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STORMWATER MANAGEMENT STRATEGY

FOR

Anne Street Subdivision

Koroit

Project Number: 22-101

Date: 18st of December 2023

Stuart Ian Titmus
MIEAust NER

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Signature ______ Date 23/07/24

Registered on the NER in the area(s) of practice of Civil Engineering

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Client Contact	St Joseph's Parish (Tony Herbert)
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Issued To	Date	Version	Author	Reviewer
Tony Herbert	23/07/24	-	George Swarbrick	Ben Meade

Accreditation

Version: -

Author: George Swarbrick

Accreditation: BEng (Civil)(Hons), GradIEAust

Reviewer: Ben Meade

Table of Contents

1 Introduction

SITEC has been engaged to compile a Storm Water Management Strategy for the 2.95ha site, at 19 Anne Street, Koroit, for a thirty-seven-lot subdivision on behalf of the St Joseph's Parish.

This document provides information about the site and the way in which storm water run-off will be conveyed to the nominated outfall points.

Figure 1 provides a locality plan and indicates the location of the proposed development.

Figure 1 - Locality Plan

2 Site Description

The site is located within a General Residential Zone, and it is proposed to subdivide the single 2.94ha lot into thirty-seven lots, see figure 2.

2.1 Proposed Development

Figure 2 below shows the concept layout, a copy of the layout plan can be found in ***Appendix A***.

Figure 2 – Concept layout plan

2.2 Existing Catchment and Outfalls

The existing site has a fence along each side of the property's perimeter. The sites high point is in the southeast corner. The land naturally falls towards the northwest corner of the site.

The site currently has two outfall locations hence the overall site will be split into 2 separate catchments. There is the eastern catchment (Appendix B) which has an area of 2.56ha that discharges the overland flows into Queen Street whilst the western catchment (Appendix B) which has an area of 0.38ha discharges into Anzac Avenue.

The development site's high and low points to AHD heights are approximately 73.1m and 69.4m respectively with an average slope of 1.56% to the Northwest.

The land upstream to this development has the stormwater currently diverted away from the site with the use of the surrounding table drains. Hence this upstream catchment analysis will be eliminated from this storm water strategy.

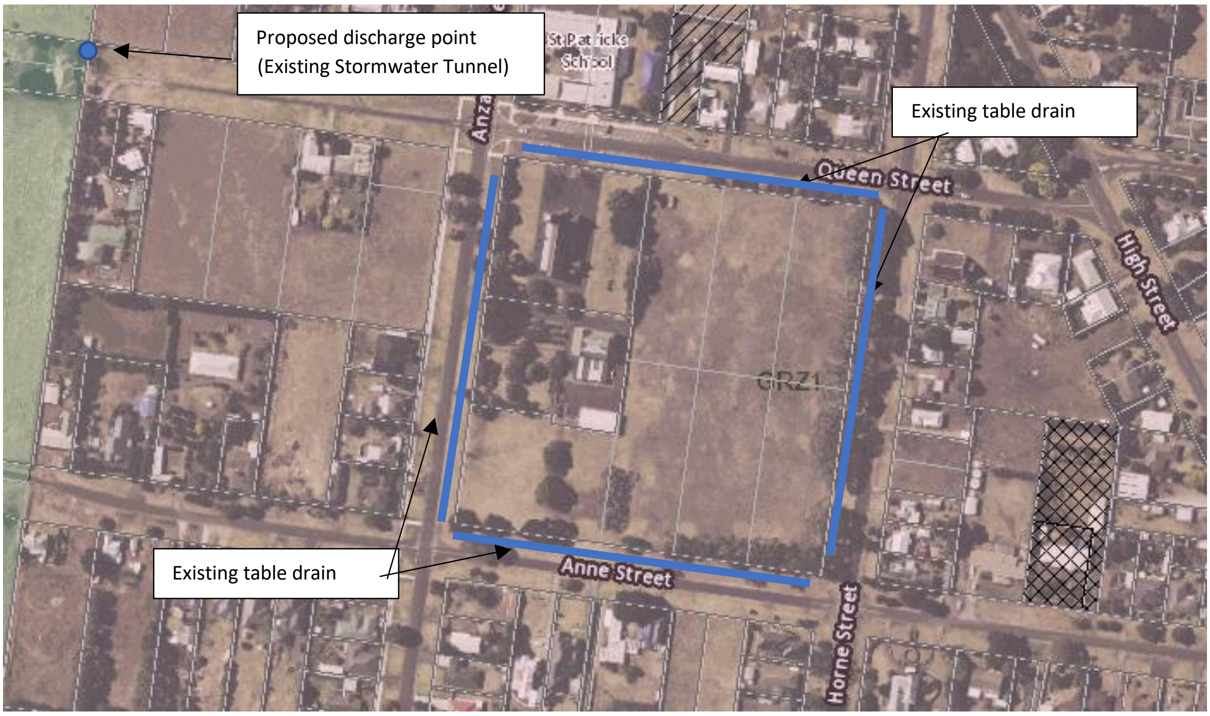

Figure 3 – Existing Stormwater Assets

The proposed drainage outfall is located at the west end of Queen Street where there is an existing storm water tunnel the directs stormwater from the Koroit CBD area to Tower Hill Reserve.

