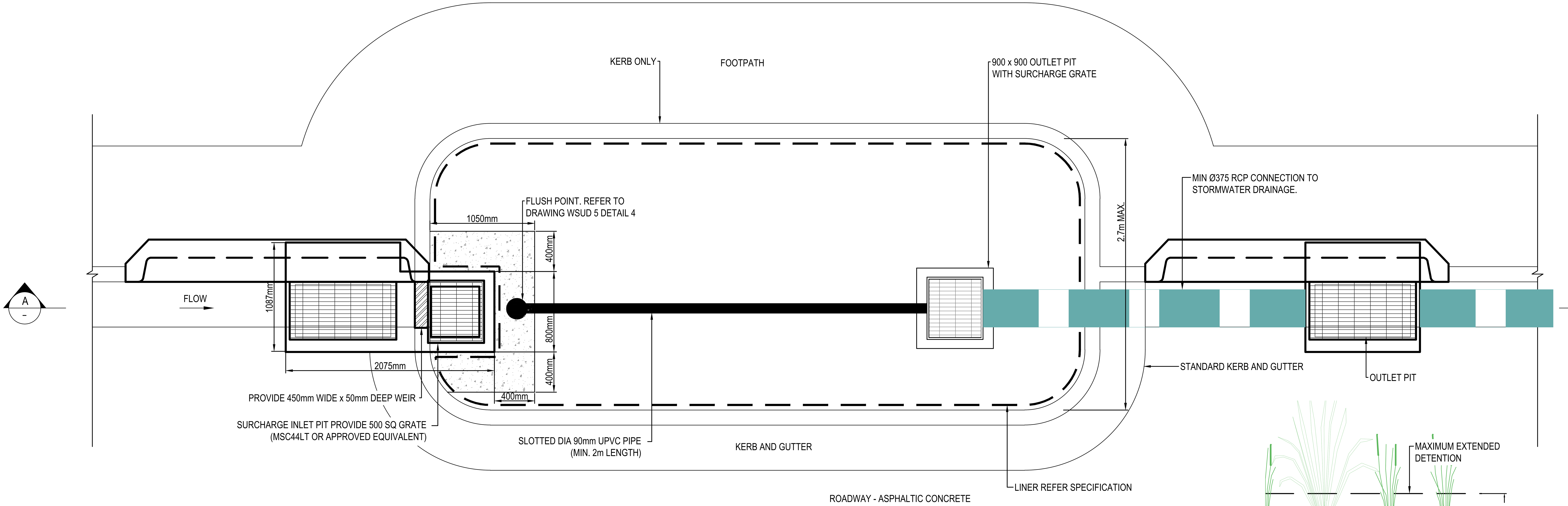
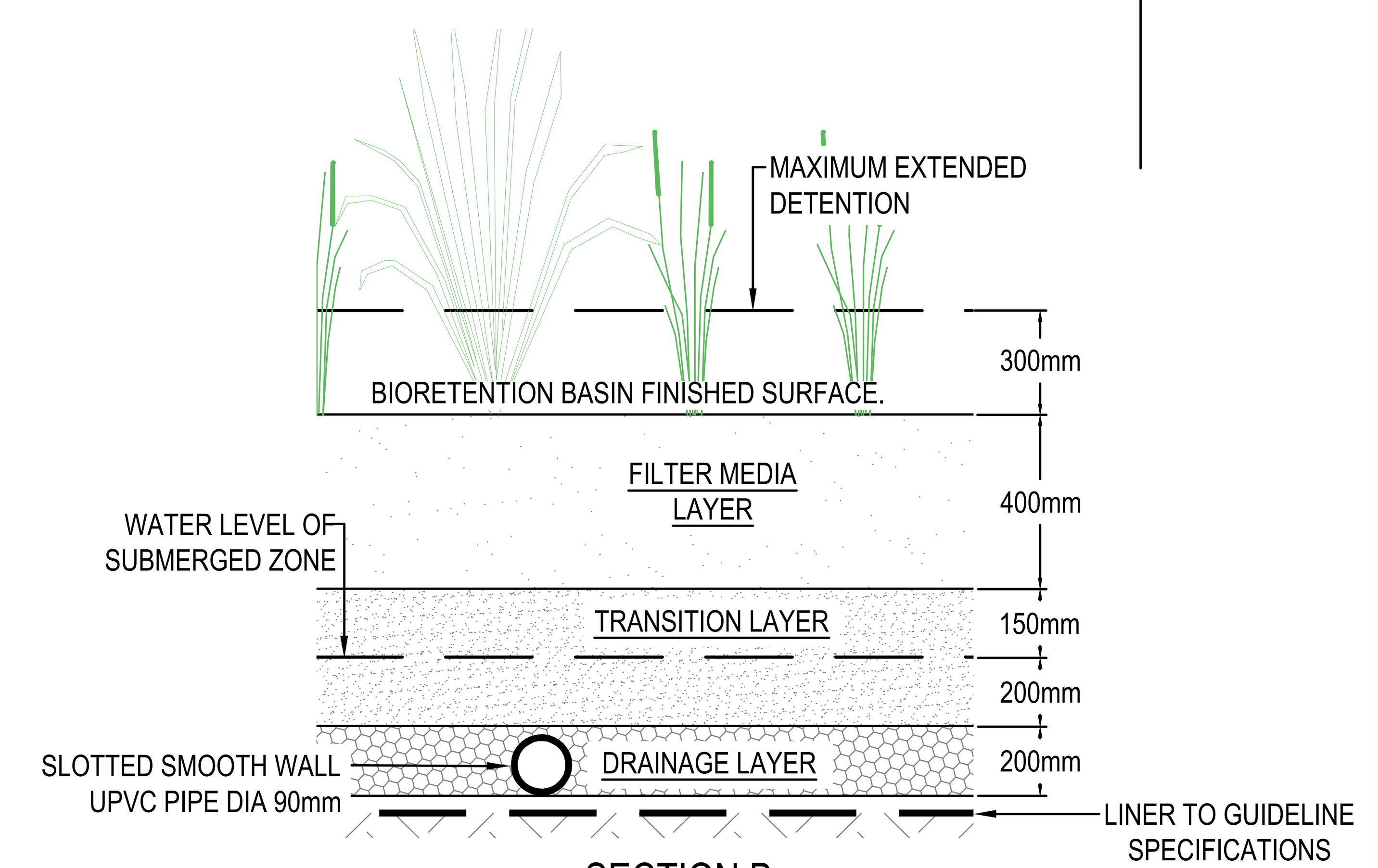


PLAN 6
BIORETENTION SYSTEM - ROADWAY / TRAFFIC CALMING DEVICE
NTS



SECTION B
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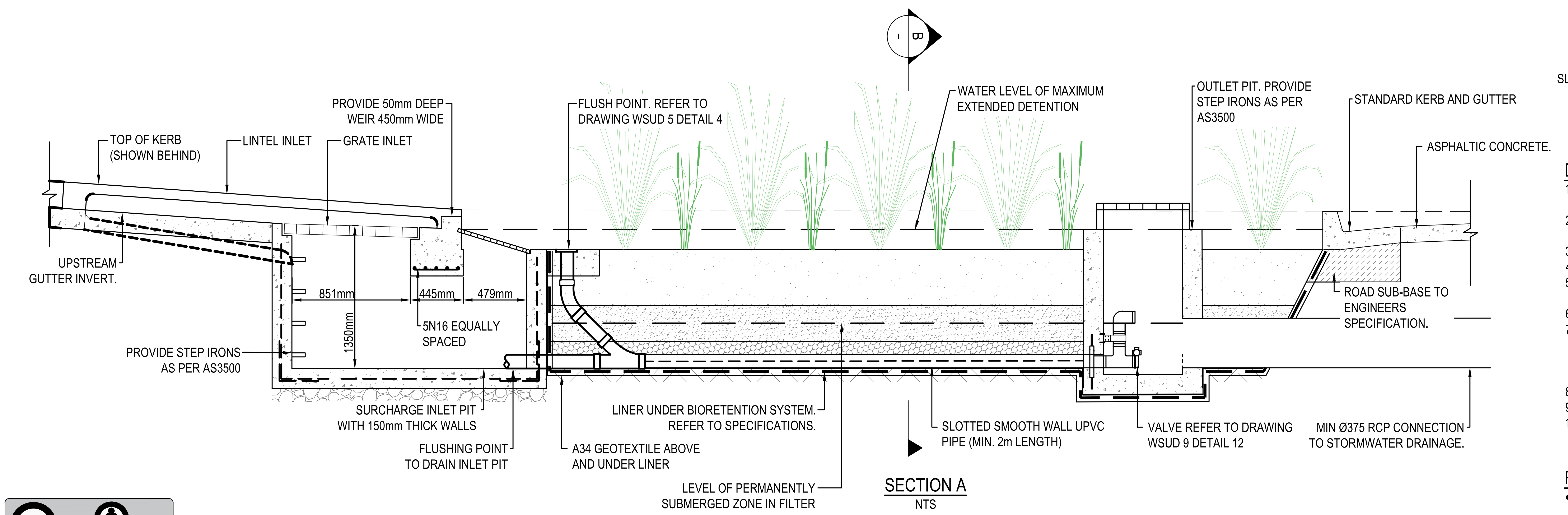

SECTION A
NTS

DESIGN NOTES:
1. THIS DESIGN APPROACH SHALL BE USED WHERE THE RAINGARDEN IS < $30m^2$ FOR CATCHMENTS UP TO $2000m^2$
2. FOR APPLICATIONS NOT IN A ROADWAY THE ARRANGEMENT SHALL BE MODIFIED TO SUIT SITE CONDITIONS
3. IN THE ROADWAY THE KEY CONSIDERATIONS ARE TRAFFIC AND DRAINAGE.
4. USE STANDARD KERB & GUTTER TO EXCLUDE VEHICLES.
5. THE ROAD IS OFTEN A MAJOR OVERLAND FLOWPATH. ESTIMATE DESIGN FLOWS AND VELOCITIES AND CONSIDER HOW THESE FLOWS WILL BE ACCOMMODATED.
6. CONSIDER IMPACT OF VEGETATION ON VISUAL SIGHT DISTANCE.
7. THE DRAWINGS SHOW THE TYPICAL LOCATION OF STORMWATER DRAINAGE PIPES WITHIN THE STREET, HOWEVER OTHER SERVICES ARE ALSO OFTEN LOCATED WITHIN THE ROADWAY. CONSIDER EXISTING UTILITY LOCATIONS AND/OR ALLOCATIONS FOR FUTURE WORKS WHEN LOCATING WSUD MEASURES.
8. A LINER IS REQUIRED TO PREVENT EXFILTRATION.
9. EMPLOY BICYCLE FRIENDLY DESIGN PRINCIPLES. REFER RMS(2005).
10. KERBS AND FOOTINGS IN THE ROADWAY MUST BE DESIGNED TO WITHSTAND VEHICLE IMPACT.

REFERENCES:
- CITY OF SYDNEY'S STANDARD DRAWING 7.2.9 "RAINGARDENS - SURCHARGE INLET PIT"

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01	POST PCG AMENDMENTS	14.04.21	XX	XX
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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: BIORETENTION - RAINGARDEN SYSTEM LESS THAN 30m2

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

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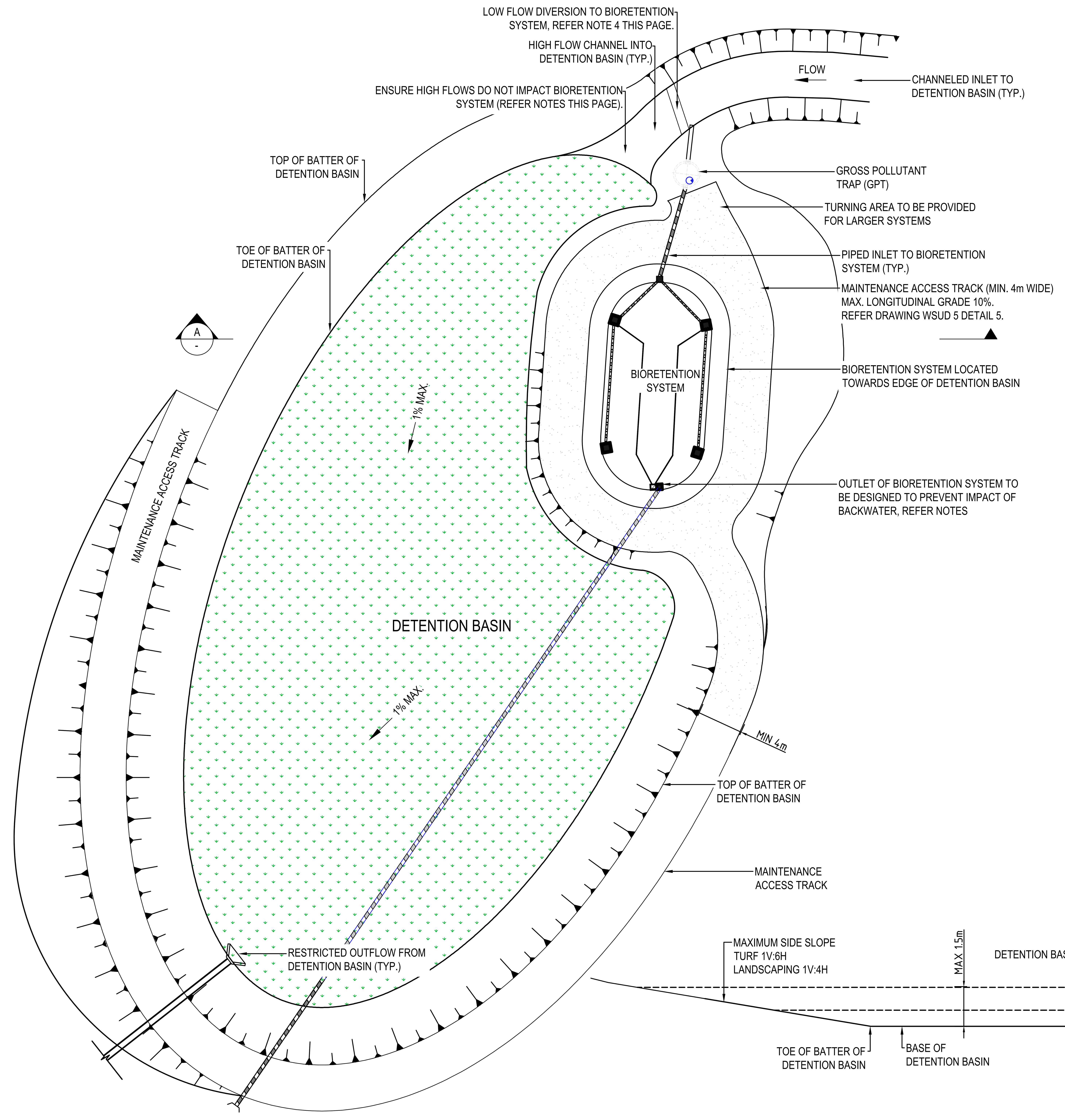
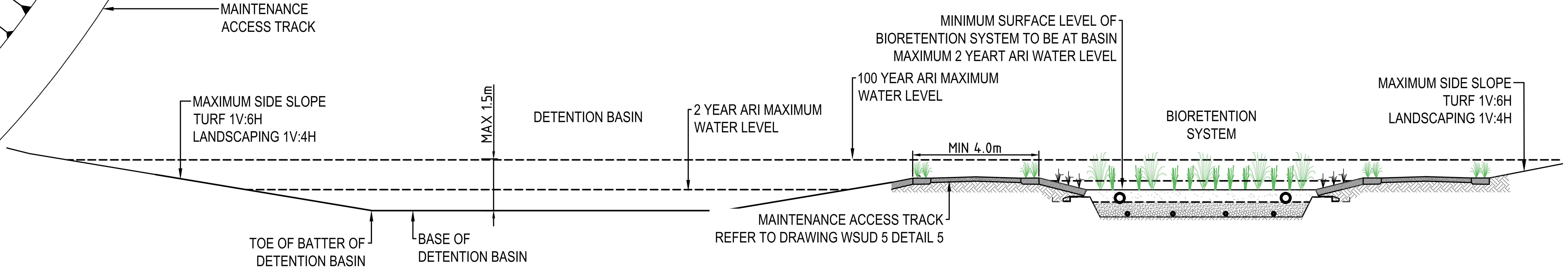


PLAN 7
BIORETENTION SYSTEM - WITHIN DETENTION BASIN
NTS



SECTION A
NTS

DESIGN NOTES:

1. DESIGN OF STORMWATER DETENTION BASIN IS TO BE UNDERTAKEN BY SUITABLY QUALIFIED ENGINEER TO MEET THE DESIGN OBJECTIVES FOR THE SITE.
2. THE INCLUSION OF A BIORETENTION SYSTEM FOR STORMWATER TREATMENT MUST NOT IMPACT ON THE FUNCTION OF THE DETENTION SYSTEM.
3. WHERE TREATED FLOWS DRAIN TO A NATURAL WATERWAY, ENSURE THAT THE SYSTEM OUTLET CAN CONNECT INTO THE STREAM WITHOUT LOWERING THE BED LEVEL.
4. ONLY TREATABLE FLOW TO BE DIVERTED TO BIORETENTION BASIN. FLOW TO BE DIVERTED WILL BE DETERMINED DURING DETAILED DESIGN TO MEET THE STORMWATER TREATMENT OBJECTIVES FOR THE SITE. THIS IS TYPICALLY THE 6 MONTH ARI PEAK FLOWS.
5. THE OUTLET OF THE BIORETENTION SYSTEM IS TO BE DESIGNED SO THAT BACKWATER DOES NOT IMPACT ON THE TREATMENT FUNCTION OF THE BIORETENTION BASIN UP TO AND INCLUDING THE 2 YEAR ARI STORM EVENT.
6. ENSURE BIORETENTION SYSTEM IS CONSTRUCTED SO THAT HIGH FLOWS INTO THE DETENTION BASIN DO NOT IMPACT ON THE INTEGRITY OF THE BIORETENTION SYSTEM.
7. THE NUMBER OF PIPES OR CULVERTS THROUGH DETENTION BASIN EMBANKMENT IS TO BE MINIMISED.
8. BIORETENTION SUBSOIL AND OUTFLOWS SHALL BE KEPT SEPARATE FROM DETENTION BASIN OUTFLOWS TO ENSURE EACH FUNCTIONS HYDRAULICALLY INDEPENDENTLY.
9. THE EMBANKMENT SHALL BE DESIGNED & SPECIFIED AS A WATER RETAINING STRUCTURE TO PREVENT PIPING FAILURE. THE DESIGN SHALL BE VERIFIED BY A GEOTECHNICAL ENGINEER
10. BASIN EMBANKMENT SHALL BE DESIGNED TO BE STABLE IN A PMF & VERIFIED BY AN EXPERIENCED GEOTECHNICAL ENGINEER

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: BIORETENTION - WITHIN FLOOD DETENTION BASIN

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

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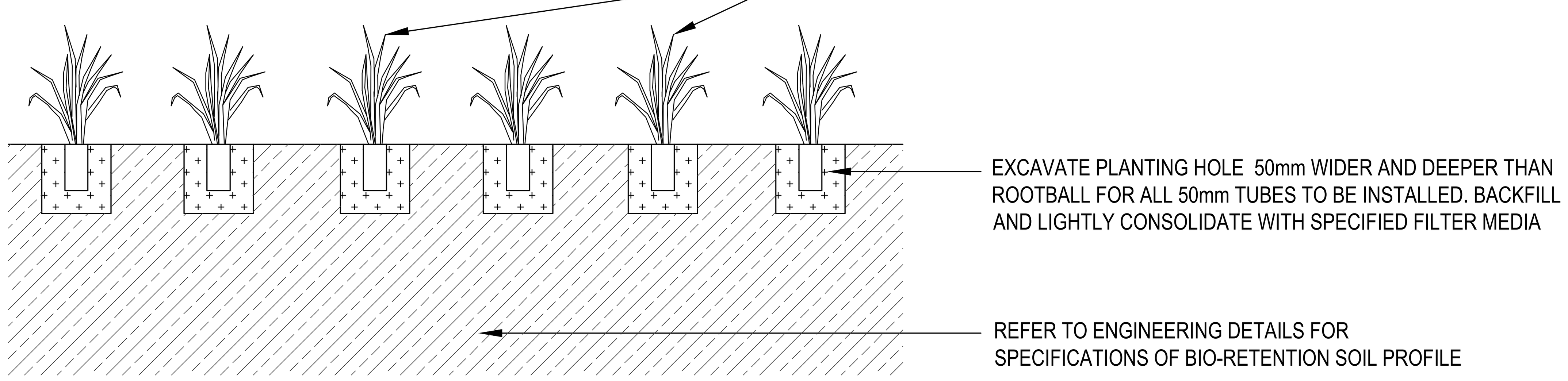
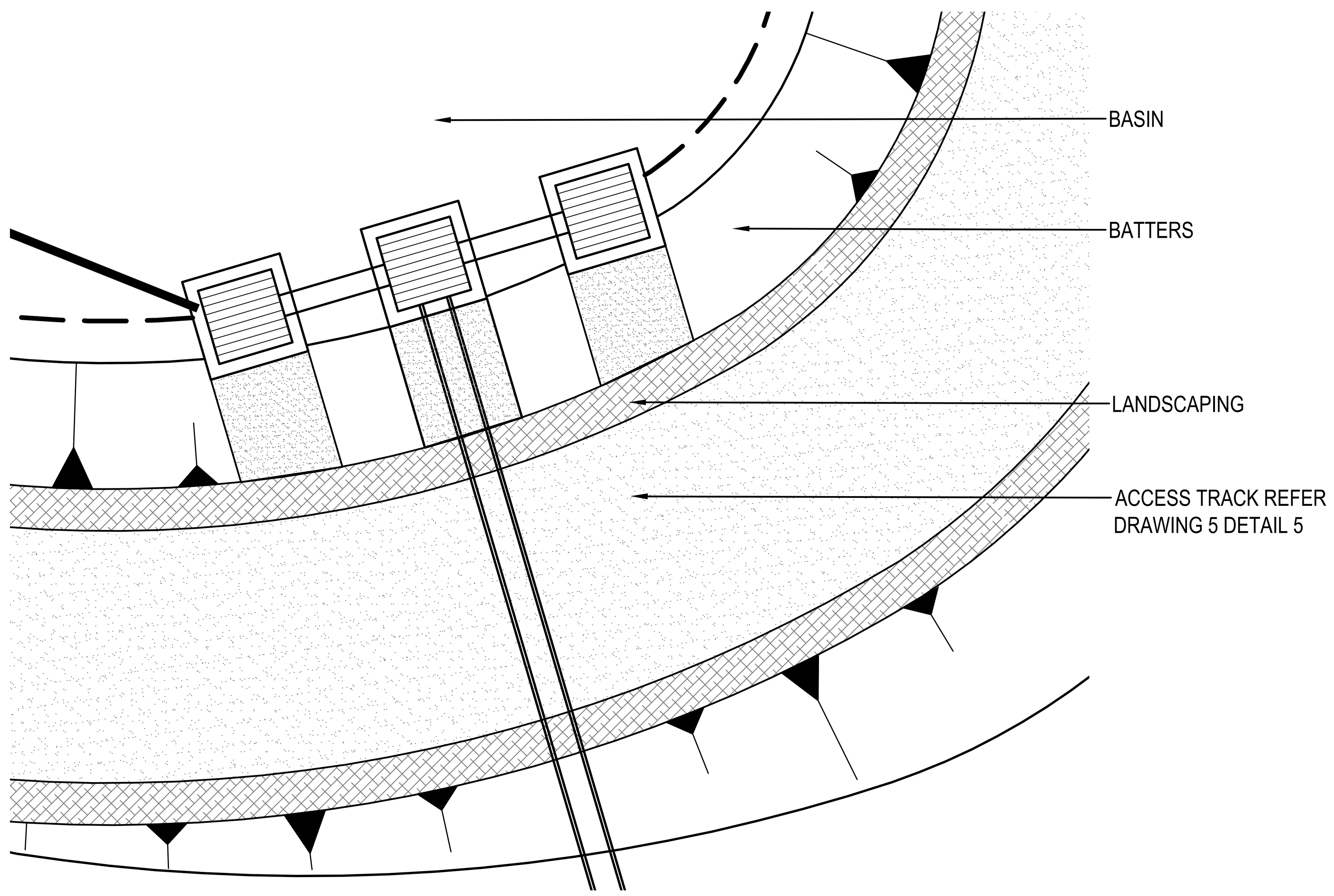
DESIGN NOTES:

1. VEGETATION COVER IS AN ESSENTIAL FUNCTIONAL COMPONENT OF THE BIORETENTION BASIN
2. PLANTS ARE TO BE 25mm HIKO CELLS OR 50mm TUBESTOCK
3. PLANTING SHOULD OCCUR NO LATER THAN 14 DAYS AFTER INSTALLATION OF THE FILTER MEDIA. AFTER PLANTING THE SOIL SHOULD BE RE-INSTATED TO A FLAT SURFACE.
4. THE PLANTS SHALL BE PLANTED AS A MATRIX ENSURING A DIVERSE COVERAGE.
5. PLANTING SHOULD INCORPORATE SEVERAL TYPES OF VEGETATION INCLUDING SHRUBS AND GRASSES AND TUFTED PLANTS FROM THE PLANTING LIST.
6. A MINIMUM OF 4 DIFFERENT SPECIES IS REQUIRED FOR RAINGARDENS (<30m²), A MIN OF 6 FOR SMALL SYSTEMS < 100m² & 10 OR MORE FOR LARGE SYSTEMS (>100m²).
7. PLANT ESTABLISHMENT AND WATERING IS REQUIRED FOR 12 MONTHS FROM PLANTING.
8. NO SURFACE MULCHING OF BIORETENTION BASINS IS PERMITTED.
9. NO WEED MAT OR HYDRO-MULCH IS TO BE APPLIED TO THE SURFACE OF THE BIORETENTION BASIN FOLLOWING THE CONSTRUCTION PHASE (I.E. IN ITS FINAL DESIGN FORM, VEGETATED AS PER PLANTING SCHEDULE), AS THIS WILL HINDER FILTRATION OF STORMWATER THROUGH THE FILTER MEDIA. JUTE MATTING IS PERMITTED.
10. 40% OF COVERAGE SHALL COMPRISE OF THE PLANTS MARKED WITH ***
11. PLANTS FROM THE PREFERRED PLANTING LIST SHALL BE PLANTED IN PREFERENCE TO PLANTS FROM THE ALTERNATIVE PLANTING LIST. PLANTS FROM THE ALTERNATIVE PLANTING LIST CAN BE USED WHERE PREFERED PLANTS ARE COMMERCIALLY UNAVAILABLE.
12. PLANTING SHALL IDEALLY OCCUR FROM OCTOBER TO MARCH TO IMPROVE VIABILITY OF JURENILE PLANTS.
13. ALL PLANTS SHALL BE HARDENED PRIOR TO PLANTING.
14. SOME PLANTS MAY NOT BE AVAILABLE COMMERCIALLY & MAY NEED TO BE GROWN FROM SEED. THIS CAN TAKE UP TO 12 MONTHS. PLANNING OF PLANTING STAGE SHALL TAKE LONG LEAD IN TIMES INTO ACCOUNT.
15. THE FINAL PLANTING LIST SHALL BE APPROVED BY COUNCIL.



DETAIL 17
TYPICAL PLANTING
NTS



PLAN 8
BIORETENTION PLANTING ZONES
NTS

PREFERED PLANTING LIST

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Tall Sedge ***	*Carex appressa*	Tufted short rhizomatous, 1.2 h	8-10	Basin
Blue Flax-Lily	*Dianella revoluta*	Tufted perennial herb, 1 h	8-10	Basin
Wallaby Grass ***	*Rytidosperma tenuior, Austrodanthonia tenuior, Danthonia tenuior*	Tufted perennial grass, 1.2 h	8-10	Basin
Common Rush ***	*Juncus usitatus*	Tufted short rhizomatous, 1 h	8-10	Basin
Kangaroo Grass ***	*Themeda trianda, Themeda australis*	Densely tufted leafy perennial, 1.2 h	8-10	Basin
Knobby Club Rush ***	*Ficina nodosa*	Rhizomatous perennial, 1 h	8-10	Basin
Eskdale, Tussock Grass	*Poa labillardieri*	Densely tufted perennial grass, 0.6 h	8-10	Basin
Gorse Bitter Pea	*Daviesia ulicifolia*	Small shrub, 2 h	1 per 2 m^2	Basin & Batters
Pink Honey Myrtle	*Melaleuca erubescens*	Hard, rough barked shrub, 2 m	1 per 2 m^2	Basin & Batters
Blueberry Lily	*Dianella longifolia*	Perenial rhizomatous tufted herb, 1 h	8-10	Batters & Landscape
Wattle Mat-rush	*Lomandra filiformis*	Perennial tussock, 0.5 h	8-10	Batters & Landscape
Tanika, Spiny Mat-rush	*Lomandra longifolia*	Perennial weeping tussock, 0.7 h	8-10	Batters & Landscape
Weeping Grass	*Microlaena stipoides*	Slender, tufted perennial grass, 0.7 h	8-10	Batters & Landscape
Pale Rush	*Juncus pallidus*		8-10	Basin
Sea Rush	*Juncus kraussii*	Tussock, rhizomatous perennial, 1 m	8-10	Basin
N/A	*Lachnagrostis filiformis*	Erect perennial grass, 0.7 h	8-10	Basin
N/A	*Lachnagrostis billardierei*	Erect perennial grass, 0.7 h	8-10	Basin
Chaffy Saw-sedge	*Gahnia filum*	Tussock forming perennial, 1 h	8-10	Basin
N/A	*Cyperus polystachyos*	Tufted perennial, short rhizome, 0.6 h	8-10	Basin
N/A	*Austrostipa stipoides*	Tufted perennial grass, 1.2 h	8-10	Basin
Tassel Sedge	*Carex fascicularis*	Tufted rhizomatous perennial, 1 h	8-10	Basin
Swamp Foxtail Grass	*Pennisetum alopecuroides*	Clumping tussocks perennial, 1.5 h	8-10	All
N/A	*Baloskion / Restio pallens*	Dioecious perennial herb, 1 h	8-10	Basin
N/A	*Schoenoplectus mucronatus*	Tufted perennial, 1 h	8-10	Basin
Marsh Clubrush	*Bolboschoenus fluviatilus*	Rhizomatous tufted perrenial, 2.5 h	8-10	Basin
N/A	*Bolboschoenus caldwellii*	Rhizomatous tufted perrenial, 1 h	8-10	Basin

THE PLANTS IN THIS LIST HAVE BEEN SELECTED SPECIFICALLY FOR WESTERN SYDNEY CONDITIONS BY HUNTER & SAINTY
h REFERS TO MATURE HEIGHT (m)

ALTERNATIVE PLANTING LIST

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Corkscrew Grass	*Austrostipa setacea*	Tufted perennial grass, 0.8h	8-10	Basin
Barbed Wire Grass	*Cymbopogan refractus*	Tufted perennial grass, 1 h	8-10	Basin
Shorthair Plume Grass	*Dichelachne micrantha*	Tufted perennial grass, 1.2 h	8-10	Basin
Forest Hedgehog Grass	*Echinopogon ovatus*	Rhizomatous perennial, 1.2 h	8-10	Basin
Wiry Panic Grass	*Entolasia stricta*	Shrubby rhizomatous perennial, 0.8 h	8-10	Basin
Paddock Lovegrass	*Eragrostis leptostachya*	Loosely tufted perennial, 1 h	8-10	Basin
Hop Goodenia	*Goodenia ovata*	Erect, ascending or prostate shrub, 2 h	1 per 2 m^2	Basin & Batters
Sticky Hop Bush	*Dodonaea viscosa*	Small shrub to tree, 8 m	1 per 2 m^2	Batters & Landscape
N/A	*Cyperus laevigatus*	Rhizomatous perennial, 0.6 h	8-10	Basin
Queensland Bluegrass	*Dichantheum sericeum*	Tufted warm season perennial, 1.2 h	8-10	Basin

BLUE MOUNTAINS CITY COUNCIL LOCAL VARIATION PLANTING LIST
PLANTS NOT SUITABLE FOR USE IN BMCC

COMMON NAME	SPECIES
Pink Honey Myrtle	*Melaleuca Erubescens*
Swamp Foxtail Grass	*Pennisetum Alopecuroides*
Queensland Blue Grass	*Dichantheum Sericeum*

NOTE LOCAL VARIATION:
FOR ADDITIONAL PLAN SPECIES FOR USE IN BLUE MOUNTAINS CITY COUNCIL REFER DRAWING WSUD14

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Client
WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - LANDSCAPING

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale	A1	Q.A. Check	Date
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BLUE MOUNTAINS CITY COUNCIL LOCAL VARIATION PLANTING LIST
ADDITIONAL PLAN SPECIES FOR USE IN BMCC (BASE OF BASIN)

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Bare Twig-Rush	*Baumea Juncea*			
Tassel Cord Rush	*Baloskion Tetraphyllum*			
Fishbone Water Fern	*Blechnum Species*			
Slender Flat-Sedge	*Cyperus Gracilis*			
Sword-Sedge	*Lepidosperma Laterale*			
Tufted Sedge	*Carex Qaudichaudiana*			
Bergalia Tussock	*Carex Longebrachiata*			
Tall Spike Rush	*Eleocharis Sphacelata*			
Clarks Saw Sedge	*Gahnia Clarkei*			
Paroo Lily	*Dianella Caerulea*			
Blue Matrush	Lomandra Glauca			

BLUE MOUNTAINS CITY COUNCIL LOCAL VARIATION PLANTING LIST
GRASSES FOR BATTER SLOPES OF BASINS

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Soft Twig Rush	*Baumea Rubiginaosa*			
Long-Hair Plume-Grass	*Dicelachne Crinata*			
Bladey Grass	*Imperata Cylindrica*			
Grass Flax	*Libertia Paniculata*			
Multifowered Mat Rush	*Lomandra Multiflora*			
Purple Flag	*Patersonia Species*			
Grey Tussock Grass	*Poa Sieberiana*			
Prickly Couch	*Zoysia Macrantha*			

BLUE MOUNTAINS CITY COUNCIL LOCAL VARIATION PLANTING LIST
SHRUBS FOR BATTER SLOPES OF BASINS

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Heath-Leaved Banksia	*banksia Ercifolia*			
Silver Banksia	*Banksia Marginata*			
Swamp Banksia	*Banksia Paludosa*			
Blackthorn	*Bursaria Spinosa*			
Crimson Bottlebrush	*Callistemon Citrinus*			
Dagger Hakea	*Hakea Teretifolia*			
Prickly Tea-Tree	*Leptospermum Continentale*			
Paperbark Tea-Tree	*Leptospermum Trinervium*			
Thyme Honey-Myrtle	*Melaleuca Thymifolia*			
Bush Pea	*Pultengeg Villifera*			

BLUE MOUNTAINS CITY COUNCIL LOCAL VARIATION PLANTING LIST
TREES - DEEP MEDIA IN BASIN

COMMON NAME	SPECIES	TYPE OF VEGETATION	PLANT DENSITY PER m^2	PLANTING ZONE (REFER PLAN 8)
Flax-leaved Paperbark	*Melaleuca Linariifolia*			
Prickly Leafed Paperbark	*Melaleuca Nodosa*			
Prickly Leafed Paperbark	*Melaleuca Styphelioide*			
Blue Mountains Water Gum	*Tristaniopsis Laurina*			

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Issue	Description	Date	Drawn	Approved
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1 0 1cm at full size 10cm 20cm

North

Client
WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - LANDSCAPING
BLUE MOUNTAINS VARIATION
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS	OCT'20

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STAGING OF BIORETENTION CONSTRUCTION WORKS

DESIGN NOTES:

1. WHERE THE UPSTREAM CATCHMENT HAS NOT ACHIEVED 80% OF FINAL CONSTRUCTION, INCLUDING LANDSCAPING, THE BIORETENTION SYSTEM IS TO BE CONSTRUCTED WITH A SACRIFICIAL LAYER.
2. ONCE THE 80% TARGET HAS BEEN ACHIEVED, THE BIORETENTION SYSTEM IS TO BE CONSTRUCTED WITHIN 6 MONTHS. CAPTURED SEDIMENT AND SATURATED SOIL IS TO BE REMOVED AND THE BIORETENTION SYSTEM CONSTRUCTED AS PER THE DESIGN.
3. THE MAINTENANCE PERIOD OF THE SYSTEM IS TO EXTEND FOR MINIMUM 36 MONTHS FROM WHEN THE BIORETENTION SYSTEM IS FULLY PLANTED BEFORE HANDOVER TO ANY FINAL CUSTODIAN.
4. BIORETENTION SYSTEMS SHALL ACHIEVE A MINIMUM DENSITY OF 8 PLANTS PER m^2 AT 36 MONTHS AND BE VIGOROUS, HEALTHY AND FREE OF WEEDS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADVISE COUNCIL IF THIS DENSITY IS NOT ACHIEVED AT 24 MONTHS AND TO REPLANT SO THAT ALL PLANTS HAVE BEEN GROWING A MINIMUM OF 12 MONTHS AT THE SPECIFIED DENSITY AT HAND OVER.
5. ANY REQUIREMENT OF FENCING OR OTHER MEASURE TO ENSURE PUBLIC SAFETY IS THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE MAINTAINED IN ACCORDANCE WITH COUNCIL OR OTHER REQUIREMENTS FOR THE DURATION OF THE CONSTRUCTION AND ESTABLISHMENT PERIOD.

