

88A-90 WEDGE STREET,
KYNETON

STORMWATER MANAGEMENT STRATEGY

Prepared by: TOMKINSON

Rev C – FEBRUARY 2023

Our Ref: 13263

P T TOMKINSON & Associates PTY LTD

ABN 11103336358

Bendigo 57 Myers Street PO Box 421 Bendigo VIC 3552 Tel: 5445 8700 Fax: 5441 3648	Wangaratta 33E Reid Street Wangaratta VIC 3677 Tel: (03) 5718 0151 FAX: (03) 5441 3648
Westmeadows 12/99-101 Western Avenue Westmeadows Vic 3049 Tel: (03) 8746 9988 Fax: (03) 5441 3648	Torquay 1/3 Cliff Street Torquay VIC 3228 Tel: (03) 5261 3788 Fax: (03) 5264 7057

Copyright © P T Tomkinson & Associates P/L 2023
 The copyright to this document is and shall remain the property of P T Tomkinson Pty Ltd. The document may only be used for the purpose for which Tomkinson intended it. Unauthorised use or copying of this document in any form whatsoever is prohibited.®

REF: 12633

Document History and Status

Rev.	Status	Date	Project Manager	Project Reviewer	Authorised
A	Draft Issue	Jan-2022	Jack Maher	Alex Reid	
B	Revised lot layout	May-2022	Brody Brown	Matthew Elliot	
C	Revised catchment	February-2023	Brody Brown	Matthew Elliot	Alex Reid

CONTENTS

1	INTRODUCTION	4
2	BACKGROUND	5
2.1	Site & Surrounds	5
2.2	Planning Zone & Overlays	6
2.3	Past Flood Studies	7
3	DESIGN INTENT	8
3.1	Stormwater Management	8
3.2	Water Sensitive Urban Design (WSUD)	8
3.3	Flood Management	9
4	CATCHMENT ANALYSIS	9
5	STORMWATER QUALITY & QUANTITY	10
5.1	Stormwater Quantity	10
5.2	Stormwater Quality	11
	<i>Roadside Swales</i>	11
	<i>Sedimentation Basin</i>	11
	<i>Bio-Retention System</i>	11
	<i>MUSIC Modelling</i>	12
6	CONSTRUCTION PHASE STORMWATER MANAGEMENT	13
7	CONCLUSION	13
8	APPENDICES	14
	APPENDIX A – CATCHMENT PLAN	15
	APPENDIX B – Detention Calculations (Boyd's Method)	16
	APPENDIX C – MUSIC Model	17

1 INTRODUCTION

Tomkinson, on behalf of the Jasper Family Trust, has been engaged to prepare a Stormwater Management Strategy for the proposed Development Plan application for a Multi Lot Subdivision at 88A-90 Wedge Street, Kyneton. The Development Plan will also include 88 Wedge Street site, but is not part of the sponsors ownership or the future subdivision application. The subject site is located between Wedge Street, Powlett Street, and Post Office Creek in Kyneton, with street frontage to Wedge Street, Powlett Street, and the current unmade Government Road. The site is approximately 2.50 hectares in area.

Macedon Ranges Council Shire is the responsible authority for the drainage facilities within the development area and the North Central Catchment Management Authority (NCCMA) and GMW is responsible for the management of Post Office Creek. The Stormwater Management Strategy is intended to provide an outline of existing site conditions, the proposed development, and to provide recommendations for the stormwater management requirements for this site. This report aims to identify suitable stormwater quality and quantity mitigation measures for the proposed development conforming to the *Infrastructure Design Manual, Urban Stormwater - Best Practice Environmental Management Guidelines (1991)*, and local authority standards detailed in the Macedon Ranges Planning scheme.

Our Ref: 13263

2 BACKGROUND

2.1 Site & Surrounds

The Subject Site is located on the southern side of the Calder Freeway and to the west of Mollison Street as shown in Figure 1 below. The 88A to 90 Wedge Street site comprises of multiple parcels approximately 2.50 hectares in area and is proposed to be subdivided into 18 lots with a reserved area for stormwater detention and treatment (See attached plan in Appendix A).

The site is typically grassed and contains various tree and vegetation clusters. The topography of the subject site generally falls from north to south towards Post Office Creek.