3 Requirements and Constraints

The proposed subdivision include:

- The storm water discharge from the development will be limited to predevelopment runoff for an 20% AEP storm event.
- If the post development runoff is greater than the predevelopment runoff, on-site retention (storage) will be required.
- Underground stormwater network will be required to convey stormwater to LPOD.
- Stormwater generated from the proposed development will not impede on the existing, neighbouring properties.
- Measures to enhance stormwater discharge quality from the site to protect downstream waterways will be required.
- Stormwater from a 1% AEP storm event is required to pass through the development via the drainage reserve without impeding on facilities or neighbouring properties.

3.1 Flood Storage Requirements

Council will require runoff from the site to be restricted to pre-development levels. This has been taken as assuming 20% AEP post-development outflows from the subject site must be restricted to pre-development flow rates at the site outfall location.

3.2 Flood Level Requirements

The 20% AEP flood event will be required to be stored in the basins, with discharge to be at or below predevelopment levels.

3.3 Water Sensitive Urban Design (WSUD) Requirements

Clause 56.07-4 of the Victorian State Planning provisions states that urban stormwater management systems must be designed to meet current best practice management performance objectives for stormwater quality management in the Urban Stormwater - Best Practice Environmental Management Guidelines (CSIRO 1999). The Best Practice Environmental Management Guidelines (BPEMG) objectives for environmental management of stormwater pollutants are:

- Total Suspended Solids (TSS) 80% retention of the typical urban annual load
- Total Phosphorus (TP) 45% retention of the typical urban annual load
- Total Nitrogen (TN) 45% retention of the typical urban annual load
- Gross Pollutants 70% retention of the typical urban annual load

3.4 Asset Ownership and Maintenance

As this site will be constructed to IDM requirements and to council's satisfaction, the stormwater network will be owned by the Moyne Shire Council once statement of compliance is reached. Hence the maintenance for the drainage will be the responsibility of the Moyne Shire Council.

3.5 Applicable Standards

All stormwater treatment elements and overland flow paths will be designed to the following:

- Australian Rainfall and Runoff 2019 (Ball et al. 2019);
- Infrastructure Design Manual (Local Government Infrastructure Design Association, V5.4, 2022);
- WSUD Engineering Procedures: Stormwater Melbourne (Melbourne Water, 2005).

4 Proposed Strategy

The SWMP proposed is briefly shown in detail in ***Appendix C & D*** and will be further shown in the (Detailed Design) documents after the planning permit is issued.

The sections below provide commentary on key aspects of the strategy.

4.1 Stormwater Treatment Elements

Two forms of treatment for this development:

An appropriately sized sedimentation basin along with a detention basin will be constructed that will adequately achieve the storage requirements and ensures WSUD guidelines are met. Details of the sedimentation basin and detention basin can be found in ***Appendix D.*** As there is a sedimentation basin to be installed as part of this development, a silt dry out zone will also be required.

The following restrictive outflow calculations have been completed using the specifications of the above-mentioned stormwater storage basin.

The table below (reproduced from ***Appendix D***) shows the treatment train effectiveness for the development.

It also shows that the treatment elements outlined above can meet all BPEMG stormwater treatment requirements for the development.

Table 1 - Expected Stormwater Pollutant Retention from Site

Pollutant	Pollutants generated from Development (kg/yr)	Pollutants Retained in Treatment Elements (kg/yr)	% Pollutants withheld relative to pollutant generation from development (%)
Total Suspended Solids	2370	311	86.9
Total Phosphorus	3.94	1.04	73.6
Total Nitrogen	25.8	14.2	45
Gross Pollutants	555	61.9	88.8

Detailed MUSIC modelling can be found in ***Appendix C***.

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4.2 Flood Storage Elements

As the post predevelopment flows for the 20% AEP event being 0.139m^3/s are greater than the pre-development flows of 0.062m^3/s, storage is required. During this event, 214m^3 of storage is required to contain the storm water generated onsite. The storage will be located onsite in stormwater basins at the low area of the development.

The calculations that were used to determine the storage requirements for the development can be found in ***Appendix C***.

The stormwater collection from the development will be stored in the storage basin. Calculations for outfall sizing can be found in ***Appendix C***, with detailed drawings for outfall restriction configuration to come once detailed design is undertaken post planning permit.

The effect of this flood storage is that the 20% AEP event is retarded to below the predevelopment flow rates as detailed in Table 2 (reproduced from ***Appendix C***).

Table 2 - Pre- and Post-Development Flow Estimates

Location	Flow Estimate (m^3/sec)			
	Pre	Critical Duration	Post	Critical Duration
Overall Catchment	**0.062**	**44-minutes**	**0.139**	**45-minutes**

Note: All flows rounded to the nearest 0.001 m3/s due to storage modelling detail.