REFER TO HOLD AND INSPECTION POINTS ON DRAWING WSUD 2

CONSTRUCTION ACTIVITIES CAN GENERATE LARGE SEDIMENT LOADS IN RUNOFF WHICH CAN SMOTHER VEGETATION AND CLOG BIORETENTION FILTER MEDIA. BIORETENTION BASINS ARE BEST CONSTRUCTED IN STAGES, IN CONJUNCTION WITH OTHER DEVELOPMENT ACTIVITIES:

STAGE 1:

TEMPORARY SEDIMENT BASIN - EXCAVATE BULK EARTHWORKS, INSTALLATION OF OUTLET TO MEET REQUIREMENTS OF BLUE BOOK, INSTALLATION OF SYSTEM INLET PIT, SURROUNDED EACH SIDE BY TEMPORARY ROCK DISSIPATOR. DISSIPATOR SHALL EXTEND A MINIMUM OF 2m AROUND THE INLET PIT AND HAVE A D_{50} = 300mm.

STAGE 2:

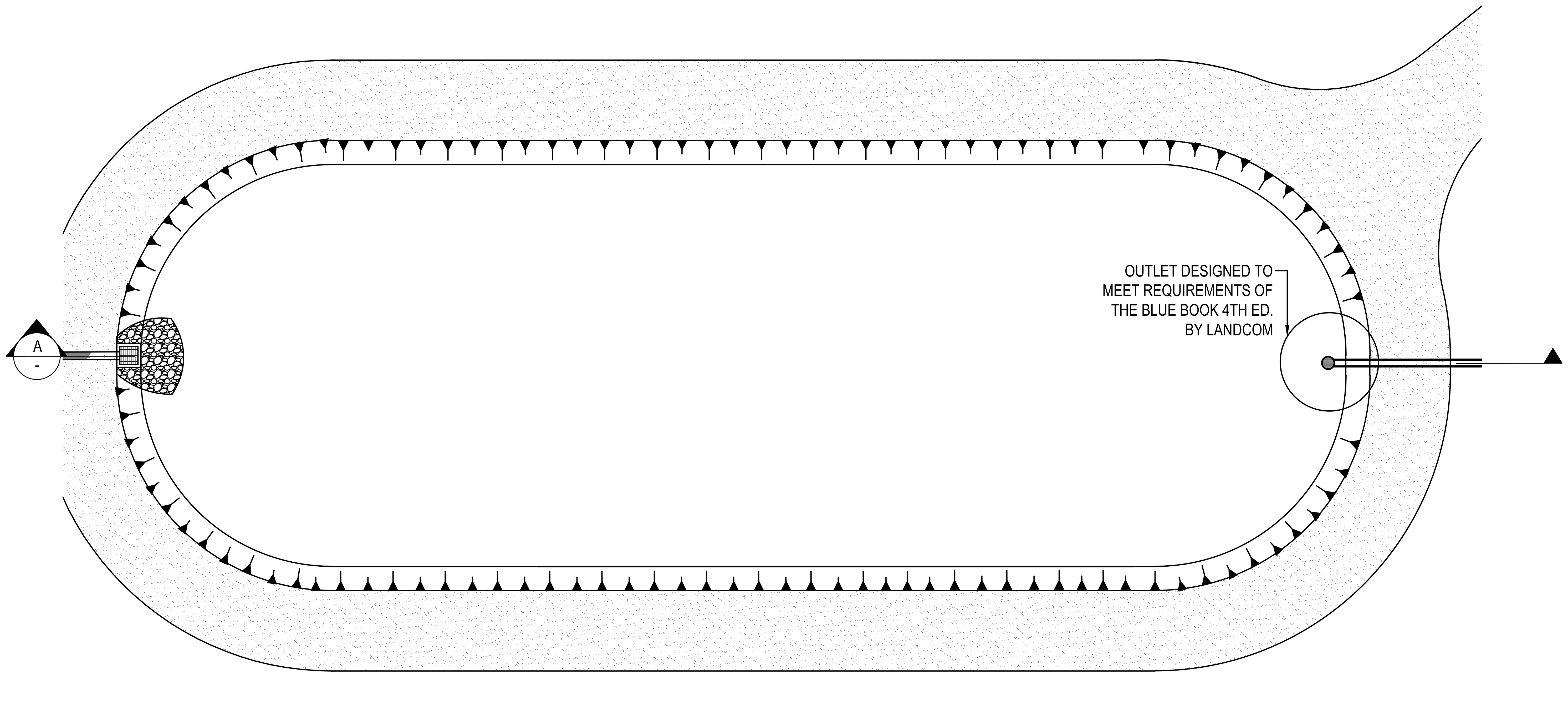
FUNCTIONAL INSTALLATION OF SACRIFICIAL BIORETENTION - ONCE UPSTREAM CATCHMENTS BULK EARTHWORKS ARE COMPLETE AND HAVE EFFECTIVELY BEEN SEALED A SACRIFICIAL FILTER SYSTEM SHALL BE CONSTRUCTED. THIS INCLUDES:

- REMOVAL OF TEMPORARY ROCK DISSIPATOR AT SYSTEM INLET PIT.
- REMOVAL OF ALL SEDIMENT
- INSTALLATION OF GEOTEXTILE AND LINERS UNDER
- INSTALLATION OF SUBSOIL DRAINS AND DRAINAGE LAYERS. TEMPORARY SUPPORT FLUSHING POINTS
- INSTALLATION OF 250mm OF TRANSITION LAYER
- INSTALLATION OF UPFLOW PITS, CONNECTING PIPES AND TEMPORARY SOIL BARRIERS
- LOCALISED MOUNDING OVER PIPES
- INSTALLATION OF TEMPORARY GEOTEXTILE AND 150mm MEDIA OR COARSE SAND LAYER
- INSTALLATION OF WASHED TURF OVER THE SACRIFICIAL MEDIA LAYER

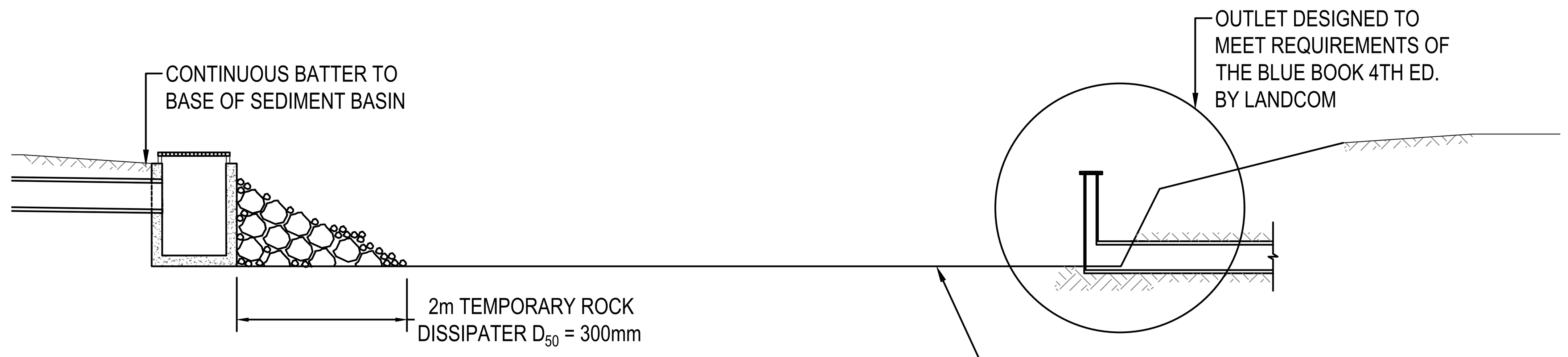
STAGE 3:

OPERATIONAL ESTABLISHMENT ONCE 90% DEVELOPMENT HAS OCCURRED- REMOVAL OF TURF, SACRIFICIAL MEDIA LAYER AND TEMPORARY GEOTEXTILE INSTALLATION OF:

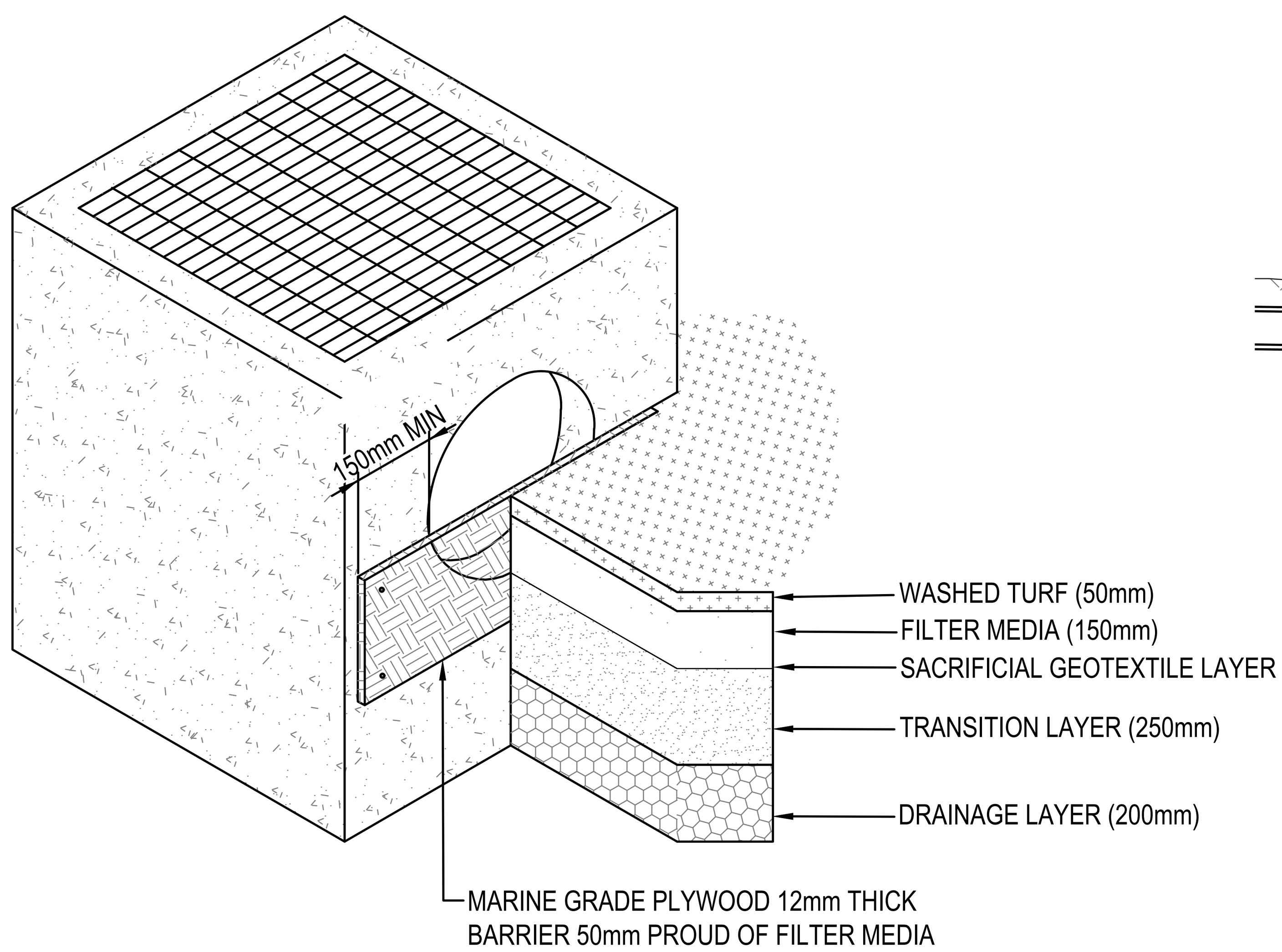
- REMAINING UPFLOW PITS
- PERMEABLE CONCRETE PIPE
- UPPER 200mm OF TRANSITION LAYER
- FILTER MEDIA LAYER
- PLANTING
- REMOVAL OF ALL SEDIMENT FROM PIPES, INLETS AND OUTLETS.



STAGE 1
NTS



SECTION A (STAGE 1)
NTS



DETAIL 18
STAGE 2 TEMPORARY SOIL BARRIER ON UPFLOW PIT
NTS

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Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

-1 0 1cm at full size 10cm 20cm

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - CONSTRUCTION WORKS STAGING - 1

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 15	01

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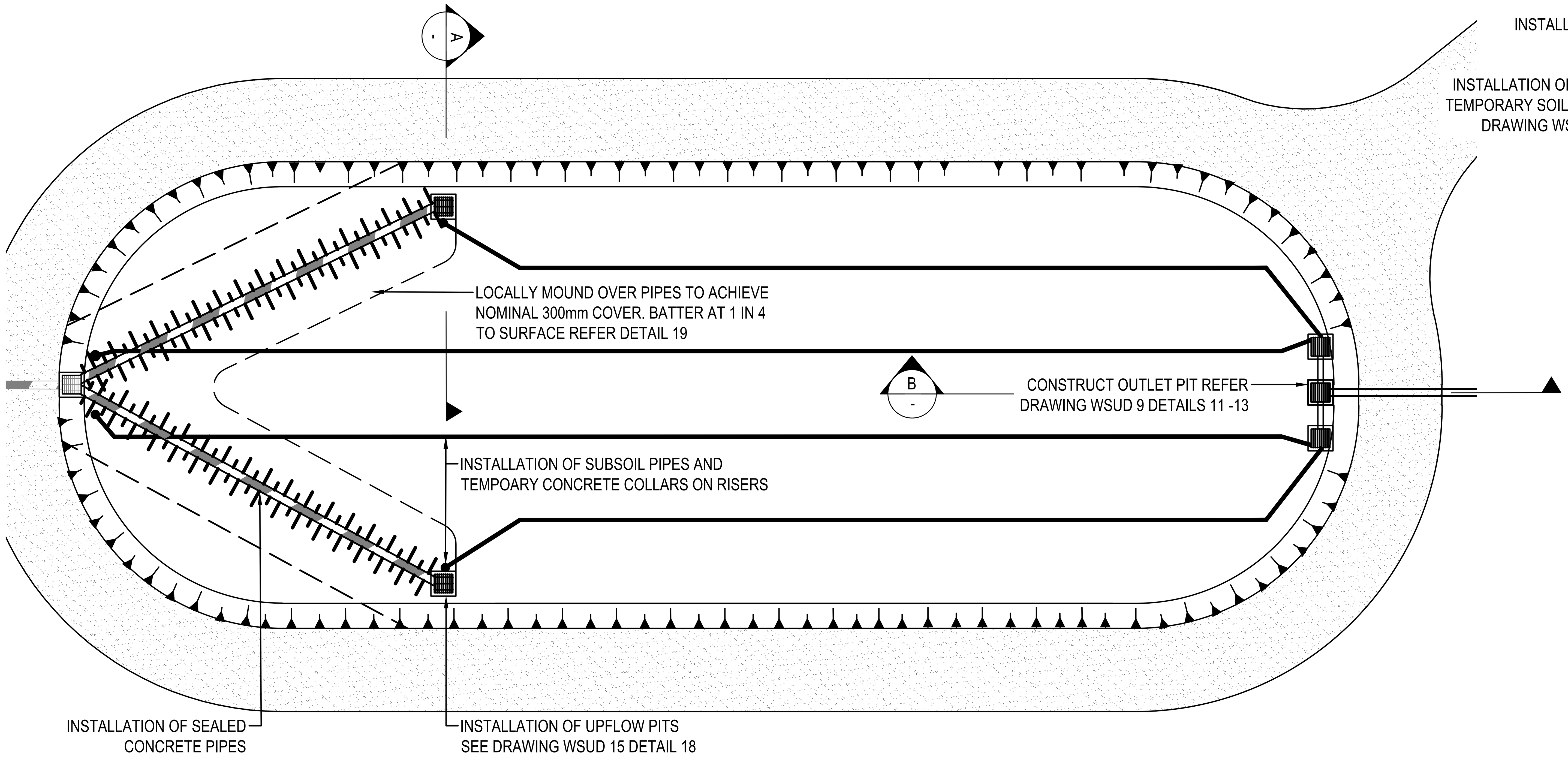

STAGE 2
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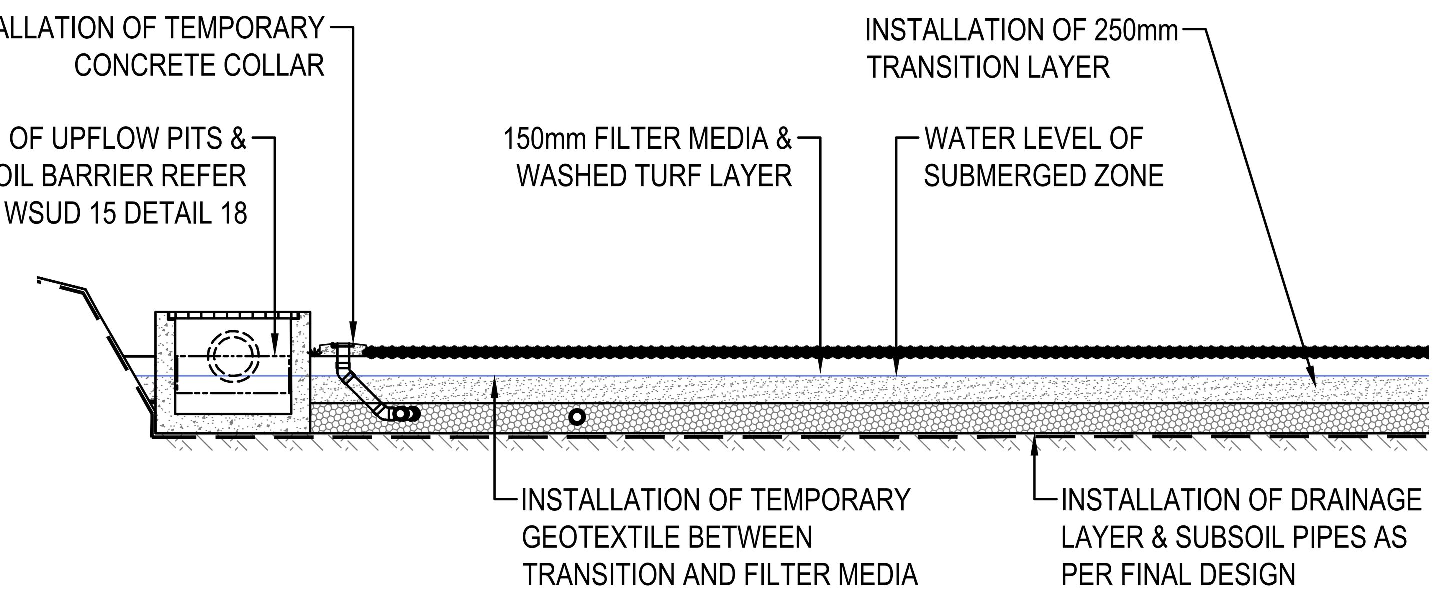
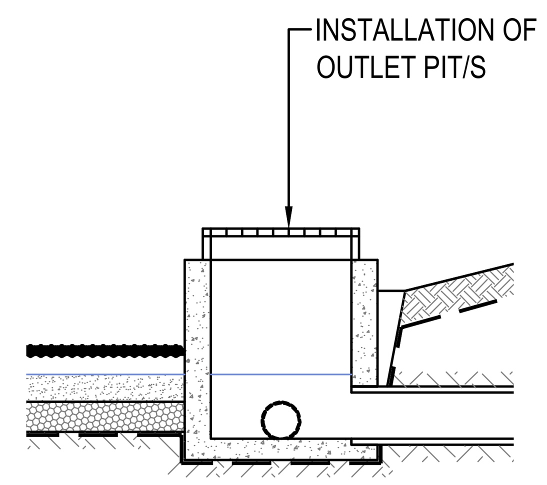
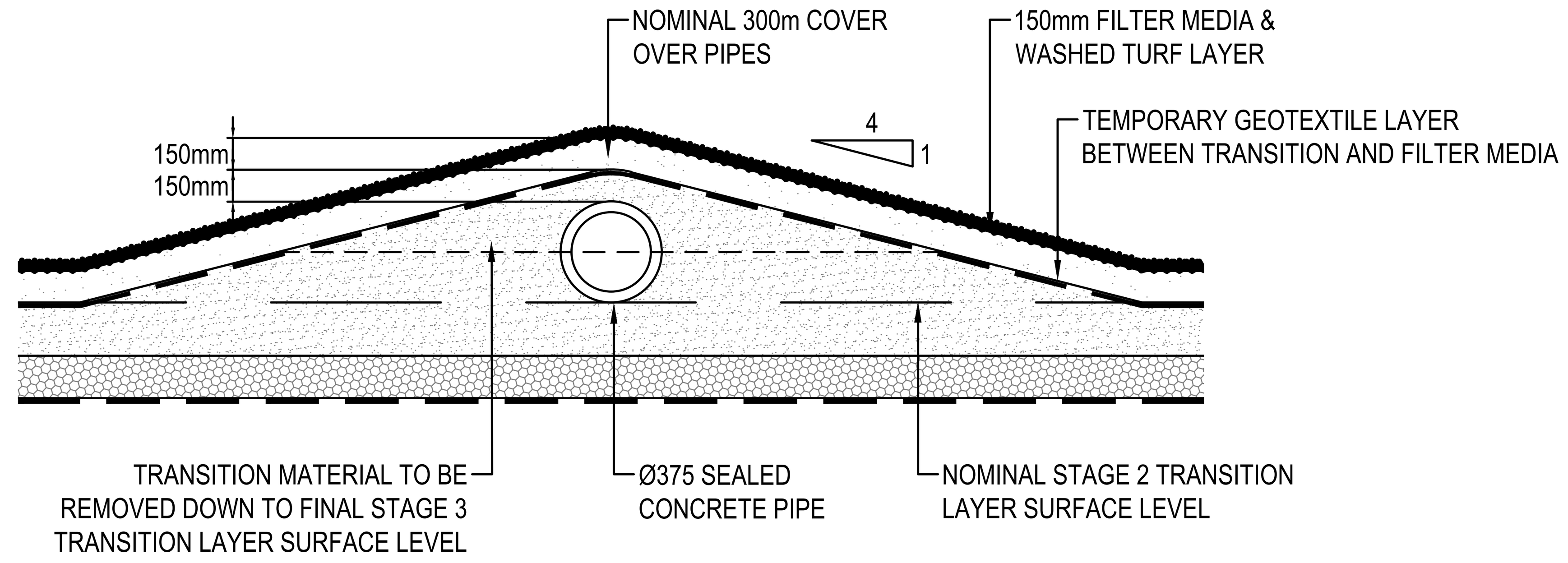


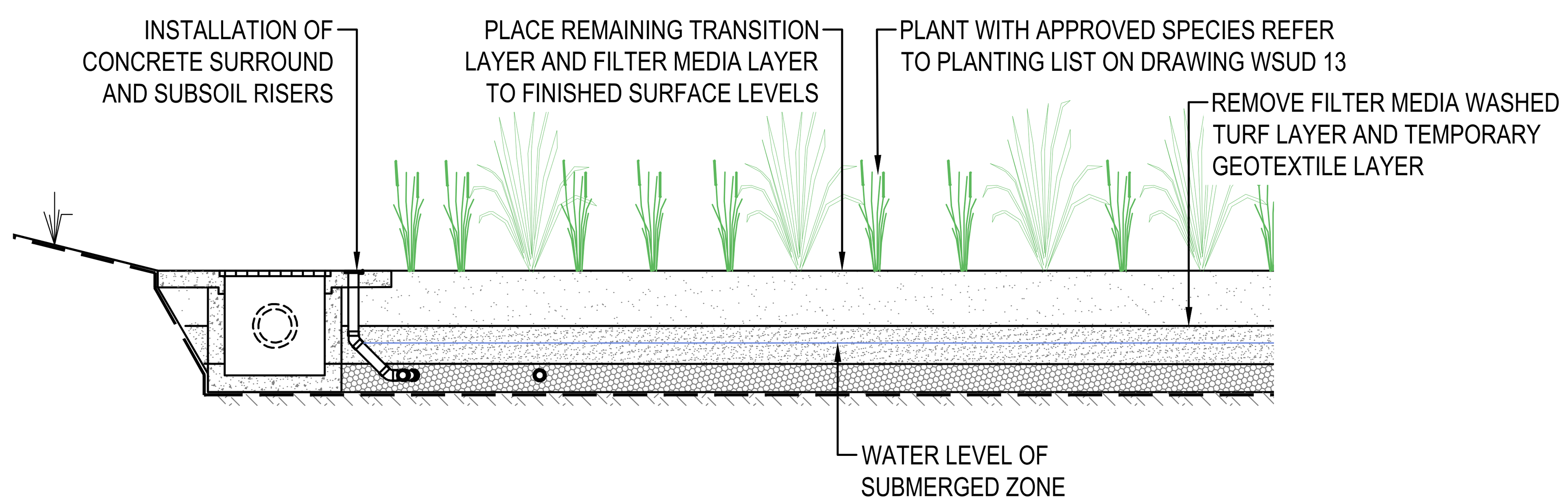
SECTION A (STAGE 2)
NTS



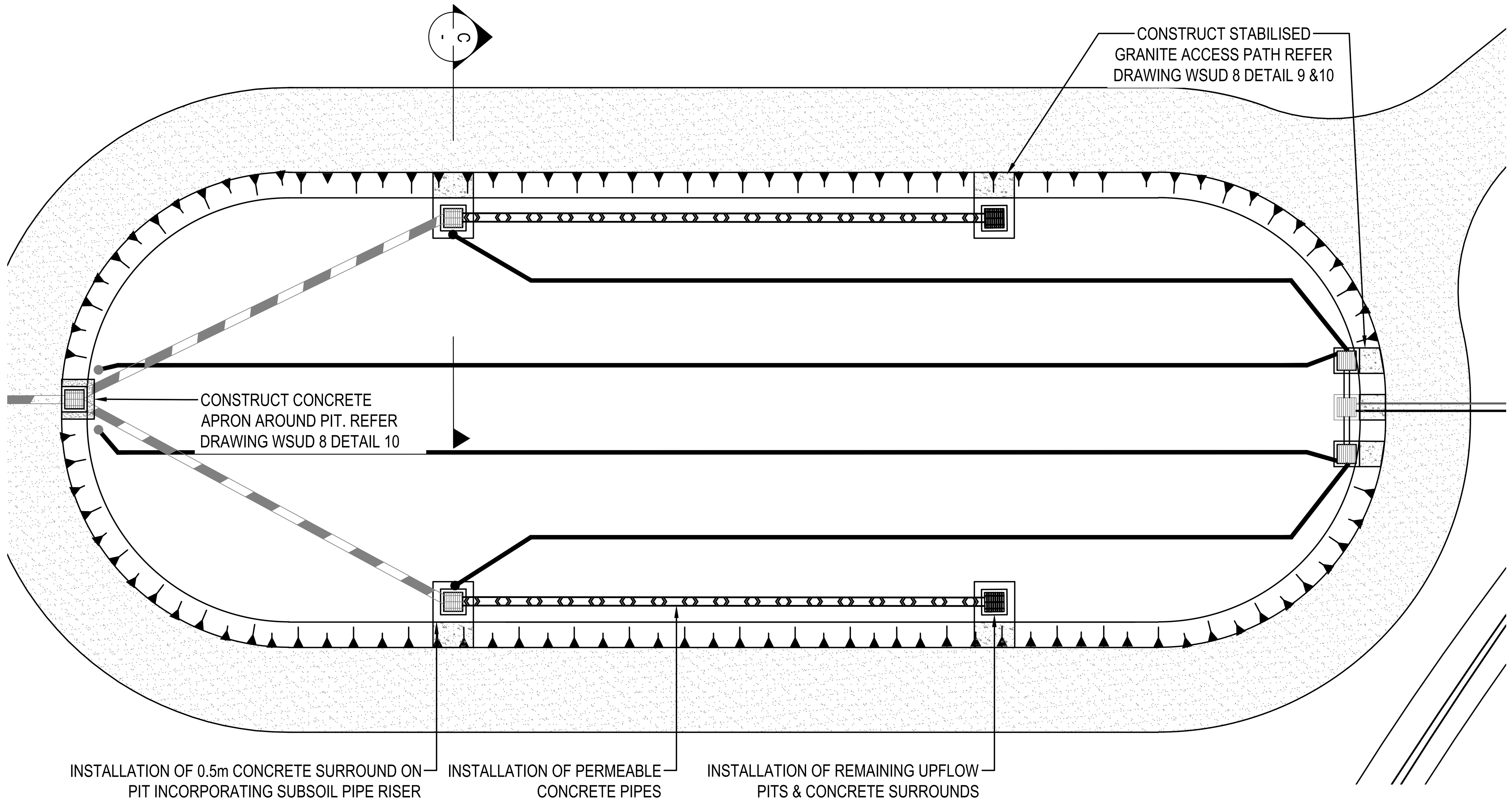
SECTION B (STAGE 2)
NTS



DETAIL 19
LOCAL MOUNDING OVER PIPES FOR STAGE 2
NTS



SECTION C (STAGE 3)
NTS



STAGE 3
NTS

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Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

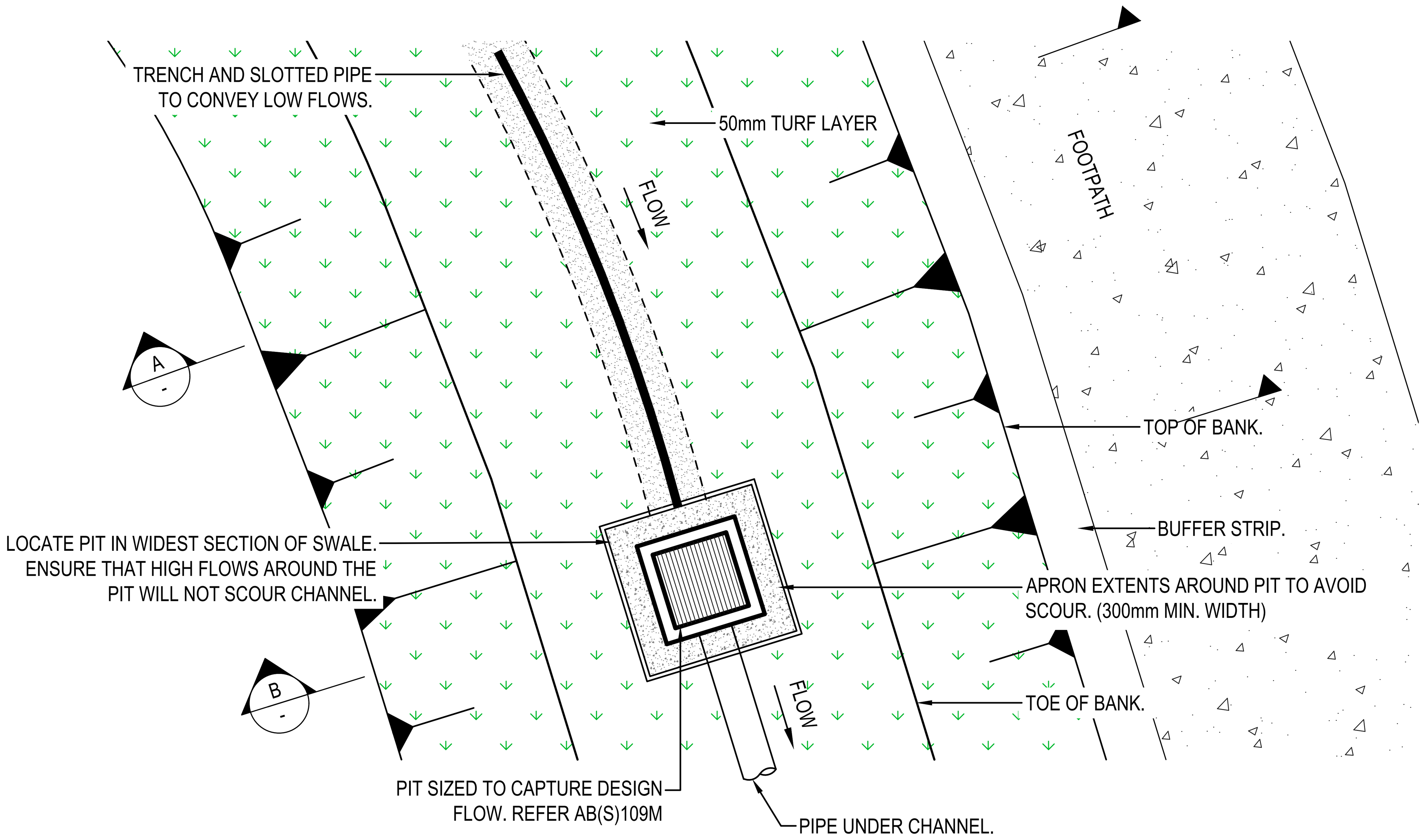
Drawing Title
BIORETENTION - CONSTRUCTION WORKS STAGING - 2

