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95 MURRADOC ROAD, DRYSDALE

STORMWATER MANAGEMENT STRATEGY

APRIL 2026

Version Rev01

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City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

CONTENTS

1 BACKGROUND 4
1.1 INTRODUCTION 4
1.2 POLICY CONTEXT 4
1.3 SITE CONDITIONS 4
2 STORMWATER MANAGEMENT OBJECTIVES 5
2.1 STORMWATER MANAGEMENT STRATEGY 5
2.2 CATCHMENT PARAMETERS 6
2.3 COMPLIANCE WITH CLAUSE 53.18 – STANDARD W2 (BUILDING AND WORKS) 7
2.4 STORMWATER MODELLING OUTCOMES – WATER QUALITY 7
2.5 STORMWATER MODELLING OUTCOMES – WATER QUALITY 8
2.6 COMPLIANCE WITH CLAUSE 53.18 – STANDARD W3 (BUILDING AND WORKS) 8
3 CONCLUSION & RECOMMENDATIONS 9
APPENDIX A 10
APPENDIX B 11
APPENDIX C 12

LIST OF FIGURES

Figure 1 Site Layout 6

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

1 BACKGROUND

1.1 INTRODUCTION

complete a stormwater management strategy for the property at 95 Murradoc Road, Drysdale. This Stormwater Management Plan (SMP) has been prepared to demonstrate compliance with Clause 53.18 – Stormwater management in urban development of the Victorian Planning Scheme for a commercial development. The document outlines how stormwater will be managed to meet best practice objectives for water quality, flow management, reuse and amenity to inform future planning and detail design documentation.

- Site address: 95 Murradoc Road, Drysdale

- Planning zone and overlays: Commercial 2 Zone

- Type of commercial use: Mixed Use Development

- Gross site area (m²): 6161m^2

- Proposed impervious area (m²): 5545m^2

1.2 POLICY CONTEXT

Relevant planning provisions, including Clause 53.18 and Clause 19.03-3S (Integrated Water Management), and applicable drainage authority requirements have been considered in the preparation of this stormwater management strategy. For this investigation the following modelling scenarios were investigated.

- Water quality treatment via bioretention/rain garden systems
- Stormwater detention vias on site storage

1.3 SITE CONDITIONS

The site comprises a single allotment fronting Murradoc Road. Existing development and surfaces are typical of the locality and include building footprints, driveways and vegetated areas. Future development is anticipated to increase impervious coverage and alter existing runoff characteristics.

The site exhibits a consistent north-to-south fall, with ground levels ranging from approximately RL 86.0 m AHD at the north-eastern corner of the site to approximately RL 80.5 m AHD along the southern boundary. This represents an overall fall of approximately 5.5 m across the site, resulting in a moderate site gradient favorable for gravity stormwater drainage.

Surface runoff generated within the site naturally drains southward toward the existing roadside drainage infrastructure, with no abrupt changes in grade observed. The uniform fall across the site supports defined overland flow paths during major rainfall events.

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

An existing open drain is located within the road reserve fronting the site along Murradoc Road. This open drain conveys flows in a generally westerly direction at an approximate longitudinal grade of 1 in 100.

The open drain forms the primary receiving element for stormwater runoff from the site and surrounding upstream catchments. Connection to this drain is subject to Council approval and must ensure no adverse hydraulic or water quality impacts on downstream infrastructure.

2 STORMWATER MANAGEMENT OBJECTIVES

The stormwater management strategy for the site aims to achieve best-practice water quality outcomes in accordance with recognised guidelines. The proposed measures are designed to deliver;

- Reductions of 80% in suspended solids,
- Reductions of 45% in total nitrogen,
- Reductions of 45% in total phosphorus, and
- Reductions of 70% in gross pollutants,
- Ensuring that post-development runoff does not adversely impact downstream receiving environments or Council infrastructure.