Post Office Creek flows in a west direction. The site contains one dwelling that is proposed to be removed.

The 88 Wedge Street site is 0.57 hectares and contains a dwelling and outbuildings. Due to the flood and location of the dwelling extents, 30m creek buffer, this site is unlikely to be further subdivided. For the purposes of this Development plan and Stormwater Management Plan report this site is assumed to remain in its existing state.



Figure 1: Locality Plan

Our Ref: 13263

2.2 Planning Zone & Overlays

The subject site is currently zoned Neighborhood Residential (NRZ) and lies within the Macedon Ranges Planning scheme. The site is subject to Land Subject to Inundation Overlay (LSIO) for portions of the land adjacent to Post Office Creek. Refer to Figure 2 below for the extent of the LSIO.

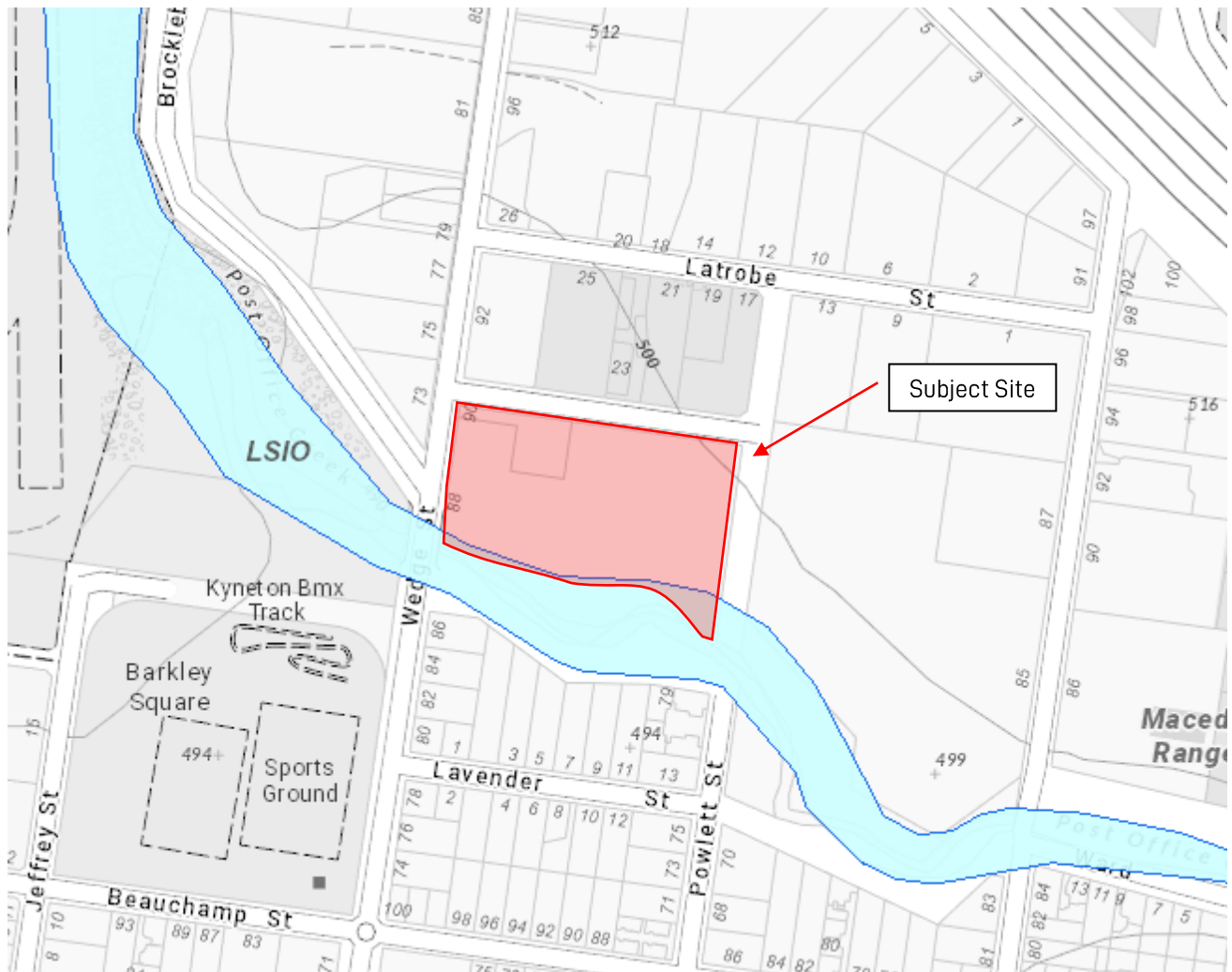


Figure 2: LSIO Extents

2.3 Past Flood Studies