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

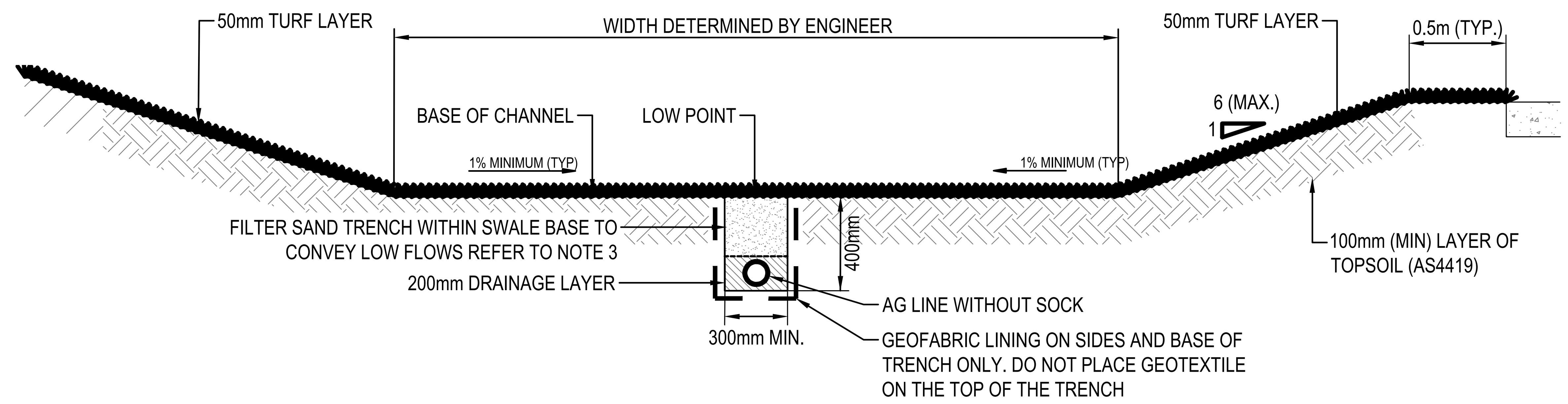
Drawn	Date	Scale	A1	Q.A. Check	Date
XX	APR' 2021	N.T.S		PWG COUNCILS	OCT'20
APPROVED FOR ISSUE	Project No. WS190098			Dwg. No. WSUD 16	Issue 01

DESIGN NOTES:

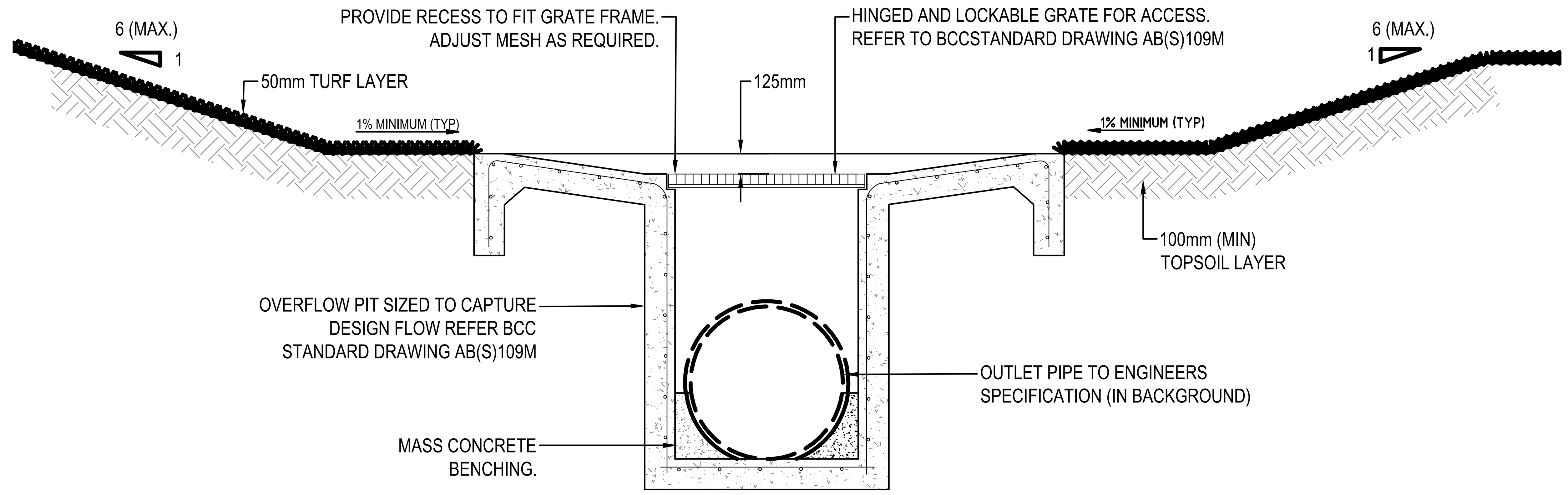
1. PERMANENT PONDING AND WATERLOGGING CAN BE AN ISSUE IN FLAT SWALES, WHERE THE LONGITUDINAL SLOPE IS 1% OR LESS, LOW FLOW DRAINAGE SHALL BE INCLUDED TO MINIMISE THIS PROBLEM. CONSIDER MULTIPLE SLOTTED PIPES IN LARGE SWALES OR WHERE THE GRADE IS LESS THAN 1%. WHERE GRADE ARE STEEPER THAN 4% USE CHECK DAMS - REFER DRAWING WSUD18 FOR DETAILS
2. WHERE SWALES ARE INCORPORATED IN STREET VERGES, OTHER KEY ISSUES INCLUDE:
   - CROSS SECTIONAL DIMENSIONS NEED TO ACCOMMODATE PATHWAYS, ETC. TO MEET LOCAL AUTHORITY GUIDELINES
   - CROSSING POINTS - REFER A(BS)103 FOR DRIVEWAY CROSSING DETAIL.
   - INFLOWS FROM NEIGHBOURING ALLOTMENTS.
   - PROTECTION FROM VEHICULAR DAMAGE. USE BOLLARDS OR OTHER BARRIERS TO PREVENT VEHICLE ENTRY.
   - A ROOT BARRIER MAY BE REQUIRED WHERE THE SWALE INCLUDES TREES PLANTED NEXT TO ROADWAYS OR OTHER INFRASTRUCTURE.
3. FILTER SAND TO COMPLY WITH SPECIFICATION FOR TRANSITION LAYER. REFER DRAWING WSUD 2 FOR DETAILS.
4. MAX ACCEPTABLE VELOCITY DURING A 100 YEAR ARI EVENT SHALL BE 1.0m/s TO AVOID SCOUR OF THE SURFACE



PLAN 10
TYPICAL SWALE FOR FLAT SITE
NTS



SECTION A
NTS



SECTION B
NTS

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
VEGETATED SWALES - FLAT SITES

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS	OCT'20

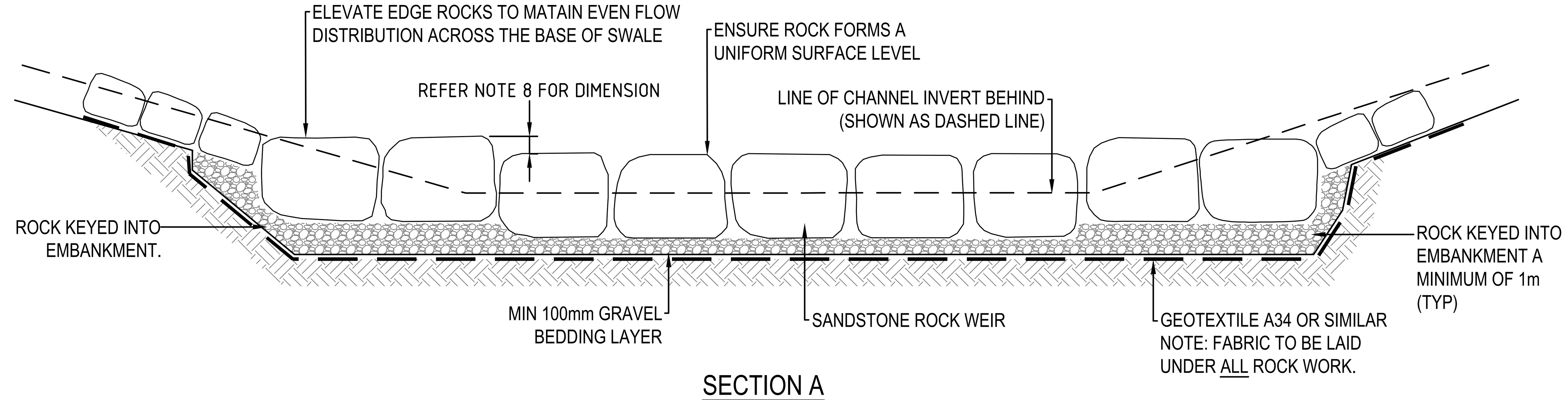
APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 17	01

DESIGN & EXPLANATORY NOTES:

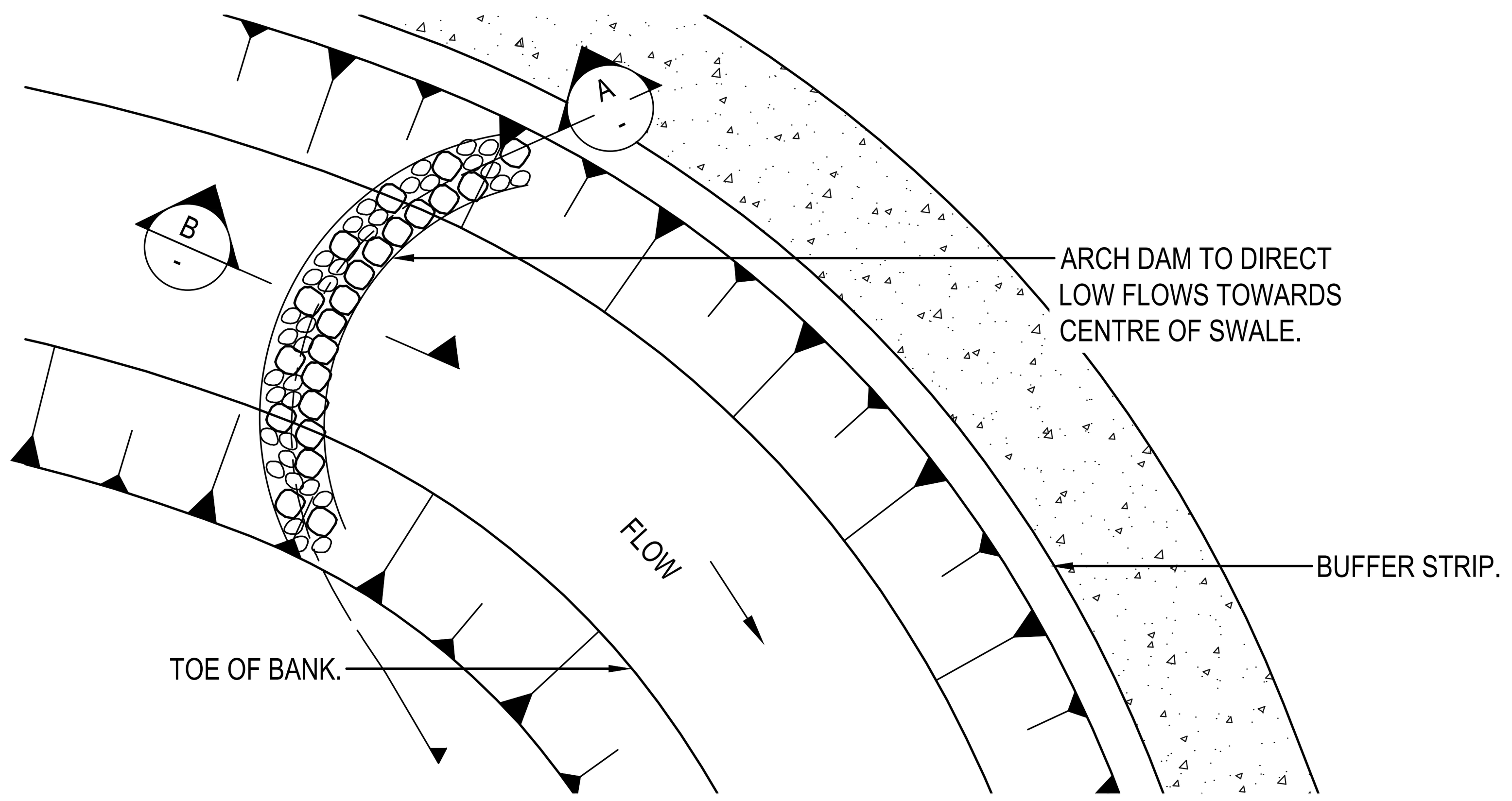
1. SCOUR AND EROSION CAN BE AN ISSUE IN STEEP SWALES, WHERE THE LONGITUDINAL SLOPE IS 4% OR GREATER. CHECK DAMS (AS SHOWN) ARE RECOMMENDED TO MINIMISE THIS PROBLEM.
2. IN STEEP SWALES, SCOUR AND EROSION CAN ALSO OCCUR AROUND OVERFLOW PITS AND OTHER STRUCTURES.
3. SWALES USING CHECK DAMS SHOULD NOT BE CONSTRUCTED AT GRADES STEEPER THAN 7%.
4. CHECK DAMS CAN BE CONSTRUCTED FROM DIFFERENT MATERIALS e.g. ROCK OR CONCRETE OR TIMBER.
5. ALL CHECK DAMS REQUIRE CAREFUL INSTALLATION TO ENSURE THEY ARE BUILT TO THE CORRECT LEVELS AND WILL BE STABLE UNDER DESIGN FLOW CONDITIONS.
6. ROCK APRON DEPTH IS TO BE EQUAL TO WEIR ROCK DIAMETER WITH A MIN OF 400mm. LENGTH = 10 x H
7. ROCK APRON LENGTH IS EQUAL TO 1.5 x WEIR ROCK DIAMETER. MIN LENGTH IS 600mm.
8. WEIR HEIGHT SHALL BE SUFFICIENT TO CONVEY THE 1 IN 10 YEAR CRITIAL STORM EVENT.
9. PLACE REINFORCED TURF FOR A DISTANCE OF 10 x H UPSTREAM OF WEIR.

REFERENCES:

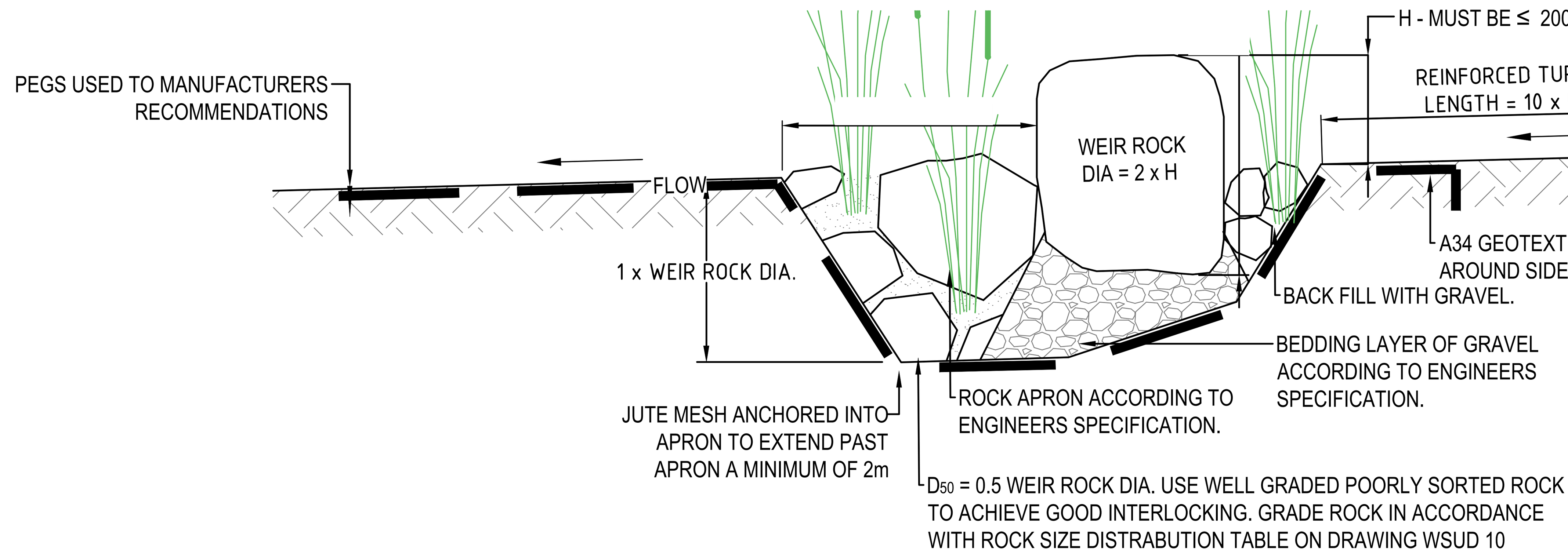
- HEALTHY WATERWAYS PARTNERSHIP (HWP) 2006 "WATER SENSITIVE URBAN DESIGN TECHNICAL GUIDELINES FOR SOUTH EAST QUEENSLAND". CHECK WATER BY DESIGN WEBSITE (www.waterbydesign.com.au) FOR LATEST UPDATE.



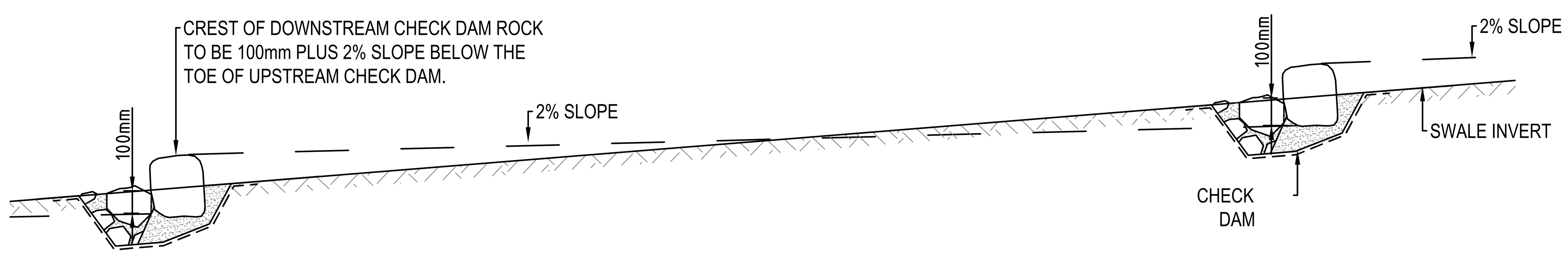
SECTION A
NTS



PLAN 11
TYPICAL SWALE STEEP SITES
NTS



SECTION B
NTS



DETAIL 20
TYPICAL LONGITUDINAL DISTRIBUTION OF CHECK DAMS
NTS

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Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
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Client: WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: VEGETATED SWALES - STEEP SITES

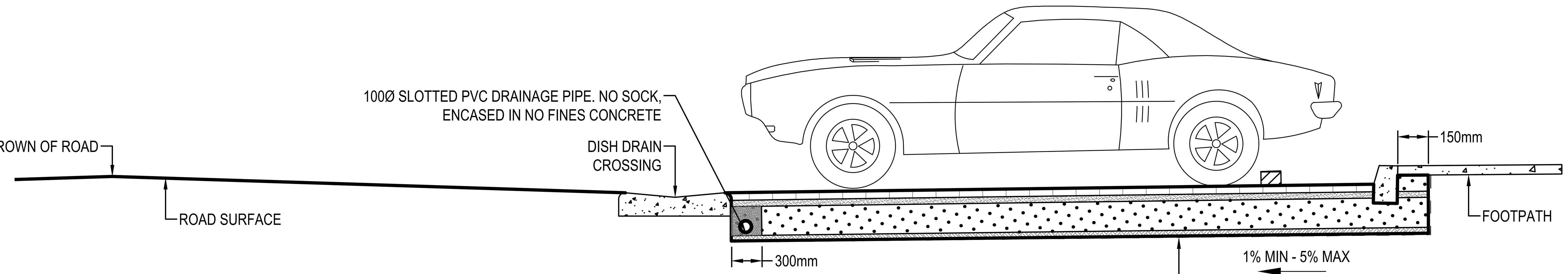
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale	A1	Q.A. Check	Date
XX	APR' 2021	N.T.S		PWG COUNCILS OCT'20	

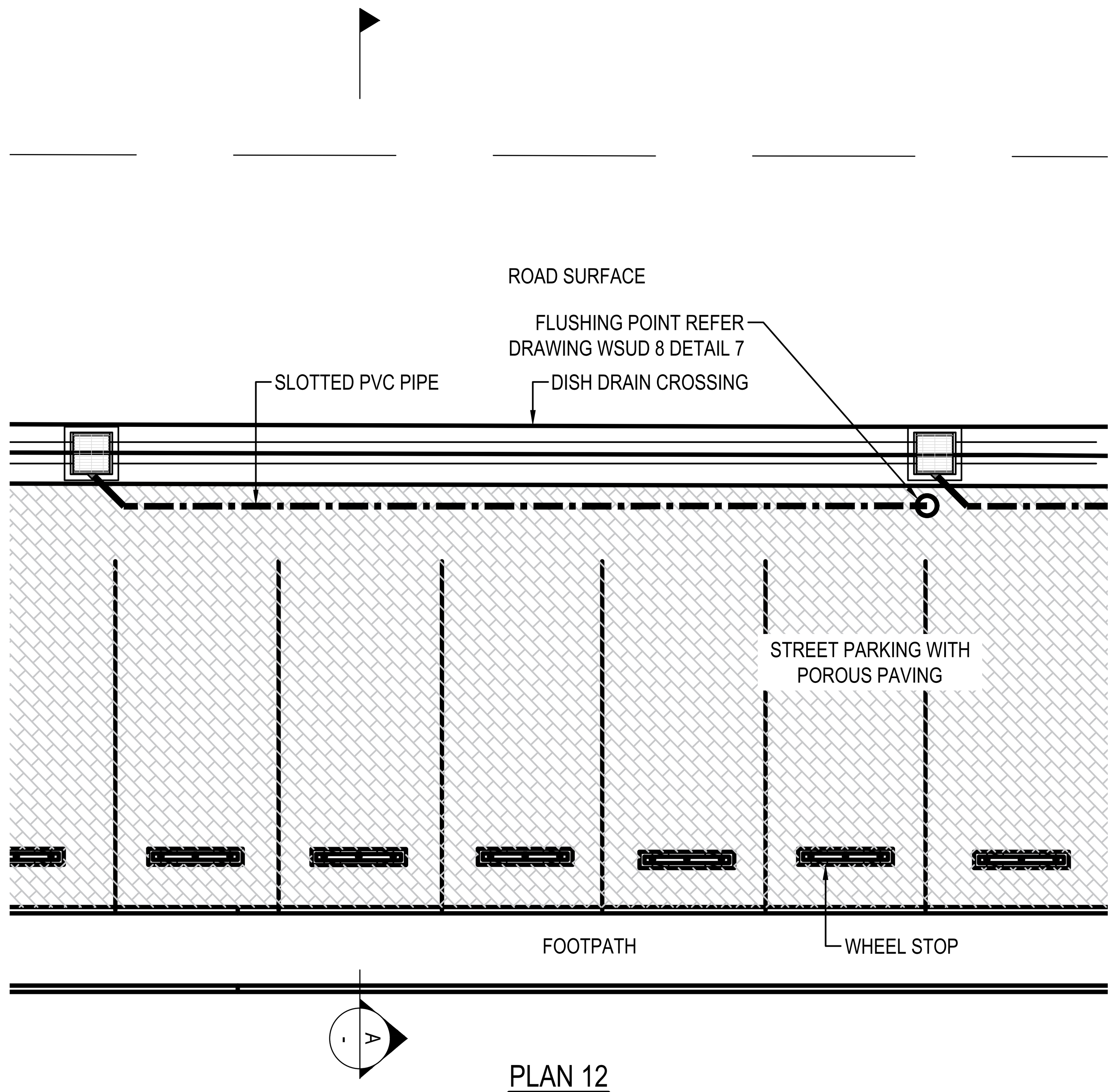
APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 18	01

DESIGN NOTES:

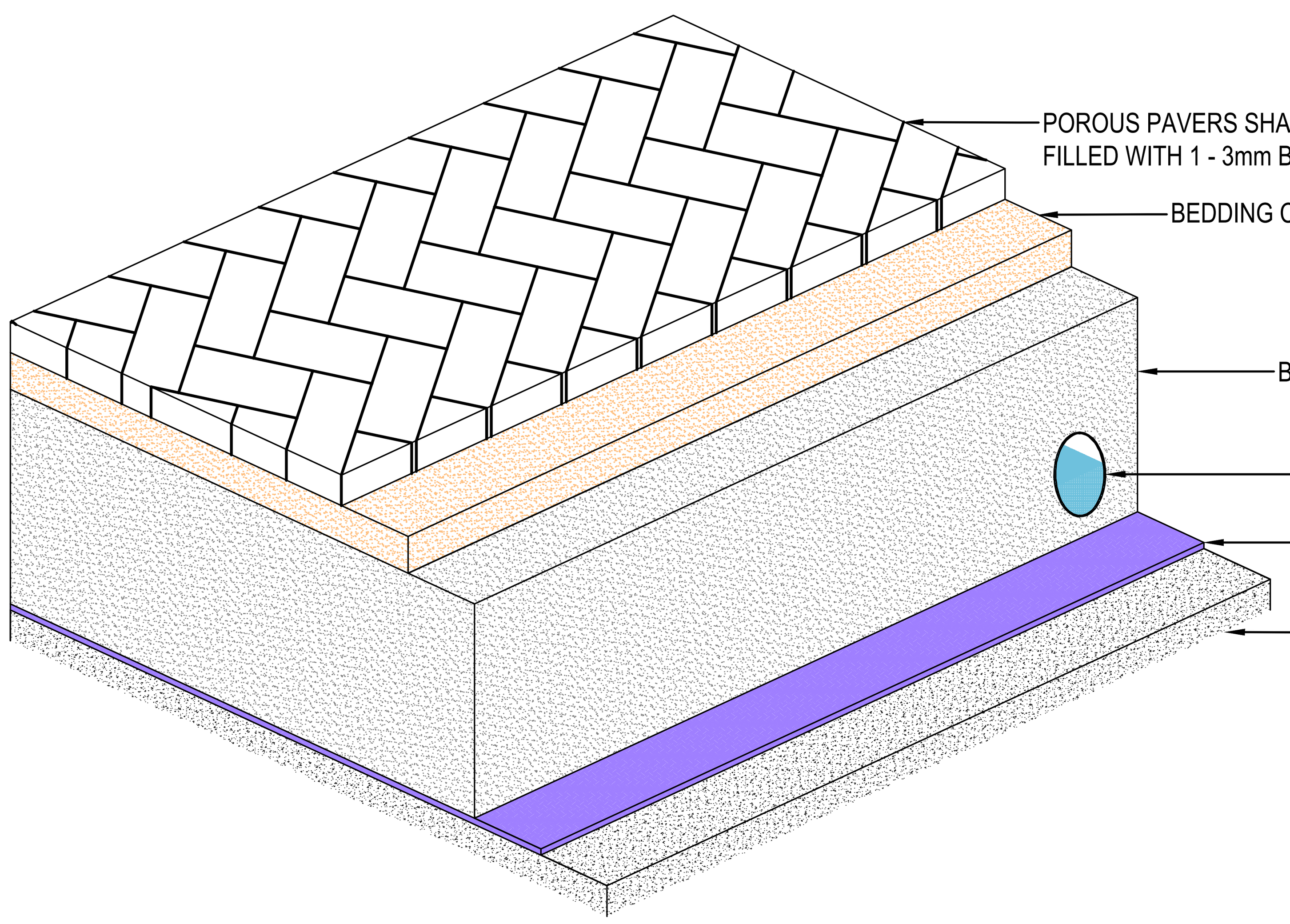
1. PERMEABLE PAVEMENT IS MOST SUITABLE TO PEDESTRIAN OR LOW TRAFFIC AREAS.
2. PERMEABLE PAVEMENT SHALL NOT BE USED IN AREAS WITH HEAVY TRAFFIC OR WHERE HEAVY VEHICLES ARE TURNING.
3. CLAY SOILS IN BLACKTOWN RESTRICT INFILTRATION. SUBSOIL DRAINAGE SHALL BE USED.
4. PERMEABLE PAVEMENTS SHALL HAVE NO RUN-ON WATERFLOW.
5. ANY PERMEABLE PAVEMENTS SHALL BE DESIGNED BY AN EXPERIENCED, QUALIFIED CIVIL, GEOTECHNICAL OR STRUCTURAL ENGINEER.
6. ONLY POROUS PAVERS SHALL BE USED.
7. IF THE BASE COURSE IS TO BE NO-FINES CONCRETE THEN THE BRIDGING LAYER IS NOT REQUIRED
8. SUBSOIL DRAIN LINES ARE TO HAVE FLUSHING POINTS EVERY 20m NOMINAL.
9. CLEANING & OR RENEWAL REQUIRED WHERE WATER PONDS FOR MORE THAN 1 HOUR AFTER RAINFALL.



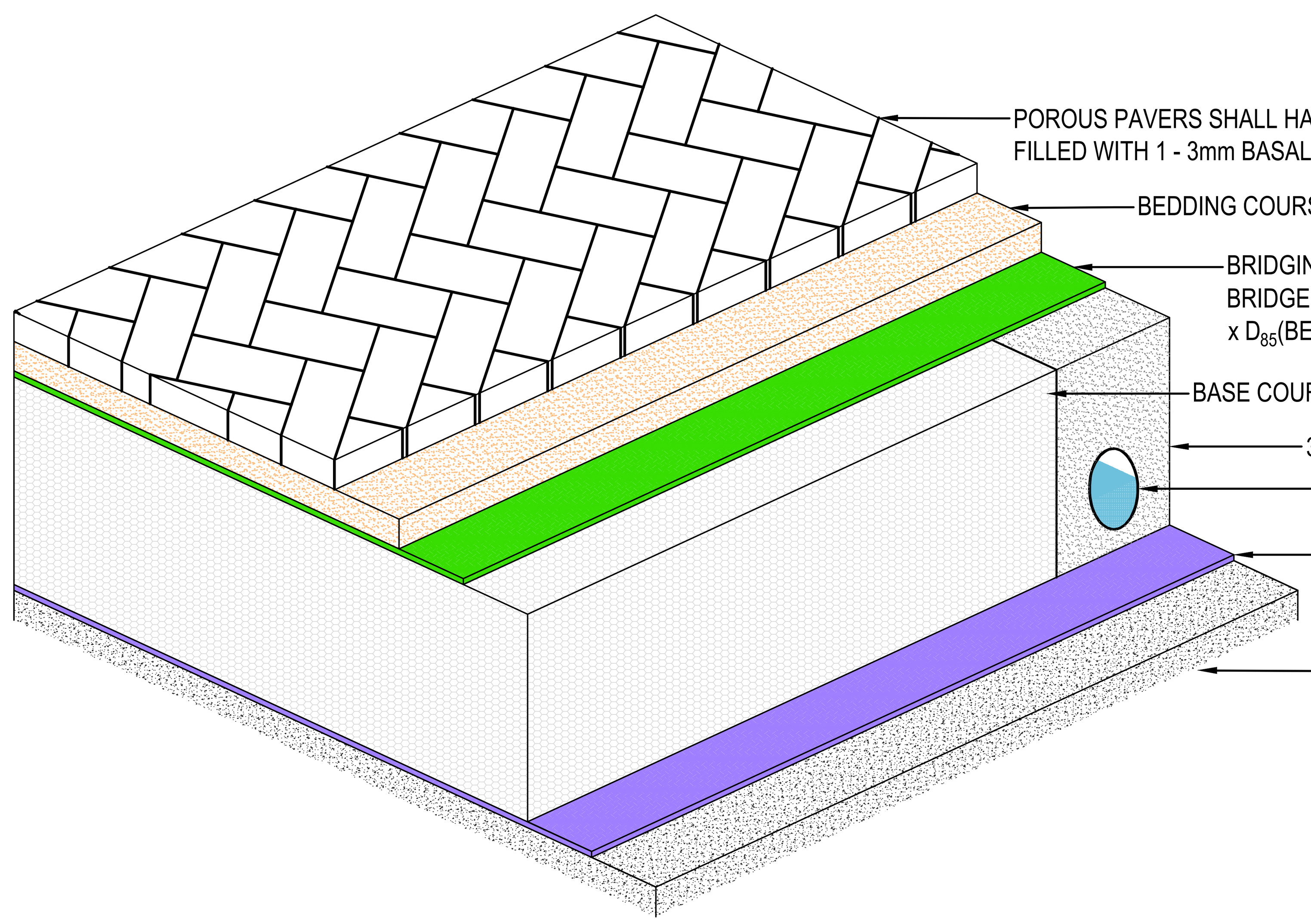
SECTION A
NTS



PLAN 12
USE OF POROUS PAVING IN ON STREET PARKING
NTS



DETAIL 21A
TYPICAL SECTION POROUS PAVERS WITH NO-FINES CONCRETE BASE COURSE
NTS



DETAIL 21B
TYPICAL SECTION POROUS PAVERS WITH CRUSHED AGGREGATE BASE COURSE
NTS

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: POUROUS PAVING

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20

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	WS190098	WSUD 19	01

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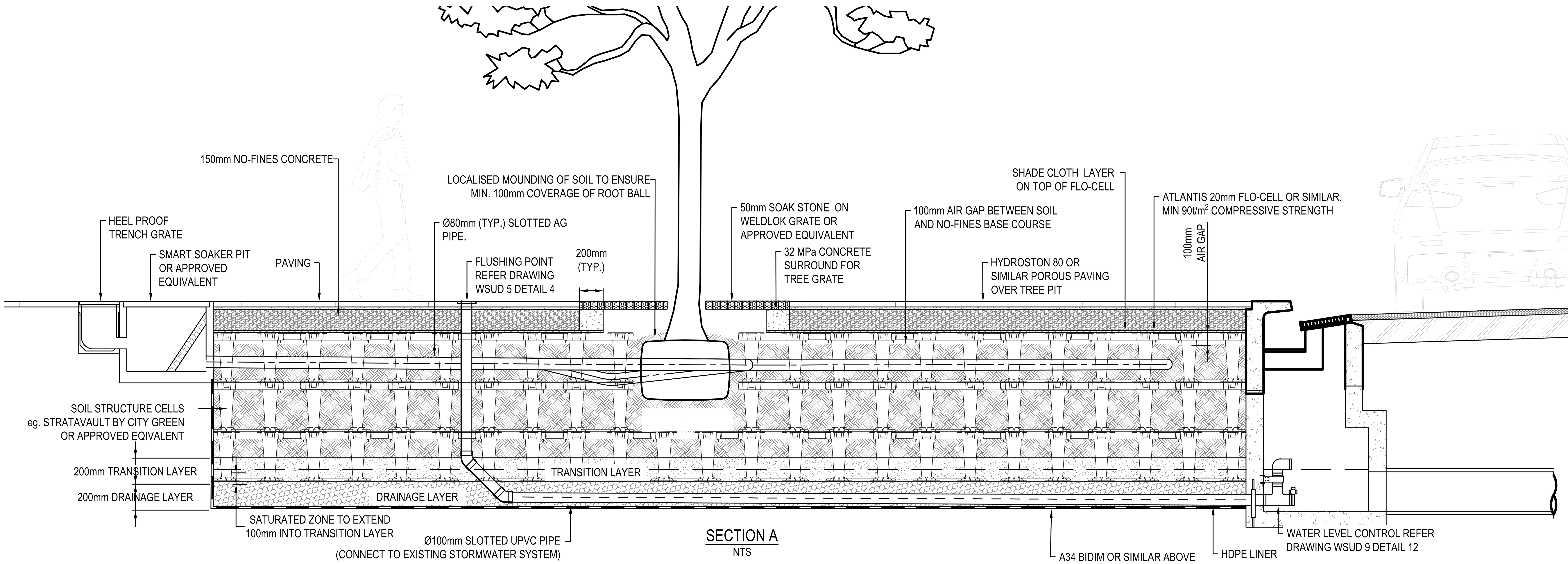