Stormwater quantity will be managed to ensure post-development discharge rates are appropriately controlled. For the 10% AEP event, site discharges will be limited to the developed 1-year event (approximately 63.2% AEP) flow rate at the point of connection to Council's drainage network. For larger events, flows up to and including the 1% AEP event will be managed such that there is no increase in peak discharge to the Council drainage system compared with existing conditions.

Stormwater conveyance systems will be designed to safely collect and convey runoff generated by rainfall events up to and including the 1% AEP event. Flows will be directed to the approved connection point within Council's drainage network without surcharge or adverse flooding impacts, ensuring reliable performance under both minor and major storm.

2.1 STORMWATER MANAGEMENT STRATEGY

The proposed stormwater management strategy has been developed to address both water quality and stormwater quantity objectives in an integrated manner.

Stormwater runoff generated within the site will first be treated through bioretention systems/rain gardens, which will provide effective removal of sediments, nutrients and gross pollutants in accordance with best-practice guidelines. Treated runoff will then be managed through a combination of on-site detention measures, with underground detention provided for minor storm events to control frequent runoff and protect the Council drainage network, and above-ground detention and controlled overland flow paths utilised for major storm events as required. This approach ensures safe conveyance of larger flows while minimizing flood risk, maintaining site functionality, and protecting downstream infrastructure and receiving environments.

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

2.2 CATCHMENT PARAMETERS

Stormwater catchment areas for the existing and developed site are provided in Table 1 and Table 2 below respectively.

Table 1 – Existing Catchment Attributes

Catchment Name	Catchment Area	Fraction Impervious
Existing	**6161**	**0.1**

Table 2 – Proposed Developed Catchment Attributes

Catchment Name	Catchment Area	Fraction Impervious
Lot 1	1174	**0.9**
Lot 2	4247	**0.9**
Common Property	740	**0.9**
Total	**6161**	**0.9**

The indicative site layout is provided in **Error! Reference source not found.** below and the catchment plan is provided in Appendix A.

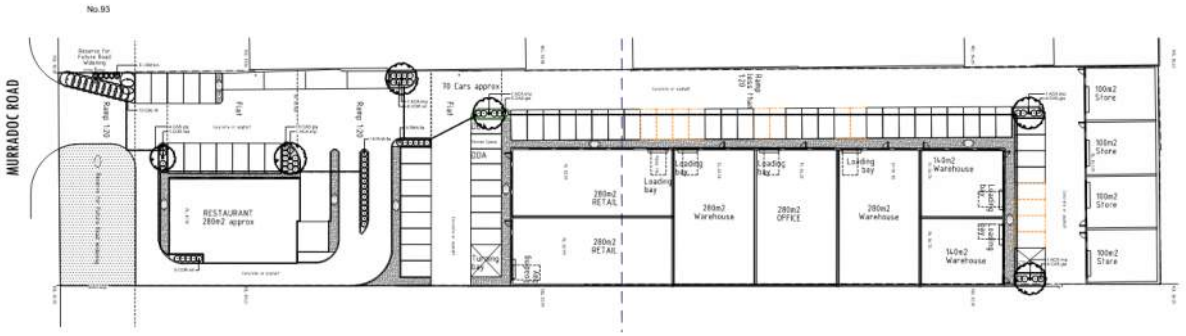


Figure 1 Site Layout

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2.3 COMPLIANCE WITH CLAUSE 53.18 – STANDARD W2 (BUILDING AND WORKS)

The proposed stormwater management strategy has been designed to meet the objectives of Clause 53.18 – Standard W2 for buildings and works. Stormwater quality treatment is provided through a distributed system of bioretention and rain gardens with a total area of approximately 70 m² and an extended detention depth of 100 mm. Modelling demonstrates that these systems achieve best-practice reductions in sediments, nutrients and gross pollutants, ensuring that discharges from the site do not adversely impact Council's drainage network or downstream receiving environments.