Using NCCMA's 'Floodeye' tool an indicative flood depth is shown for a 1% AEP event across the subject site. (Figure 3 below). These flood depths will not be assessed in detail as part of this report, rather used as a guideline for the proposed design elements of the subdivision. All proposed lots are clear of this flooding footprint.

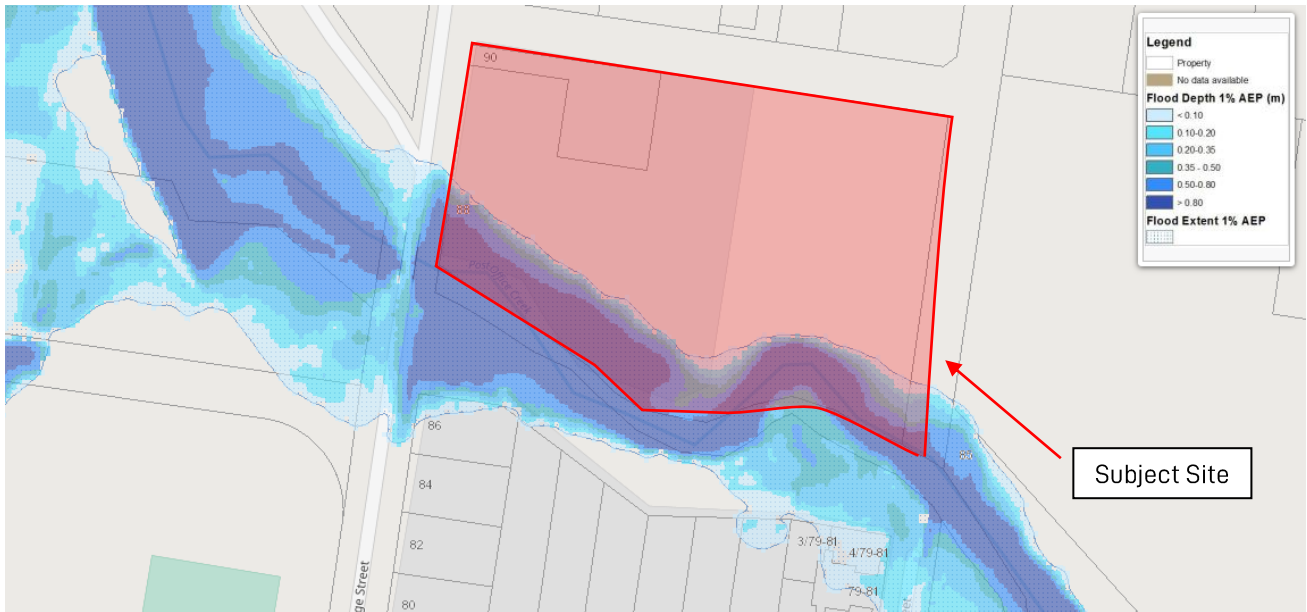


Figure 3: NCCMA 'Floodeye' Map

3 DESIGN INTENT

The proposal for this site will address the requirements for stormwater quantity and quality management by recommending suitable drainage infrastructure to achieve Stormwater Quality and Quantity objectives. The catchment plan within Appendix A shows the preliminary stormwater layout, swale catchment extents (catchment A and B), overall catchment extents (A, B, and C), and general topography of the catchment.

For the detailed drainage layout, refer to the Preliminary Development Servicing Report, Appendix A provided by Tomkinson.