SECTION A
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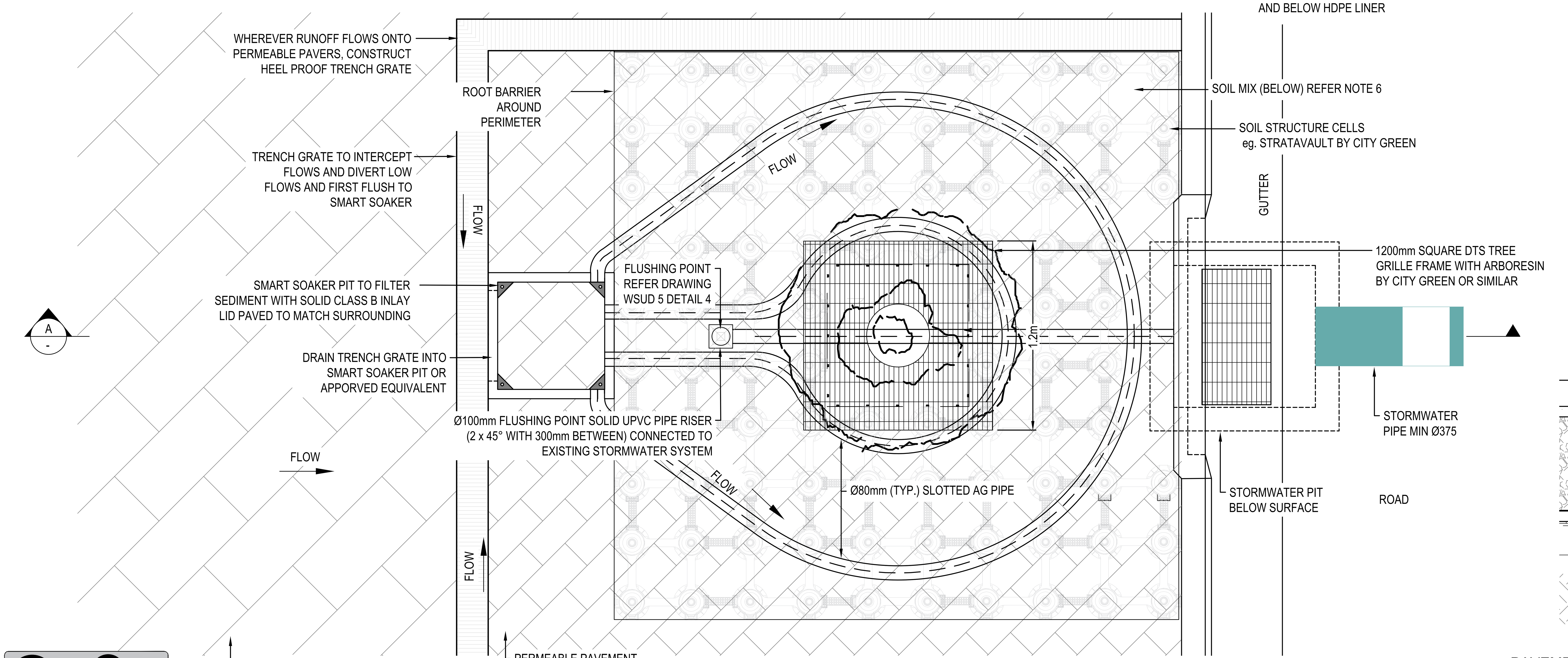
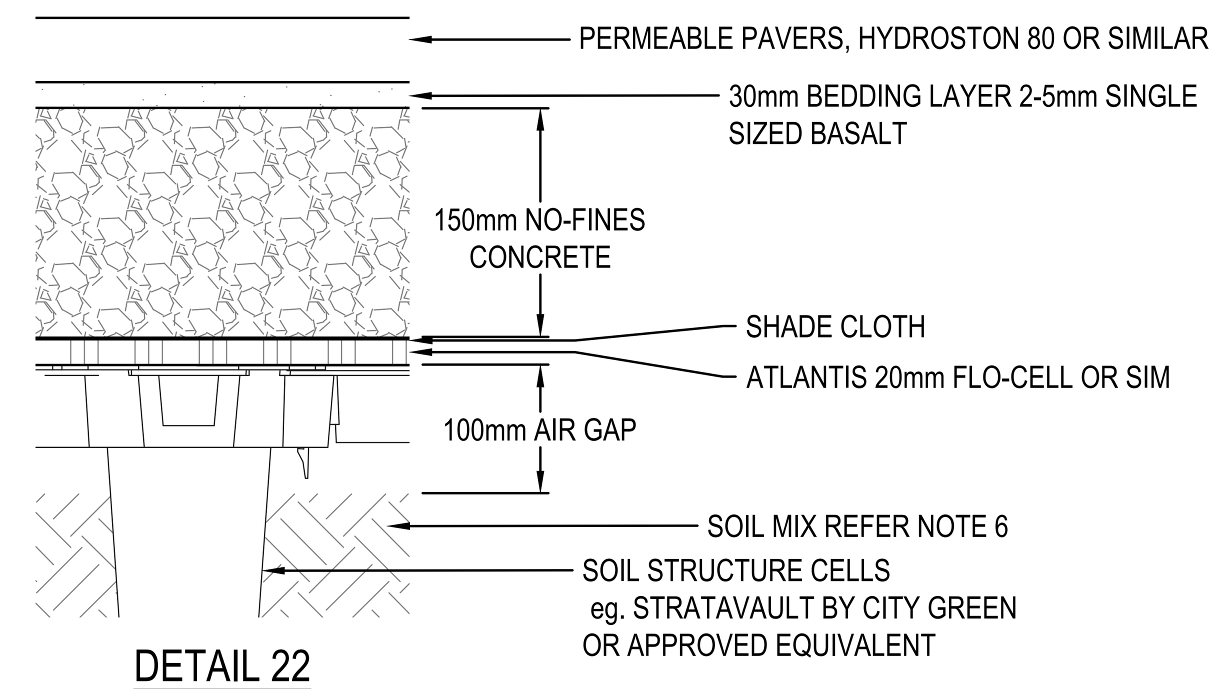


PLAN 13
TREE PIT LAYOUT 1 - TYPICAL
NTS

DESIGN NOTES:

1. IT IS INTENDED THAT THIS TREATMENT IS APPLICABLE TO TOWN CENTRES AND DENSE URBAN AREAS. IT WOULD BE SUITABLE FOR PAVED OPEN SPACE AREAS WHICH CAN BENEFIT FROM EXTENSIVE SHADING AND URBAN COOLING SUCH AS OUTDOOR EATING AREAS.
2. THE LENGTH TO WIDTH RATIO OF THE TREE PIT SHALL NOT EXCEED 2:1.
3. THE STANDARD DETAILS SHOWN ON THIS DRAWING ARE TYPICAL ONLY. THESE DETAILS MAY NEED TO BE RECONFIGURED TO SUIT SITE SPECIFIC CONDITIONS
4. THE VOLUME OF SOIL TO BE USED IN A TREE PIT SHALL BE A MIN. OF $30m^3$.
5. WHERE POSSIBLE GRADE PAVING TO DIRECT FLOWS TOWARDS THE TREE PITS WITHOUT CREATING A TRAPPED LOW POINT.
6. SOIL MIX SHALL BE AS PER CITY GREEN RECOMMENDATIONS FOR TREE PITS.
7. WHERE TRENCH GRATES OR PERMEABLE PAVERS ARE INAPPROPRIATE OR THE CATCHMENT IS LESS THAN $100m^2$ CONSIDER SUPPLYING WATER FROM ALTERNATIVE SOURCES SUCH AS ROOF RUNOFF AND PROVIDE A HIGH FLOW BYPASS.



DETAIL 22
PAVEMENT LAYERS FOR TREE PIT
NTS

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
BIORETENTION - TOWN CENTRES
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale	A1	Q.A. Check	Date
XX	APR' 2021	N.T.S		PWG COUNCILS	OCT'20

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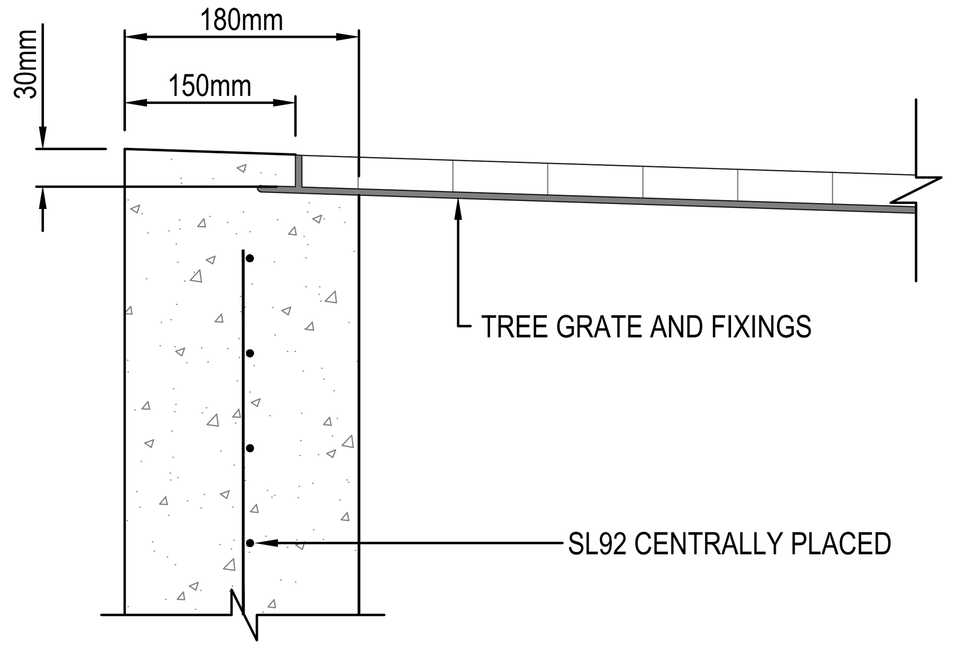
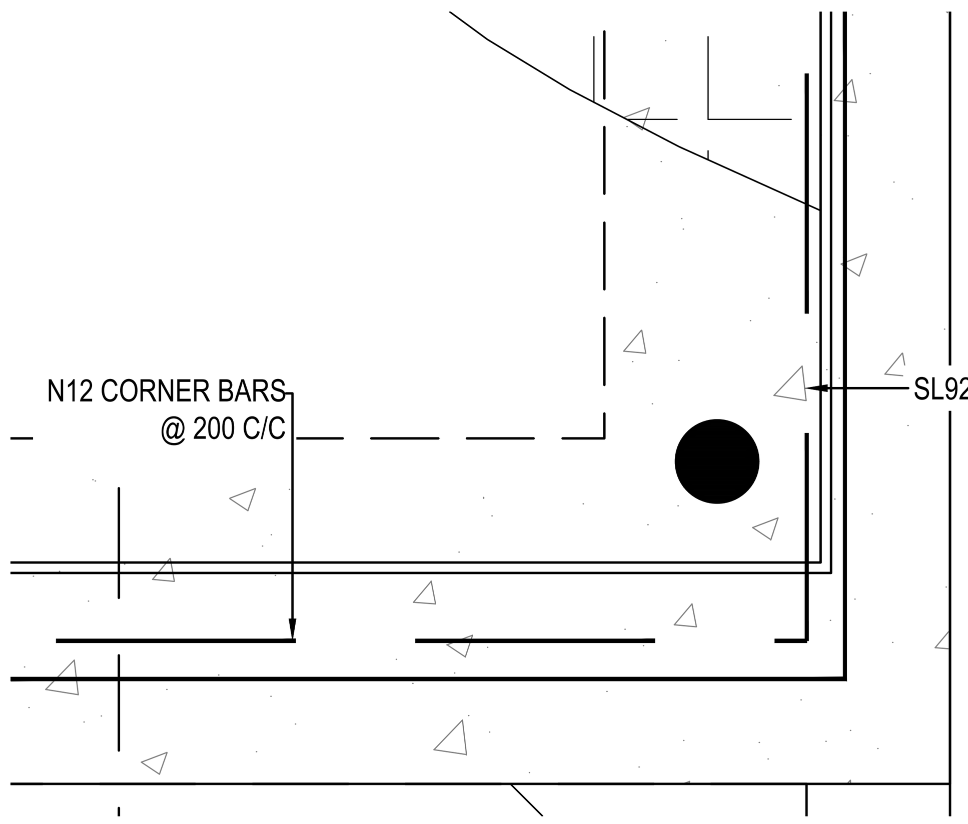
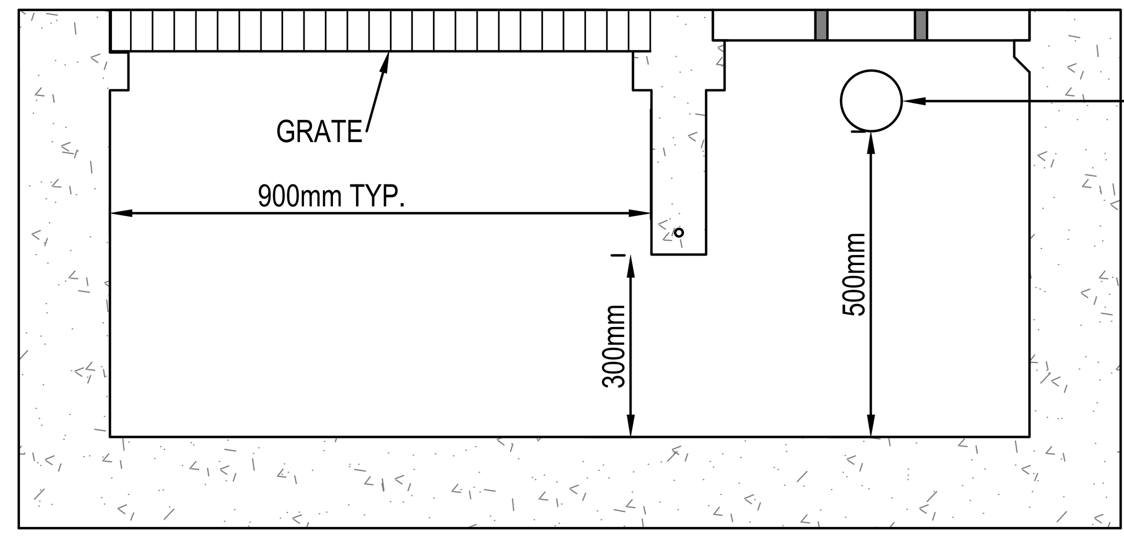


DETAIL 23
TREE PIT WALL DETAIL
NTS



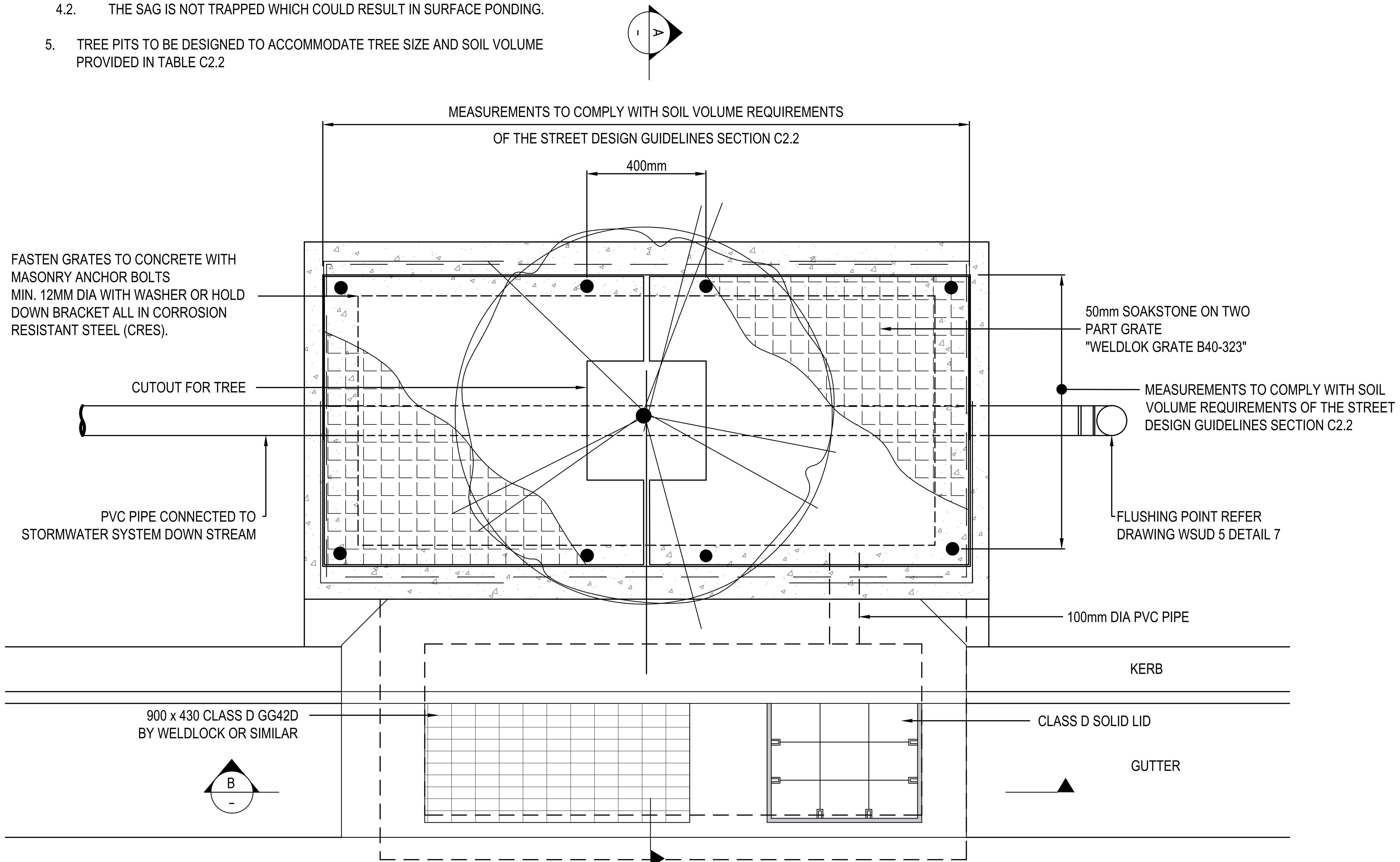
DETAIL 24
TREE PIT CORNER REINFORCEMENT
NTS



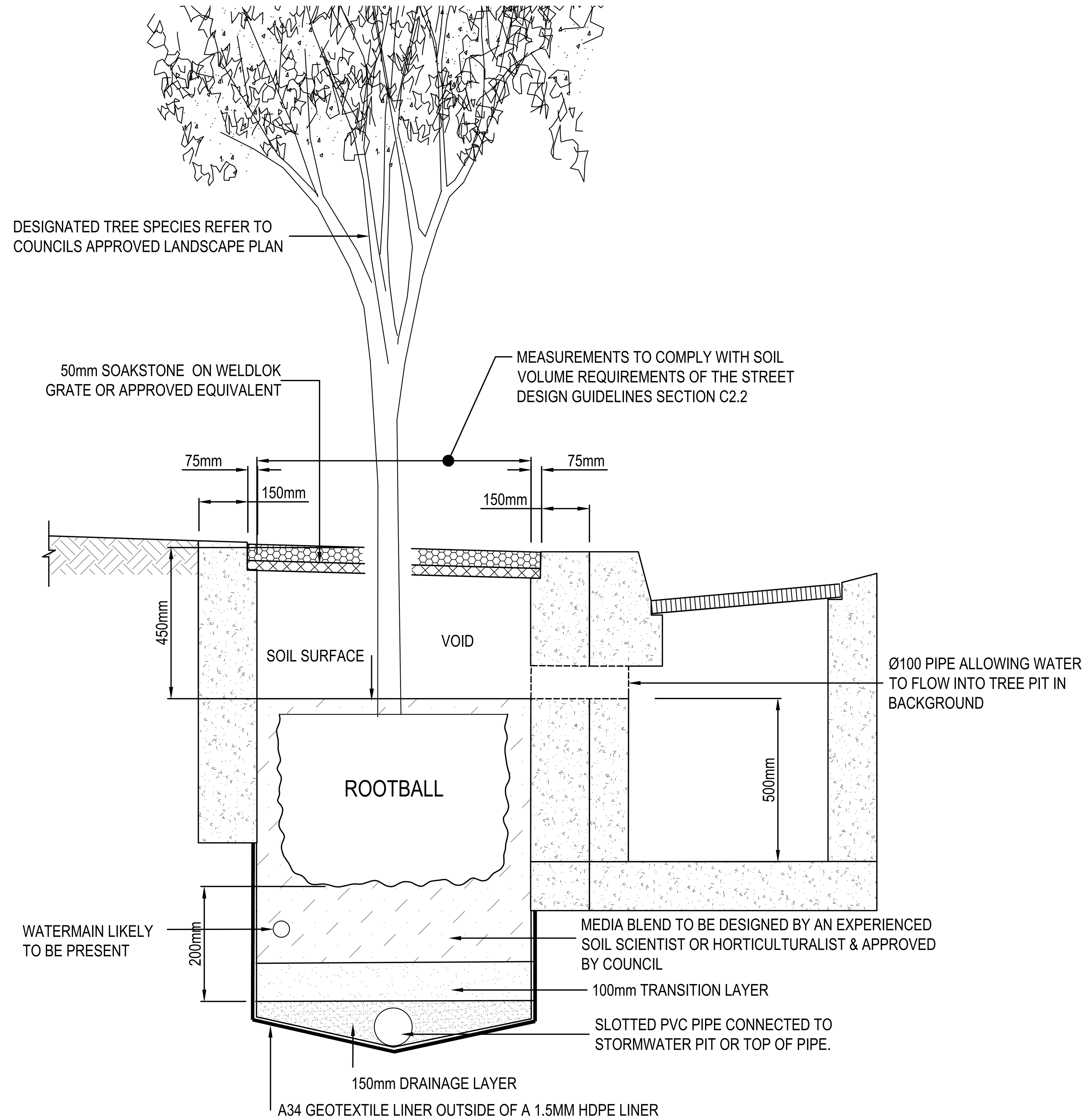
SECTION B
NTS

DESIGN NOTES:

1. ALL CONCRETE KERBS AND GRATES TO BE FLUSH WITH SURROUNDING PAVEMENT AND KERB.
2. FOOTPATHS TO BE REINSTATED AS PER COUNCIL STANDARD (WHERE REQUIRED).
3. BIORETENTION TREE PITS SHOULD NOT BE PLACED ON CRESTS WHERE THEY DO NOT RECEIVED ADEQUATE HYDRAULIC LOADING.
4. CARE SHOULD BE TAKEN WHEN LOCATING PITS IN SAGS. ENSURE THAT:
   - 4.1. THE TREE PIT IS NOT OVERLOADED HYDRAULICALLY
   - 4.2. THE SAG IS NOT TRAPPED WHICH COULD RESULT IN SURFACE PONDING.
5. TREE PITS TO BE DESIGNED TO ACCOMMODATE TREE SIZE AND SOIL VOLUME PROVIDED IN TABLE C2.2



PLAN 14
TYPICAL TREE PIT LAYOUT 2 - ADJACENT TO KERB
NTS



SECTION A
NTS

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01	POST PCG AMENDMENTS	14.04.21	XX	XX
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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: TREE PIT BIORETENTION - STREET

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20	

Approved for issue	Project No.	Dwg. No.	Issue
	WS190098	WSUD 21	01

DESIGN NOTES:

1. ALL SYSTEMS SHALL USE AT LEAST 2 ORIFICE PLATES TO CONTROL FLOWS.
   - THE 1.5 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 40 L/s/ha.
   - THE 100 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 190 L/s/ha.
2. STORAGE SHALL BE PROVIDED AS FOLLOWS:
   - VOLUME UP TO 1.5 YEAR ARI TWL = 300m^3/ha
   - VOLUME UP TO 100 YEAR ARI TWL = 455m^3/ha
3. ORIFICE FLOW RATES WILL BE ADJUSTED FOR BYPASS WITH A MAXIMUM SITE BYPASS OF 15%.

TOTAL OSD BYPASS	ENVIRONMENTAL DISCHARGE (1.5 YEAR ARI ORIFICE) (L/s/ha)	ENVIRONMENTAL STORAGE (BELOW 1.5 YEAR ARI WEIR) (m^3/ha)	FLOOD DISCHARGE (100 YEAR ARI ORIFICE) (L/s/ha)	FLOOD STORAGE (BELOW EMERGENCY WEIR) (m^3/ha)
0%	40.0	300	190	455
2.5%	38.5	300	176	455
5%	37.0	300	162	455
7.5%	35.5	300	148	455
10%	34.0	300	134	455
12.5%	32.5	300	120	455
15%	31.0	300	106	455

4. STORAGE VOLUMES WILL BE ADJUSTED FOR DROWNED ORIFICES.
5. ALL PITS GREATER THAN 1.2m SHALL BE FITTED WITH COUNCIL APPROVED STEP IRONS AT nom 300mm C/C IN A STAGGERED CONFIGURATION AND IN ACCORDANCE WITH AS 4198-1994
6. MINIMUM PIT SIZE 900mm x 900mm, ALL PITS DEEPER THAN 1.2m SHALL BE A MINIMUM SIZE OF 1200mm X 1200mm
7. FOR ORIFICE DIAMETERS:
   - LESS THAN 150mm:
     PROVIDE MAXI-MESH TRASH SCREEN WITH SURFACE AREA 50 TIMES THAT OF THE ORIFICE OPENING
   - GREATER THAN 150mm:
     PROVIDE WELDLOK F40/203 TRASH SCREEN WITH SURFACE AREA 20 TIMES THAT OF THE ORIFICE OPENING
8. CONCRETE BENCHING INSIDE THE PITS SHALL BE CARRIED OUT POST INSTALLATION OF THE ORIFICE PLATES
9. ALL REDUCED LEVELS AND DIAMETERS, DIMENSIONS OR TOLERANCES ARE TO BE NOMINATED BY THE DESIGNER
10. THE ORIFICE PLATE SHALL BE 3mm THICK STAINLESS STEEL FOR ORIFICE SIZES < 150mm OR FOR ORIFICES > 150mm USE 5mm THICK STAINLESS STEEL WITH SHARP EDGES MACHINED TO 0.5mm ACCURACY - FASTENED TO PIT WALL USING "HILTI" (OR APPROVED EQUIVALENT) STAINLESS HSIx1(R) - M6x40 BOLTS
11. THE DOWNSTREAM PIPE DIAMETER SHALL BE AT LEAST 3x ORIFICE DIAMETER. MINIMUM Ø100mm & HAVE A MIN CAPACITY OF 2 x ORIFICE FLOW
12. REFER TO UPRCT "ON-SITE STORMWATER DETENTION HANDBOOK" 4th EDITION DECEMBER 2005

DESIGN NOTES:

13. THE BASE OF THE DETENTION STORAGE TANK IS TO BE BENCHED TO FALL @ 2% TO THE INVERT OF THE OUTLET POINT
14. OWNERS MUST BE ABLE TO INSPECT CRITICAL PARTS OF THE STORAGE TANK FROM THE SURFACE WITHOUT HAVING TO REMOVE HEAVY ACCESS COVERS. ALL SECTIONS OF THE OSD SHALL HAVE GRATED ACCESS POINTS
15. FOR PITS:
    - LESS THAN THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 900mm x 900mm
    - GREATER THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 1.2m x 1.2m
16. FOR ALL OTHER ACCESS POINTS TO THE DETENTION TANK THE MINIMUM OPENING SIZE IS 900mm x 900mm
17. ALL OPENINGS SHALL BE COVERED BY A HINGED GALVANISED MILD STEEL GRATE AND FRAME AND FITTED WITH CHILD PROOF LOCKS
18. DETENTION STORAGE ACCESS GRATES TO THE BELOW GROUND OSD ARE TO BE POSITIONED SUCH THAT THE MAXIMUM REACH FROM ANY POINT IN THE TANK TO THE NEAREST GRATE IS DETERMINED BY THE TABLE BELOW:

DEPTH OF TANK	LENGTH OF REACH
0.5m - 0.7m	1.5m
0.7m - 1m	2m
1m - 1.5m	3m
1.5m - 2m	4m
>2m	6m

19. FOR BELOW GROUND OSD TANKS AS SHOWN ON DRAWING WSUD 24 THE MINIMUM INTERNAL HEIGHT IS TO BE A MINIMUM OF 0.5m FOR EASE OF MAINTENANCE AND SAFE WORK SPACE REQUIREMENTS.
20. THE SAME ACCESS REQUIREMENTS AS IN NOTE 18. APPLY TO FILTER STORAGE AREAS WHERE USED. SEE DRAWING WSUD 25
21. THE MINIMUM ORIFICE SIZE SHALL BE 25mm DIA.
22. STRUCTURAL DESIGN OF OSD STORAGE TO BE DESIGNED BY A QUALIFIED ENGINEER.
23. CONFINED SPACE ENTRY REQUIREMENTS APPLY.
24. UNDERGROUND OSD EMERGENCY OVERFLOW WEIR SHALL BE DESIGNED TO CONVEY 100 YEAR ARI, 5 MINUTE STORM EVENT AND BE A MINIMUM HEIGHT OF 100mm

DANGER

CONFINED SPACE
NO ENTRY WITHOUT
CONFINED SPACE
TRAINING

CONFINED SPACE DANGER SIGN

NOTES:

1. A CONFINED SPACE DANGER SIGN SHALL BE PLACED NEXT TO EACH AND EVERY ACCESS POINT SO THAT THEY ARE VISIBLE TO PERSONS ENTERING ANY BELOW GROUND TANK OR PIT.
2. COLOURS:
   - "DANGER" AND BACKGROUND- WHITE
   - ELLIPTICAL AREA - RED
   - RECTANGLE CONTAINING ELLIPSE - BLACK
   - LETTERING AND BORDER - BLACK
3. MINIMUM DIMENSIONS OF THE SIGN:
   - LARGE ENTRIES: - 300mm x 450mm
   - SMALL ENTRIES: - 250mm x 180mm
4. SIGN TO BE MADE FROM COLOUR BONDED ALUMINIUM OR POLYPROPYLENE.
5. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY

300mm

450mm

WARNING
ON SITE DETENTION AREA
STORMWATER MAY RISE
IN THIS AREA
DURING HEAVY RAIN

ON SITE STORMWATER DETENTION WARNING SIGN

NOTES:

1. SIGN SHALL BE PLACED IN A CLEAR AND VISIBLE LOCATION AT EACH DETENTION BASIN.
2. COLOURS:
   - TRIANGLE AND "WARNING" - RED
   - WATER - BLUE
   - FIGURE AND LETTERING - BLACK
3. SIGN TO BE MADE FROM COLOUR BONDED ALUMINIUM OR POLYPROPYLENE.
4. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY

110mm

80mm

THIS IS AN
ON-SITE STORMWATER
DETENTION SYSTEM
REQUIRED BY BLACKTOWN CITY COUNCIL

FLOOD RISK ON LOWER LAND MAY INCREASE IF THE VOLUME OF THE TANK OR POND IS REDUCED, OR IF THE OUTLET PLATE IS INTERFERED WITH.

