MEMO

ARCADIS Design & Consultancy for natural and built assets

Date	11/10/2019
To	Edward Ottery
From	Michelle Fletcher
Copy to	Georgia Ashdown, Mark Kuhne, Dov Ben Avraham and Melanie Gostelow
Subject	Westfield Penrith Alterations and Additions – Development Application Stormwater Memo

Introduction

Arcadis has been engaged by Scentre Group Limited to prepare a stormwater management strategy to support the Development Application (DA) for the proposed Westfield Penrith Alterations and Additions project. The development will be confined to the Westfield site and consist of landscaping upgrades, expansion of specialty and food retail spaces.

This memo provides a summary of the stormwater management strategy for the proposed development and addresses the following as they relate to the development:

- Stormwater requirements (including stormwater drainage upgrades, WSUD and OSD requirements);
- Flooding constraints; and
- Flood planning controls and requirements.

This memo should be read in conjunction with the Civil DA drawings and MUSIC-link report included in Appendix A and B respectively, as well as the Penrith City Council Flood Letter (29 May 2018) provided in Appendix C.

The overall Stormwater Management Strategy has been developed in accordance with the following documents:

- Penrith City Council Development Control Plan (2014)
- WSUD Technical Guidelines Version 3 (2015)
- Stormwater Drainage Guidelines for Building Developments (2016)

Site Description

The proposed development is to be situated on an existing brownfield site located at 569 High Street, Penrith NSW 2750 (Lot 1, DP1137699) and is located within the Penrith City Council (PCC) Local Government Area (LGA). The proposed development site is approximately 0.458 hectares in area and is bounded by Westfield Penrith (North and East), High Street (South) and the Joan Sutherland Performing Arts Centre (West). The subject site and aerial are shown in Figure 1.

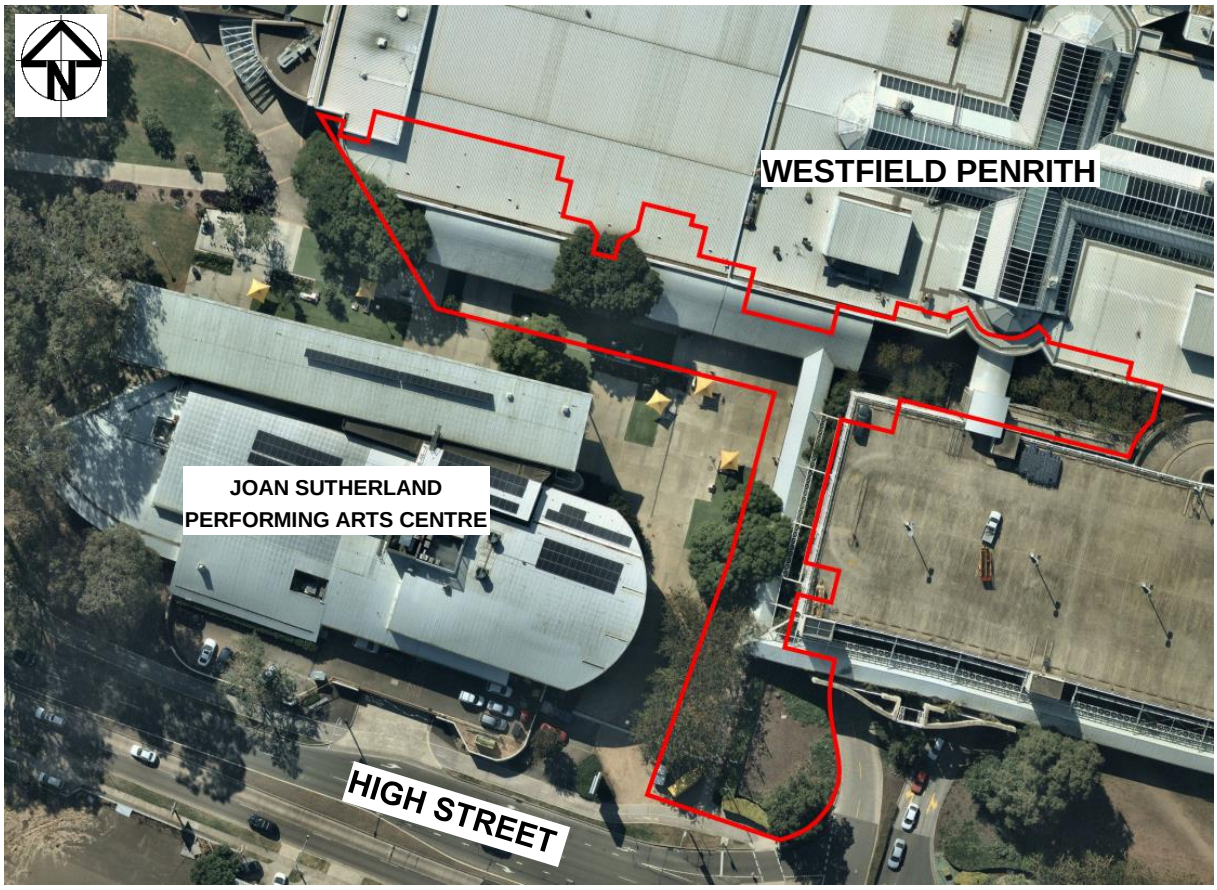


Figure 1 – Site Aerial (Source: Nearmaps, 2018)

The existing site generally grades to a sag at the centre of the community space where a series of grated trench drains and grated stormwater pits incorporated amongst the landscaping features collects stormwater runoff and conveys it into the existing twin 1350mm dia. trunk drainage pipeline (refer to Appendix A – Civil DA drawings). Furthermore, the areas fronting High Street bypass the existing stormwater drainage infrastructure within the site and are drained via the road drainage along High Street.

Stormwater Requirements

Proposed Development

The surface treatments for the proposed private domain upgrades have been categorised as follows:

- Impervious (concrete paving, gravel, synthetic turf and roof); and
- Pervious (vegetated landscaping)

Referring to the Stormwater Catchment Plan (Appendix A – Drawing No. C221), the net total site imperviousness in the post-development scenario has increased by 332 m^2, which has triggered the requirement for Water Sensitive Urban Design (WSUD) and On-Site Detention (OSD) as per the guidelines and requirements of PCC.

