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STORMWATER MANAGEMENT PLAN
FOR PROPOSED DEVELOPMENT AT
1 RENSHAW STREET, CRANEBROOK NSW 2749

Job Ref: 210285

Date: November 2021

Revision: B

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CONTENTS

1.0 INTRODUCTION

Richmond and Ross Pty Ltd, Consulting Engineers, have been engaged to prepare a Stormwater Management Plan for the proposed development at 1 Renshaw Street, Cranebrook NSW 2749. No responsibility to third parties under the law of contract, tort or otherwise for any loss or damage is accepted.

The purpose of this assessment is to provide advice with respect to stormwater management for the proposed development. The results of this study are limited to this scope.

This assessment has been prepared by reviewing published topographic maps, physical land survey, hydraulic and hydrological calculations, available Ariel photography of the site and in accordance with Penrith City Council Policies below:

- ES002 – Stormwater Drainage Guidelines for Building Developments
- Water Sensitive Urban Design (WSUD) fact sheet
- Development Control Plans – Part C – C3

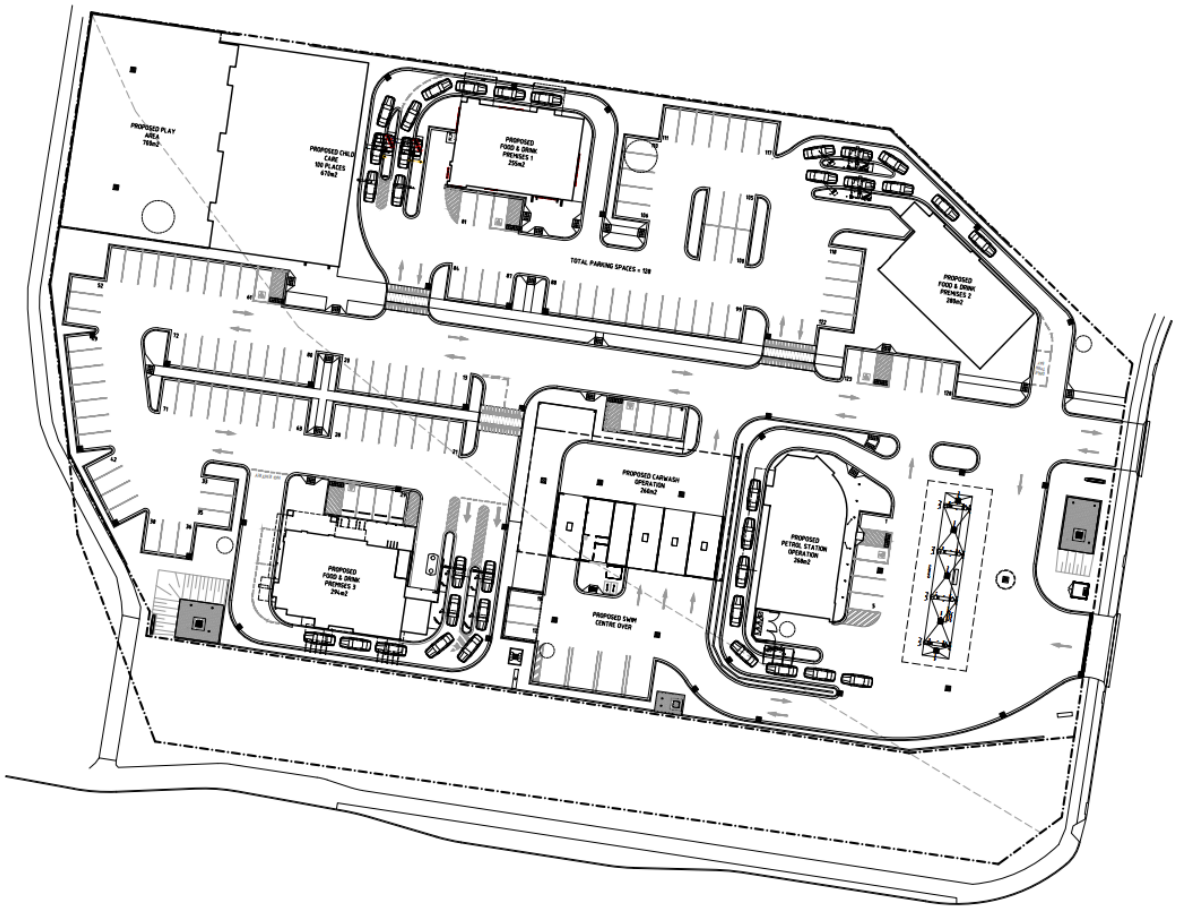
2.0 SITE LOCATION AND DESCRIPTION

The subject site is located at 1 Renshaw Street, Cranebrook NSW 2749 of Lot 13 of DP 286586. The total area of the lot is approximately 1.49Ha (14,845m^2). The Lot generally slopes to the South of the site towards the creek. The existing site is fully pervious. The site drains via infiltration and surface runoff.

Figure 1. Proposed Development Satellite View (Extract from NearMap)

3.0 DEVELOPMENT PROPOSAL

The plan is to construct six establishments inside the lot boundary. The building on the Northwestern side will be use as a facility to supervise and provide care services for the kids with an approximate area of 1370m². The building on the Southeastern side of the site will be a service centre with food/drink service has an area around 268m² and car fueling canopy of around 290m². Three buildings will be a quick service restaurant has an approximate total area of 829m² and will include a drive through service. Lastly, a carwash on the ground floor with 260m² area and a swim school on the second floor of around 620m².



4.0 EXISTING STORMWATER NETWORK

The Lot generally slopes to the South of the site towards the creek. There is no evidence of existing underground stormwater line on the site.

5.0 PROPOSED STORMWATER NETWORK

It is proposed to construct a new stormwater network to convey stormwater from the site on the following principles:

- A new network of pipes and pits is proposed to convey the runoff from the site to a stormwater treatment train prior to exiting the site.