THE BASE OF THE OUTLET CONTROL PIT AND THE DEBRIS SCREEN MUST BE CLEANED OF DEBRIS AND SEDIMENT ON A REGULAR BASIS BY THE OWNER

THIS PLATE MUST NOT BE REMOVED

ON SITE STORMWATER DETENTION SYSTEM SIGN

NOTES:

1. CORNERS SQUARE
2. COLOURS:
   ETCHED AND FILLED BLACK LEDGEND ON A NATURAL SILVER BACKGROUND.
3. CONSTRUCTED FROM ALUMINIUM 0.9mm MILL.
4. THIS SIGN SHALL BE PLACED IN A VISIBLE LOCATION NEAR A DISCHARGE CONTROL PIT OR AT THE ACCESS TO ONE.
5. SIGN FIXED USING HILTI CHEMSETS OR EXPOXY

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01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

-1 0 1cm at full size 10cm 20cm

North

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

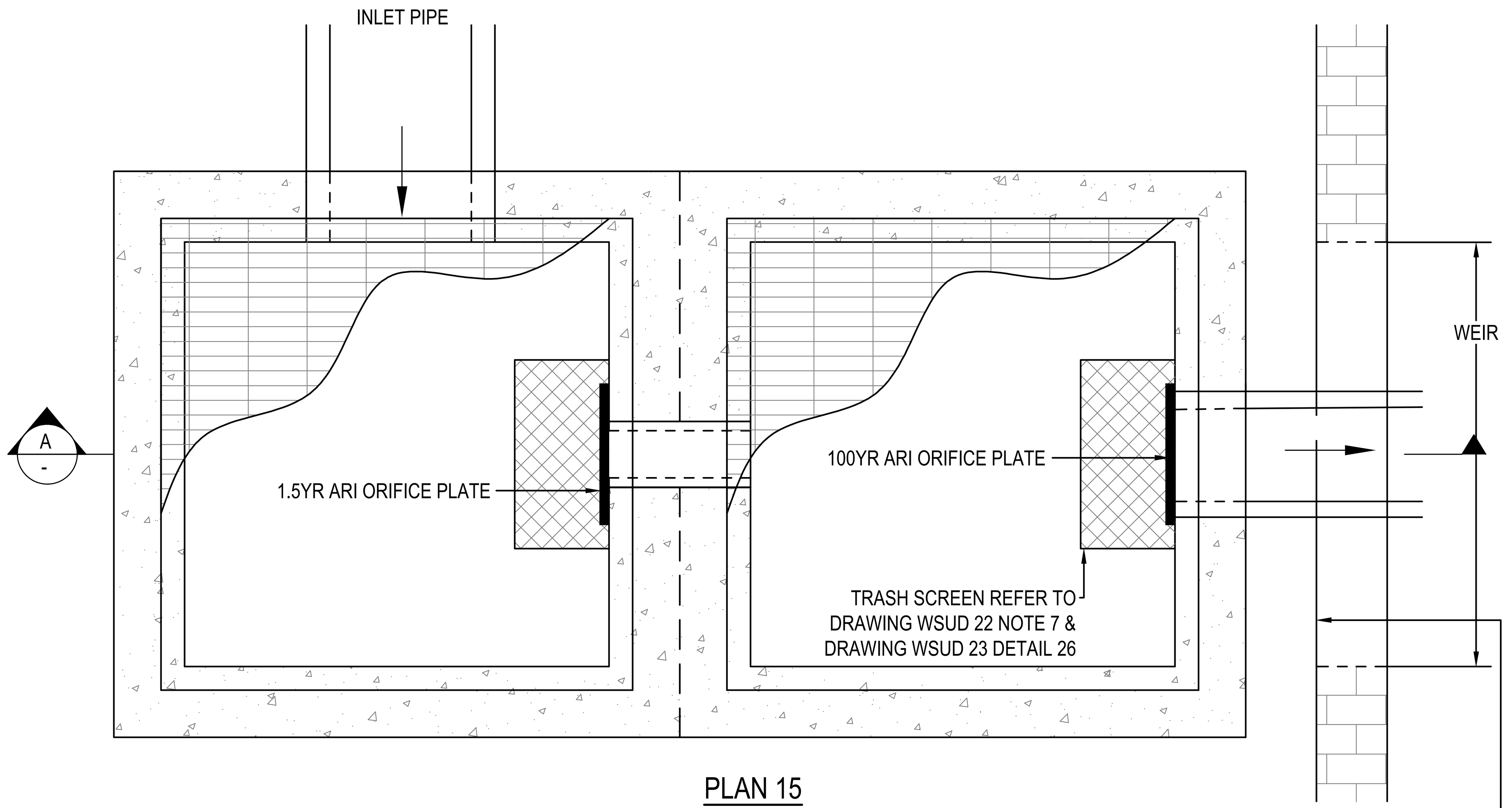
Drawing Title
DRAINAGE SIGNAGE

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

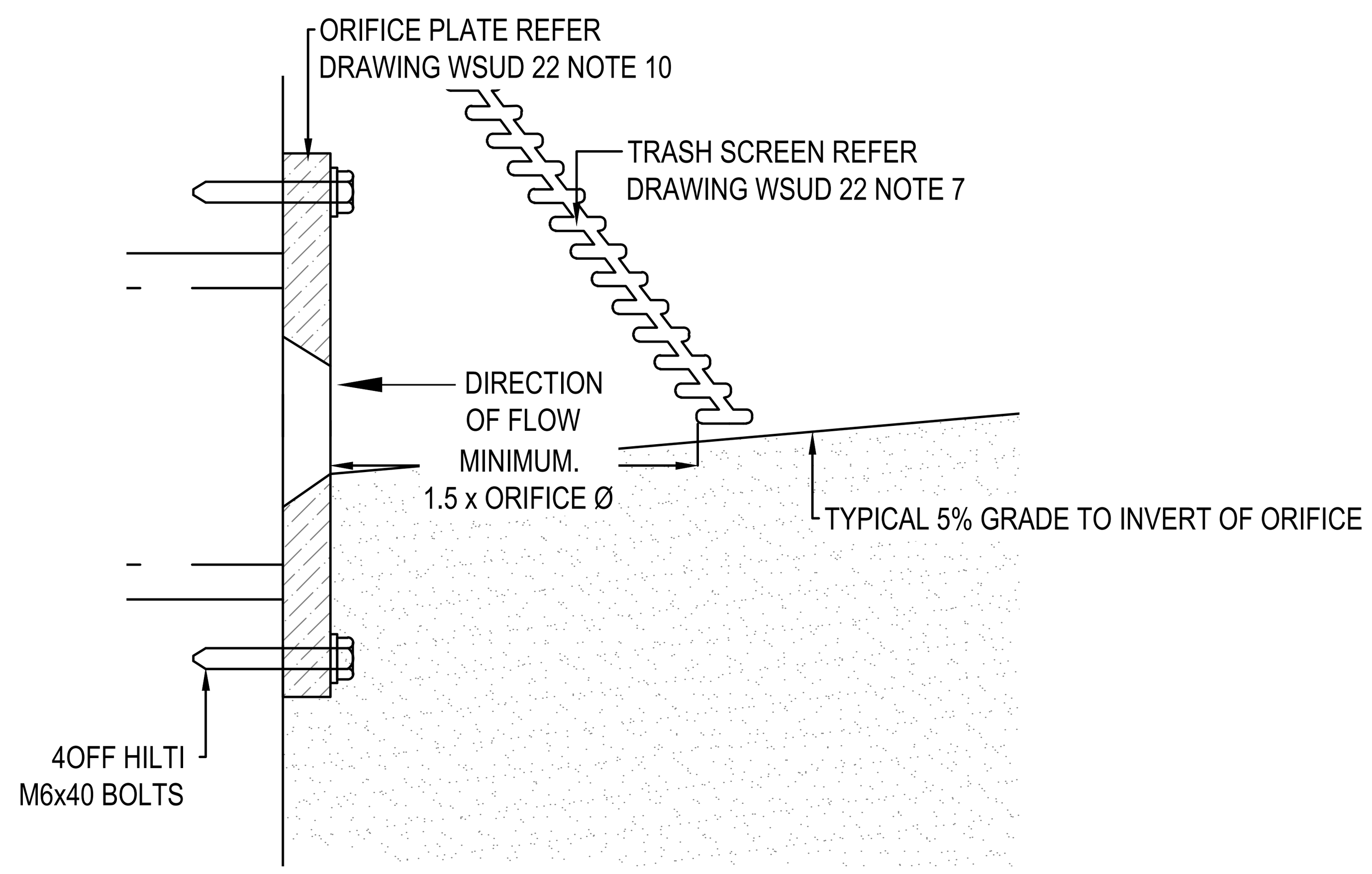
Drawn	Date	Scale A1	Q.A. Check Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 22	01

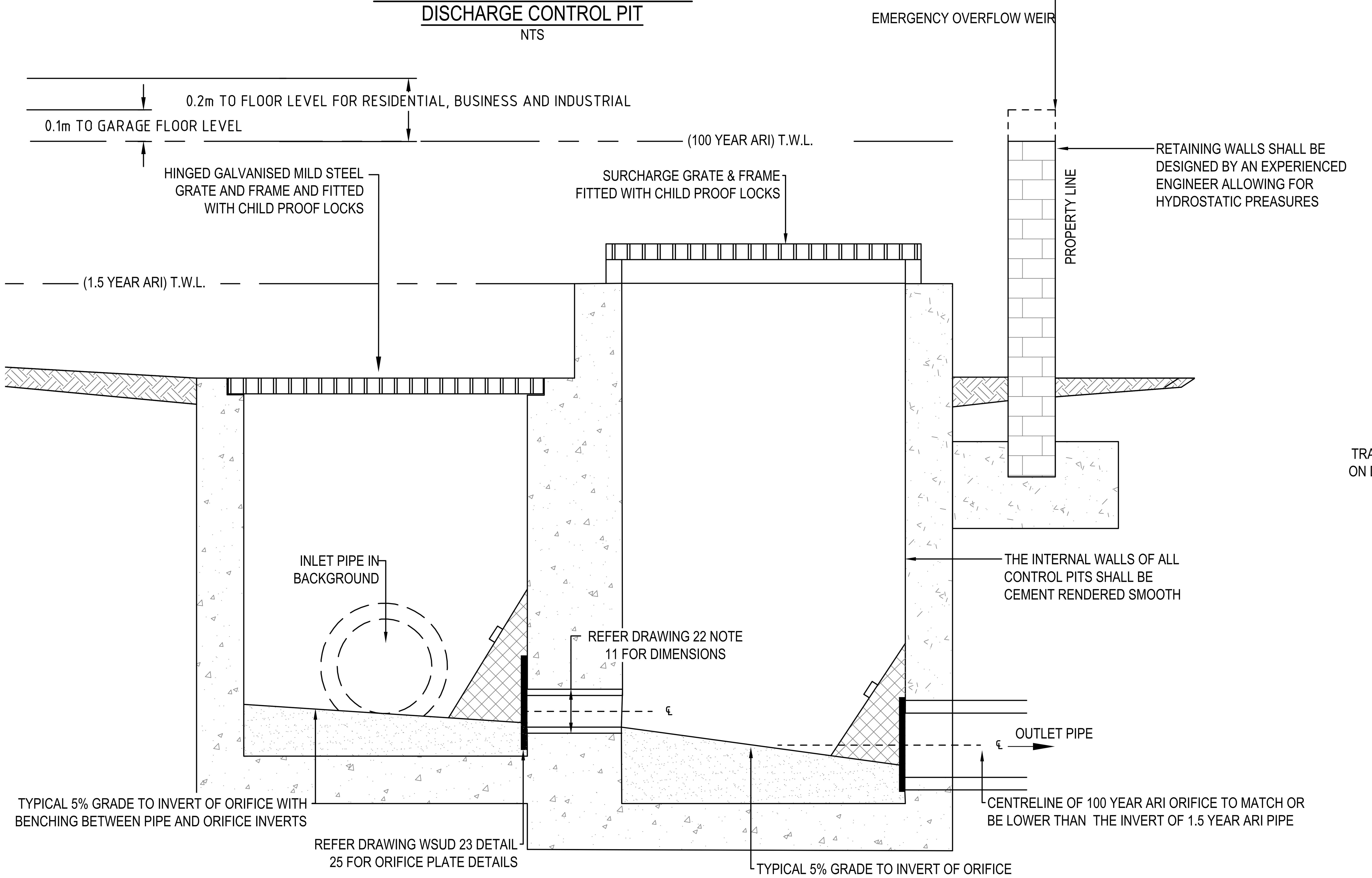
Apr 15, 2021 - 11:13am



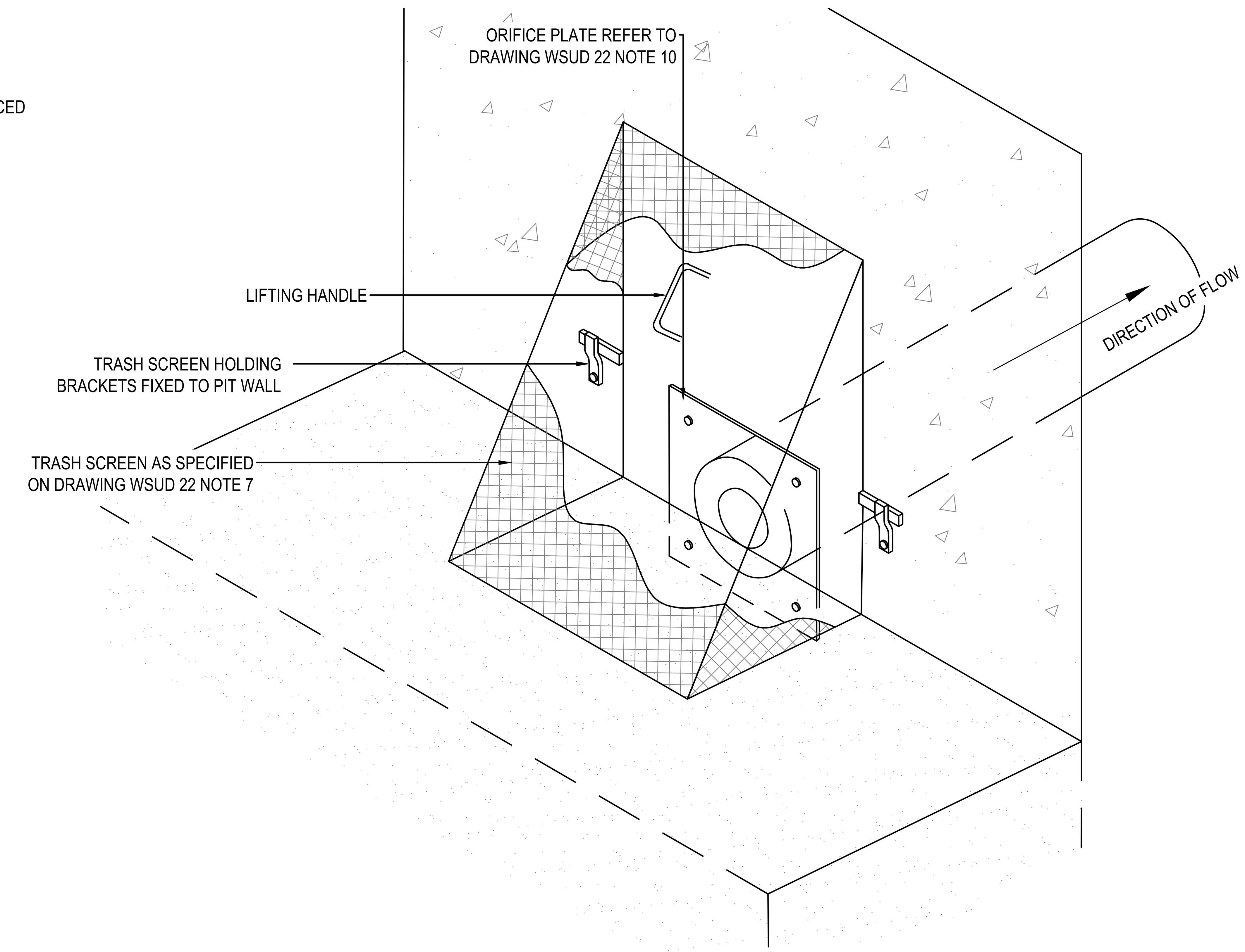
PLAN 15
TYPICAL CONFIGURATION OF AN OSD
DISCHARGE CONTROL PIT
NTS



DETAIL 25
ORIFICE PLATE
NTS



SECTION A
NTS



DETAIL 26
ORIFICE PLATE & TRASH SCREEN
NTS

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Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

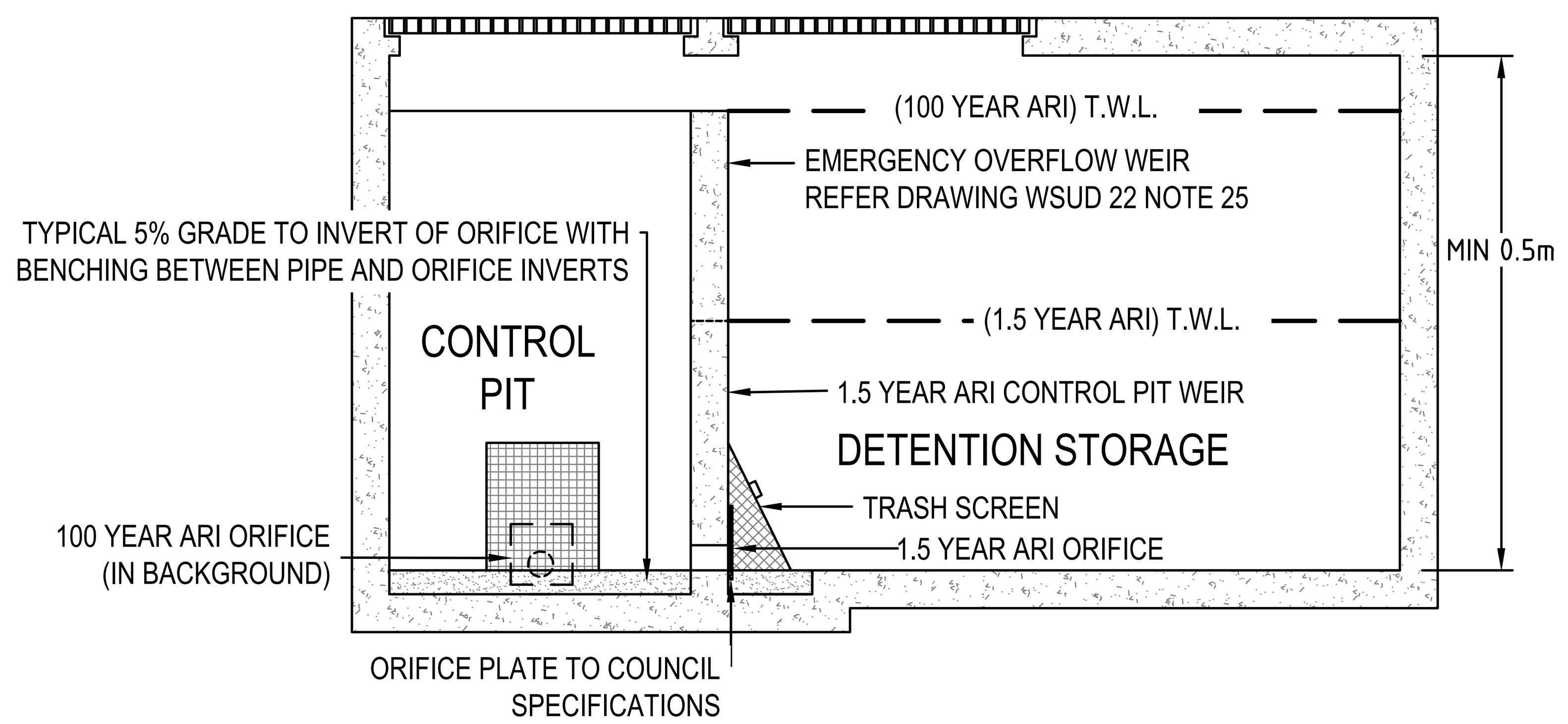
Project
WSUD STANDARD DRAWINGS

Drawing Title
OSD - ABOVE GROUND STORAGE

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale	A1	Q.A. Check	Date
XX	APR' 2021	N.T.S		PWG COUNCILS OCT'20	

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 23	01



SECTION A
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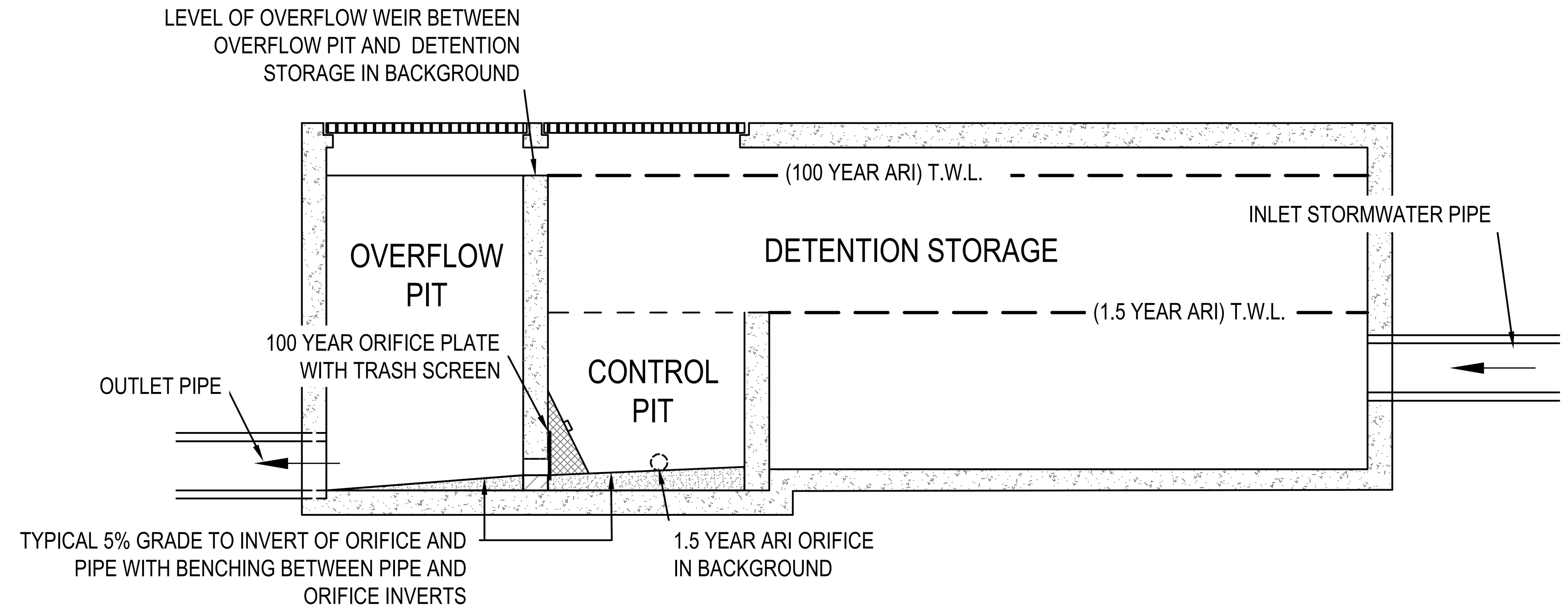
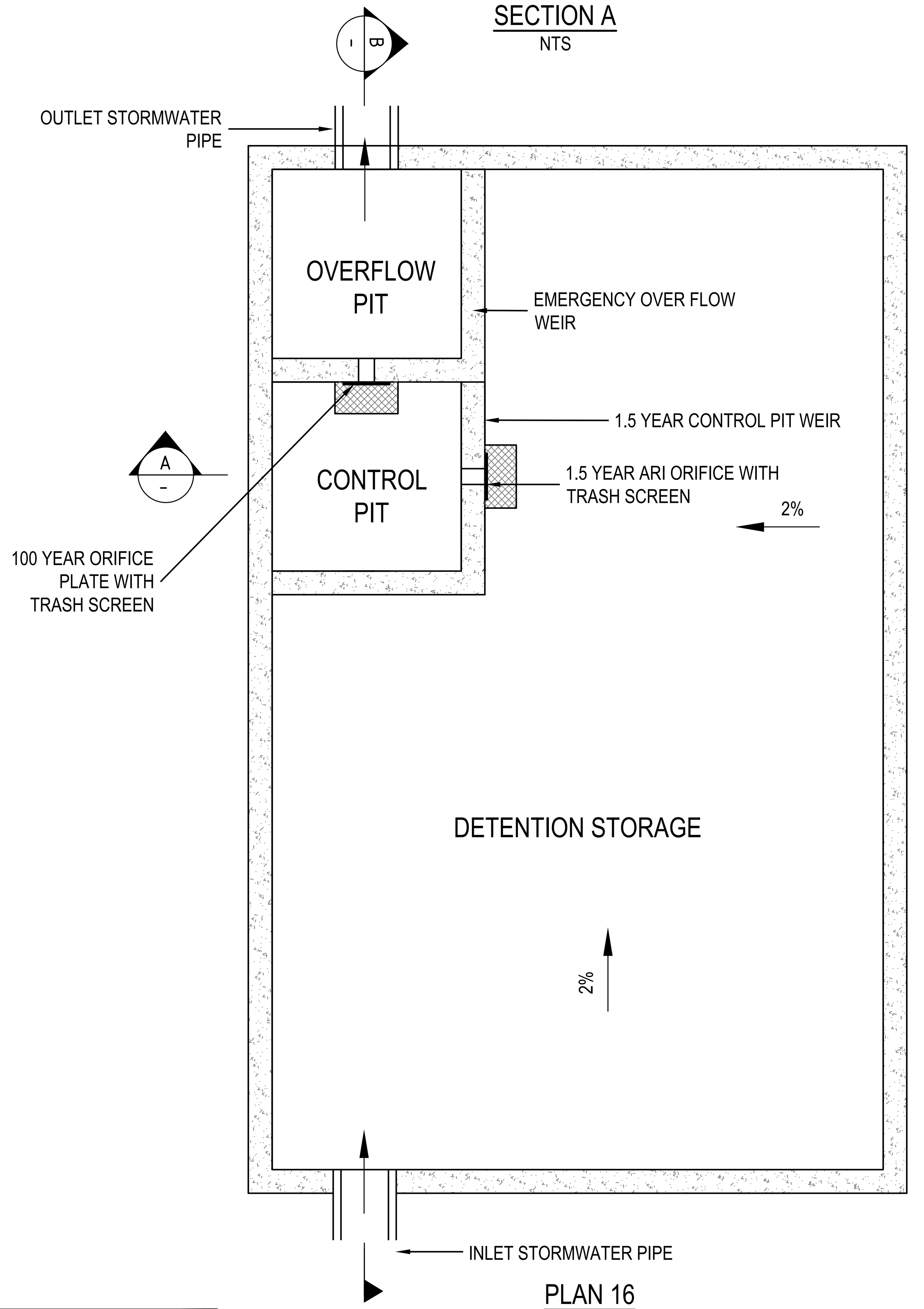


SECTION B
NTS



PLAN 16
DISCHARGE CONTROL PIT WITH EMERGENCY OVERFLOW
NTS

DESIGN NOTES:

1. ALL SYSTEMS SHALL USE AT LEAST 2 ORIFICE PLATES TO CONTROL FLOWS.
   - THE 1.5 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 40 L/s/ha.
   - THE 100 YEAR ARI ORIFICE SHALL BE DESIGNED TO CONVEY A MAXIMUM OF 190 L/s/ha.
2. STORAGE SHALL BE PROVIDED AS FOLLOWS:
   - VOLUME UP TO 1.5 YEAR ARI TWL = 300m^3/ha
   - VOLUME UP TO 100 YEAR ARI TWL = 455m^3/ha
3. ORIFICE FLOW RATES WILL BE ADJUSTED FOR BYPASS WITH A MAXIMUM SITE BYPASS OF 15%.

TOTAL OSD BYPASS	ENVIRONMENTAL DISCHARGE (1.5 YEAR ARI ORIFICE) (L/s/ha)	ENVIRONMENTAL STORAGE (BELOW 1.5 YEAR ARI WEIR) (m^3/ha)	FLOOD DISCHARGE (100 YEAR ARI ORIFICE) (L/s/ha)	FLOOD STORAGE (BELOW EMERGENCY WEIR) (m^3/ha)
0%	40.0	300	190	455
2.5%	38.5	300	176	455
5%	37.0	300	162	455
7.5%	35.5	300	148	455
10%	34.0	300	134	455
12.5%	32.5	300	120	455
15%	31.0	300	106	455

4. STORAGE VOLUMES WILL BE ADJUSTED FOR DROWNED ORIFICES.
5. ALL PITS GREATER THAN 1.2m SHALL BE FITTED WITH COUNCIL APPROVED STEP IRONS AT nom 300mm C/C IN A STAGGERED CONFIGURATION AND IN ACCORDANCE WITH AS 4198-1994
6. MINIMUM PIT SIZE 900mm x 900mm, ALL PITS DEEPER THAN 1.2m SHALL BE A MINIMUM SIZE OF 1200mm X 1200mm
7. FOR ORIFICE DIAMETERS:
   - LESS THAN 150mm:
     PROVIDE MAXI-MESH TRASH SCREEN WITH SURFACE AREA 50 TIMES THAT OF THE ORIFICE OPENING
   - GREATER THAN 150mm:
     PROVIDE WELDLOK F40/203 TRASH SCREEN WITH SURFACE AREA 20 TIMES THAT OF THE ORIFICE OPENING
8. CONCRETE BENCHING INSIDE THE PITS SHALL BE CARRIED OUT POST INSTALLATION OF THE ORIFICE PLATES
9. ALL REDUCED LEVELS AND DIAMETERS, DIMENSIONS OR TOLERANCES ARE TO BE NOMINATED BY THE DESIGNER
10. THE ORIFICE PLATE SHALL BE 3mm THICK STAINLESS STEEL FOR ORIFICE SIZES < 150mm OR FOR ORIFICES > 150mm USE 5mm THICK STAINLESS STEEL WITH SHARP EDGES MACHINED TO 0.5mm ACCURACY - FASTENED TO PIT WALL USING "HILTI" (OR APPROVED EQUIVALENT) STAINLESS HSIx1(R) - M6x40 BOLTS
11. THE DOWNSTREAM PIPE DIAMETER SHALL BE AT LEAST 3x ORIFICE DIAMETER. MINIMUM Ø100mm & HAVE A MIN CAPACITY OF 2 x ORIFICE FLOW
12. REFER TO UPRCT "ON-SITE STORMWATER DETENTION HANDBOOK" 4th EDITION DECEMBER 2005

DESIGN NOTES:

13. THE BASE OF THE DETENTION STORAGE TANK IS TO BE BENCHED TO FALL @ 2% TO THE INVERT OF THE OUTLET POINT
14. OWNERS MUST BE ABLE TO INSPECT CRITICAL PARTS OF THE STORAGE TANK FROM THE SURFACE WITHOUT HAVING TO REMOVE HEAVY ACCESS COVERS. ALL SECTIONS OF THE OSD SHALL HAVE GRATED ACCESS POINTS
15. FOR PITS:
    - LESS THAN THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 900mm x 900mm
    - GREATER THAN 1.2m DEEP OPENINGS MUST BE MINIMUM OF 1.2m x 1.2m
16. FOR ALL OTHER ACCESS POINTS TO THE DETENTION TANK THE MINIMUM OPENING SIZE IS 900mm x 900mm
17. ALL OPENINGS SHALL BE COVERED BY A HINGED GALVANISED MILD STEEL GRATE AND FRAME AND FITTED WITH CHILD PROOF LOCKS
18. DETENTION STORAGE ACCESS GRATES TO THE BELOW GROUND OSD ARE TO BE POSITIONED SUCH THAT THE MAXIMUM REACH FROM ANY POINT IN THE TANK TO THE NEAREST GRATE IS DETERMINED BY THE TABLE BELOW:

DEPTH OF TANK	LENGTH OF REACH
0.5m - 0.7m	1.5m
0.7m - 1m	2m
1m - 1.5m	3m
1.5m - 2m	4m
>2m	6m

19. FOR BELOW GROUND OSD TANKS AS SHOWN ON DRAWING WSUD 24 THE MINIMUM INTERNAL HEIGHT IS TO BE A MINIMUM OF 0.5m FOR EASE OF MAINTENANCE AND SAFE WORK SPACE REQUIREMENTS.
20. THE SAME ACCESS REQUIREMENTS AS IN NOTE 18. APPLY TO FILTER STORAGE AREAS WHERE USED. SEE DRAWING WSUD 25
21. THE MINIMUM ORIFICE SIZE SHALL BE 25mm DIA.
22. STRUCTURAL DESIGN OF OSD STORAGE TO BE DESIGNED BY A QUALIFIED ENGINEER.
23. CONFINED SPACE ENTRY REQUIREMENTS APPLY.
24. UNDERGROUND OSD EMERGENCY OVERFLOW WEIR SHALL BE DESIGNED TO CONVEY 100 YEAR ARI, 5 MINUTE STORM EVENT AND BE A MINIMUM HEIGHT OF 100mm

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01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

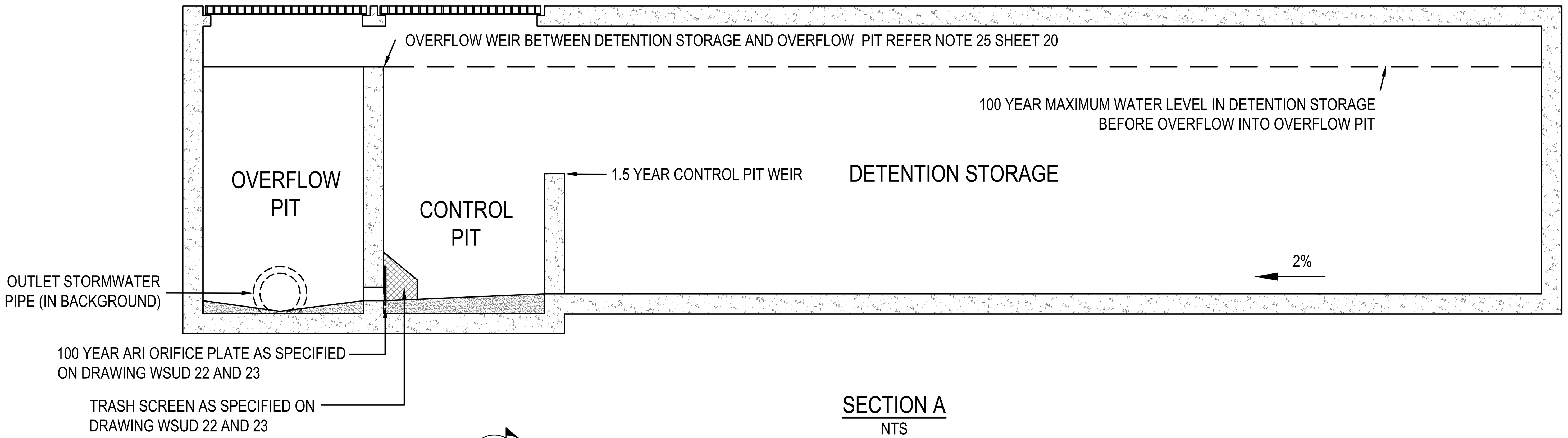
Project
WSUD STANDARD DRAWINGS

Drawing Title
OSD - UNDERGROUND STORAGE

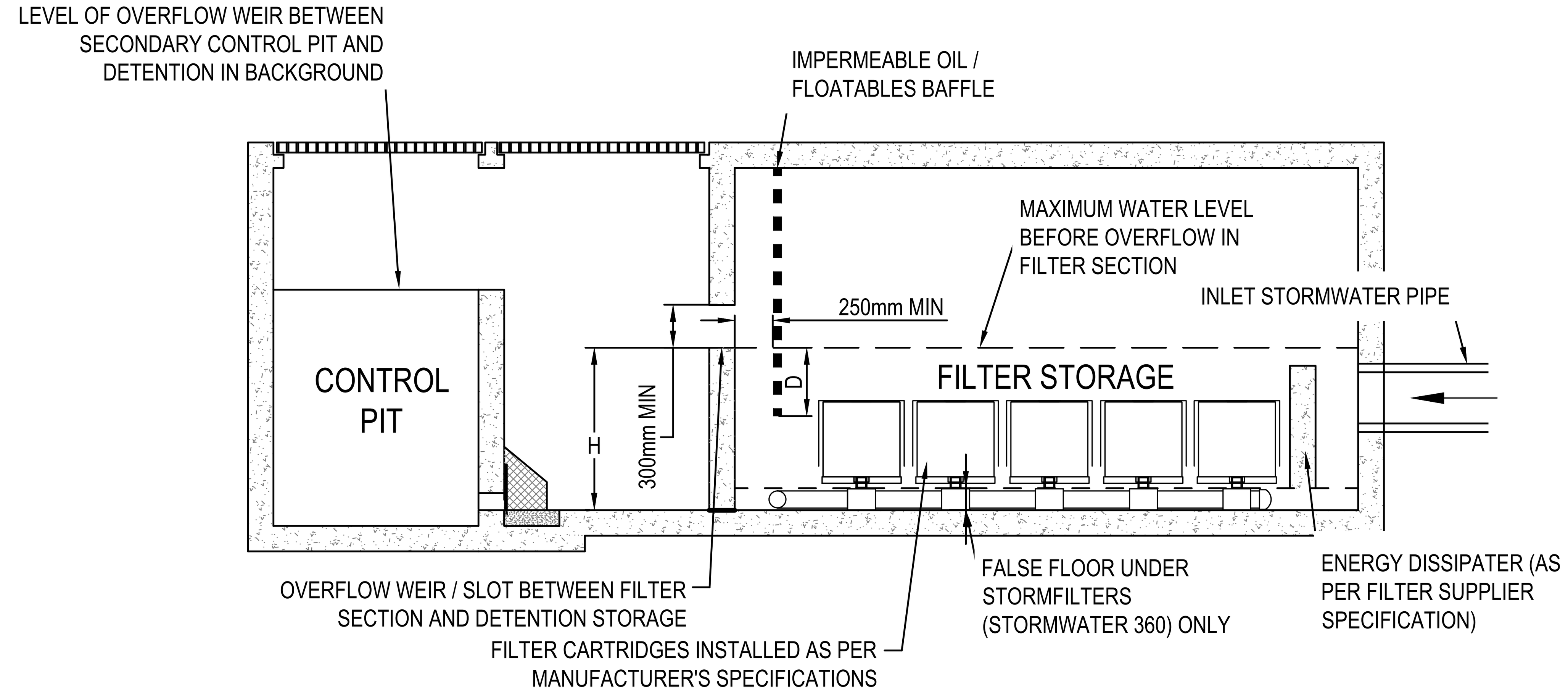
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS	OCT'20