On-Site Detention (OSD)

To address stormwater detention objectives, an OSD storage has been designed to attenuate stormwater peak flows for all stormwater events (up to and including the 100-year ARI event) to pre-development levels in accordance with the PCC – *Development Control Plan (2014), Section 3.6 Stormwater Management and Drainage*. The OSD has been designed to comply with the OSD storage and Permissible Site Discharge (PSD) requirements as detailed in PCC's – *Stormwater Drainage Guidelines for Building Developments (2016), Section 4 On-Site Detention*.

The OSD storage tank is proposed to be located within the basement carpark level under R4 (refer to Appendix A – Drawing No. C201) and would collect stormwater runoff from 332m^2 of the proposed roof area. The OSD is proposed to discharge to the existing DN750 pipe located in the vicinity. The invert level and available capacity of this pipe will need to be confirmed in detailed design.

Catchment modelling has been undertaken using DRAINS modelling software to analyse and confirm that the OSD storage tank designed in accordance with PCC guidelines would indeed achieve PCC peak flow targets. Key parameters used in the DRAINS analysis are summarised in Table 1.

Table 1 – DRAINS modelling parameters

DRAINS Parameter	Value
Rainfall IFD	AR&R1987 IFD Data in accordance with Penrith City Council's – *Stormwater Drainage Guidelines for Building Developments (2016), Appendix E*
Paved Area Depression Storage	1 mm
Supplementary Area Depression Storage	1 mm
Pervious Area Depression Storage	5 mm
Antecedent Moisture Condition	3
Soil Type	3

A summary comparison of peak flow results for the pre-development and post-development site is detailed in Table 2. The proposed OSD storage tank has a 38mm orifice with volume of 13 m^3.

Table 2 – Stormwater Peak Flow Results

Storm Event	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow Incl. OSD Tank (m^3/s)
10-year ARI	0.139	0.132
100-year ARI	0.200	0.192

The DRAINS model results indicate that the proposed OSD storage would ensure that post-development discharge would achieve PCC stormwater peak flow requirements and ensure that site discharge would not exceed pre-development levels.

Water Sensitive Urban Design

To address stormwater quality objectives, water sensitive urban design measures have been implemented into the proposed site redevelopment in order to meet PCC load reduction targets in accordance with the PCC *WSUD Technical Guidelines Version 3 (2015)*.

A stormwater quality model was developed for the site using MUSIC modelling software (V6.3) with modelling parameters being adopted from the PCC MUSIC-Link and *WSUD Technical Guidelines Version 3 (2015)*.

The treatment measures proposed for the site include two stormwater filter cartridges (690mm PSorb StormFilter by Ocean Protect or similar) which are to be installed within the OSD.

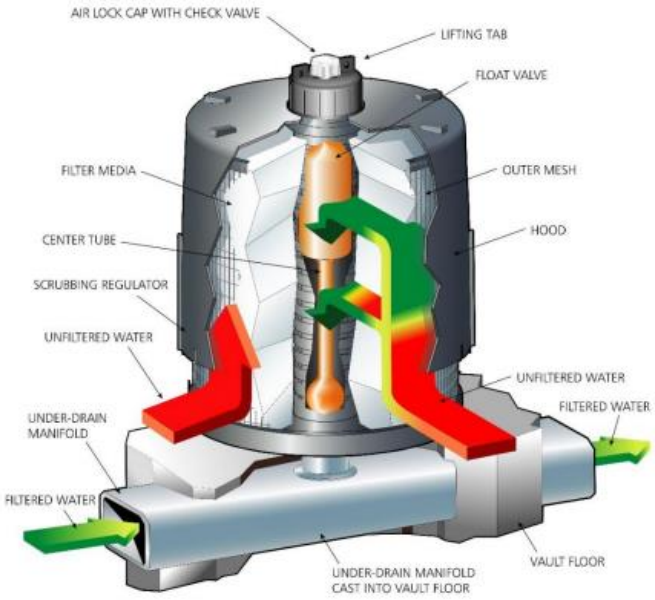


Figure 2 StormFilter cartridge detail (Source: Ocean Protect)

All existing areas within the private domain not subject to redevelopment works and any existing hardstand bypass areas were excluded from the MUSIC model as these areas will remain consistent with pre-development conditions. Table 3 summarises the achieved pollutant reductions.

Table 3 – Stormwater Quality Pollutant Reduction Results

Key Pollutant	Penrith City Council Load Reduction Targets	Load Reduction Achieved
Total Suspended Solids (TSS)	85%	87.8%
Total Phosphorus (TP)	60%	81.4%
Total Nitrogen (TN)	45%	56.7%
Gross Pollutants	90%	100%

The MUSIC model results indicate that the proposed water quality strategy would achieve PCC pollutant load reduction targets. The PCC MUSIC-link report has been included in Appendix B for reference.