3.1 Stormwater Management

Underground pipe and pit drainage sized for the 10% AEP storm event will be provided within the development to collect and convey stormwater. This drainage will discharge to the proposed Sedimentation Basin and Raingarden incorporated into a detention basin for WSUD located at the site's southern end. The proposed rain garden will outfall the Post Office Creek to the south via underground drainage.

Overland flows for both internal and external catchments for events exceeding 10% AEP up to 1% AEP will be conveyed via the road network to the South and East of the site and overflow into Post Office Creek.

The sedimentation basin and rain garden will provide appropriate storage to restrict the stormwater generated in 50% AEP storm event to the peak predeveloped flow rate calculated as per Appendix B.

The 88 Wedge Street site currently discharges to Post Office Creek and is proposed to remain unchanged.

3.2 Water Sensitive Urban Design (WSUD)

In combination with stormwater detention, the basin and rain garden will provide stormwater treatment measures to improve stormwater quality and meet the objectives of *Urban Stormwater - Best Practice Environmental Management Guidelines 1991' (BPEM)* reduction measures outlined in Table 1 below.

Pollutant	Percent Reduction
Suspended Solids	80%
Phosphorus	45%
Nitrogen	45%
Gross Pollutants	70%

Table 1: Stormwater Quality Pollution Reduction Standards

Our Ref: 13263

3.3 Flood Management

The south of the site lies within an LSIO, triggering flood management measures to be undertaken to ensure the development does not impede or adversely affect the existing waterway and flood plain. NCCMA requires the waterway to be managed so that future flood flows do not pose risk to proposed and existing properties and ensure safe access is maintained to every property.

To meet NCCMA and GMW guidelines dwellings have an average setback of 30m from the top of the creek bank is proposed for lots with floor heights being nominated above the 1% AEP flood level as required by the authorities to ensure proposed dwellings are constructed above flood level.

The raingarden is proposed to be located in land that is subject to inundation. Appropriate measures have been taken to ensure damage is mitigated during times of inundation. These measures include a stabilised batter to minimize erosion from runoff and vegetated batters to catch gross pollutants.

4 CATCHMENT ANALYSIS

The stormwater catchments considered as part of this assessment include the subject site and part of the Powlett Street Road reserve.

Internally, catchment C will capture the stormwater runoff inside the property and direct towards WSUD elements. The external catchments considered are A and B as the stormwater runoff at these locations will be directed into the property's drainage infrastructure through the swale drains. The small remaining catchments (D, E, F and G) in the analysis have been considered as uncontrolled. The northern site falls southwest into the proposed table drain and will therefore discharge into the existing Wedge Street network. The majority of the Powlett Street Road reserve catchment will flow into the swale and discharge into either the Post Office Creek or the existing Wedge Street network, as illustrated in the stormwater management plan. However, the 88 Wedge Street property has not been considered in the assessment due to the property being developed and with little opportunity for further development in the future due to the flood extents on the site. The property's catchment already runs directly into Post Office Creek so will have no change to post development flows.

An estimation for the stormwater flows generated in pre and post-developed site conditions have been undertaken utilising the Rational Method is presented in Table 2 below. The Major / Minor design approach to urban drainage will be followed to design the underground drainage and overland flow paths within the proposed subdivision for the 10% AEP and 1% AEP storm events, respectively.

Total Catchment	Area (ha)	C _{10%}	C _{1%}	T _c (min)	I _{10%} (mm/hr)	I _{1%} (mm/hr)	Q _{10%} (m ³ /s)	Q _{1%} (m ³ /s)
Pre-Developed	1.52	0.30	0.30	21	58.9	101.4	0.075	0.128
Post-Developed								
A	0.18	0.7	0.7	7	103.1	177.5	0.036	0.062
B	0.10	0.7	0.7	7	103.1	177.5	0.020	0.035
C	1.24	0.7	0.7	7	103.1	177.5	0.249	0.428
Total	1.52	0.7	0.7	7	103.1	177.5	0.305	0.525

Table 2: Catchment Flow Calculations for Major / Minor Storm Events

Additional flow calculations have been undertaken for the design of WSUD elements proposed for the Southern end of the site. Table 3 below shows flow calculations for the 4EY (3 month) and the 50% AEP (2 year) under pre and post-developed site conditions.