- All runoff from the roof will be directed to a rainwater tank, which will be used for toilet flushing and landscape irrigation. The collected water will be used for toilet flush and landscape irrigation within the site. Overflow from the tanks will be connected to the underground SW network prior to discharge from the site. Analysis by MUSIC indicates that 80% of the estimated potable water requirement is provided by this arrangement.
- A system consisting of Stormfilter cartridges are proposed to treat the stormwater runoff for a portion of the site. Analysis from MUSIC indicates the treatment targets are achieved by the proposed treatment train. See stormwater quantity management in section 6 for more details.
- Another treatment proposed are bio retention basins on the Southeastern side and Southwestern side of the site to capture runoff. Analysis from MUSIC indicates the treatment targets are achieved by the proposed treatment train. See stormwater quantity management in section 6 for more details.
- A Humeceptor has been proposed in the system. This is primarily intended to capture any gross pollutants and hydrocarbons in runoff from the pavement areas.

6.0 STORMWATER QUALITY MANAGEMENT

A stormwater treatment train is proposed comprising of the following components.

6.1. Gross Pollutant Traps (GPT)

The HumeCeptor system is an underground, precast concrete stormwater treatment solution that utilizes hydrodynamic and gravitational separation to efficiently remove Total Suspended Solids (TSS) and entrained hydrocarbons from runoff. The specified unit has an oil storage capacity of 3540l and is situated adjacent a hard stand area for ease of maintenance.

A Humeceptor STC3 is proposed to treat a portion of the site.

6.2. Rainwater tank

The rainwater is designed to allow the reuse of collected rainwater for toilet flushing and garden watering. In reference to Penrith City Council Technical WSUD guidelines, for industrial and commercial developments, a 0.1 KL/day per toilet and 0.4 kL/year/m² as PET-Rain is required. However, the childcare will only be occupied 5 days per week the daily usage rate is to be proportioned by 5/ 7; thus, will use 0.07 KL/day per toilet.

Stormwater reuse is not recommended for the car wash due to the following reasons:

- The warranty for the rollover equipment would most likely be voided.
- Reclaim equipment would also not be warranted.

- The human health risk of potentially aerosolising unknown microorganisms
- Additional treatment would be required to ensure TDS levels for the final rinse cycle could be reduced to less than 40mg/L (to ensure a residue or 'spotting' is not left on the vehicles).