Stormwater flows are managed through a combination of below-ground and above-ground detention. Underground detention of approximately 84 m³ is provided for minor storm events, with outflows controlled such that discharge during the 10% AEP event is limited to the developed 1-year (63.2% AEP) flow rate at the point of connection. For major events, total available detention increases to approximately 113 m³ for the 1% AEP event, incorporating above-ground storage and controlled overland flow paths. Modelling confirms that this approach limits peak discharges and safely conveys stormwater in accordance with Standard W2 requirements.

A schematic plan indicating possible arrangement of required infrastructure is provided in Appendix A

2.4 STORMWATER MODELLING OUTCOMES – WATER QUALITY

Storm / Blue Factor were used to determine required water quality attributes for the subject site utilising parameters provided in Table 1 and

Table 2.

The below provides a summary of the water quality treatment performance.

- Type – Raingarden - Bioretention
- Areas – 70m^2
- Extended Detention Depth – 100mm

Table 3 –Modelling Results

Pollutant Target	Result	Target
Total suspended solids (%)	80	80
Total phosphorus (%)	69	45
Total nitrogen (%)	65	45
Total gross pollutants (%)	83	70

Details of the above treatment performances are provided in Appendix B

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

2.5 STORMWATER MODELLING OUTCOMES – WATER QUALITY

Stormwater detention requirements were determined using Boydes Method and are summarised below. Detailed calculations are provided in Appendix B.

Design Storm	Outflow		Storage Volume
	AEP (%)	Flow (l/s)	(m3)
10% - Minor	63.2	12	84.55
1% - Major	1	37	113

2.6 COMPLIANCE WITH CLAUSE 53.18 – STANDARD W3 (BUILDING AND WORKS)

Prior to commencement of construction on site, a Sediment and Erosion Control Plan / Site Environmental Management Plan is to be prepared and implemented to describe how the site will be managed prior to and during the construction period. The plan must set out practicable measures to protect drainage infrastructure and receiving waters from sedimentation and contamination, including controls for erosion and sediment, stormwater, litter, concrete and other construction wastes, and chemical contamination.

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

3 CONCLUSION & RECOMMENDATIONS

Based on the outcomes of this Stormwater Management Plan, including the proposed design response and indicative modelling results, it is demonstrated that the development is capable of achieving compliance with the objectives and standards of Clause 53.18 of the Victorian Planning Scheme. The report confirms that stormwater quantity, quality and site management requirements can be appropriately addressed through detailed design and implementation during the site development phase.

Accordingly, it is anticipated that any future planning permit conditions relating to stormwater management, drainage design, modelling verification and asset maintenance can be satisfactorily met as part of the development's detailed design, construction and operational stages. We trust that this is all in line with your requirements, should you wish to discuss any of the above further, please do not hesitate to contact the undersigned.

Kind regards,

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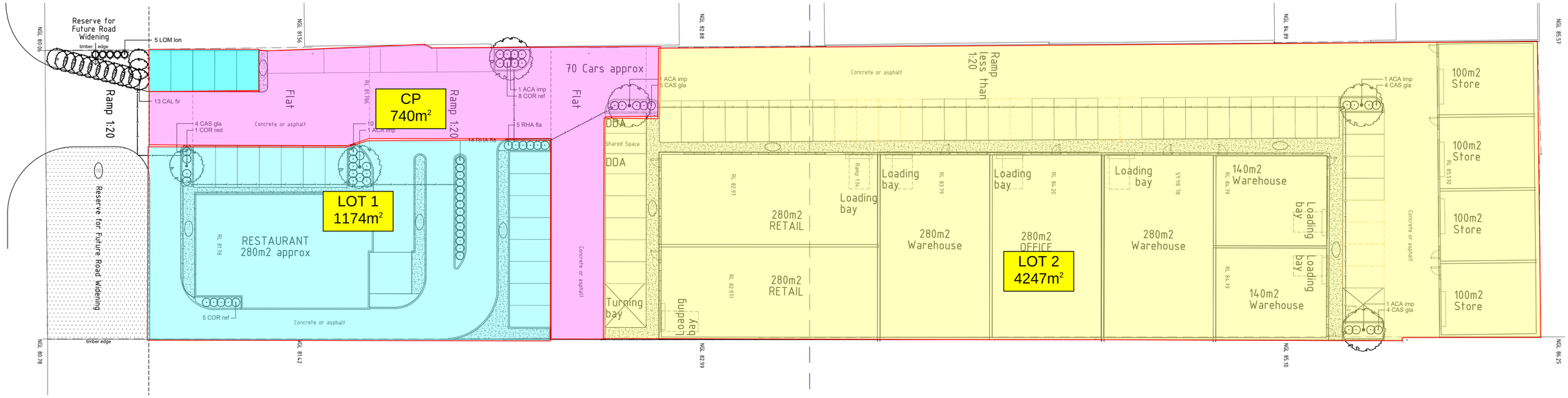
APPENDIX A