Total Catchment	Area (ha)	C	Tc (min)	I _{4EY} (mm/hr)	I _{50%} (mm/hr)	Q _{4EY} (m ³ /s)	Q _{50%} (m ³ /s)
Pre-Developed	1.52	0.30	21	14.9	32	0.019	0.041
Post-Developed							
A	0.18	0.7	7	25.7	56.5	0.009	0.020
B	0.10	0.7	7	25.7	56.5	0.005	0.011
C	1.24	0.7	7	25.7	56.5	0.062	0.136
Total	1.52	0.7	7	25.7	56.5	0.076	0.167

Table 3: Catchment Flow Calculations for WSUD

Runoff Coefficients have been adopted from Section 16.7 of the *Infrastructure Design Manual*. When assessing the pre-developed site conditions a C-Value of 0.3 was adopted. Most proposed lots are between 600m² to 700m² in size, therefore, a C-Value of 0.7 was utilised for post-developed conditions.

Rainfall intensities have been obtained from the BOM website and are relevant to this site. The proposed time of concentration (Tc) has been calculated using a 6-minute lot Tc and flow velocity of 1.0m/s within the piped network.

5 STORMWATER QUALITY & QUANTITY

The proposed stormwater treatment nodes are to be located in the reserve at the southern end of the site. Access to these nodes will be provided by the proposed internal court bowl for future maintenance of this infrastructure.

These structures will cater for stormwater detention and treatment to provide a practical solution that can be easily maintained and integrated into the overall landscaping of the site. The rain garden will outfall to the South via underground drainage to the creek and this will be the Legal Point of Discharge for the development. This outfall point to the creek will be constructed to relevant Authority and NCCMA standards.

5.1 Stormwater Quantity

The objective of the proposed stormwater detention storage within the basin and rain garden is to restrict the post-developed stormwater flows generated from the site to a pre-developed rate. Excess stormwater generated from post-developed site conditions is stored and released at a rate that does not exceed the pre-developed rate for a determined storm event, protecting the downstream stormwater network.

Storage detention will be provided to meet *Water Sensitive Urban Design Guidelines 2009* and *Best Practice Environmental Guidelines* requirement to limit 50% AEP storm flows to be detained to pre-developed levels. Appropriate freeboard will be provided above the 50% AEP storage level to allow for suitable conveyance of storm flows greater than the design storage.

Retardation of greater than 50% AEP is considered unnecessary due to the close proximity to the creek, and the resultant time of concentration of the peak flow (Tc) against the much large Tc of the Creek. Providing significant site retardation will more likely align peak Tc's. Therefore not providing significant event retardation will separate the two peak flows for an improved outcome.

The outfall will be controlled by an appropriately sized outlet with the end configuration to be determined in a detailed design. In addition to this outlet structure an appropriate overflow system

Our Ref: 13263

will be designed for 10% AEP, 1% AEP and greater storm events for the safe conveyance of these flows to Post Office Creek.

Detention volumes required for the design storm noted above have been estimated using Boyd's Method of OSD. A summary outlining the required stormwater detention volumes for the proposed development is shown in Table 4 below and Appendix B.

Storm Event - AEP (%)	Peak Inflow (L/s)	Peak Outflow (L/s)	S _{max} (m ³)
WSUD Storm - 50%	101	41	68.33

Table 4: Total Catchment 50% AEP Detention Volume Summary

5.2 Stormwater Quality

Water Sensitive Urban Design Guidelines 2009 and *Best Practice Environmental Management Guidelines (BPEM)* set out water quality standards required to be achieved using WSUD treatment elements. The catchment size largely determines the type and size of treatment required to achieve the design objectives.

A combination of Primary and Secondary treatment is proposed in the form of roadside swales, a sedimentation basin, and a bioretention/rain garden system. The treatment train has been designed per BPEM and its effectiveness verified within stormwater quality modeling software MUSIC. (See Appendix C)

Roadside Swales

The roadside swales on the north and eastern road reserves will act as a primary treatment for these catchments. These swales will be grassed to allow for the screening and removal of gross pollutants such as litter and coarse sediment. It will also provide additional benefits through providing some nutrient removal and delaying the stormwater runoff into the system.