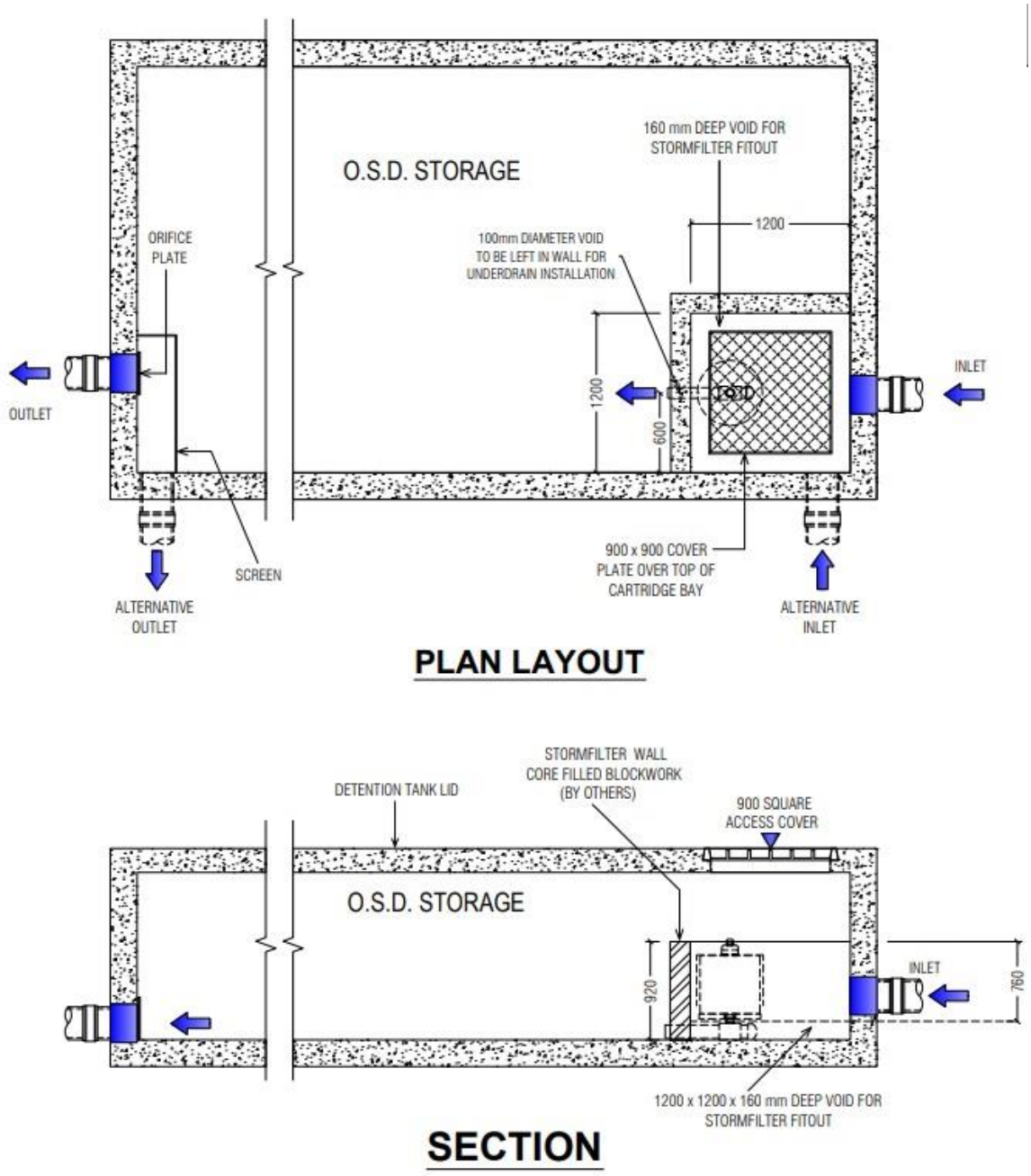


Figure 3 – Typical Plan and Section of combined OSD and StormFilter Unit (Source: Ocean Protect)

Stormwater Drainage Infrastructure

All existing stormwater drainage infrastructure within the public domain will be retained and no modifications are proposed as part the alterations and additions.

No modifications to the trunk drainage infrastructure (twin 1350mm dia. stormwater pipes) contained within the 7.5m wide easement are proposed as part of the redevelopment of the site.

Flooding Constraints

Existing Flood Conditions

PCC flood mapping indicates that there is localised overland flooding in the north-eastern corner of the development area as seen in Figure 3 below (refer to Appendix C - Flood Letter from Penrith City Council).

Figure 4 – 1% AEP Local Overland Flow Flood Map (Penrith City Council Flood Letter, 29 May 2018)

The designated flood level is RL 27.2 m AHD and is either associated with surcharge from the local stormwater network within the site, or insufficient inlet capacity to drain runoff within the low point in during the 1% AEP flood event (100-year ARI event).

Proposed Development

The proposed landscaping upgrades will not affect drainage capacity nor is it proposed to modify surface levels or gradients within the flood affected area.

Due to the inclusion of OSD infrastructure attenuating peak flows to less than existing levels, we expect there to be a minor improvement in site hydrology and flooding conditions in the proposed development scenario. Furthermore, despite the extension of the existing awning connected to the Westfield Penrith Shopping Centre, it will be extended over existing impervious areas and hence there will be no net change in site imperviousness in the flood affected private domain.

Flood Planning Controls and Requirements

Flood Planning Levels

As stated in PCC's *DCP (2014), Section 3.5 Flood Planning*, where possible, internal floor levels, access to internal stairs and lifts to basement levels shall be at least 0.5m above the 1% AEP flood event (100-year ARI event) level of RL 27.2m (refer to Appendix C – Flood Letter from Penrith City Council) Therefore, the flood planning level relevant to this site is RL 27.7m.

Scentre Group Limited have nominated extensions to the existing Westfield Penrith Shopping Centre, identified as proposed retail premises R1, R5, R6, R7 and R8 and proposed food premises R2, R3, R4, R10 and R11. These extensions will have a finished floor level (FFL) of RL 27.3 to match the existing FFL of the remaining Westfield Penrith Shopping Centre to which they are attached.

Referring to *PCC's DCP (2014), Section 3.5C (7a) Industrial/Commercial – Extensions and Infill Development*, PCC may approve of the development with floor levels below the 1% AEP flood event (100-year ARI event) if:

- *The raising of the floor levels would be out of character with adjacent buildings.*

As the proposed retail and food extensions will be connected to the existing Westfield Penrith Shopping Centre, the FFL's should remain generally consistent between the existing and proposed developments rather than apply a proposed flood planning level of RL 27.7m, which is significantly higher than the existing Westfield Penrith Shopping Centre FFL of RL 27.3m and typically applied to new developments including independent structures. Furthermore, it should be noted that the proposed FFL's will still be above the 1% AEP flood event level of RL 27.2m.

Conclusion

Arcadis has been engaged by Scentre Group Limited to prepare a stormwater management strategy to support a DA for the proposed Mondo redevelopment at Westfield Penrith in accordance with Penrith City Council guidelines and requirements. This memorandum details existing flood conditions as well as stormwater requirements that will be applicable to the proposed development.

As the proposed redevelopment results in a net increase in impervious area from existing conditions, OSD and WSUD measures have been implemented to address Penrith City Council requirements and manage site runoff in terms of peak flow attenuation and water quality.

It is expected that the proposed infill development will not have an impact or worsen existing flood conditions and that existing surfaces, levels, grades and stormwater drainage infrastructure will be retained within the public domain. OSD and WSUD measures will offset the increase of imperviousness and runoff within the private domain.

We trust the contents of this memorandum satisfies the requirements of our scope and objective. If you have any questions, please feel free to contact me on my number below.