Table 1. Proposed rainwater tank

	Size	Modelled size	Total re use rates			% Reuse	
						Met	Target
Childcare	60kL	60kL	Pans	11x	0.77 kL/day	80.12	80.00
			Irrigation	180m²	72 kL/year/m²		
Food/Drink Premise 1	60kL	60kL	Pans	2x	0.2 kL/day	81.17	80.00
			Irrigation	262m²	105 kL/year/m²		
Food/Drink Premise 2	15kL	15kL	Pans	2x	0.2 kL/day	81.82	80.00
			Irrigation	110m²	44 kL/year/m²		
Food/Drink Premise 3	25kL	25kL	Pans	2x	0.2 kL/day	80.56	80.00
			Irrigation	200m²	80 kL/year/m²		
Swim School/Carwash	130kL	130kL	Pans	9x	0.9 kL/day	80.49	80.00
			Irrigation	225m²	90 kL/year/m²		
OTR	45kL	45kL	Pans	2x	0.2 kL/day	81.18	80.00
			Irrigation	685m²	274 kL/year/m²		

6.3. Bio retention basins

Three bio retention basins are proposed and shown on the civil drawings. Reference should be made to the drawings for sizes and locations. The bio has been sized to accommodate the 3 month flow for each. Overflows are collected by shallow pits and the outlet pipes of these cross over the existing stormwater line.

6.4. Filter Cartridges

The Psorb StormFilter, used on site, is a stormwater treatment system using rechargeable, self-cleaning, media-filled cartridges to absorb and retain required level of pollutants from stormwater runoff including total suspended solids, hydrocarbons, nutrients, soluble heavy metals, and other common pollutants. The filter cartridges clean stormwater through a passive filtration system and removes pollutants.

A system is proposed using 4 x Psorb StormFilter, installed within a 2.5x2m Stormfilter Chamber

6.5. Water quality outcome – MUSIC modelling

MUSIC modelling was undertaken for the proposed treatment train. The model was set up using the latest MUSIC-Link data and in accordance with Penrith City Council requirements. The site will discharge to the creek through three exit points. Each division will have its proposed treatment train to meet the requirements of Penrith City Council. A copy of the MUSIC link summary sheet is included in the appendices.