Sedimentation Basin

The sedimentation basin will form the first part of the main treatment train and additional primary treatment to the swale catchments. The purpose of the sedimentation basin is to remove larger sediments from the stormwater before Secondary Treatment along with some removal of nutrients. To achieve these objectives a sedimentation basin with a permanent pool area of 75m² and a 0.2m extended detention depth was proposed. The sedimentation basin will be located in the drainage reserve which will be approximately 530m².

Bio-Retention System

The bioretention system will be used as a secondary treatment node within the treatment train to remove dissolved nutrients and fine sediments not removed by the sedimentation basin. Vegetation will be utilised within the bioretention system design to further improve nutrient uptake and provide a landscaping feature integrated into the overall reserve and basin design.

The bioretention system is designed to be vegetated with a filter media area of 25m² and an extended detention depth of 0.2m. The detention requirements for the basin provide substantial room for the bioretention system required and allow for flexibility with the location and shape which is to be determined in detailed design.

Music Modelling

Internal Catchments

The proposed treatment system has been modeled in MUSIC software to appropriately size the treatment nodes and ensure the design meets BPEM objectives for this site. The pollution reduction is achieved, and the results are shown in Table 7.

Pollutant	Percent Reduction Target	Percent Reduction Achieved
Suspended Solids	80%	89%
Phosphorus	45%	63.5%
Nitrogen	45%	53%
Gross Pollutants	70%	100%

Table 7: Stormwater Quality Pollution Reduction Results – Internal

Both the Water Quality System and Detention System are proposed to be designed as an integrated system, with the sedimentation basin and bioretention system to be constructed within the floor of the detention basin. This approach is commonly used resulting in efficient use of space and a reduction in ongoing maintenance.

The general arrangement of the stormwater detention and treatment system is subject to detailed design and is subject to change. However, the preliminary design solution proposed in this report confirms the minimum requirements for stormwater quality can be achieved with the external catchments being untreated as illustrated in the stormwater management plans.

Internal and External Catchments

The external catchments have been included in a separate MUSIC model to demonstrate that BPEM objectives have largely been achieved for both internal and external catchments by an overcompensation of the internal catchments.

It is recommended that the industrial site to the north provides its own treatment methods in the future to achieve the BPEM objectives.

Pollutant	Percent Reduction Target	Percent Reduction Achieved
Suspended Solids	80%	88.7%
Phosphorus	45%	63.3%
Nitrogen	45%	34.1%
Gross Pollutants	70%	100%

Table 8: Stormwater Quality Pollution Reduction Results – Internal and External

6 CONSTRUCTION PHASE STORMWATER MANAGEMENT

During the construction phase of the subdivision the primary civil contractor will be required to manage stormwater on site including sediment & erosion control. Prior to starting construction, the contractor is required to prepare a construction environmental management plan for the site to EPA guidelines. Some critical items to be included in the construction management plan are:

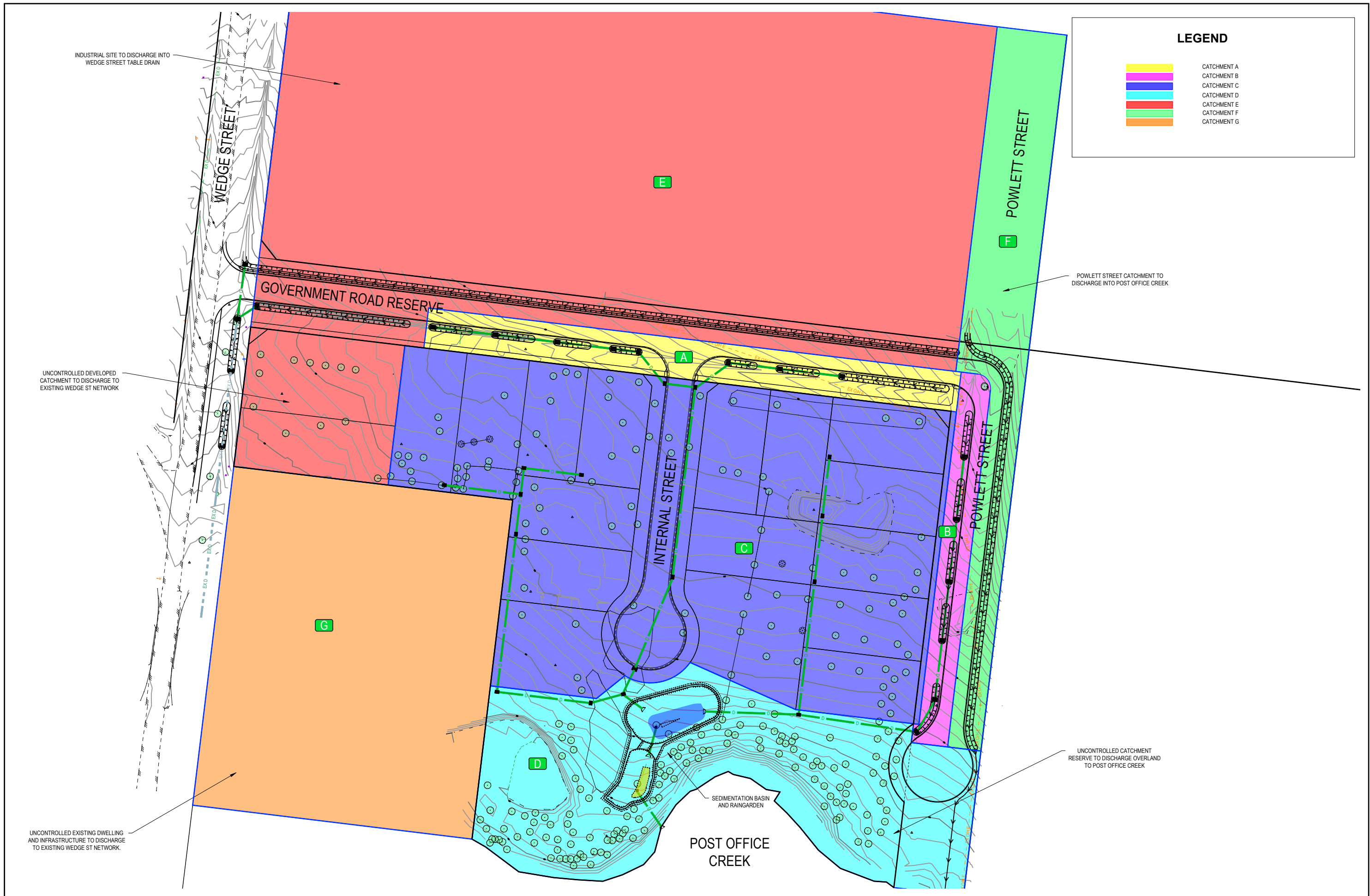
- Sedimentation basin is to be excavated early in the development to provide an adequate location to direct flows
- Confining land disturbance to as small an area as possible
- Stabilising finished areas as soon as practicable
- Installing temporary and/or permanent erosion and sediment control facilities on drainage lines from all disturbed areas with the use of silt fences, diversion channels, and hay bales
- Locating stockpiles outside hazard areas including drainage lines
- Catch drains are to be completed at soonest possibility to direct runoff away from construction areas towards swales and basin.
- Isolation and disposal of contaminated water if encountered.

7 CONCLUSION

This Stormwater Management Plan demonstrates that the proposed subdivision can meet the required objectives for stormwater quality and quantity management. Utilising the proposed drainage infrastructure outlined in this report, this system has met the following requirements:

- Best Practice Environment Guidelines through a network of swales and underground drainage conveying flows to a detention basin containing a sedimentation pond and rain garden. These WSUD elements treat the conveyed flows to achieve adequate reduction in pollutants while also detaining the 50% AEP event.
- Macedon Ranges Planning scheme requirements through integrating the proposed system into surrounding networks, ensuring the system discharge rate does not exceed the calculated predevelopment conditions, and identifying land that is to be reserved for drainage system components including nominating the discharge point of the proposed development.

The proposed drainage infrastructure outline in this report is subject to change throughout the detailed design process following the obtainment of a planning permit.