Yours sincerely

Michelle Fletcher
Senior Stormwater Engineer
(02) 8907 3952

Appendix A. Civil DA Drawings

Appendix B. Penrith City Council MUSIC-link Report

Appendix C. Penrith City Council Flood Letter for Westfield Penrith (dated 29 May 2018)

Appendix A – Civil DA Drawings

WESTFIELD PENRITH ALTERATIONS AND ADDITIONS
DEVELOPMENT APPLICATION

CIVIL DRAWING LIST

GENERAL

C001 COVER SHEET AND DRAWING LIST

SITE PREPARATION

C101 EROSION AND SEDIMENT CONTROL PLAN
C111 EROSION AND SEDIMENT CONTROL DETAILS

STORMWATER DRAINAGE

C201 STORMWATER MANAGEMENT PLAN
C221 STORMWATER CATCHMENT PLAN

LOCALITY PLAN
1 : 5000

nearmap.com IMAGERY EXTRACTED FROM nearmap.com

DISCLAIMER

THIS MAP HAS BEEN PREPARED USING nearmap.com IMAGERY. THIS DATA IS NOT GUARANTEED TO BE FREE FROM ERROR OR OMISSION. THEREFORE ARCADIS AND ITS EMPLOYEES DISCLAIM LIABILITY OF ANY ACT DONE OR OMISSION MADE ON THE INFORMATION CONTAINED IN THIS DATA AND ANY CONSEQUENCES OF SUCH ACTS OR OMISSIONS. THIS DRAWING IS PROVIDED FOR THE INFORMATION OF THE PERSON OR ORGANISATION TO WHOM ARCADIS PROVIDES IT. IT MAY NOT BE PROVIDED TO, OR USED BY, ANY OTHER PERSON WITHOUT ARCADIS' PRIOR WRITTEN CONSENT.

Issue	Description	Date
04	ISSUE FOR DEVELOPMENT APPLICATION	11/10/19
03	FINAL ISSUE FOR DEVELOPMENT APPLICATION	27/02/19
02	REVISED ISSUE FOR CLIENT REVIEW	24/08/18
01	ISSUE FOR CLIENT REVIEW	06/06/18

100mm on Original

0 50 100 200 300 400 500m
1 : 5000

Client: SCENTRE GROUP
Owner and Operator of Westfield in Australia and New Zealand

Status: DEVELOPMENT APPLICATION
NOT TO BE USED FOR CONSTRUCTION

		Current Issue Signatures	
Scales	1 : 5000	Drawn A.ZHAO	
Original	A1	Designed C.DING	
Height Datum	AHD	Checked D.BEN-AVRAHAM	
Grid	MGA	Approved D.BEN-AVRAHAM	

Filename: C001-10019736-04-nsd-CoverSheetAndDrawingList.dwg

Project: WESTFIELD PENRITH ALTERATIONS AND ADDITIONS

Title: COVER SHEET AND DRAWING LIST

ARCADIS
Arcadis Australia Pacific Pty Limited
Level 16, 580 George St
SYDNEY NSW 2000
ABN 76 104 485 289

Tel No: +61 2 8907 9000
Fax No: +61 2 8907 9001
arcadis.com

Drawing No.	Project No.	Issue
C001	– 10019736 - 04 –	04

Date Plotted: 11 Oct 2019 - 10:32AM File Name: F:\10019736\10019736-04 Westfield Penrith Mondo DA\E-CAD\C-Civil\D-Final\C001-10019736-04-nsd-CoverSheetAndDrawingList.dwg V1

WESTFIELD PENRITH

JOAN SUTHERLAND PERFORMING ARTS CENTRE

HIGH STREET

EASEMENT TO DRAIN WATER VARIABLE WIDTH - DP838756

EASEMENT FOR ELECTRICITY PURPOSES - DP644608

OSD

LEGEND

- PROPOSED LIMIT OF WORKS BOUNDARY
- PROPOSED SEDIMENT FENCE (SD 6-8)
- PROPOSED 1.8m HIGH CHAINWIRE BARRIER FENCE (LOCATION TO BE CONFIRMED ON SITE BY CONTRACTOR)
- PROPOSED GEOTEXTILE INLET FILTER (SD 6-12)
- PROPOSED STABILISED SITE ACCESS (SD 6-14)
- PROPOSED GATE
- OVERLAND FLOW DIRECTION
- PROPOSED TEMPORARY STOCKPILE (SD 4-1)
- EXISTING GRATED STORMWATER PIT
- EXISTING SEALED STORMWATER PIT
- EXISTING GRATED TRENCH DRAIN
- PROPOSED SEALED STORMWATER PIT
- PROPOSED GRATED STORMWATER PIT

NOTES

1. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
2. ALL SEDIMENT AND SOIL EROSION CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH THE "BLUE BOOK". CONTRACTOR TO ENSURE THESE MEASURES ARE IN PLACE AND MAINTAINED AT ALL TIMES DURING CONSTRUCTION WORKS.

Issue	Description	Date
04	ISSUE FOR DEVELOPMENT APPLICATION	11/10/19
03	FINAL ISSUE FOR DEVELOPMENT APPLICATION	27/02/19
02	REVISED ISSUE FOR CLIENT REVIEW	24/08/18
01	ISSUE FOR CLIENT REVIEW	06/06/18

0 5 10 15 20 25m

1 : 250

100mm on Original

Client: SCENTRE GROUP

Owner and Operator of Westfield in Australia and New Zealand

Status: DEVELOPMENT APPLICATION
NOT TO BE USED FOR CONSTRUCTION

Scales	1 : 250	Current Issue Signatures	
		Drawn A.ZHAO	
Original	A1	Designed C.DING	
Height Datum	AHD	Checked D.BEN-AVRAHAM	
Grid	MGA	Approved D.BEN-AVRAHAM	

Filename: C101-10019736-04-nsd-ErosionAndSedimentControlPlan.dwg

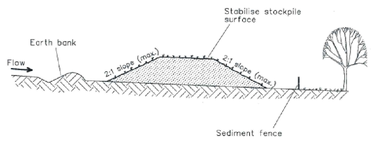
Project: WESTFIELD PENRITH ALTERATIONS AND ADDITIONS

Title: EROSION AND SEDIMENT CONTROL PLAN

ARCADIS
Arcadis Australia Pacific Pty Limited
Level 16, 580 George St
SYDNEY NSW 2000
ABN 76 104 485 289
Tel No: +61 2 8907 9000
Fax No: +61 2 8907 9001
arcadis.com