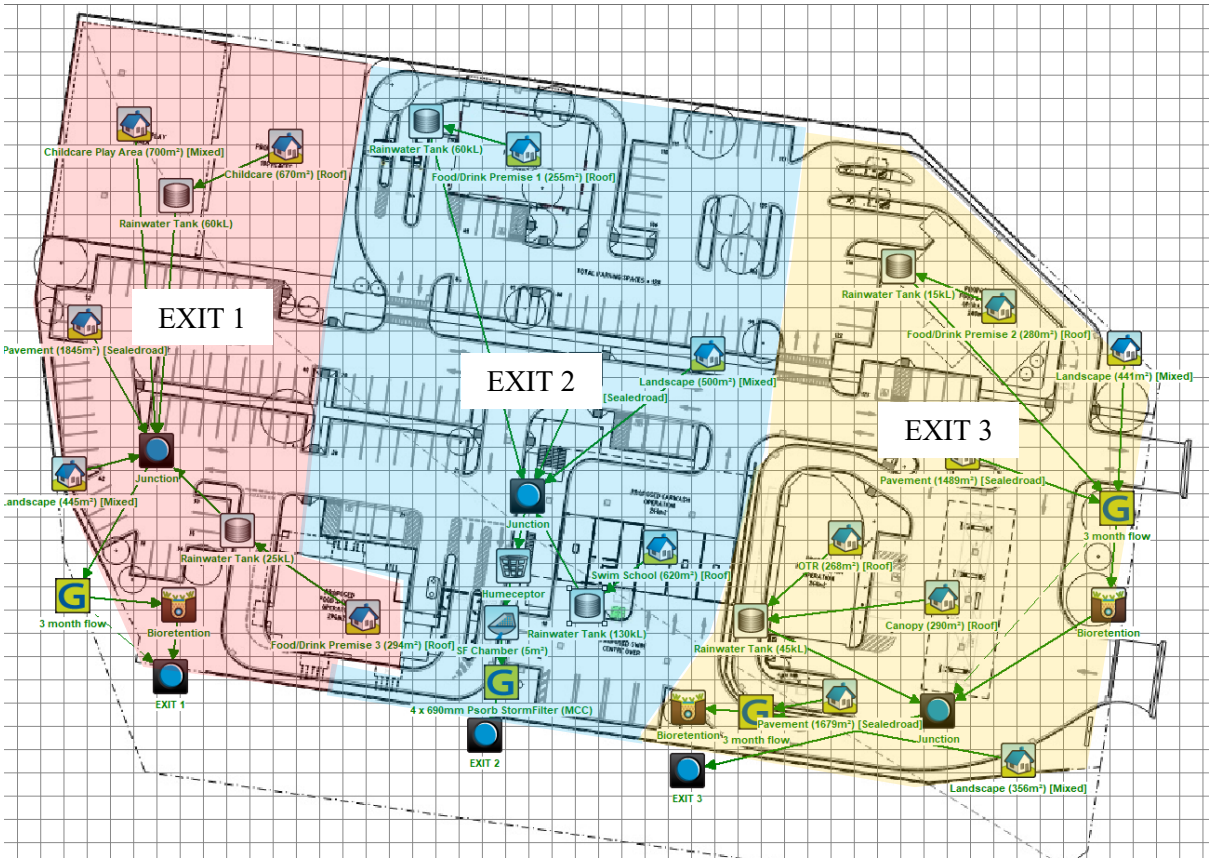


Table 2 Treatment levels for the site

	SOURCES	RESIDUAL LOAD	% REDUCTION	
			Target	*Actual*
EXIT 1				
Total Suspended Solids [TSS] (kg/yr)	423	54.7	80.0	87.1
Total Phosphorus [TP] (kg/yr)	0.761	0.184	60.0	75.8
Total Nitrogen [TN] (kg/yr)	4.06	1.67	45.0	58.8
Gross Pollutants [GP] (kg/yr)	46.6	0.123	90.0	99.7
EXIT 2				
Total Suspended Solids [TSS] (kg/yr)	961	96.1	80.0	90
Total Phosphorus [TP] (kg/yr)	1.69	0.613	60.0	63.8
Total Nitrogen [TN] (kg/yr)	7.75	4.16	45.0	46.4
Gross Pollutants [GP] (kg/yr)	90.5	0	90.0	100
EXIT 3				
Total Suspended Solids [TSS] (kg/yr)	333	22.1	80.0	93.4
Total Phosphorus [TP] (kg/yr)	0.612	0.108	60.0	82.3
Total Nitrogen [TN] (kg/yr)	3.3	1.03	45.0	68.9
Gross Pollutants [GP] (kg/yr)	38.6	0.24	90.0	99.5

7.0 OVERLAND FLOW PATHS

If storms higher than the design storm occur, the site is graded to allow an overland flow path to form which protects the buildings. The Bio Basins are designed to have an overflow pit when higher storm occurs, the water will go directly to the pit then out to the headwall. Overland flows will exit the site via overtopping of kerbs.

8.0 CONCLUSION

A system has been proposed for the control of stormwater on the subject site, which considers the requirements for water pollution control and water sensitive urban design.

The proposed system will result in adequate environment protection and reduction in water pollutant loads based on modelling. We believe the system satisfies the requirements of Penrith City Council.

APENDIX A – MUSIC MODEL

APENDIX B– MUSIC LINK

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MUSIC-*link* Report

Project Details		Company Details	
Project:	IPD CRANBEBROOK	**Company:**	RICHMOND AND ROSS PTY LTD
Report Export Date:	11/11/2021	**Contact:**	VEYA SANTOS
Catchment Name:	210285 - IPD Cranebrook	**Address:**	38 WILLOUGHBY ROAD, CROWS NEST
Catchment Area:	0.396ha	**Phone:**	0451861209
Impervious Area*:	141.919191919192%	**Email:**	VEYAS@RICHMONDROSS.COM.AU
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:	6.34		
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		Treatment Nodes		Source Nodes	
Node: EXIT 1	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	27.1%	Rain Water Tank Node	6	Urban Source Node	16
TSS	87.6%	Sedimentation Basin Node	1		
TP	75.9%	Bio Retention Node	3		
TN	58.9%	GPT Node	1		
GP	99.7%	Generic Node	4		

Comments

Roof node does not have base flow. Also, the filter cartridge chamber has been modelled as a detention basin; however, it's not used to provide treatment as a sedimentation basin. Therefore, non-compliant MUSIC link parameters for the filter cartridge and roof node can be ignored.