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 24	01



SECTION A
NTS



SECTION B
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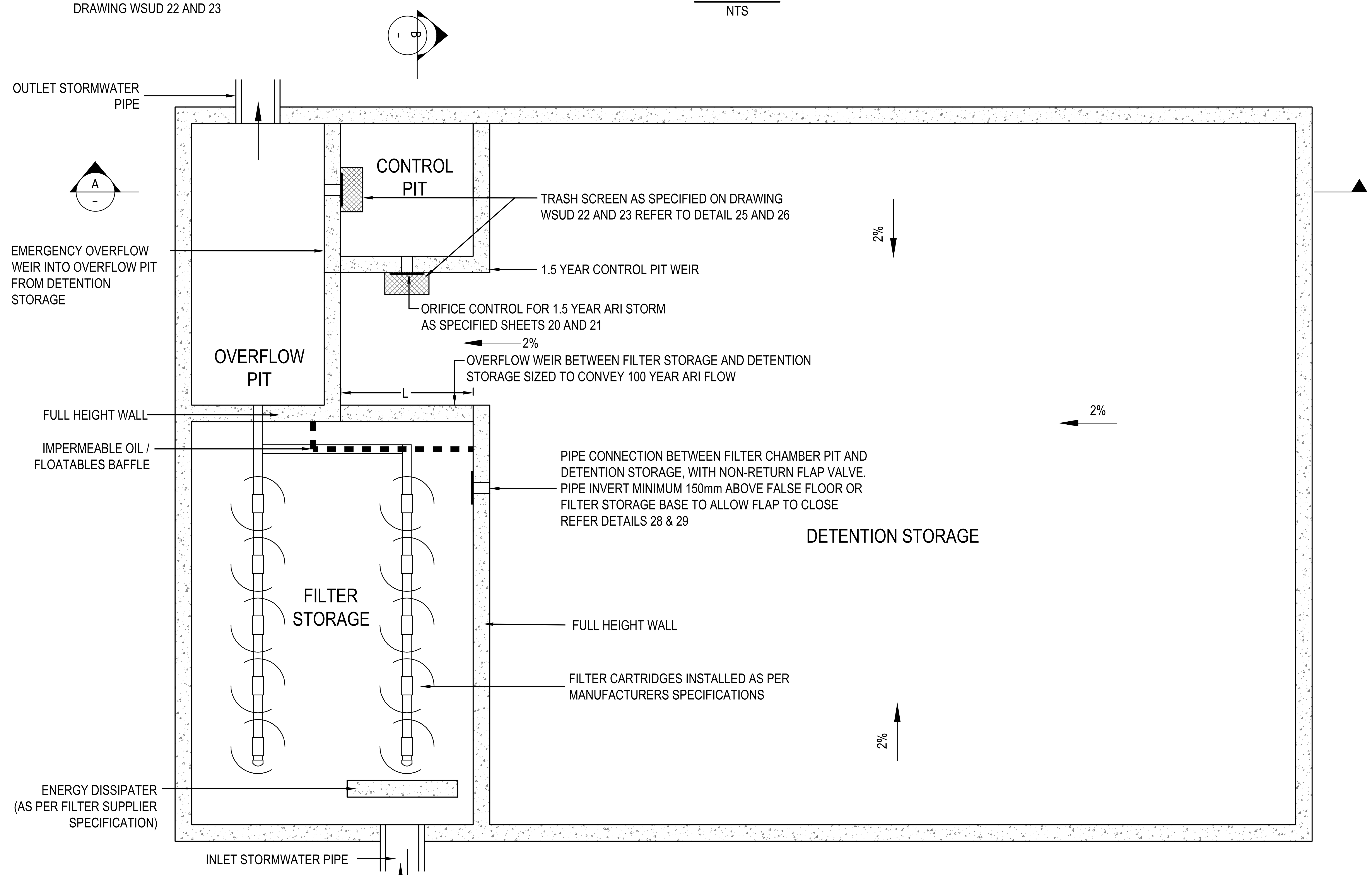


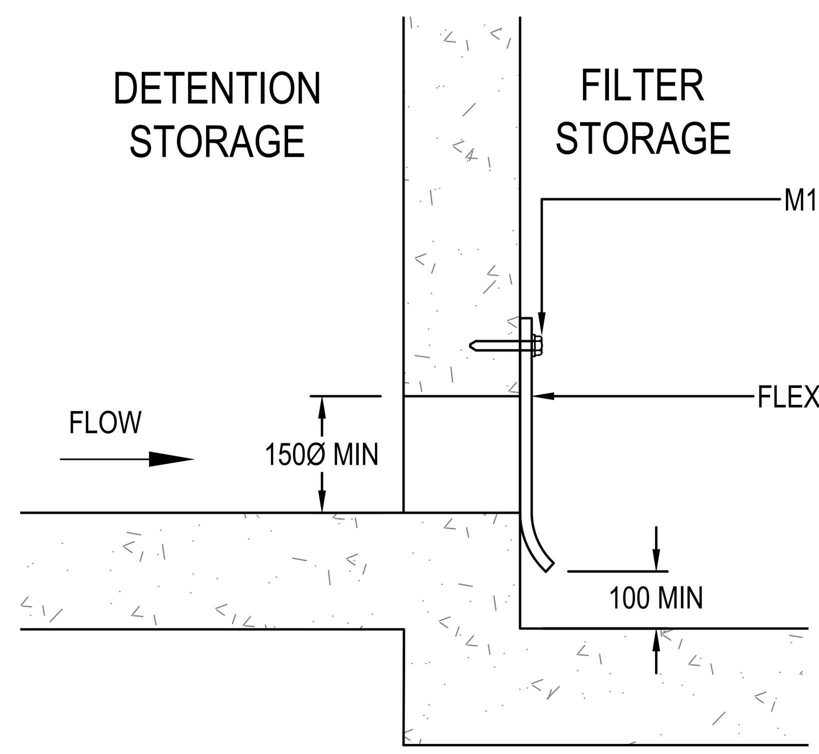
PLAN 17
TYPICAL STORMWATER FILTER CARTRIDGE CONFIGURATION
UPSTREAM OF DISCHARGE CONTROL PIT
NTS

DESIGN NOTES:

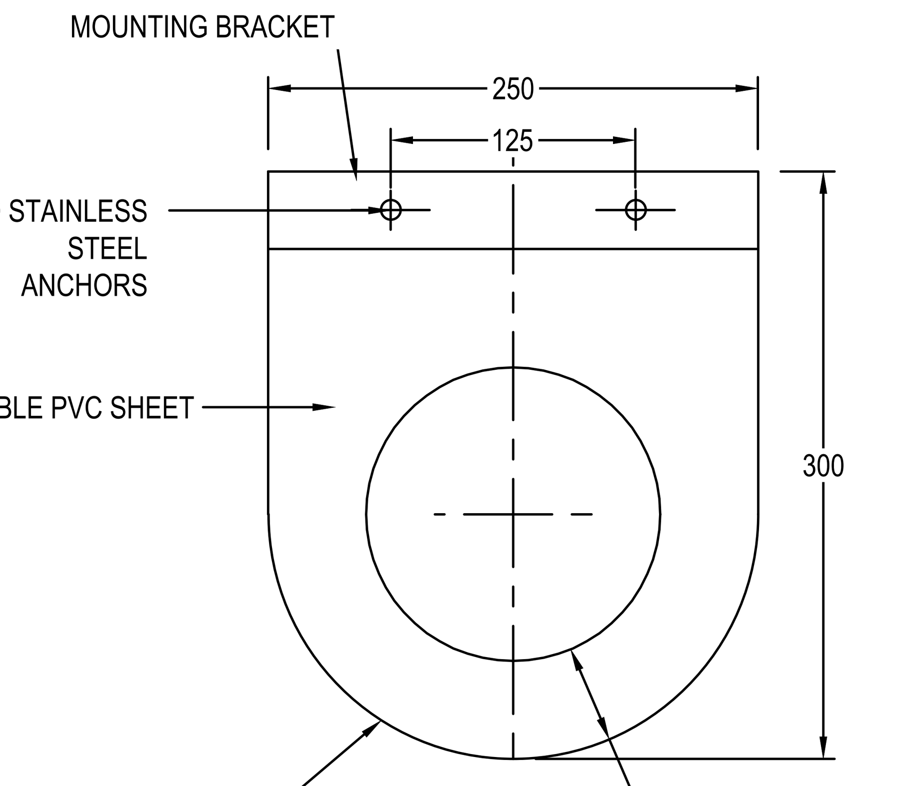
1. THE FILTER TANK STORAGE IS CONSIDERED AS PART OF THE 1.5 YEAR ARI DETENTION STORAGE.
2. COMBINED OSD & FILTER CARTRIDGE SYSTEMS SHALL COMPLY WITH THE STORAGE VOLUME AND DISCHARGE REQUIREMENTS DOCUMENTED ON DRAWING WSUD 22. THIS REQUIRES THAT ORIFICES BE ADJUSTED TO ACCOUNT FOR THE COMBINED FLOW FROM THE CARTRIDGES AND THE ORIFICES.
3. THE SIZING OF THE 1.5 YEAR ARI ORIFICES NEEDS TO TAKE INTO ACCOUNT THE BYPASS OF WATER THROUGH THE UNDERDRAIN FROM THE FILTER STORAGE USING THE MANUFACTURERS NOMINAL DESIGN FLOW RATES (REFER MANUFACTURER'S SPECIFICATIONS). IF THE MINIMUM ORIFICE SIZE NEEDS TO BE LESS THAN 15mm.
4. IN THE EVENT THAT THE NOMINAL DISCHARGE FROM THE FILTER STORAGE EXCEEDS THE 1.5 YEAR ARI FLOW THEN OMIT THE 1.5 YEAR ARI ORIFICE CONTROL AND GRADE FLOOR OF OSD TANK TO NON-RETURN FLAP.
5. THE SIZING OF THE 100 YEAR ARI ORIFICE NEEDS TO TAKE INTO ACCOUNT THE BYPASS OF WATER FROM THE FILTER CARTRIDGES, THE CARTRIDGE FLOW WILL EXCEED THE NOMINAL DESIGN FLOW RATES DURING EVENTS LARGER THAN A 1.5 YEAR ARI STORM DUE TO ADDITIONAL HEAD ON EACH CARTRIDGE. CONTACT THE MANUFACTURER FOR THE REVISED CARTRIDGE FLOW AT THE 100 YEAR TOP WATER LEVEL.
6. THE ADJUSTED ORIFICE SIZES WILL BE MANUALLY CALCULATED USING THE DIFFERENCE BETWEEN THE FLOW RATES FROM DRAWING WSUD 22 AND THE CARTRIDGE FLOW RATE.
7. DETAILED DESIGN OF THE DETENTION AND FILTER CARTRIDGE SYSTEM IS TO BE DONE IN ACCORDANCE WITH SPECIFICATIONS FOR ONSITE DETENTION AND THE DETAILED DESIGN SPECIFICATIONS FROM THE CARTRIDGE MANUFACTURER.
8. DIMENSIONS D, H AND WEIR LENGTH (L) IN METRES FOR FLOW ($Q = m^3/s$) (REFER SECTION B ABOVE). FOR DETENTION TANKS Q IS 100 YEAR ARI HOWEVER FOR OFF LINE TREATMENT MINIMUM Q IS 0.75 x 1 YEAR ARI.

FILTER CARTRIDGE	D	H	L
STORMFILTER (690)	400mm	770mm + FALSE FLOOR THICKNESS	10.0 x Q
STANDARD STORMFILTER (460)	300mm	540mm + FALSE FLOOR THICKNESS	13.2 x Q
SMALL STORMFILTER (310)	200mm	390mm + FALSE FLOOR THICKNESS	17.8 x Q
SPEL FILTER EMC - 45N (STANDARD)	450mm	850mm	10.0 x Q
SPEL FILTER EMC - 45L (LOW)	250mm	530mm	13.2 x Q

9. ALL SECTIONS OF THE OSD SYSTEM SHALL HAVE GRATED ACCESS POINTS. MINIMUM 900mm x 900mm AS PER AS3500



DETAIL 28
NON-RETURN FLAP MOUNTING
NTS



DETAIL 29
NON-RETURN FLAP MIN DIMENSIONS
NTS

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01	POST PCG AMENDMENTS	14.04.21	XX	XX
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Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

Drawing Title
OSD - COMBINED OSD & FILTER CARTRIDGES

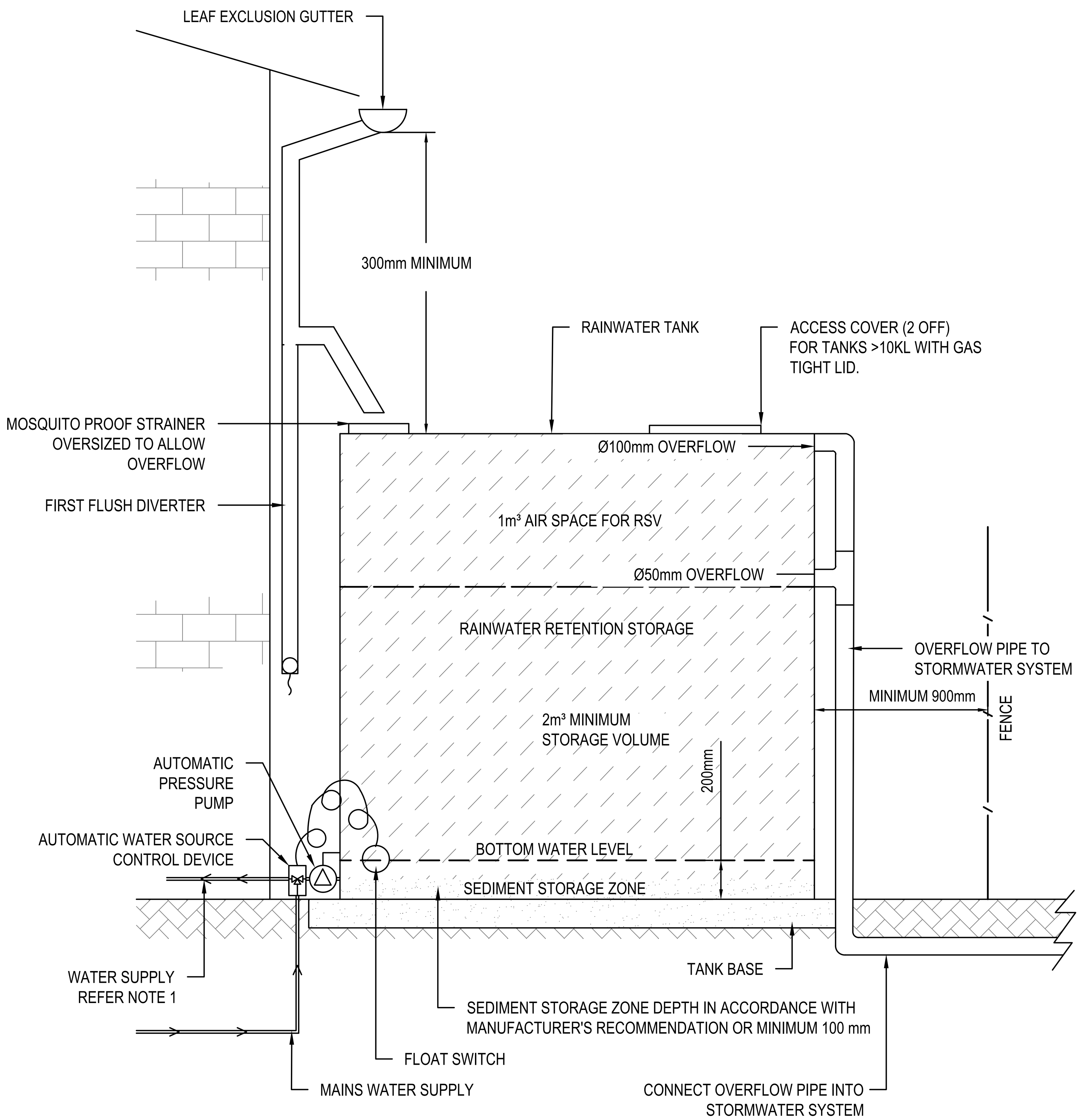
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS	OCT'20

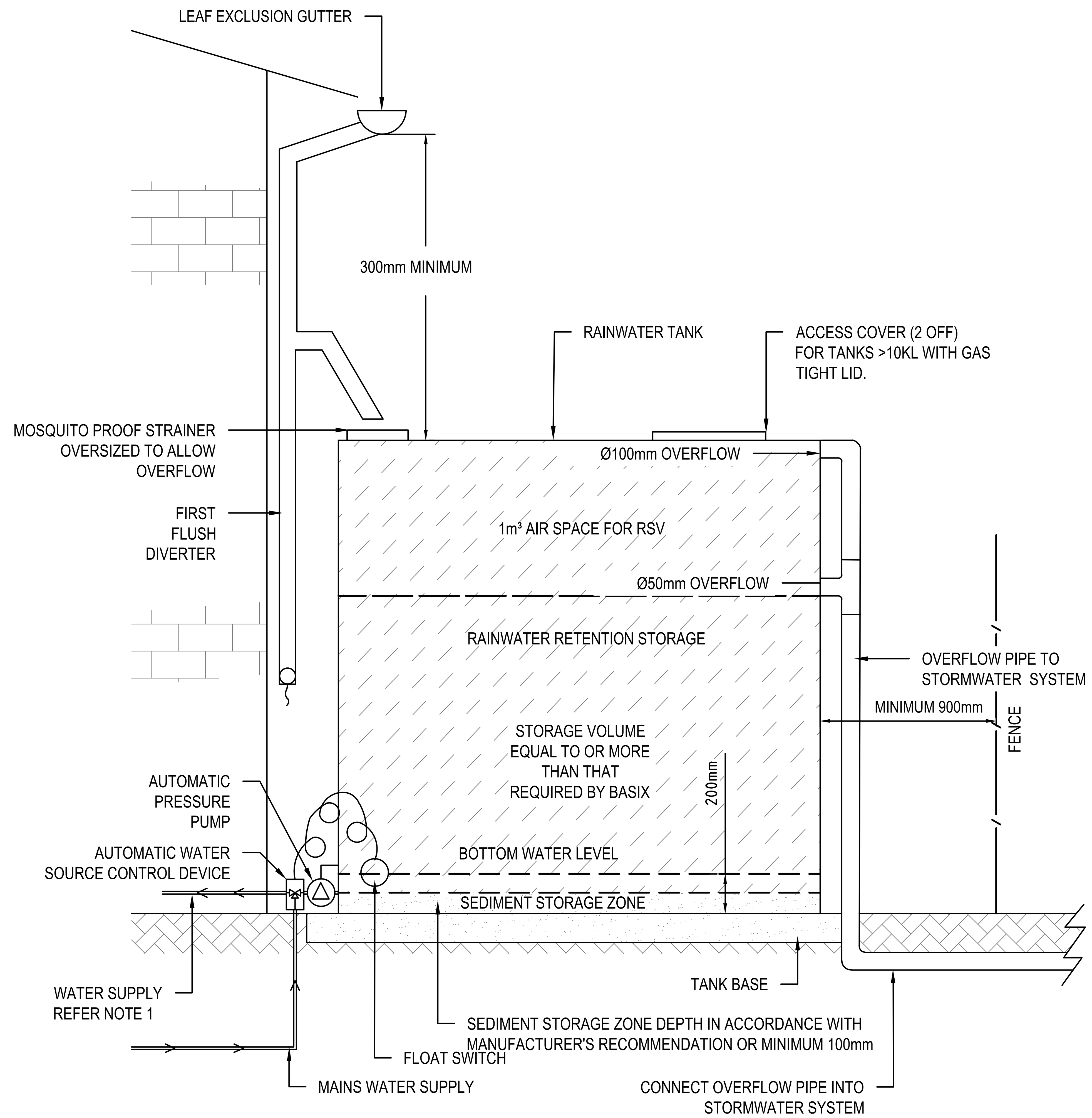
APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 25	01

NOTES:

1. THE TANK SHALL SUPPLY TOILET, LAUNDRY & ALL OUTDOOR TAPS.
2. REFER DRAWING WSUD 27 FOR FURTHER DETAILS & NOTES



DETAIL 30
DEEMED TO SATISFY ON SITE STORMWATER DETENTION & WATER CONSERVATION SOLUTION FOR BUSINESS & INDUSTRIAL DEVELOPMENT FOR SITES 150m^2 TO 500m^2
NTS



DETAIL 31
RAINWATER TANK
NTS

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

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01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

-1 0 1cm at full size 10cm 20cm

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Architect

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Project
WSUD STANDARD DRAWINGS

Drawing Title
OSD DEEMED TO COMPLY SOLUTION

ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 26	01

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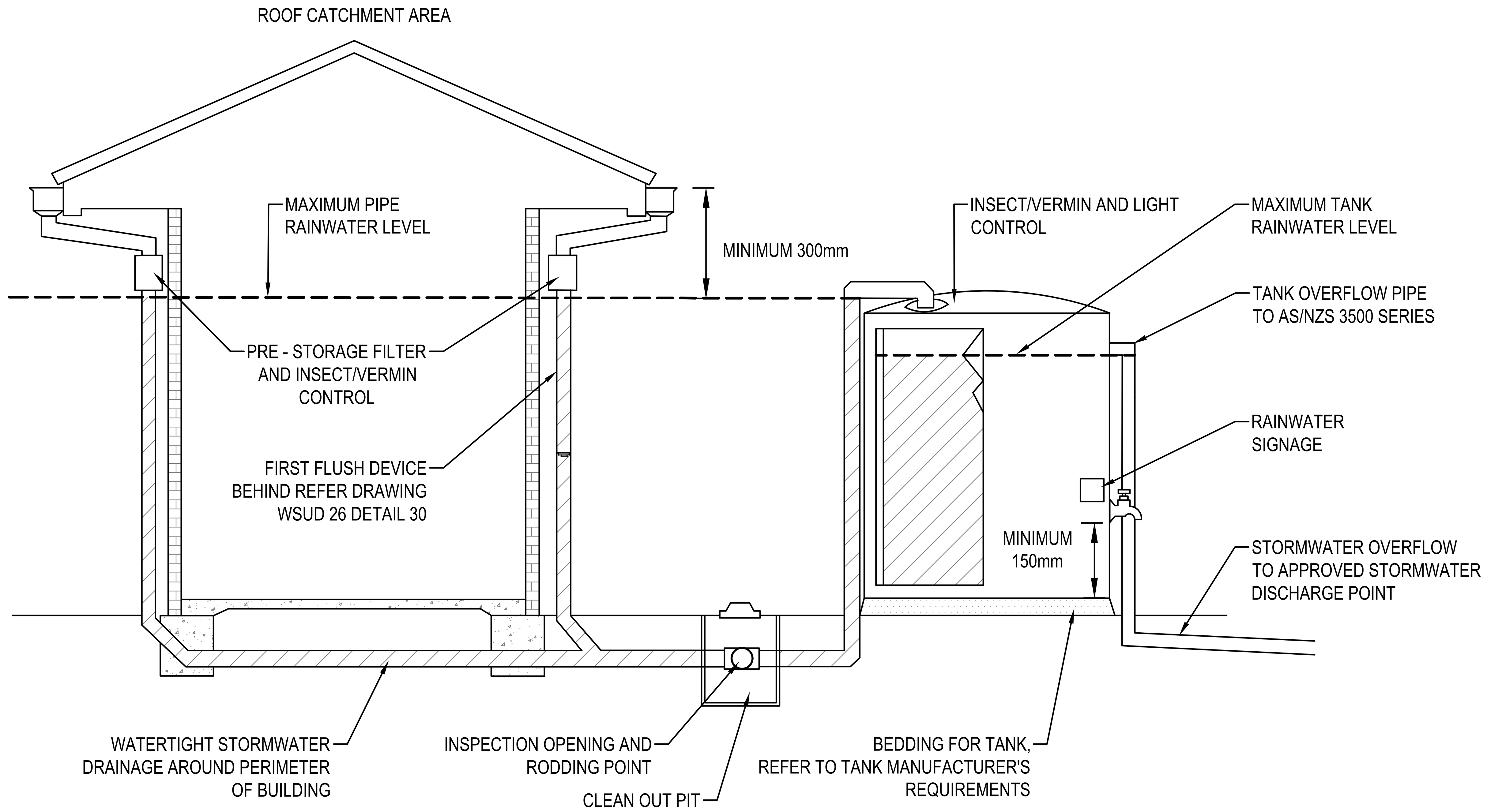

DETAIL 32
RAINWATER TANK WITH CHARGED LINE
NTS

DESIGN NOTES FOR CHARGED SYSTEMS:

1. CHARGE LINES ARE TO USE TYPE 'P' PRESSURE RATED SOLVENT.
2. SOLVENT SEALED TO UNDERSIDE OF EAVES. PAINT ALL EXPOSED SURFACES OR USE UV STABILISED PIPES.
3. FORCE LOW POINT IN CHARGE LINE TO CLEAN OUT PIT.
4. FOR ISOLATED PIT WITHOUT OUTLET PIPES PROVIDE 4 OFF 5mm Ø SEEPAGE HOLES IN BASE WITH GRAVEL UNDER.

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

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Architect

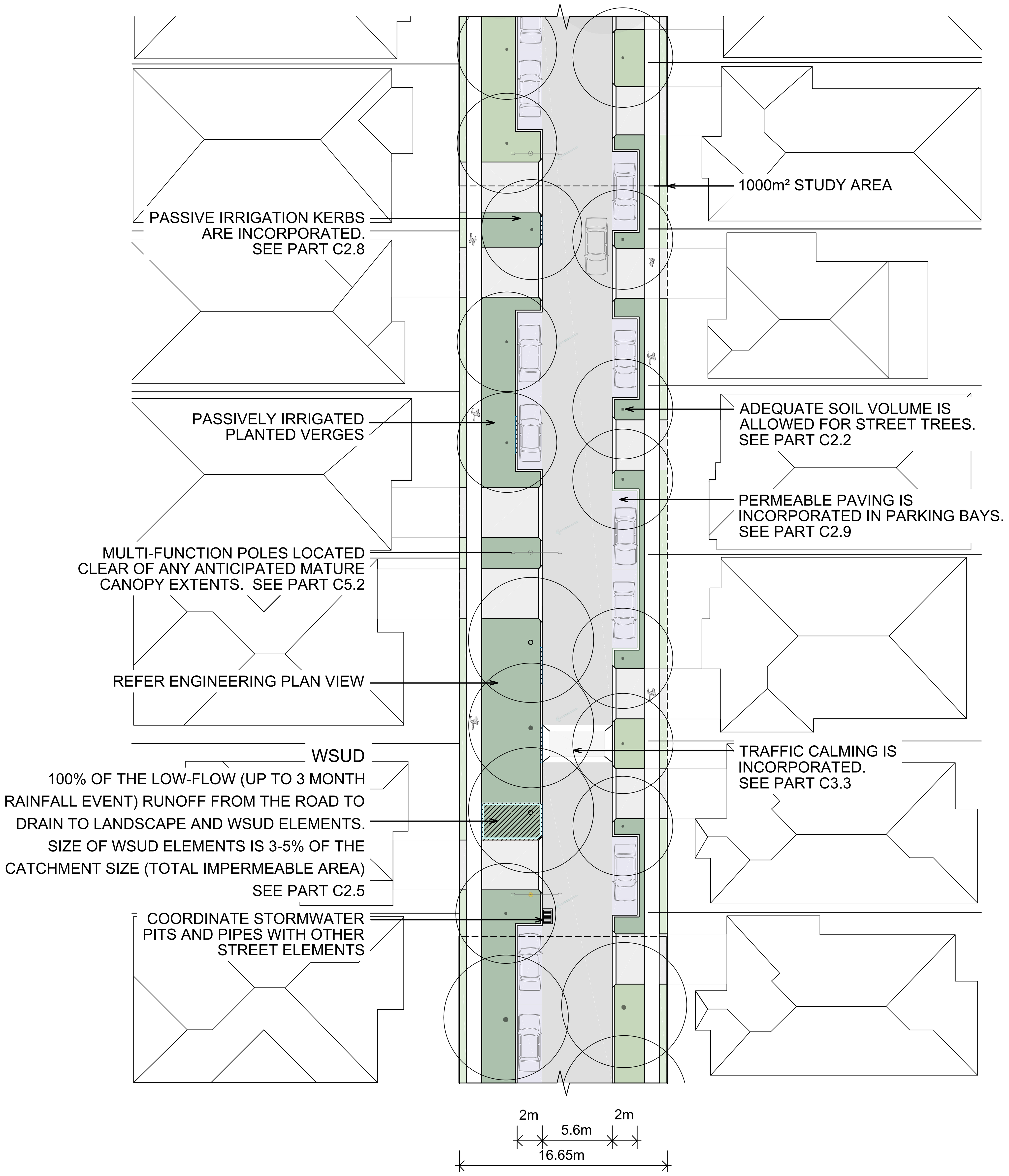
WESTERN SYDNEY PLANNING PARTNERSHIP

Project
WSUD STANDARD DRAWINGS

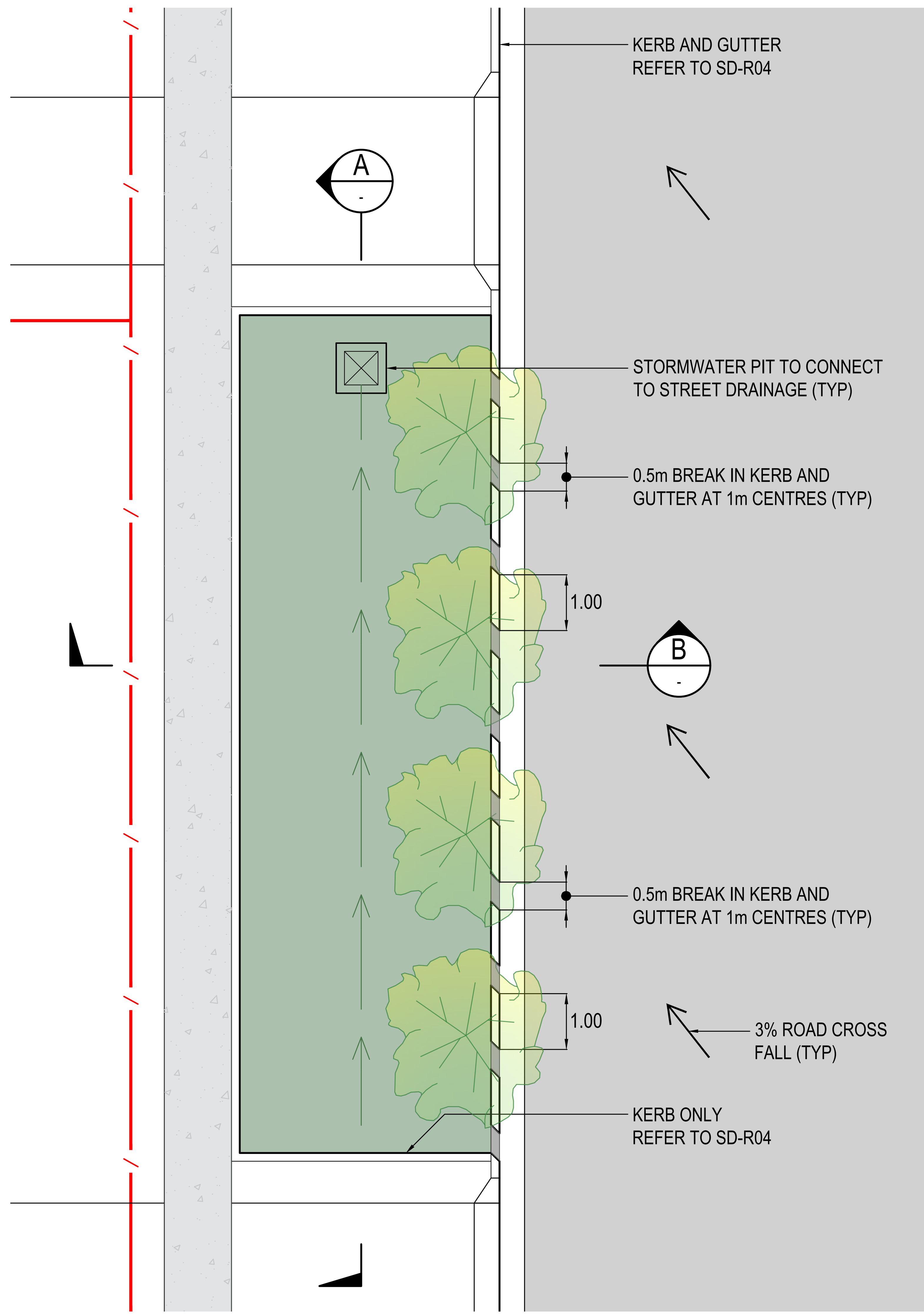
Drawing Title
RAINWATER TANK - CHARGED LINE SYSTEMS & MUSIC MODELLING REQUIREMENTS
ORIGINAL SOURCE FROM BLACKTOWN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS	OCT'20

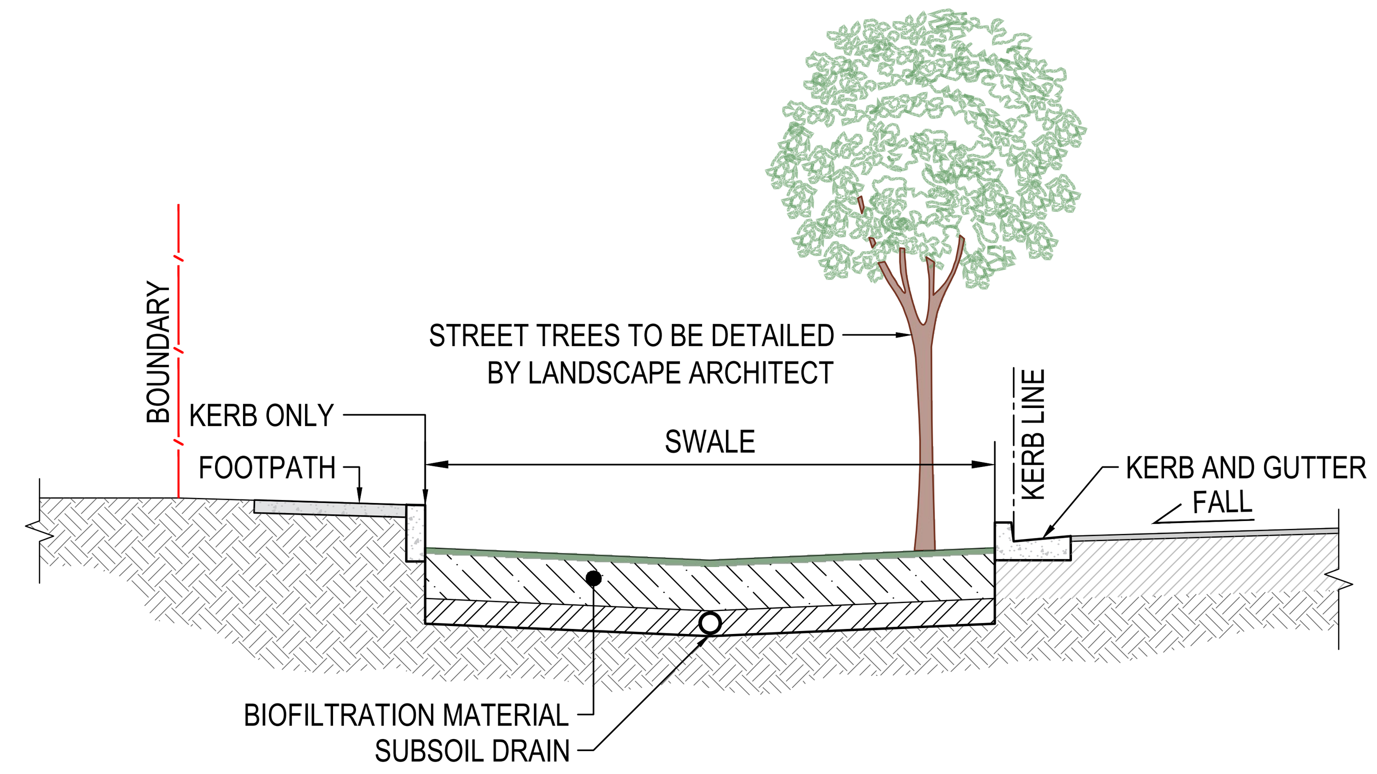
APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 27	01