Drawing No.	Project No.	Issue
C101	– 10019736 - 04 –	04

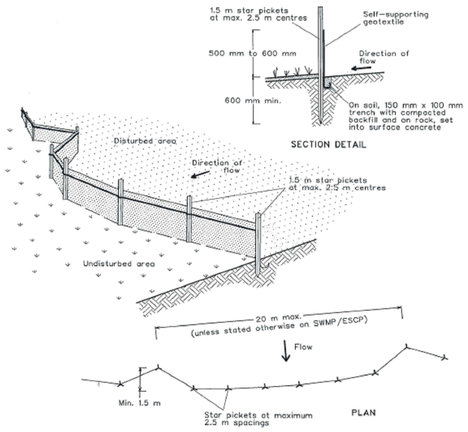
Date Plotted: 11 Oct 2019 - 10:32AM File Name: F:\10019736\10019736-04 Westfield Penrith Mondo DA\E-CAD\C-Civil\D-Final\C101-10019736-04-nsd-ErosionAndSedimentControlPlan.dwg V1



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more then 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

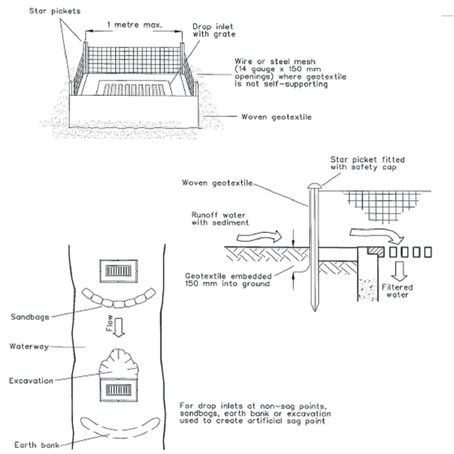
TEMPORARY STOCKPILES (SD 4-1)



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

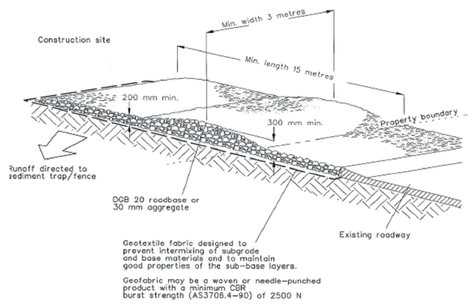
SEDIMENT FENCE (SD 6-8)



Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-7 and Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.

GEOTEXTILE INLET FILTER (SD 6-12)



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS (SD 6-14)

Issue	Description	Date
04	ISSUE FOR DEVELOPMENT APPLICATION	11/10/19
03	FINAL ISSUE FOR DEVELOPMENT APPLICATION	27/02/19
02	REVISED ISSUE FOR CLIENT REVIEW	24/08/18
01	ISSUE FOR CLIENT REVIEW	06/06/18

100mm on Original

Client: SCENTRE GROUP
Owner and Operator of Westfield in Australia and New Zealand

Status: DEVELOPMENT APPLICATION
NOT TO BE USED FOR CONSTRUCTION

		Current Issue Signatures	
Scales	N.T.S.	Drawn A.ZHAO	
Original	A1	Designed C.DING	
Height Datum	AHD	Checked D.BEN-AVRAHAM	
Grid	MGA	Approved D.BEN-AVRAHAM	

Filename: C111-10019736-04-nsd-ErosionAndSedimentControlDetails.dwg

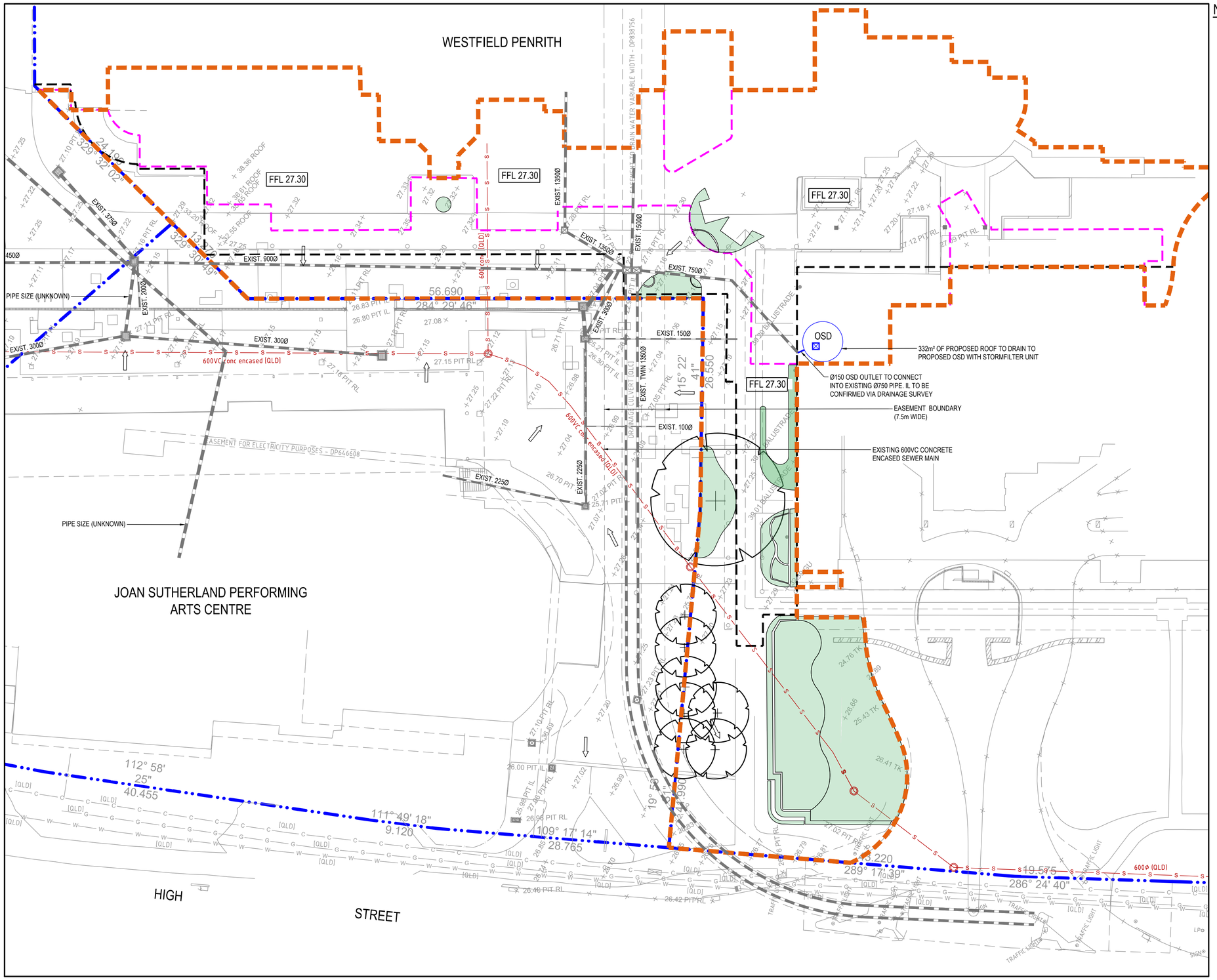
Project: WESTFIELD PENRITH
ALTERATIONS AND ADDITIONS