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Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
GPT	Humeceptor	Hi-flow bypass rate (cum/sec)	None	99	99
Rain	Rainwater Tank (130kL)	% Reuse Demand Met	80	None	80.49
Rain	Rainwater Tank (15kL)	% Reuse Demand Met	80	None	81.8191
Rain	Rainwater Tank (25kL)	% Reuse Demand Met	80	None	80.5598
Rain	Rainwater Tank (45kL)	% Reuse Demand Met	80	None	81.1839
Rain	Rainwater Tank (60kL)	% Reuse Demand Met	80	None	80.12
Rain	Rainwater Tank (60kL)	% Reuse Demand Met	80	None	81.16
Sedimentation	SF Chamber (5m^2)	High Flow Bypass Out (ML/yr)	None	None	0
Urban	Canopy (290m^2)	Area Impervious (ha)	None	None	0.029
Urban	Canopy (290m^2)	Area Pervious (ha)	None	None	0
Urban	Canopy (290m^2)	Total Area (ha)	None	None	0.029
Urban	Childcare (670m^2)	Area Impervious (ha)	None	None	0.067
Urban	Childcare (670m^2)	Area Pervious (ha)	None	None	0
Urban	Childcare (670m^2)	Total Area (ha)	None	None	0.067
Urban	Childcare Play Area (700m^2)	Area Impervious (ha)	None	None	0
Urban	Childcare Play Area (700m^2)	Area Pervious (ha)	None	None	0.07
Urban	Childcare Play Area (700m^2)	Total Area (ha)	None	None	0.07
Urban	Food/Drink Premise 1 (255m^2)	Area Impervious (ha)	None	None	0.026
Urban	Food/Drink Premise 1 (255m^2)	Area Pervious (ha)	None	None	0
Urban	Food/Drink Premise 1 (255m^2)	Total Area (ha)	None	None	0.026
Urban	Food/Drink Premise 2 (280m^2)	Area Impervious (ha)	None	None	0.028
Urban	Food/Drink Premise 2 (280m^2)	Area Pervious (ha)	None	None	0
Urban	Food/Drink Premise 2 (280m^2)	Total Area (ha)	None	None	0.028
Urban	Food/Drink Premise 3 (294m^2)	Area Impervious (ha)	None	None	0.029
Urban	Food/Drink Premise 3 (294m^2)	Area Pervious (ha)	None	None	0
Urban	Food/Drink Premise 3 (294m^2)	Total Area (ha)	None	None	0.029
Urban	Landscape (356m^2)	Area Impervious (ha)	None	None	0
Urban	Landscape (356m^2)	Area Pervious (ha)	None	None	0.036
Urban	Landscape (356m^2)	Total Area (ha)	None	None	0.036
Urban	Landscape (441m^2)	Area Impervious (ha)	None	None	0
Urban	Landscape (441m^2)	Area Pervious (ha)	None	None	0.044
Urban	Landscape (441m^2)	Total Area (ha)	None	None	0.044
Urban	Landscape (445m^2)	Area Impervious (ha)	None	None	0
Urban	Landscape (445m^2)	Area Pervious (ha)	None	None	0.045
Urban	Landscape (445m^2)	Total Area (ha)	None	None	0.045
Urban	Landscape (500m^2)	Area Impervious (ha)	None	None	0
Urban	Landscape (500m^2)	Area Pervious (ha)	None	None	0.05