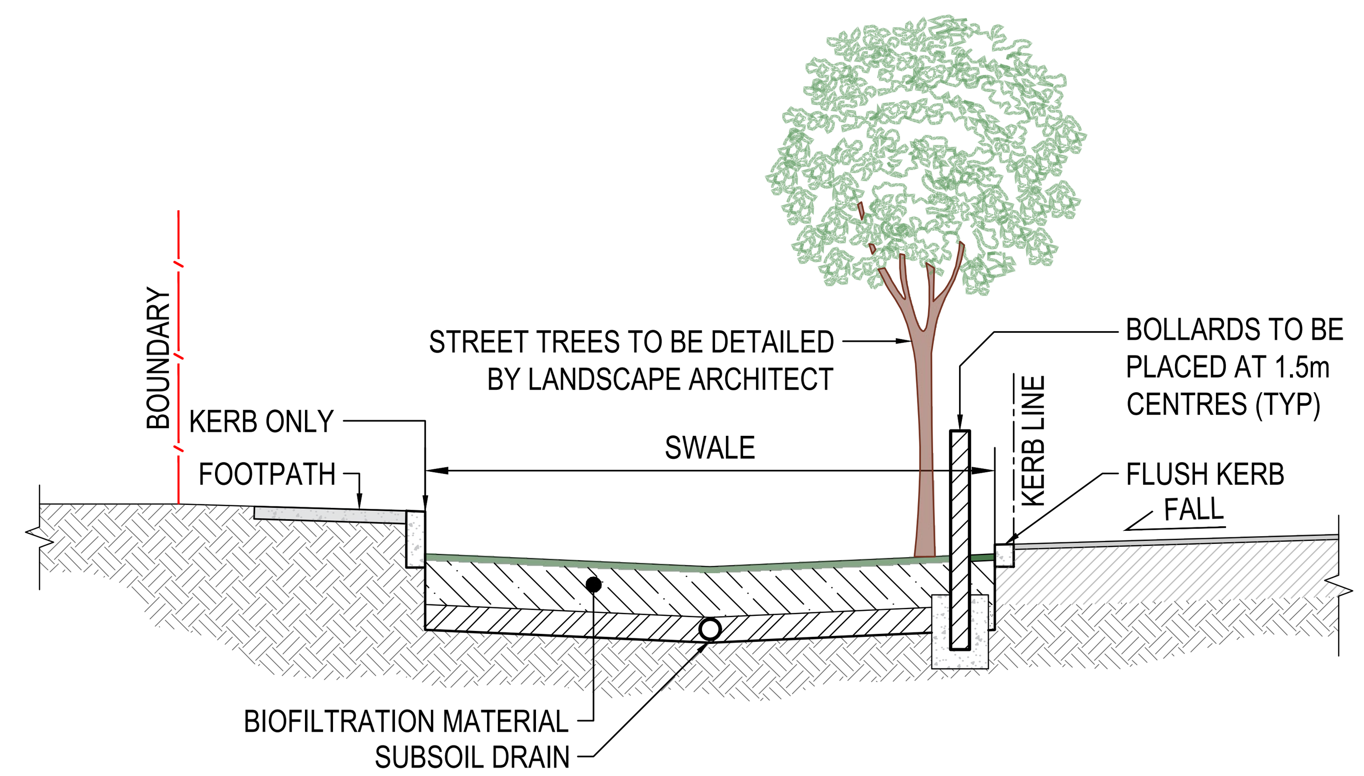
LOCAL STREET PLAN
NTS



ENGINEERING PLAN VIEW
NTS



SECTION B
OPTION 1 NTS



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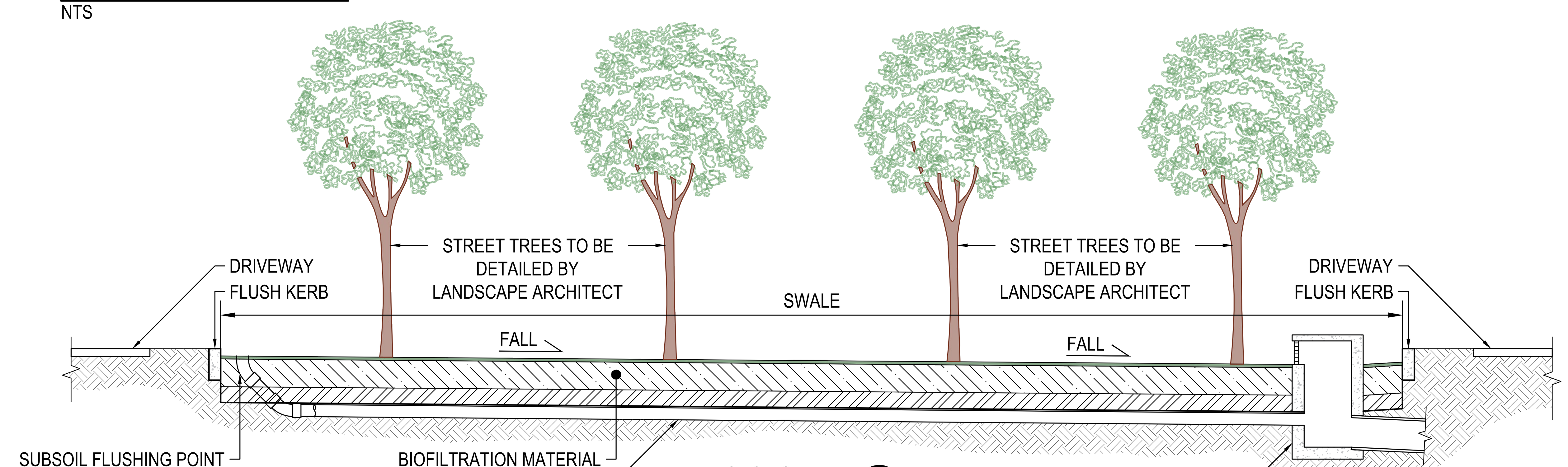
OPTION 2 NTS



SECTION A
NTS

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

North

Client
WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

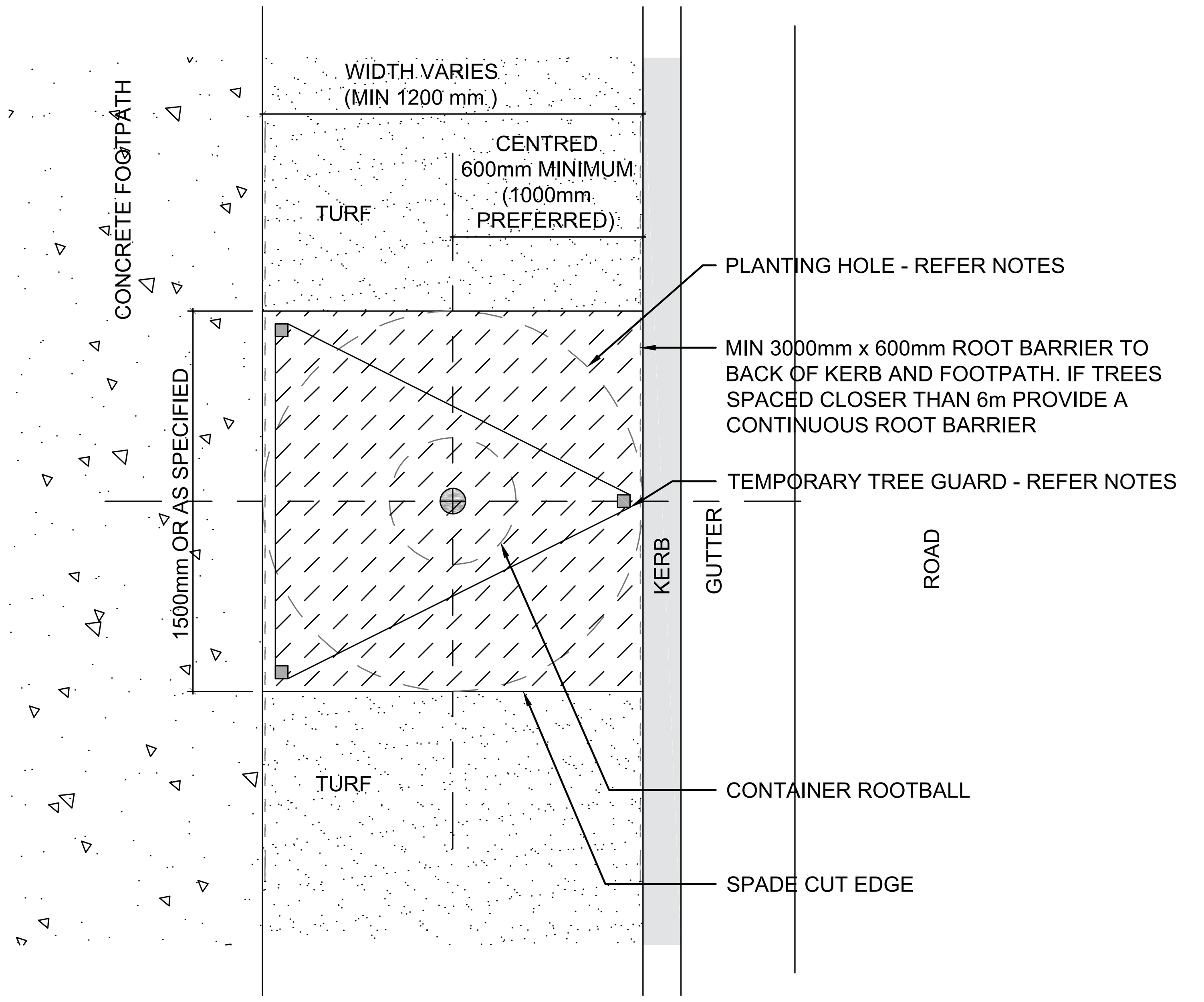
Project
WSUD STANDARD DRAWINGS

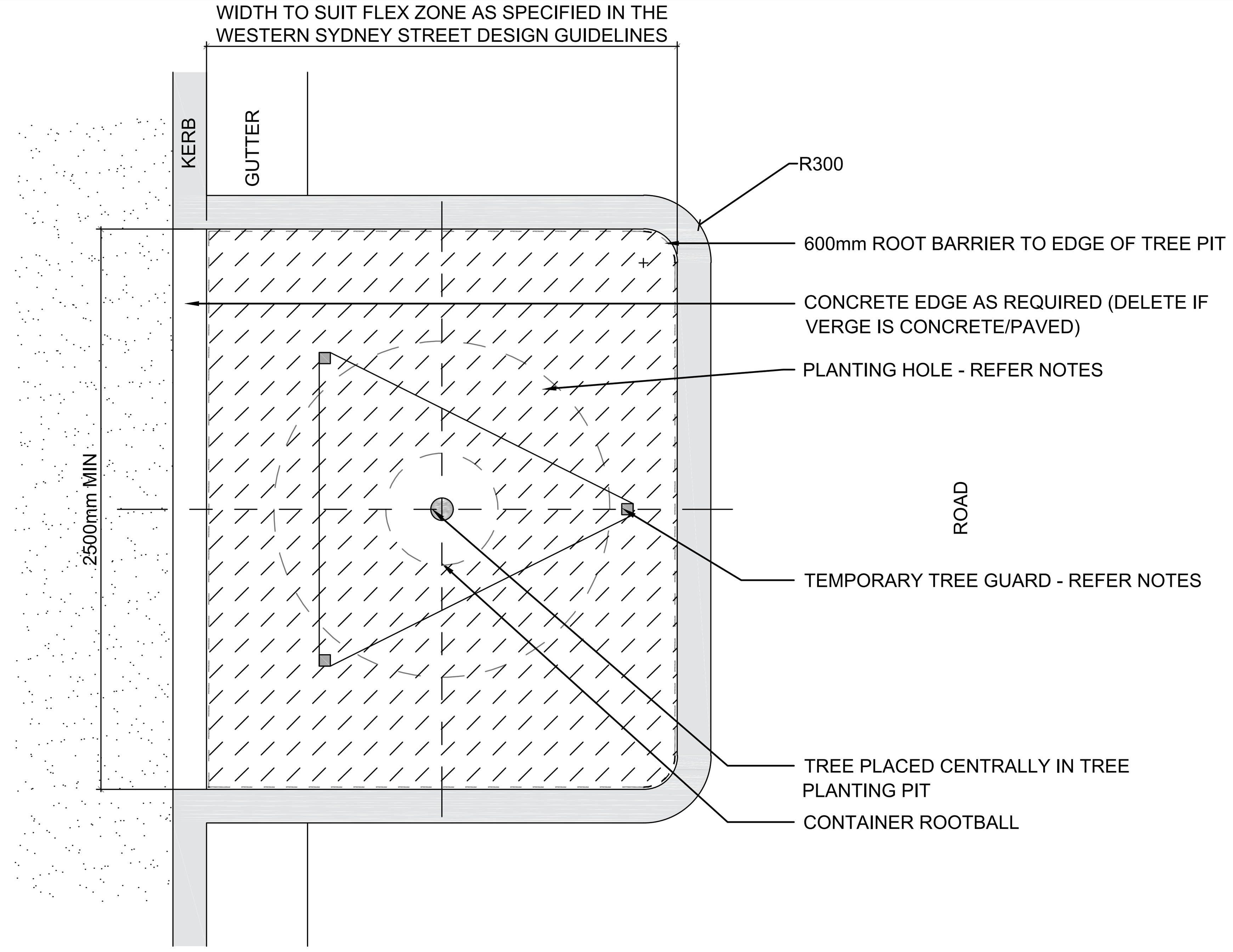
Drawing Title
WSUD FLEX ZONE SWALE

ORIGINAL SOURCE FROM ACOR/C&R

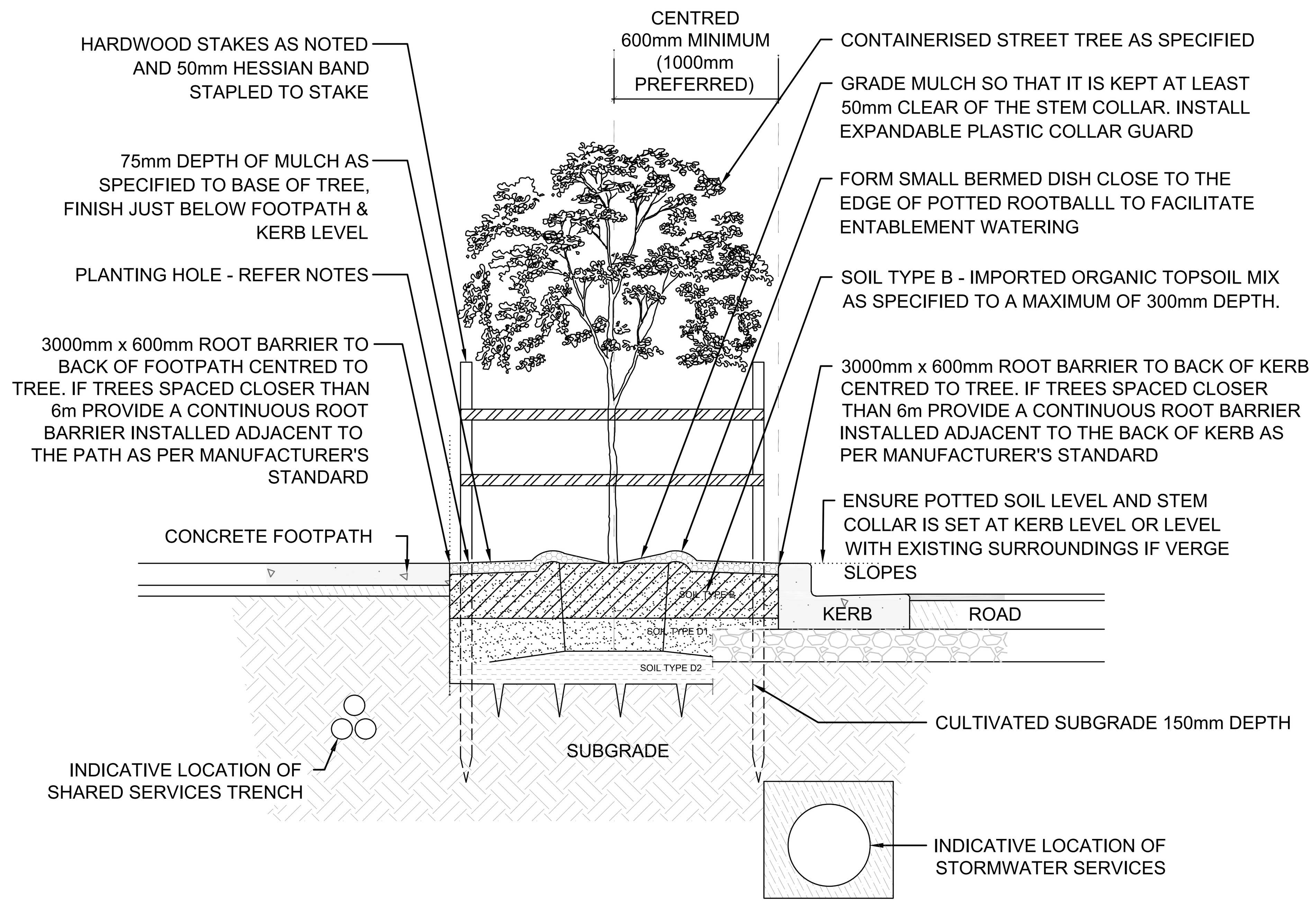
Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20	

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 28	01

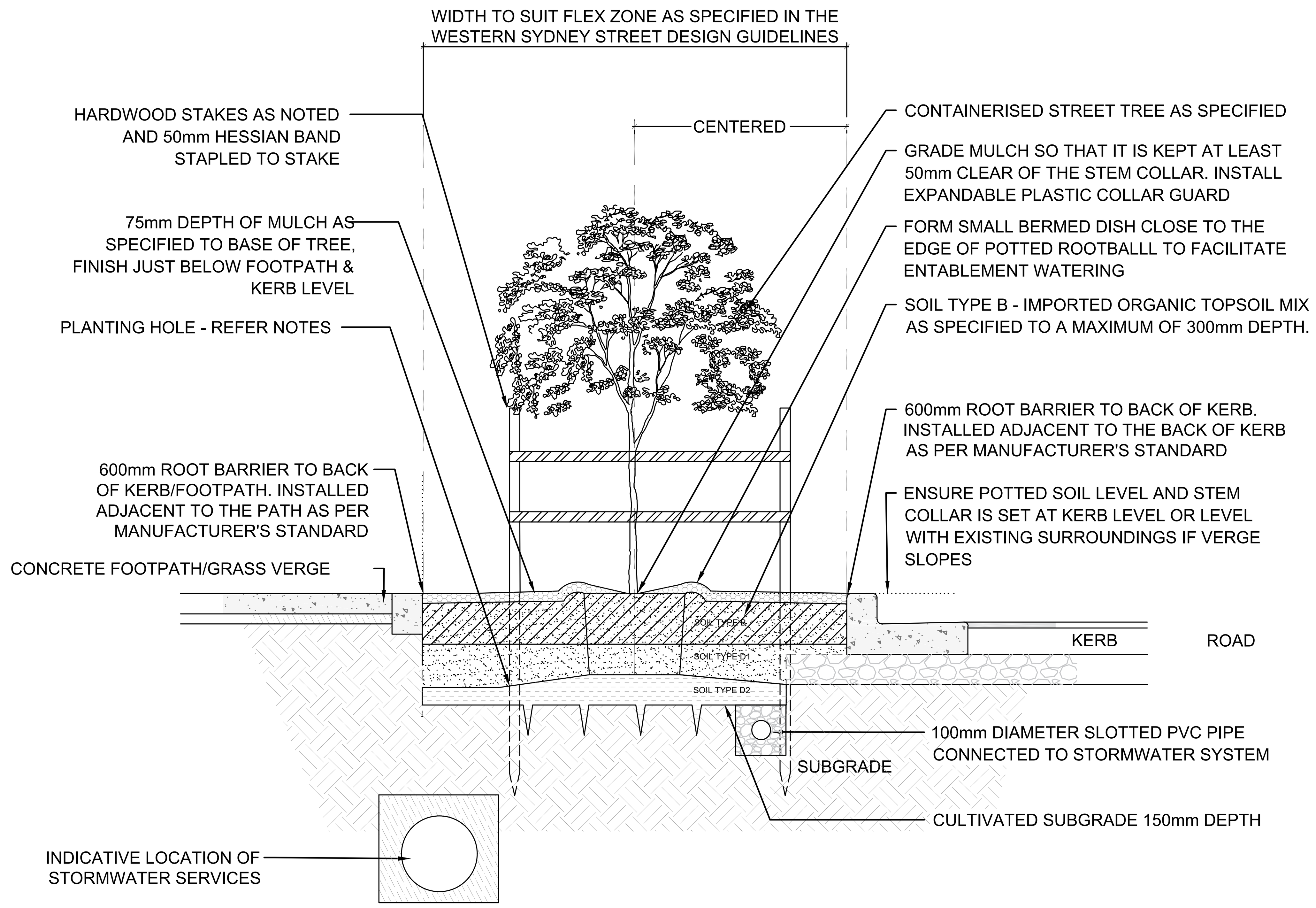




MEASUREMENTS TO COMPLY WITH SOIL VOLUME REQUIREMENTS OF THE STREET DESIGN GUIDELINES SECTION C2.2



TREE PLANTING IN GRASSED VERGE STRIP WITH ADJOINING PATH



TREE PLANTING IN PARKING BAY

NOTES

TEMPORARY TREE GUARD

TEMPORARY TREE GUARD USING THREE (3) 50 X 50 X 1800mm HARDWOOD STAKES AT EDGE OF PLANTING PIT. STAKES TYPICALLY DRIVEN 300mm to 600mm DEEP, OR UNTIL SECURE. STAKES TO BE DRIVEN TO A CONSISTENT DEPTH FOR EACH TREE. ARRANGE IN TRIANGULAR FORM TO MINIMISE CONFLICT WITH OPENING CAR DOORS. ENSURE STAKES ARE DRIVEN OUTSIDE OF SUPPLIED CONTAINER ROOTBALL

PLANTING HOLE

PLANTING HOLE TO BE THREE TIMES THE DIAMETER OF THE CONTAINER ROOTBALL DIAMETER OR THE VOLUME SPECIFIED ON TABLE C2.2 OF THE WESTERN SYDNEY STREET DESIGN GUIDELINES WHICHEVER IS GREATER. TREE TO BE PLANTED AT THE SAME DEPTH AS POTTED ROOTBALL PLUS 150mmFOR SOIL MIX TYPE D2. 75mm DEPTH OF MULCH AS SPECIFIED (CHIPPING RECYCLED WOOD EWASTE, NO FINES, IF NOTHING SPECIFIED) TO THE BASE OF THE TREE TO THE EXTENT SHOWN.

SOIL SCHEDULE

ITEM	LOCATION	SPECIFICATIONS
Soil Mix Type A	Turf	Min. 100mm deep. Commercially available premium grade topsoil, free of rocks and debris.
Soil Mix Type B	Tree Pit - Maximum depth 300mm	Commercially available premium grade manufactured sandy loam organic garden mix conforming to AS4419.
Soil Mix Type D1	Tree Pit - Depths below 200mm	Commercially available premium grade manufactured loam sand soil of less than 2% organic matter complying with AS4419. Do not backfill with organically enriched soil. It may contain a small proportion of recovered site topsoil or subsoil, provided the organic matter upper limit is not exceeded.
Soil Mix Type D2	Tree Pit - Base of excavated tree pit	A washed coarse sand, with uniform particle size, 0.5mm to 1.5mm. Particle shape is to be round to sub-round. Placed to depth of 150mm to be base of the excavated tree pit.

BIORETENTION DRAINAGE PROFILE

THE BIORETENTION PROFILE SHOWN IS INDICATIVE ONLY. EACH BIORETENTION SYSTEM MUST BE DESIGNED TO SUIT THE INDIVIDUAL SITE REQUIREMENTS AND ENSURE THAT IT IS APPROPRIATE FOR THE INTENDED FUNCTIONAL, AESTHETIC, CONSTRUCTION AND MAINTENANCE REQUIREMENTS OF EACH SITE.

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

North

Client: WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

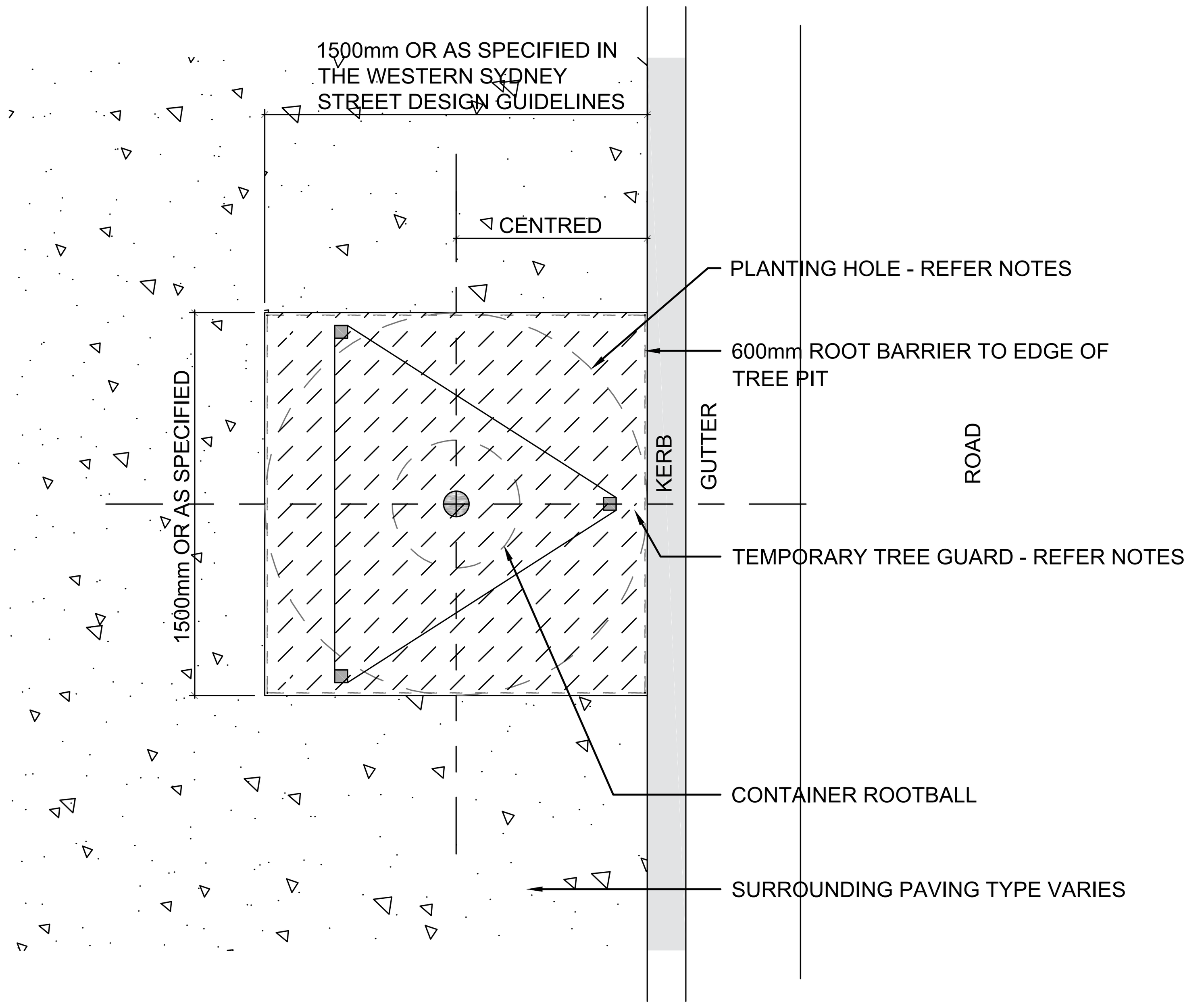
WESTERN SYDNEY PLANNING PARTNERSHIP

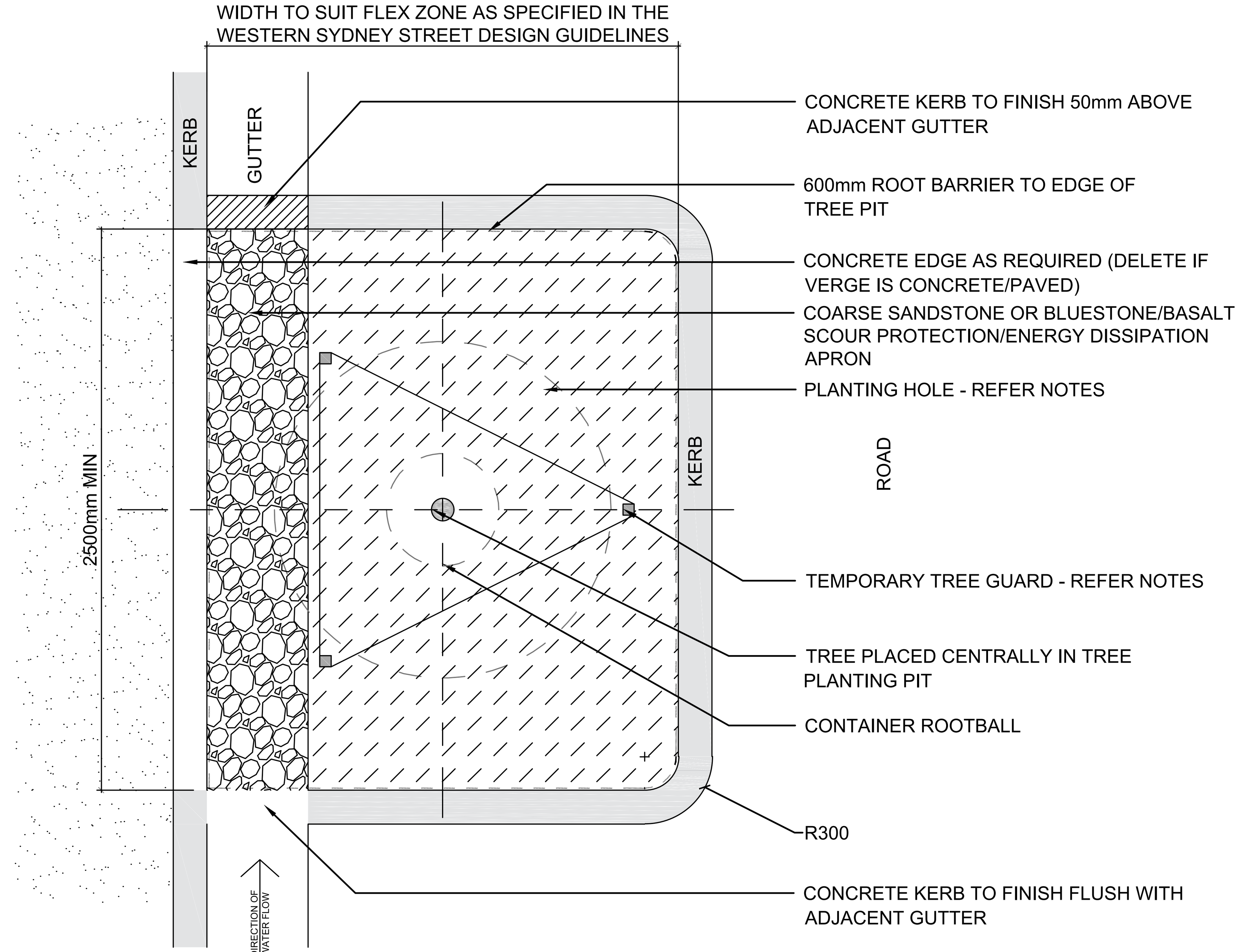
Project: WSUD STANDARD DRAWINGS

Drawing Title: WSUD STREET TREE PIT DETAILS
SHEET 1
ORIGINAL SOURCE FROM CAMDEN CITY COUNCIL

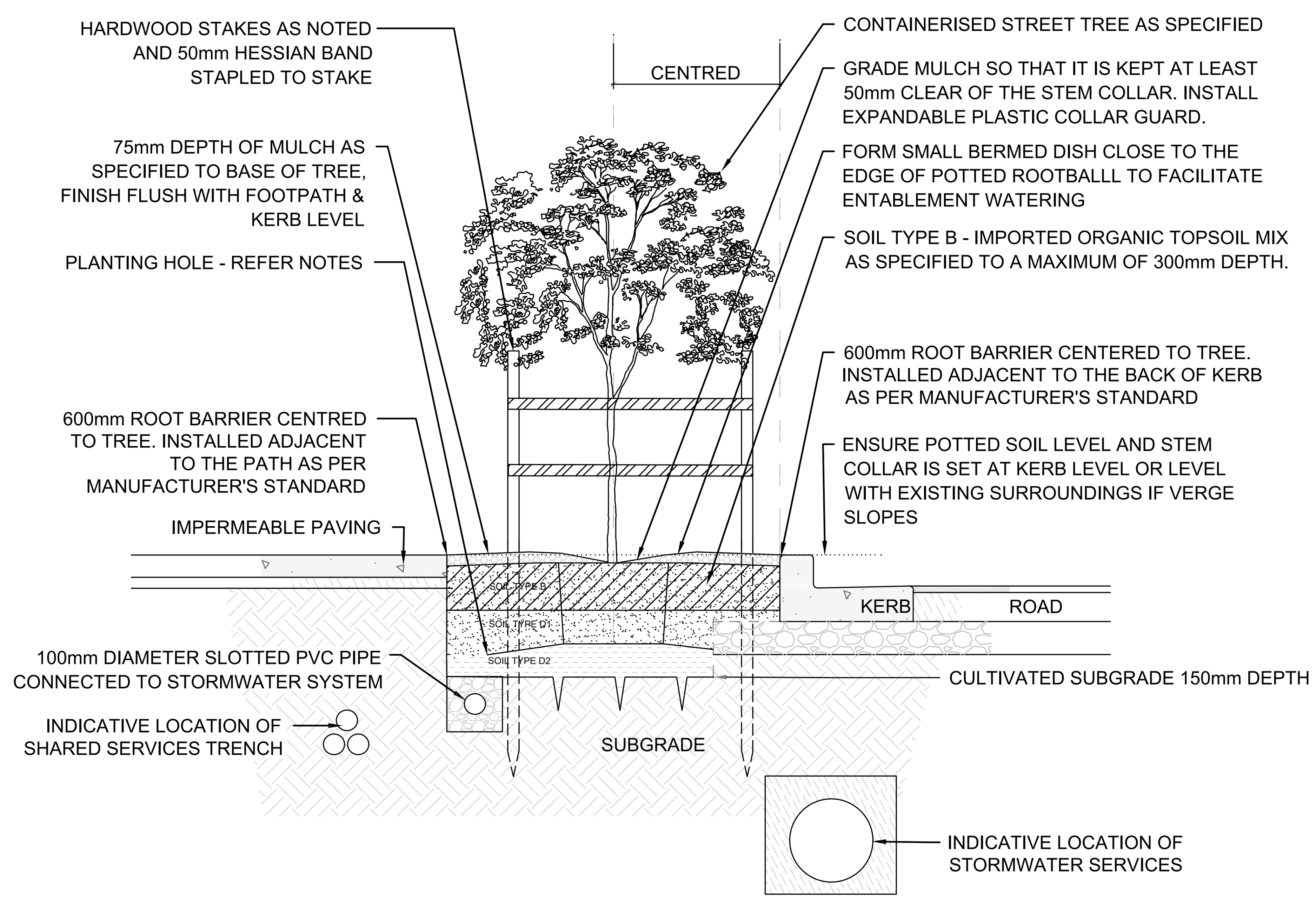
Drawn	Date	Scale	A1	Q.A. Check	Date
XX	APR' 2021	N.T.S		PWG COUNCILS OCT'20	

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 29	01

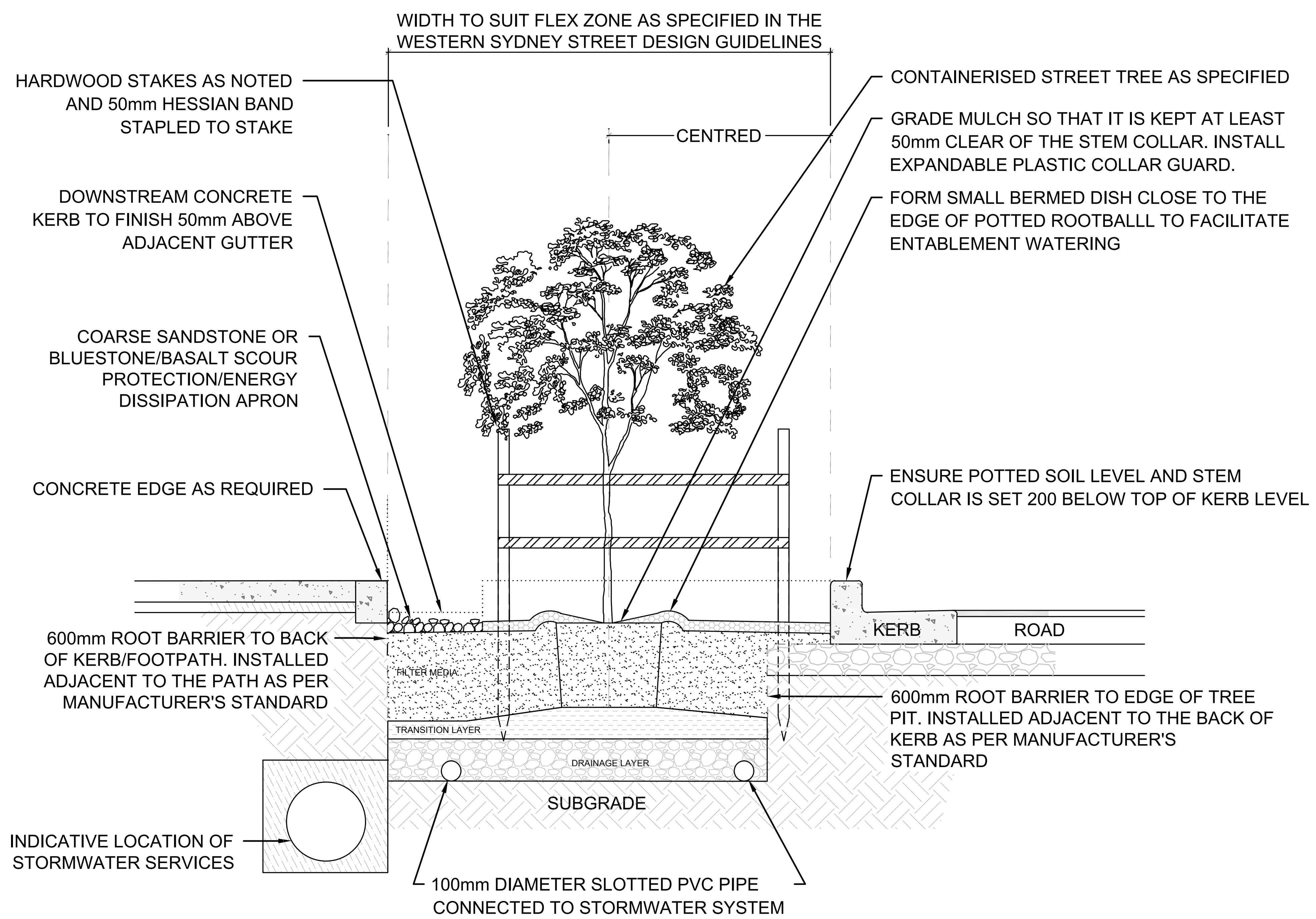




MEASUREMENTS TO COMPLY WITH SOIL VOLUME REQUIREMENTS OF THE STREET DESIGN GUIDELINES SECTION C2.2



TREE PLANTING IN PAVING



TREE PLANTING IN PARKING BAY WITH PASSIVE IRRIGATION - OPTION 1

NOTES

TEMPORARY TREE GUARD

TEMPORARY TREE GUARD USING THREE (3) 50 X 50 X 1800mm HARDWOOD STAKES AT EDGE OF PLANTING PIT. STAKES TYPICALLY DRIVEN 300mm to 600mm DEEP, OR UNTIL SECURE. STAKES TO BE DRIVEN TO A CONSISTENT DEPTH FOR EACH TREE. ARRANGE IN TRIANGULAR FORM TO MINIMISE CONFLICT WITH OPENING CAR DOORS. ENSURE STAKES ARE DRIVEN OUTSIDE OF SUPPLIED CONTAINER ROOTBALL

PLANTING HOLE

PLANTING HOLE TO BE THREE TIMES THE DIAMETER OF THE CONTAINER ROOTBALL DIAMETER OR THE VOLUME SPECIFIED ON TABLE C2.2 OF THE WESTERN SYDNEY STREET DESIGN GUIDELINES WHICHEVER IS GREATER. TREE TO BE PLANTED AT THE SAME DEPTH AS POTTED ROOTBALL PLUS 150mmFOR SOL MIX TYPE D2. 75mm DEPTH OF MULCH AS SPECIFIED (CHIPPING RECYCLED WOOD EWASTE, NO FINES, IF NOTHING SPECIFIED) TO THE BASE OF THE TREE TO THE EXTENT SHOWN.