Title: EROSION AND SEDIMENT CONTROL DETAILS

ARCADIS
Arcadis Australia Pacific Pty Limited
Level 16, 580 George St
SYDNEY NSW 2000
ABN 76 104 485 289
Tel No: +61 2 8907 9000
Fax No: +61 2 8907 9001
arcadis.com

Drawing No.	Project No.	Issue
C111	– 10019736 - 04 –	04

Date Plotted: 11 Oct 2019 - 10:32AM File Name: F:\10019736\10019736-04 Westfield Penrith Mondo DA\E-CAD\C-Civil\D-Final\C111-10019736-04-nsd-ErosionAndSedimentControlDetails.dwg V1



NOTES

1. ALL EXISTING STORMWATER DRAINAGE INFRASTRUCTURE TO BE RETAINED UNLESS NOTED OTHERWISE.
2. SUBSOIL DRAINAGE TO BE INCORPORATED INTO ALL LANDSCAPED AREAS.
3. SERVICES SHOWN ARE INDICATIVE ONLY AND WERE OBTAINED FROM A DBYD (QUALITY LEVEL D). DETAILED SURVEY OF ALL SERVICES TO BE CONDUCTED TO QUALITY LEVEL A PRIOR TO DETAILED DESIGN.
4. DETAILED DRAINAGE SURVEY TO BE CONDUCTED PRIOR TO DETAILED DESIGN TO CONFIRM INVERT LEVELS AND DIMENSIONS OF ALL EXISTING STORMWATER DRAINAGE INFRASTRUCTURE.
5. EXISTING STORMWATER DRAINAGE PIPES NOT DRAWN TO SCALE.

LEGEND

- PROPOSED LIMIT OF WORKS BOUNDARY
- EXISTING LOT BOUNDARY
- PROPOSED ROOF BOUNDARY
- PROPOSED BUILDING LINE
- EXIST ø375 — EXISTING STORMWATER DRAINAGE PIPE
- EXISTING GRATED STORMWATER PIT
- EXISTING SEALED STORMWATER PIT
- EXISTING GRATED TRENCH DRAIN
- PROPOSED STORMWATER DRAINAGE PIPE
- PROPOSED GRATED STORMWATER PIT
- PROPOSED SEALED STORMWATER PIT
- LANDSCAPING - REFER TO LANDSCAPE PLANS BY OTHERS
- S — S — EXISTING SEWER PIPE
- FLOW DIRECTION

WATER QUALITY TREATMENT NODES:

1. TWO OCEAN PROTECT PSORB FILTER CARTRIDGE (HEIGHT: 690mm) - TO BE INSTALLED INSIDE PROPOSED OSD TANK

TREATMENT STANDARDS:

POLLUTANT	REDUCTION TARGET	REDUCTION ACHIEVED
GROSS POLLUTANTS	90%	100%
TOTAL SUSPENDED SOLIDS	85%	87.8%
TOTAL PHOSPHORUS	60%	84.4%
TOTAL NITROGEN	45%	56.7%

* MUSIC MODEL PARAMETERS AND POLLUTANT REDUCTION TARGETS IN ACCORDANCE WITH PENRITH CITY COUNCIL - WSUD TECHNICAL GUIDELINES VERSION 3 (JUNE 2015) AND MUSIC V6.3 PENRITH CITY COUNCIL MUSIC-LINK

** NOTE THAT EXISTING AREAS WITHIN THE PRIVATE DOMAIN NOT SUBJECT TO REDEVELOPMENT WORKS AND EXISTING HARDSTAND BYPASS AREAS WERE EXCLUDED FROM THE MUSIC MODEL AS THEY WILL REMAIN CONSISTENT WITH PRE-DEVELOPMENT CONDITIONS

OSD TANK REQUIREMENTS:

LAND USE	PSD (L/s/ha)	SSR (m3/ha)
COMMERCIAL	120	280

PENRITH CITY COUNCIL - STORMWATER DRAINAGE GUIDELINES FOR BUILDING DEVELOPMENTS (28 NOVEMBER 2016) TABLE 7

CATCHMENT AREA TO OSD TANK = 0.033 ha
CATCHMENT AREA TO BYPASS = 0.00 ha
TOTAL CATCHMENT AREA = 0.033 ha
PERCENT OF TOTAL CATCHMENT AREA TO BYPASS = 0%
PSD REQUIREMENT = 3.98 L/s
SSR REQUIREMENT = 9.3 m³

OSD TANK AND ORIFICE DETAILS:

PSD ACHIEVED = 4 L/s
VOLUME ACHIEVED = 13 m³

Issue	Description	Date
04	ISSUE FOR DEVELOPMENT APPLICATION	11/10/19
03	FINAL ISSUE FOR DEVELOPMENT APPLICATION	27/02/19
02	REVISED ISSUE FOR CLIENT REVIEW	24/08/18
01	ISSUE FOR CLIENT REVIEW	06/06/18

0 5 10 15 20 25m
1 : 250

100mm on Original

Client: SCENTRE GROUP
Owner and Operator of Westfield in Australia and New Zealand