Only certain parameters are reported when they pass validation

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Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Landscape (500m²)	Total Area (ha)	None	None	0.05
Urban	OTR (268m²)	Area Impervious (ha)	None	None	0.027
Urban	OTR (268m²)	Area Pervious (ha)	None	None	0
Urban	OTR (268m²)	Total Area (ha)	None	None	0.027
Urban	Pavement (1489m²)	Area Impervious (ha)	None	None	0.149
Urban	Pavement (1489m²)	Area Pervious (ha)	None	None	0
Urban	Pavement (1489m²)	Total Area (ha)	None	None	0.149
Urban	Pavement (1679m²)	Area Impervious (ha)	None	None	0.168
Urban	Pavement (1679m²)	Area Pervious (ha)	None	None	0
Urban	Pavement (1679m²)	Total Area (ha)	None	None	0.168
Urban	Pavement (1845m²)	Area Impervious (ha)	None	None	0.185
Urban	Pavement (1845m²)	Area Pervious (ha)	None	None	0
Urban	Pavement (1845m²)	Total Area (ha)	None	None	0.185
Urban	Pavement (4577m²)	Area Impervious (ha)	None	None	0.458
Urban	Pavement (4577m²)	Area Pervious (ha)	None	None	0
Urban	Pavement (4577m²)	Total Area (ha)	None	None	0.458
Urban	Swim School (620m²)	Area Impervious (ha)	None	None	0.062
Urban	Swim School (620m²)	Area Pervious (ha)	None	None	0
Urban	Swim School (620m²)	Total Area (ha)	None	None	0.062

Only certain parameters are reported when they pass validation

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Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	99	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	99	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	99	100
Sedimentation	SF Chamber (5m)	Notional Detention Time (hrs)	8	12	0.204
Sedimentation	SF Chamber (5m)	Total Nitrogen - k (m/yr)	500	500	1
Sedimentation	SF Chamber (5m)	Total Phosphorus - k (m/yr)	6000	6000	1
Sedimentation	SF Chamber (5m)	Total Suspended Solids - k (m/yr)	8000	8000	1

Only certain parameters are reported when they pass validation

PENRITH CITY COUNCIL

POLICY DOCUMENT

POLICY NAME
Stormwater Drainage Guidelines for Building Developments

POLICY NUMBER
ES 002

DATE ADOPTED
28 November 2016

COUNCIL MINUTE NUMBER
PRC62

ECM NUMBER
7604470

POLICY TYPE
Council

REVIEW DATE
June 2020

RESPONSIBLE DEPARTMENT
Engineering Services

RELATED DOCUMENTS
-

Purpose

To provide guidance to engineers, designers, architects and developers to ensure that stormwater drainage for building developments is designed to provide a robust, safe and low maintenance system to manage stormwater impacts on the drainage network and surrounding properties in a holistic manner that is incorporated aesthetically with the overall development.

Policy Statement

- Minimise any adverse impacts and prevent damage to the built and natural environment as a result of stormwater runoff from building developments;
- Manage the quantity of stormwater runoff generated by building developments;
- Protect the existing public stormwater drainage assets;
- Minimise the impacts of flooding (mainstream and local) to the built and natural environment;
- Manage risk to lives and property from the impacts of stormwater and flooding;
- Ensure the design and construction of the stormwater drainage systems for building developments can be economically maintained;
- Provide uniform specification and technical requirements in design and construction of stormwater drainage systems for building developments within the Penrith City Council Local Government Area (LGA); and
- Have uniform approach and ensure consistency in the assessment of stormwater drainage systems for building developments.

Scope

This policy applies to Building and Development in the Penrith Local Government Area.

7. APPENDICES

APPENDIX A

CHECKLIST FOR STORMWATER CONCEPT PLAN (SCP)

Survey Information	Yes	No	NA
1. Site boundaries	X		
2. North point	X		
3. Services within the public footway	X		
4. Site features, including tree, structures, depressions	X		
5. Contours at 0.1m for flat sites ranging to 0.5m for steep sites and extending 10m into adjoining properties	X		
6. Top of kerb levels	X		
7. Boundary levels	X		
8. Benchmarks	X		
9. Levels to AHD where site is affected by overland flow, flooding or where works on Council's drainage network are required	X		
General	**Yes**	**No**	**NA**
1. Plans to scale of 1:100 or 1:200 1:250 scale drawings provided		X	
2. Designer's name, qualifications, contact details provided	X		
3. Design report, including details of any variations provided	X		
4. Plan number and date of issue shown	X		
5. Consistency between stormwater, architectural and landscape plans	X		
6. 1% AEP overland flow extents shown	X		
7. Development layout, building envelope and proposed driveway locations shown	X		
8. Drainage calculations to support the proposed design submitted			X
9. Proposed finished floor, garage and ground surface levels shown	X		

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

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