SOIL SCHEDULE

ITEM	LOCATION	SPECIFICATIONS
Soil Mix Type A	Turf	Min. 100mm deep. Commercially available premium grade topsoil, free of rocks and debris.
Soil Mix Type B	Tree Pit - Maximum depth 300mm	Commercially available premium grade manufactured sandy loam organic garden mix conforming to AS4419.
Soil Mix Type D1	Tree Pit - Depths below 200mm	Commercially available premium grade manufactured loam sand soil of less than 2% organic matter complying with AS4419. Do not backfill with organically enriched soil. It may contain a small proportion of recovered site topsoil or subsoil, provided the organic matter upper limit is not exceeded.
Soil Mix Type D2	Tree Pit - Base of excavated tree pit	A washed coarse sand, with uniform particle size, 0.5mm to 1.5mm. Particle shape is to be round to sub-round. Placed to depth of 150mm to be base of the excavated tree pit.

BIORETENTION DRAINAGE PROFILE

THE BIORETENTION PROFILE SHOWN IS INDICATIVE ONLY. EACH BIORETENTION SYSTEM MUST BE DESIGNED TO SUIT THE INDIVIDUAL SITE REQUIREMENTS AND ENSURE THAT IT IS APPROPRIATE FOR THE INTENDED FUNCTIONAL, AESTHETIC, CONSTRUCTION AND MAINTENANCE REQUIREMENTS OF EACH SITE.

This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

1cm at full size 10cm 20cm

North

Client
WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

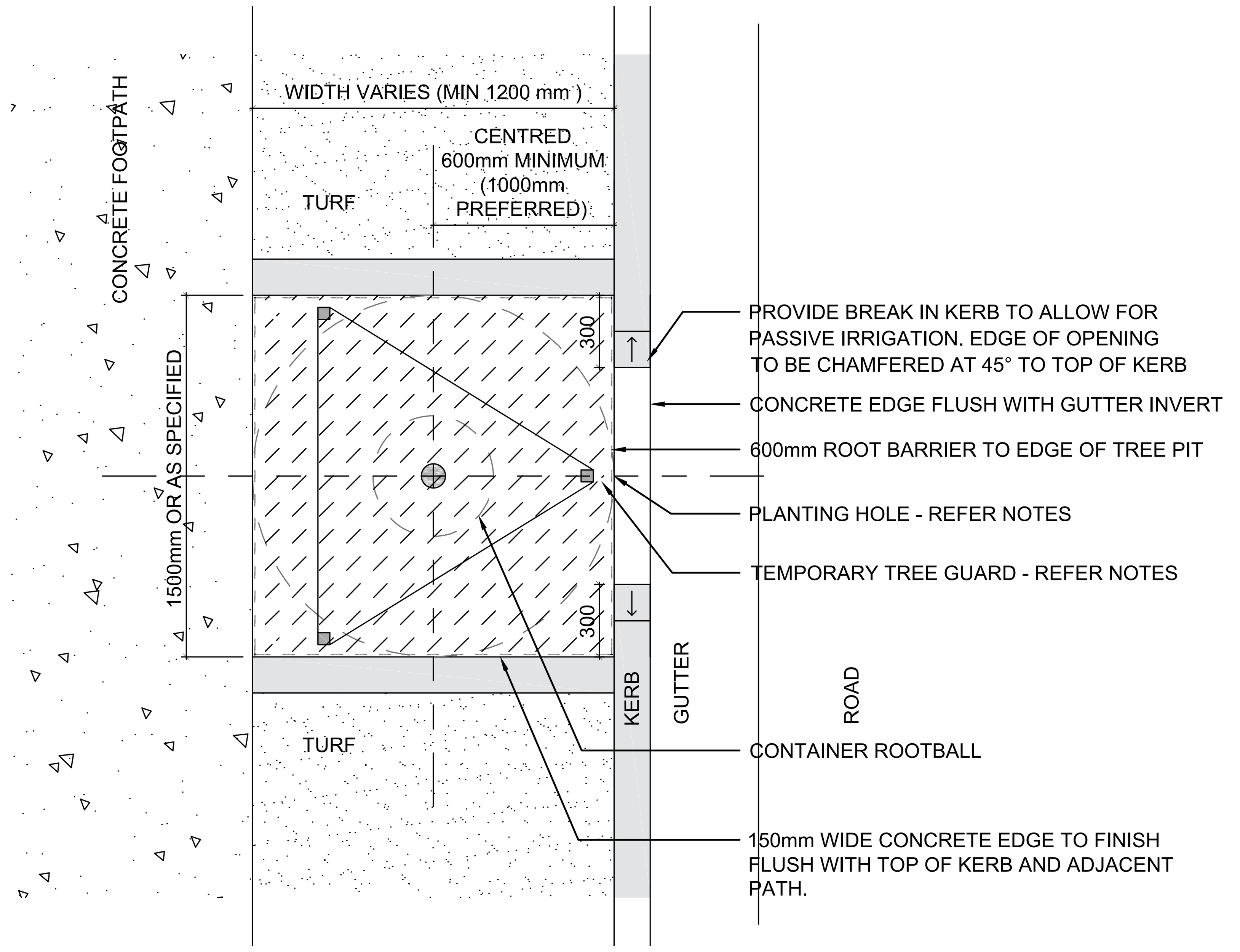
Project
WSUD STANDARD DRAWINGS

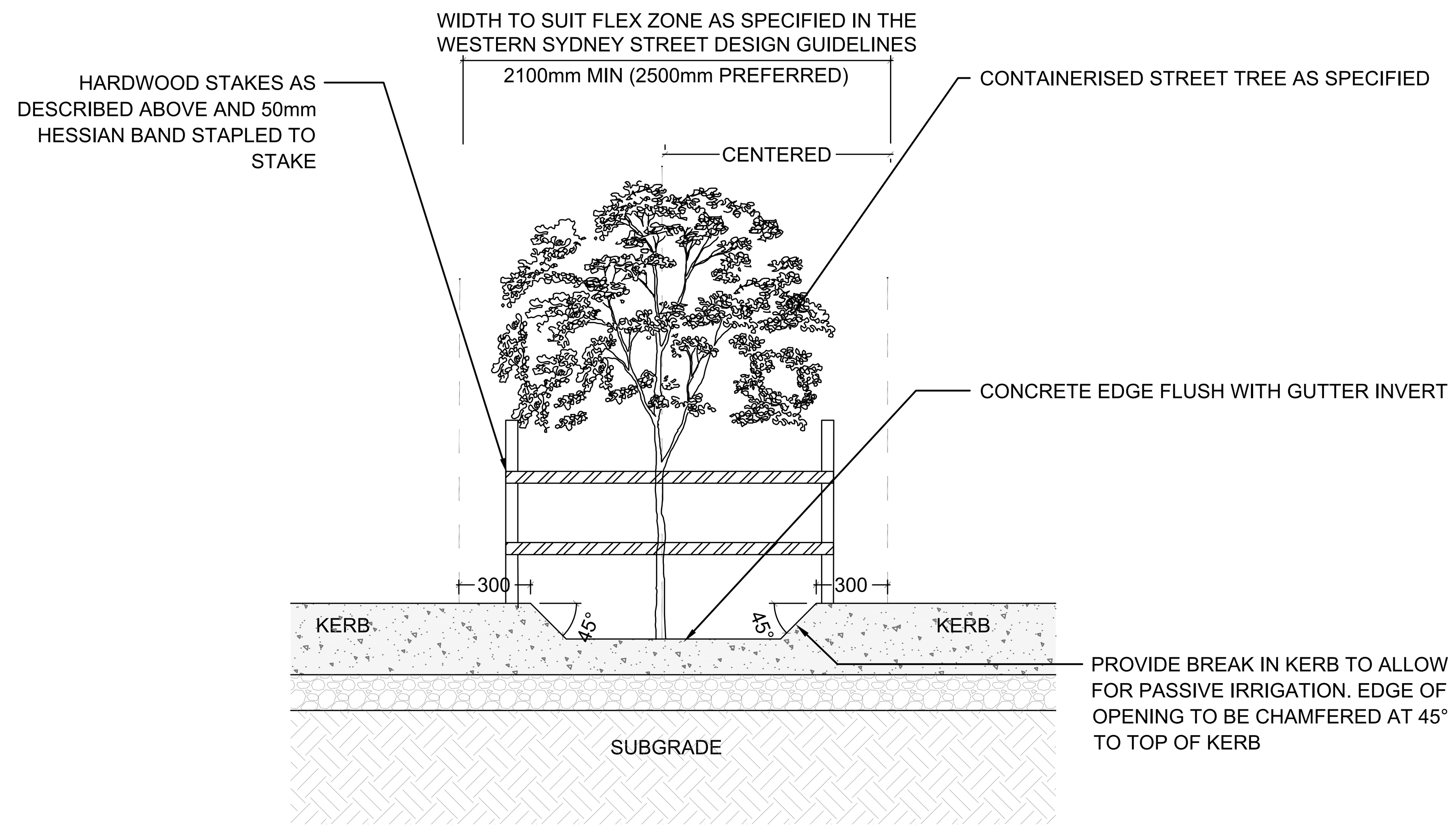
Drawing Title
WSUD STREET TREE PIT DETAILS
SHEET 2
ORIGINAL SOURCE FROM CAMDEN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20

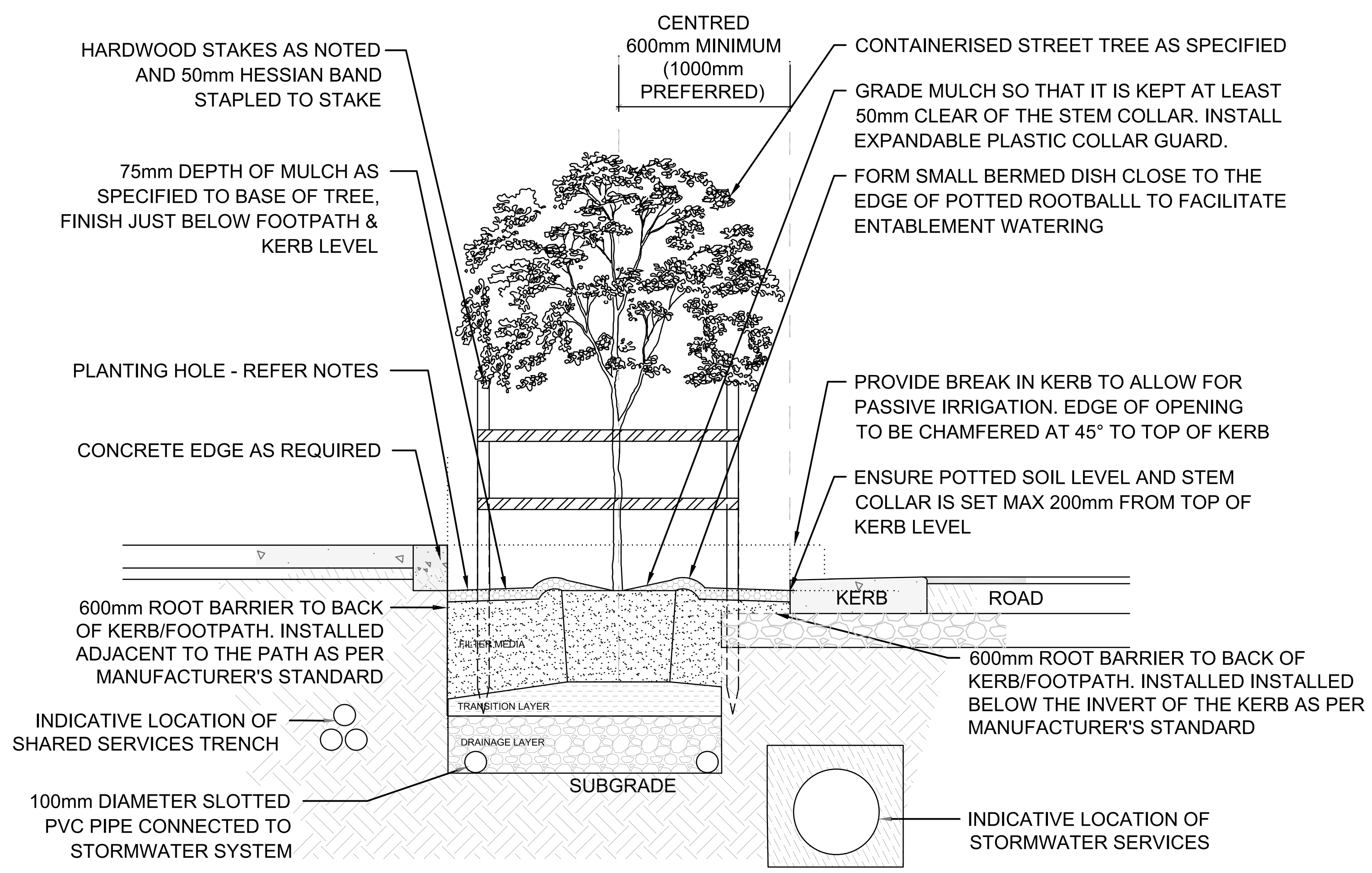
APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
SJD 14.4.21	WS190098	WSUD 30	01

Apr 19, 2021 - 3:15pm \\192.168.5.2\Synergy\Projects\WS19\WS190098\Drawings





MEASUREMENTS TO COMPLY WITH SOIL VOLUME REQUIREMENTS OF THE STREET DESIGN GUIDELINES SECTION C2.2



TREE PLANTING IN PARKING BAY WITH PASSIVE IRRIGATION - OPTION 2

NOTES

TEMPORARY TREE GUARD
TEMPORARY TREE GUARD USING THREE (3) 50 X 50 X 1800mm HARDWOOD STAKES AT EDGE OF PLANTING PIT. STAKES TYPICALLY DRIVEN 300mm to 600mm DEEP, OR UNTIL SECURE. STAKES TO BE DRIVEN TO A CONSISTENT DEPTH FOR EACH TREE. ARRANGE IN TRIANGULAR FORM TO MINIMISE CONFLICT WITH OPENING CAR DOORS. ENSURE STAKES ARE DRIVEN OUTSIDE OF SUPPLIED CONTAINER ROOTBALL

PLANTING HOLE
PLANTING HOLE TO BE THREE TIMES THE DIAMETER OF THE CONTAINER ROOTBALL DIAMETER OR THE VOLUME SPECIFIED ON TABLE C2.2 OF THE WESTERN SYDNEY STREET DESIGN GUIDELINES WHICHEVER IS GREATER. TREE TO BE PLANTED AT THE SAME DEPTH AS POTTED ROOTBALL PLUS 150mmFOR SOIL MIX TYPE D2. 75mm DEPTH OF MULCH AS SPECIFIED (CHIPPING RECYCLED WOOD EWASTE, NO FINES, IF NOTHING SPECIFIED) TO THE BASE OF THE TREE TO THE EXTENT SHOWN.

SOIL SCHEDULE

ITEM	LOCATION	SPECIFICATIONS
Soil Mix Type A	Turf	Min. 100mm deep. Commercially available premium grade topsoil, free of rocks and debris.
Soil Mix Type B	Tree Pit - Maximum depth 300mm	Commercially available premium grade manufactured sandy loam organic garden mix conforming to AS4419.
Soil Mix Type D1	Tree Pit - Depths below 200mm	Commercially available premium grade manufactured loam sand soil of less than 2% organic matter complying with AS4419. Do not backfill with organically enriched soil. It may contain a small proportion of recovered site topsoil or subsoil, provided the organic matter upper limit is not exceeded.
Soil Mix Type D2	Tree Pit - Base of excavated tree pit	A washed coarse sand, with uniform particle size, 0.5mm to 1.5mm. Particle shape is to be round to sub-round. Placed to depth of 150mm to be base of the excavated tree pit.

BIORETENTION DRAINAGE PROFILE
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This drawing has been assigned an electronic code that signifies the drawing has been checked and approved by:

Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

North

Client
WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

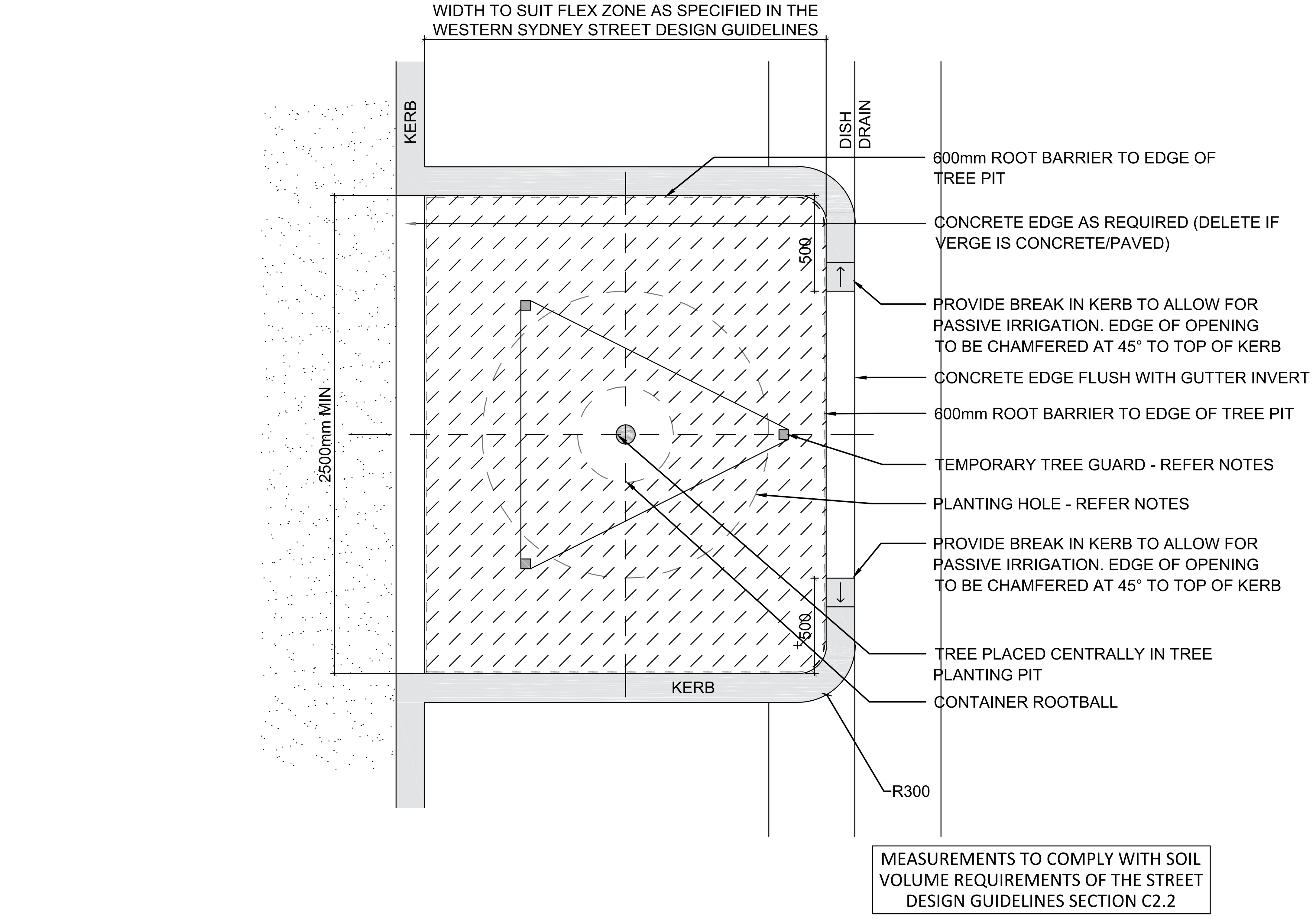
WESTERN SYDNEY PLANNING PARTNERSHIP

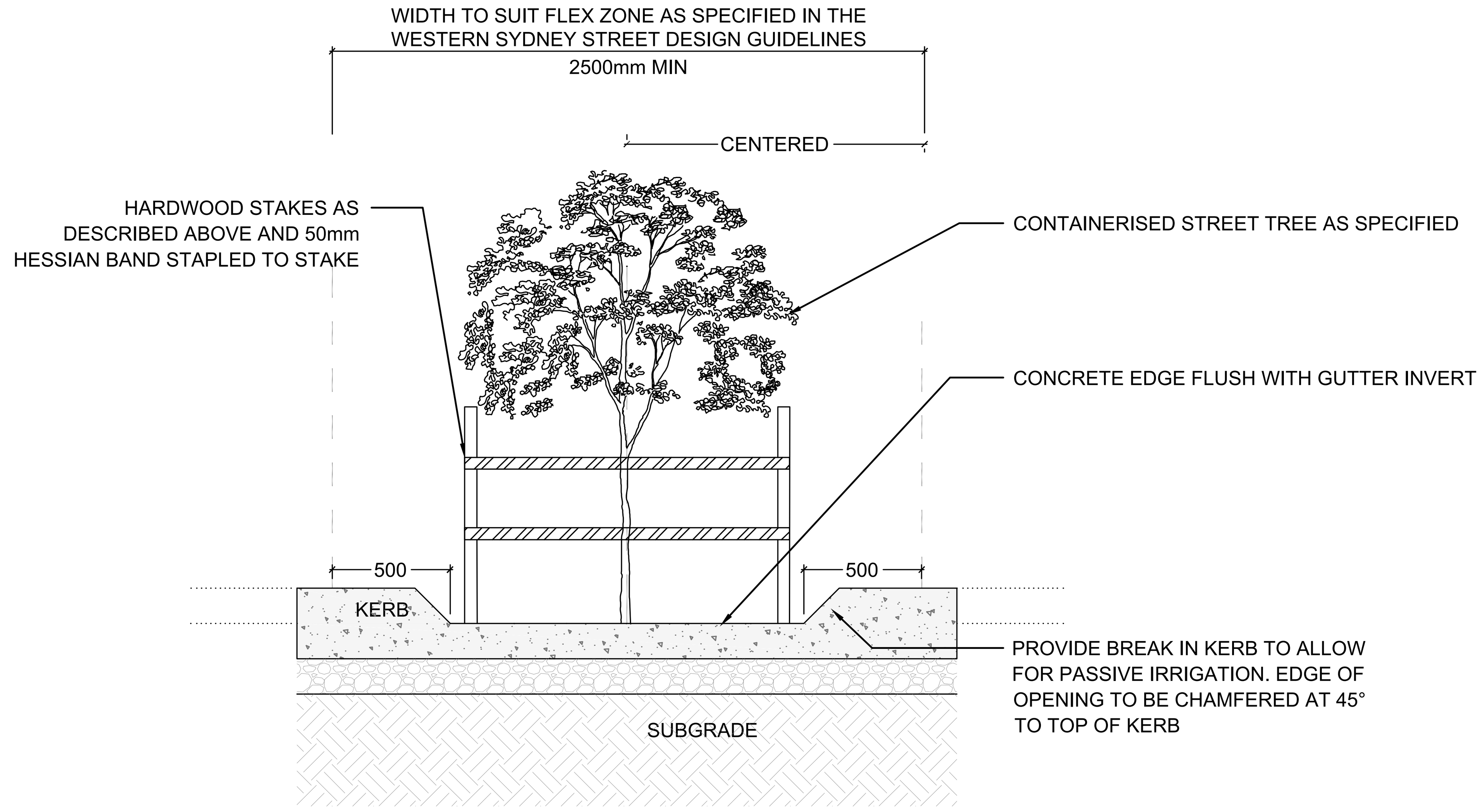
Project
WSUD STANDARD DRAWINGS

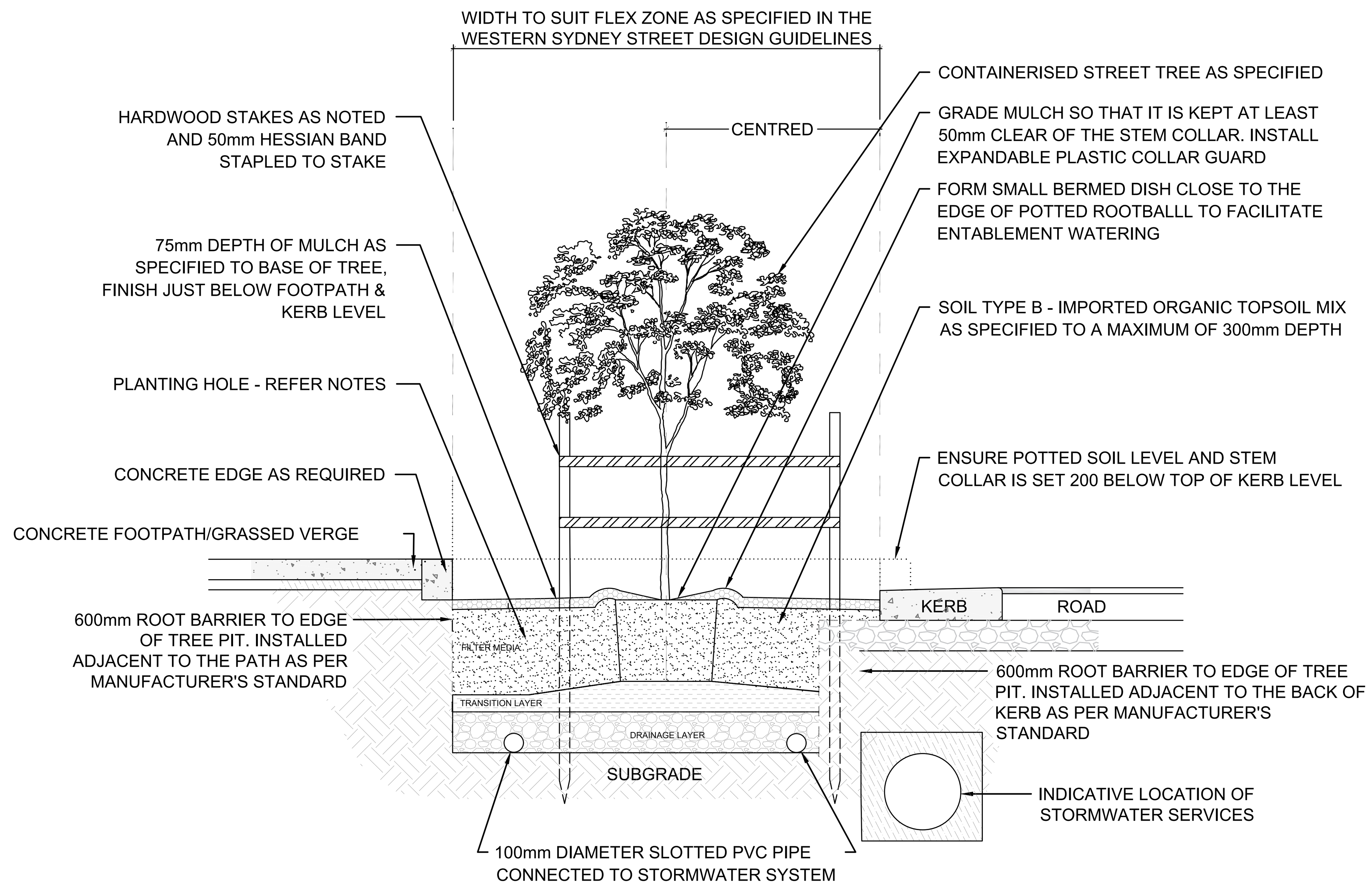
Drawing Title
WSUD STREET TREE PIT DETAILS
SHEET 3
ORIGINAL SOURCE FROM CAMDEN CITY COUNCIL

Drawn	Date	Scale	A1	Q.A. Check	Date
XX	APR' 2021	N.T.S		PWG COUNCILS	OCT'20

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 31	01







TREE PLANTING IN PARKING BAY WITH PASSIVE IRRIGATION - OPTION 3

NOTES

TEMPORARY TREE GUARD

TEMPORARY TREE GUARD USING THREE (3) 50 X 50 X 1800mm HARDWOOD STAKES AT EDGE OF PLANTING PIT. STAKES TYPICALLY DRIVEN 300mm to 600mm DEEP, OR UNTIL SECURE. STAKES TO BE DRIVEN TO A CONSISTENT DEPTH FOR EACH TREE, ARRANGE IN TRIANGULAR FORM TO MINIMISE CONFLICT WITH OPENING CAR DOORS. ENSURE STAKES ARE DRIVEN OUTSIDE OF SUPPLIED CONTAINER ROOTBALL

PLANTING HOLE

PLANTING HOLE TO BE THREE TIMES THE DIAMETER OF THE CONTAINER ROOTBALL DIAMETER OR THE VOLUME SPECIFIED ON TABLE C2.2 OF THE WESTERN SYDNEY STREET DESIGN GUIDELINES WHICHEVER IS GREATER. TREE TO BE PLANTED AT THE SAME DEPTH AS POTTED ROOTBALL PLUS 150mmFOR SOL MIX TYPE D2. 75mm DEPTH OF MULCH AS SPECIFIED (CHIPPING RECYCLED WOOD EWASTE, NO FINES, IF NOTHING SPECIFIED) TO THE BASE OF THE TREE TO THE EXTENT SHOWN.

SOIL SCHEDULE

ITEM	LOCATION	SPECIFICATIONS
Soil Mix Type A	Turf	Min. 100mm deep. Commercially available premium grade topsoil, free of rocks and debris.
Soil Mix Type B	Tree Pit - Maximum depth 300mm	Commercially available premium grade manufactured sandy loam organic garden mix conforming to AS4419.
Soil Mix Type D1	Tree Pit - Depths below 200mm	Commercially available premium grade manufactured loam sand soil of less than 2% organic matter complying with AS4419. Do not backfill with organically enriched soil. It may contain a small proportion of recovered site topsoil or subsoil, provided the organic matter upper limit is not exceeded.
Soil Mix Type D2	Tree Pit - Base of excavated tree pit	A washed coarse sand, with uniform particle size, 0.5mm to 1.5mm. Particle shape is to be round to sub-round. Placed to depth of 150mm to be base of the excavated tree pit.

BIORETENTION DRAINAGE PROFILE

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Issue	Description	Date	Drawn	Approved
01	POST PCG AMENDMENTS	14.04.21	XX	XX
00	ISSUE FOR PCG	06.11.20	XX	XX

North

Client: WESTERN SYDNEY COUNCILS OF BLACKTOWN CITY, BLUE MOUNTAINS CITY, CAMDEN, CAMPBELLTOWN CITY, FAIRFIELD CITY, HAWKESBURY CITY, LIVERPOOL CITY, PENRITH CITY AND WOLLONDILLY SHIRE.

Architect

WESTERN SYDNEY PLANNING PARTNERSHIP

Project: WSUD STANDARD DRAWINGS

Drawing Title: WSUD STREET TREE PIT DETAILS SHEET 4
ORIGINAL SOURCE FROM CAMDEN CITY COUNCIL

Drawn	Date	Scale A1	Q.A. Check	Date
XX	APR' 2021	N.T.S	PWG COUNCILS OCT'20	

APPROVED FOR ISSUE	Project No.	Dwg. No.	Issue
	WS190098	WSUD 32	01