SCEMATIC LAYOUT PLAN

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No.93

MURRADOC ROAD



City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

APPENDIX B

WATER QUALITY TREATMENT OUTCOMES – BLUE FACTOR

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

Project # 70756B3D
V2: 95 Murradoc Road, Drysdale

95 Murradoc Rd, Drysdale VIC 3222, Australia
14 April 2026 4:49 p.m.

95 Murradoc Road, Drysdale

145%
SCORE

The proposed stormwater treatments provide 'deemed to comply' compliance with the minimum planning requirement for total nitrogen but does not comply with all the relevant objectives for management of stormwater flows on-site.

Project details

Name	V2: 95 Murradoc Road, Drysdale
Project ID	70756B3D
Street address	95 Murradoc Rd, Drysdale VIC 3222, Australia
Municipality	Greater Geelong
Site area	6161 m^2
Planning Number	

Flow and pollutant load reductions

Item	Result	Target	
Mean annual runoff volume harvested or evapotranspired (%)	4%	>32%	✗
Mean annual runoff volume infiltrated or filtered (%)	31%	>3%	✓
Total suspended solids (%)	80%	>80%	✓
Total phosphorus (%)	69%	>45%	✓
Total nitrogen (%)	65%	>45%	✓
Total gross pollutants (%)	83%	>70%	✓

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

Configuration 1

 **Lot 1 - Hardstand** Paved, 894m2

 **Lot 1 - Roof** 280m2

 **CP** Paved, 740m2

 **Lot 2 - Roof** 1680m2

 **Lot 2 - Paved** 2567m2

 **Raingarden 1** Area: 70 m^2, Extended detention depth: 0.1 m, Submerged zone depth: 0 m, Site soil type: Sandy loam

Catchments

 **Lot 1 - Hardstand** Paved, 894m2

 **Lot 1 - Roof** 280m2

 **CP** Paved, 740m2

 **Lot 2 - Roof** 1680m2

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026



Lot 2 - Paved 2567m2

Treatments



Raingarden 1 Area: 70 m^2, Extended detention depth: 0.1 m, Submerged zone depth: 0 m, Site soil type: Sandy loam **145%**

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

LOETIS

APPENDIX C

DETETNION CALCULATIONS – BOYDES METHOD

City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

BOYDS FORMULA

To be input by user

Calculated by spreadsheet

Project:	95 Murradoc Road, Drysdale
Job No.:	J10341
Designer:	
Date:	Apr-26

$$S_{max} = V_1 (1 - Q_p/I_p)$$

S_{max} = Maximum Volume of temporary Storage (m^3)

V_1 = Volume of inflow flood (m^3)

I_p = Peak discharge of inflow hydrograph (m^3/s)

Q_p = Peak discharge of outflow hydrograph (m^3/s)