Status: DEVELOPMENT APPLICATION
NOT TO BE USED FOR CONSTRUCTION

		Current Issue Signatures	
Scales	1:250	Drawn A.ZHAO	
Original	A1	Designed C.DING	
Height Datum	AHD	Checked D.BEN-AVRAHAM	
Grid	MGA	Approved D.BEN-AVRAHAM	

Filename: C201-10019736-04-nsd-StormwaterManagementPlan.dwg

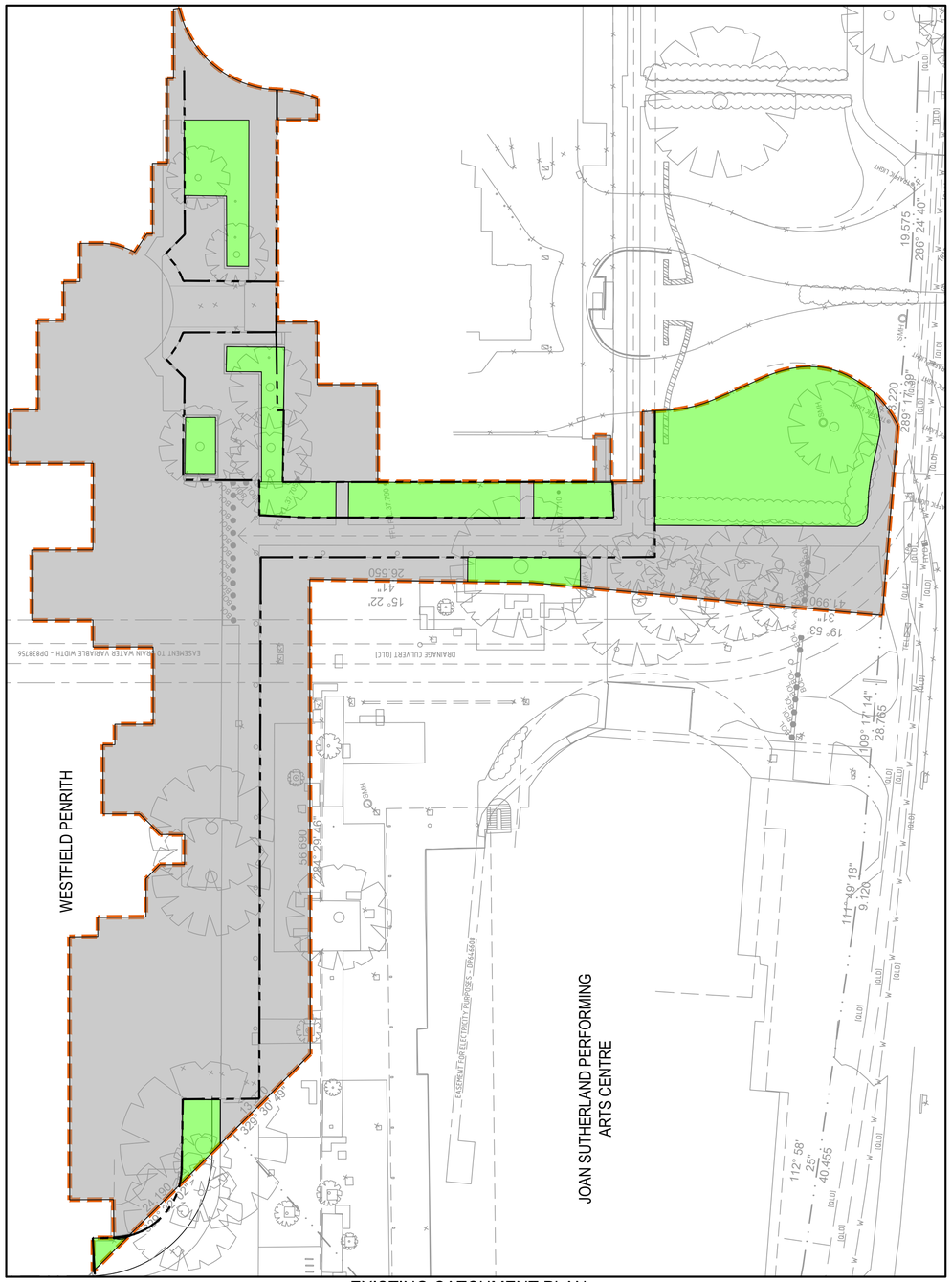
Project: WESTFIELD PENRITH ALTERATIONS AND ADDITIONS

Title: STORMWATER MANAGEMENT PLAN

ARCADIS
Arcadis Australia Pacific Pty Limited
Level 16, 580 George St
SYDNEY NSW 2000
ABN 76 104 485 289
Tel No: +61 2 8907 9000
Fax No: +61 2 8907 9001
arcadis.com

Drawing No.	Project No.	Issue
C201	— 10019736 - 04 —	04

Date Plotted: 11 Oct 2019 - 10:32AM File Name: F:\10019736\10019736-04 Westfield Penrith Mondo DA\E-CAD\C-Civil\D-Final\C201-10019736-04-nsd-StormwaterManagementPlan.dwg V1



EXISTING CATCHMENT PLAN

SCALE: 1:350

SURFACE TREATMENT	AREA (m2)
IMPERVIOUS	3730
PERVIOUS	855
TOTAL	4585

PROPOSED CATCHMENT PLAN

SCALE: 1:350

SURFACE TREATMENT	AREA (m2)
IMPERVIOUS	4062
PERVIOUS	527
TOTAL	4589

LEGEND

- PROPOSED LIMIT OF WORKS BOUNDARY
- EXISTING ROOF BOUNDARY
- PROPOSED ROOF BOUNDARY
- IMPERVIOUS (CONCRETE PAVING, GRAVEL, SYNTHETIC TURF AND ROOF)
- PERVIOUS (VEGETATED LANDSCAPING)

Issue	Description	Date
04	ISSUE FOR DEVELOPMENT APPLICATION	11/10/19
03	FINAL ISSUE FOR DEVELOPMENT APPLICATION	27/02/19
02	REVISED ISSUE FOR CLIENT REVIEW	24/08/18
01	ISSUE FOR CLIENT REVIEW	06/06/18

100mm on Original

0 7 14 21 28 35m

1 : 350

Client

SCENTRE GROUP

Owner and Operator of Westfield in Australia and New Zealand

Status

DEVELOPMENT APPLICATION

NOT TO BE USED FOR CONSTRUCTION

Scales	1:350	Current Issue Signatures	
		Drawn A.ZHAO	
Original	A1	Designed C.DING	
Height Datum	AHD	Checked D.BEN-AVRAHAM	
Grid	MGA	Approved D.BEN-AVRAHAM	