REV	DES	DWG	CHK	DATE
C	BB	09/02/23		
B	BB	ME	12/05/22	
A	JM	AR	27/01/22	



Tomkinson
 SURVEY > ENGINEERING > PLANNING > PROJECT MANAGEMENT

HEAD OFFICE: 57 MYERS STREET BENDIGO PH 03 5445 8700
 ABN 11 103 336 358 WWW.TOMKINSON.COM

SCALE 1:1,000
 LENGTHS ARE IN METRES - PAPER SIZE A3

© COPYRIGHT THE INFORMATION CONTAINED ON THIS DRAWING IS THE INTELLECTUAL PROPERTY OF TOMKINSON GROUP. COPYING OR USING THIS DRAWING IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF TOMKINSON GROUP INFRINGES COPYRIGHT

DIAL BEFORE YOU DIG
www.1100.com.au

COMPASS ASSURANCE ISO 9001 QUALITY

MULTI LOT SUBDIVISION
88A-90 WEDGE STREET, KYNETON
 CATCHMENT PLAN
 MACEDON RANGES SHIRE COUNCIL
 ADTS PL

DWG STATUS: **CONCEPT**

PROJECT & DWG No: 13263SMP01 / 01

REV: C

NOTE: THIS IS AN UNCONTROLLED DOCUMENT AND WILL NOT BE UPDATED. IT IS THE RESPONSIBILITY OF THE USER TO CONFIRM THAT THIS IS A CURRENT COPY AND SUITABLE FOR THE PROPOSED USE. THIS SHEET MUST BE READ IN CONJUNCTION WITH ALL SHEETS OF THIS SET AND ANY ACCOMPANYING DOCUMENTS. PLOT DATE: 09/02/2023 FILE: C:\12\DATA\TOMKINSON\13263 - ADTS PL AS TRUSTEE FOR THE WASPER FAMILY TRUST, KYNETON_2702ENG000REPORT\CURRENT\1326301 CONCEPT PLAN SMP_REV.CDWG

DETENTION CALCULATION

BOYDS FORMULA



Date: Nov-21
Project: Wedge St Kyneton
Job Number: 1326301

Address: 88A-90 Wedge Street Kyneton
Prepared By: B Brown

Description: Detention calculation for WSUD treatment

Design AEP	50	%
Catchment Tc	17	min
Manual Outlet Discharge Rate	0.041	m ³ /s
Factor of Safety	1	

Initial Storm Duration	5	min
Storm Increment	1	min

Sub-Catchment Details:

	Runoff		
	Area ha	Coefficient	CA
SC 1:	0.18	0.7	0.126
SC 2:	0.1	0.7	0.07
SC 3:	1.24	0.7	0.868
SC 4:			
Total	1.52	0.7	1.064

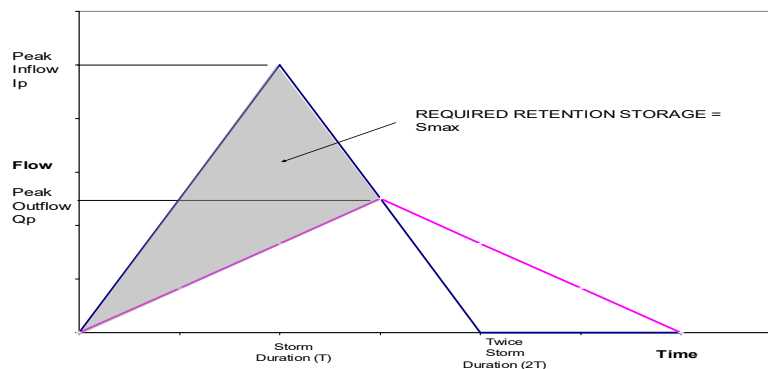
Outlet Calculations:

Orifice Calculation:			
Outlet RL			m
Basin Floor RL			m
Maximum Water Level			m
Discharge Coefficient		0.8	
Outlet Diameter			mm
Peak Discharge		0.000	m ³ /s

Detention Results: Critical Storm Duration

	T _d min	I mm/hr	I _p m ³ /s	Q _p m ³ /s	V ₁ m ³	S _{MAX} m ³
Critical Storm Duration	19	34.01	0.101	0.041	114.60	68.33

Detention Theory: Boyds Method



Our Ref: 13263

APPENDIX B – Detention Calculations (Boyd's Method)