Pre-Developed Inputs

Catchment Area (A) =	0.6161	ha	
AEP	1	%	
Fraction Imp	0.1		
Assume Clay Soils	Y		
Frequency Factor	1.2		
Addopted 60 min 10Yr Int	21.26		
Runoff Coefficient	0.1605		IDM 16.7 Runoff Coefficients - Table 10
AEP Effective Catchment Area = ∑CA =	0.10	ha	
Time of Concentration	6	mins	
Depth of Flow	13.34	mm	
Intensity of Flow	133.37	mm/hr	
Restricted outflow requirement =	0.04	m^3/s	

Developed Inputs

Catchment Area (A) =	0.6161	ha	
AEP	1	%	
Runoff Coefficient	0.90		IDM 16.7 Runoff Coefficients - Table 10
AEP Effective Catchment Area = ∑CA =	0.55	ha	
Method of Storage	Tank		

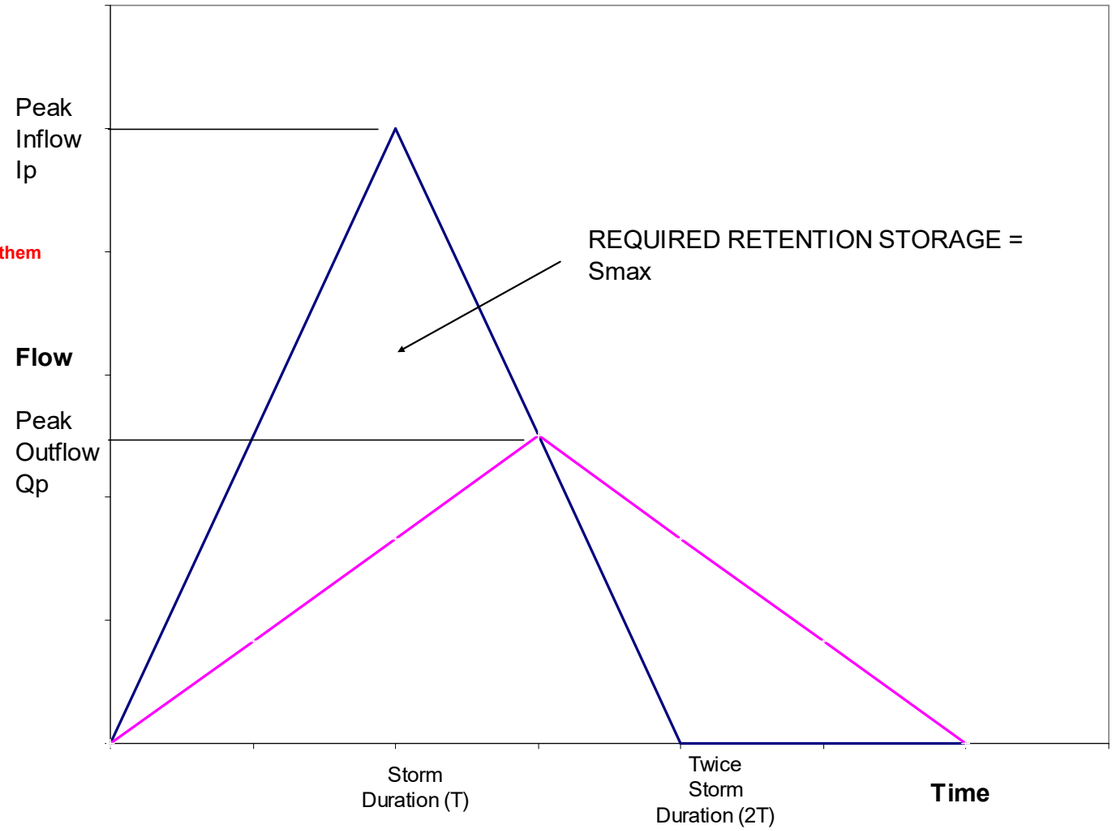
*** All methods of storage have restrictions on them in accordance with IDM section 19.3.2.**