Filename: C221-10019736-04-nsd-StormwaterCatchmentPlan.dwg

Project

WESTFIELD PENRITH
ALTERATIONS AND ADDITIONS

Title

STORMWATER
CATCHMENT PLAN

ARCADIS

Arcadis Australia Pacific Pty Limited
Level 16, 580 George St
SYDNEY NSW 2000
ABN 76 104 485 289

Tel No: +61 2 8907 9000
Fax No: +61 2 8907 9001
arcadis.com

Drawing No.	Project No.	Issue
C221	— 10019736 - 04 —	04

Date Plotted: 11 Oct 2019 - 11:24AM File Name: F:\10019736\10019736-04 Westfield Penrith Mondo DA\E-CAD\C-Civil\D-Final\C221-10019736-04-nsd-StormwaterCatchmentPlan.dwg

MEMO

ARCADIS Design & Consultancy for natural and built assets

Appendix B – Penrith City Council MUSIC-link Report

PENRITH CITY COUNCIL

music@link

MUSIC-*link* Report

Project Details		Company Details	
Project:	Westfield Penrith - Alterations and Additions	**Company:**	Arcadis
Report Export Date:	9/10/2019	**Contact:**	Michelle Fletcher
Catchment Name:	Westfield Penrith - Water Quality Model - October 2019	**Address:**	Level 16 580 George Street Sydney, NSW, 2000
Catchment Area:	0.033ha	**Phone:**	02 8907 3952
Impervious Area*:	100%	**Email:**	michelle.fletcher@arcadis.com
Rainfall Station:	67113 PENRITH		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	691mm		
Evapotranspiration:	1158mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.32		
Study Area:	Penrith		
Scenario:	Penrith Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness

Node: Post-Development Node	Reduction
Flow	0.00871%
TSS	87.7%
TP	81.6%
TN	56.8%
GP	100%

Treatment Nodes

Node Type	Number
Detention Basin Node	1
Generic Node	1

Source Nodes

Node Type	Number
Urban Source Node	1

Comments

PENRITH CITY COUNCIL

music@link

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Detention	OSD	Hi-flow bypass rate (cum/sec)	None	99	99
Post	Post-Development Node	% Load Reduction	None	None	0.00871
Post	Post-Development Node	GP % Load Reduction	90	None	100
Post	Post-Development Node	TN % Load Reduction	45	None	56.8
Post	Post-Development Node	TP % Load Reduction	60	None	81.6
Post	Post-Development Node	TSS % Load Reduction	85	None	87.7
Urban	Roof	Area Impervious (ha)	None	None	0.033
Urban	Roof	Area Pervious (ha)	None	None	0
Urban	Roof	Total Area (ha)	None	None	0.033

Only certain parameters are reported when they pass validation

MEMO

ARCADIS Design & Consultancy for natural and built assets

Appendix C – Penrith City Council Flood Letter for Westfield Penrith (dated 29 May 2018)

PENRITH

Our Reference: ECM 8199005
Contact: Ratnam Thilliyar
Telephone: 4732 7988

29 May 2018

Clement Ding
Level 16
580 George Street
SYDNEY NSW 2000

Dear Sir/Madam

Flood Level Enquiry
Lot 1033 DP 849297 - No. 597-599 High Street, Penrith

Please find enclosed Flood Level information for the above property.

Should you require any further information please do not hesitate to contact me on 4732 7988.

Yours sincerely

Ratnam Thilliyar
Engineering Stormwater Supervisor

Penrith City Council
PO Box 60, Penrith
NSW 2751 Australia
T 4732 7777
F 4732 7958
penrithcity.nsw.gov.au

PENRITH
CITY COUNCIL

Flood Information
Lot 1033 DP 849297 No. 597-599 High Street, Penrith

Date of issue: 29 May 2018

The 1% AEP local overland flow flood level affecting the above property is estimated to be RL27.2m AHD.

Property less than 0.5m above the 1% AEP flood level is subject to Penrith Development Control Plan 2014 Section C3.5 Flood Planning. The Penrith Development Control Plan 2014 is available from Council's website www.penrithcity.nsw.gov.au.

Definitions

AEP – *Annual Exceedance Probability* – the chance of a flood of this size occurring in any one year.

AHD – *Australian Height Datum* – A standard level datum used throughout Australia, approximately equivalent to mean sea level.

Legend

	Extent of 1% AEP local catchment overland flow path. Generally depths less than 150mm is not shown.

Notes:

1. The contours shown above in yellow numbering are at 0.5m intervals and are based on Aerial Laser Scanning (ALS) Survey undertaken in 2002. The contour levels are approximate and for general information only. Accurate ground levels should be obtained by a Registered Surveyor.
2. The flood level is based on current information available to Council at the date of issue. The flood level may change in the future if new information becomes available. The 1% AEP flood is the flood adopted by Council for planning controls. Rarer and more extreme flood events will have a greater effect on the property.
3. Council's studies are reflected in flood mapping for the City which show properties potentially affected by overland flows in excess of 150mm.
4. This property is shown on Council's flood mapping as potentially so affected.
5. Council imposes flood related development controls where, in its opinion, such controls are justified. Such controls may or may not be imposed with respect to this property in the event of an application for development consent.
6. If a development proposal is submitted with respect to this property, Council will consider the possibility of flood or overland flow in the context of the application. Council may impose a requirement that the applicant for development consent carry out a detailed assessment of the possible overland water flows affecting the property (a flood study) and/or may impose other controls on any development designed to ameliorate flood risk.
7. You are strongly advised if you propose to carry out development upon the property, that you retain the assistance of an experienced flooding engineer and have carried out a detailed investigation.
8. Council accepts no liability for the accuracy of the flood levels (or any other data) contained in this certificate, having regard to the information disclosed in Notes "1" to "4". As such you should carry out and rely upon your own investigations.

Penrith City Council
PO Box 60, Penrith
NSW 2751 Australia
T 4732 7777
F 4732 7958
penrithcity.nsw.gov.au

Ratnam Thilliyar
Engineering Stormwater Supervisor

PENRITH CITY COUNCIL