Storage requirement is highest value of S_{max} calculated in the table below

Critical storm duration is the storm duration when S_{max} occurs

Continue table until a clear Smax is calculated

Storm Duration (min)	Annual Exceedance Probability (AEP) Depth (mm)	Annual Exceedance Probability (AEP) Intensity (mm/hr)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)	
5	11.67	140.01	0.216	0.027	64.70	56.46	
10	18.50	110.98	0.171	0.027	102.56	86.08	
15	22.72	90.86	0.140	0.027	125.96	101.23	
20	25.58	76.73	0.118	0.027	141.82	108.86	
25	27.67	66.41	0.102	0.027	153.44	112.23	
30	29.30	58.60	0.090	0.027	162.47	113.02	
45	32.71	43.61	0.067	0.027	181.36	107.19	
60	35.06	35.06	0.054	0.027	194.40	95.51	
90	38.57	25.71	0.040	0.027	213.84	65.49	
120	41.41	20.70	0.032	0.027	229.59	31.79	
150	43.94	17.57	0.027	0.027	243.63	-3.62	
180	46.28	15.43	0.024	0.027	256.64	-40.05	
210	48.50	13.86	0.021	0.027	268.94	-77.21	
240	50.62	12.65	0.019	0.027	280.68	-114.91	
						113.02	Storage Required



City of Greater Geelong, Statutory Planning - Date Received 26/08/2026

BOYDS FORMULA

To be input by user

Calculated by spreadsheet

Project:	95 Murradoc Road, Drysdale
Job No.:	J10341
Designer:	
Date:	Apr-26

$$S_{max} = V_1 (1 - Q_p/I_p)$$

S_{max} = Maximum Volume of temporary Storage (m^3)

V_1 = Volume of inflow flood (m^3)

I_p = Peak discharge of inflow hydrograph (m^3/s)

Q_p = Peak discharge of outflow hydrograph (m^3/s)

Pre-Developed Inputs

Catchment Area (A) =	0.6161	ha	
AEP	63.2	%	
Fraction Imp	0.1		
Assume Clay Soils	Y		
Frequency Factor	0.8		
Addopted 60 min 10Yr Int	25		
Runoff Coefficient	0.1802		IDM 16.7 Runoff Coefficients - Table 10
AEP Effective Catchment Area = ∑CA =	0.11	ha	
Time of Concentration	6	mins	
Depth of Flow	4.00	mm	
Intensity of Flow	40.03	mm/hr	
Restricted outflow requirement =	0.01	m^3/s	

Developed Inputs

Catchment Area (A) =	0.6161	ha	
AEP	10	%	
Runoff Coefficient	0.90		IDM 16.7 Runoff Coefficients - Table 10
AEP Effective Catchment Area = ∑CA =	0.55	ha	
Method of Storage	Tank		

*** All methods of storage have restrictions on them in accordance with IDM section 19.3.2.**

Storage requirement is highest value of S_{max} calculated in the table below

Critical storm duration is the storm duration when S_{max} occurs

Continue table until a clear Smax is calculated

Storm Duration (min)	Annual Exceedance Probability (AEP) Depth (mm)	Annual Exceedance Probability (AEP) Intensity (mm/hr)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)	
5	7.05	84.59	0.130	0.009	39.09	36.31	
10	10.78	64.70	0.100	0.009	59.79	54.23	
15	13.15	52.61	0.081	0.009	72.93	64.59	
20	14.84	44.51	0.069	0.009	82.28	71.16	
25	16.14	38.72	0.060	0.009	89.47	75.58	
30	17.19	34.38	0.053	0.009	95.31	78.64	
45	19.54	26.05	0.040	0.009	108.33	83.33	
60	21.26	21.26	0.033	0.009	117.88	84.55	
90	23.90	15.93	0.025	0.009	132.50	82.50	
120	26.02	13.01	0.020	0.009	144.27	77.60	
150	27.87	11.15	0.017	0.009	154.53	71.19	
180	29.55	9.85	0.015	0.009	163.84	63.83	
210	31.10	8.89	0.014	0.009	172.46	55.79	
240	32.56	8.14	0.013	0.009	180.55	47.21	
						84.55	Storage Required