4.3 Flood Impact

No inundation of the proposed roads and intersection is expected as stormwater flows will traverse down Queen Street. The internal road and stormwater network will have the capacity to convey the stormwater in the 1% AEP event.

4.4 Subdivision Drainage Layout

Lots 1-4 make up the western catchment that directs the stormwater into Anzac Avenue whilst lots 5-37 and the internal road make up the eastern catchment directing stormwater into Queen Street. The allowable discharge from the entire site is the predevelopment flow of 0.062m3/sec. The western catchment will discharge the stormwater at development flow levels 0.014m3/sec. Whilst the eastern catchment will discharge the remaining amount of the developments allowable discharge flow rate being 0.048m3/sec. With the eastern catchments development flows being retained in the stormwater basin for detention and treatment. Following this treatment, the stormwater will re-enter the underground stormwater network at the outfalls of the development which will connect into the existing stormwater drainage in Queen Street.

4.5 Proposed Easement or Reserve

The stormwater drainage network is located both in the road reserve and internal allotments. As the stormwater network will be located through some allotments, drainage easements will be required.

4.6 Wider Catchment Issues

The proposed stormwater management strategy will benefit the neighbouring properties with greater control of stormwater runoff compared to the exiting site. As there is minimal underground stormwater infrastructure in the area, the surrounding streets rely on table drains to convey the stormwater. This can cause isolated flooding in larger stormwater events.
Plans of the pre and post development catchments can be seen in ***Appendix B and Appendix D***.

5 Concluding Remarks and Further Work Required

The SWMP detailed within this report and associated documents, details the designs of assets required to service the proposed development. To ensure all applicable planning controls are met, the proposed development is to incorporate:

- A stormwater treatment facility to service lots 1-37 and the proposed internal road will be in the form of a basin at the low North-West side of the development will enable WSUD treatment to occur.
- The development flows will be restricted to predevelopment level by an appropriately sized pipe at the correct grade at the outfalls of the internal stormwater network.
- In a stormwater event that generates flows greater than the predevelopment flow rate, excess flow will be stored in the basin.
- Overland flows will not inundate the development or existing establishments in the 1% AEP storm event.

As such, it is requested that Council approve the SWMP presented herein, allowing the planning process to progress.

6 Abbreviations, Descriptions and Definitions

The following table lists some common abbreviations and drainage system descriptions and their definitions which may be referred to in this report.

Table 3 - Common Abbreviations Associated with Stormwater Management Plans

Abbreviation / Descriptions	**Definition**
AHD - Australian Height Datum	Common base for all survey levels in Australia. Height in metres above mean sea level.
ARI - Average Recurrence Interval.	The average length of time in years between two floods of a given size or larger. A 100 Year ARI event has a 1 in 100 chances of occurring in any one year.
AEP – Annual Exceedance Probability	The chance of a storm (flow) of that magnitude (or larger) occurring in a given year. $\mathbf{AEP = 1 - e^{\left(\frac{-1}{ARI}\right)}}$. i.e. 18.13% AEP = 5 Year ARI
BPEMG	Best Practice Environmental Management Guidelines available from CSIRO (2009).
DSS or DS	Development Services Scheme (DSS) or Drainage Scheme (DS) is a master plan developed my MWC for drainage within a catchment area.
ED	Extended detention. A hight that corresponds to the vertical limit of a volume of water stored for treatment within a treatment element.
EY – Exceedances per year	The amount of times a storm (flow) of that magnitude is expected to be exceeded per year. i.e. 4 EY = 3 Month ARI
Hectare (ha)	10,000 square metres
HECRAS	A hydraulic software package that enables the calculations of flood levels and velocities along a waterway given a specified flow.
Kilometre (km)	1000 metres
m^3/s -cubic metre/second	Unit of discharge usually referring to a design flood flow along a stormwater conveyance system
Megalitre (ML) (1000 cubic metres)	1,000,000 litres = 1000 cubic metres. Often a unit of water body (e.g. pond) size
MUSIC	Hydrologic computer program used to calculate stormwater pollutant generation in a catchment and the amount of treatment which can be attributed to the WSUD elements placed in that catchment
MWC	Melbourne Water Corporation
Retarding basin	A flood storage dam which is normally empty. May contain a lake or wetland in its base

NWL - Normal Water Level	Water level of a wetland or pond defined by the lowest invert level of the outlet structure
NSL – Natural Surface Level	The surface level of the natural (existing) surface before works.
RORB	Hydrologic computer program used to calculate the design flood flow (in m^3/s) along a stormwater conveyance system (e.g. waterway)
RCP	Representative Concentration Pathway. A relative greenhouse gas concentration into the future. RCP 8.5 represents no significant reduction in emissions until 2100 resulting in significant global warming.
Sedimentation basin (Sediment pond)	A pond that is used to remove coarse sediments from inflowing water mainly by settlement processes.
Swale	A small shallow drainage line designed to convey stormwater discharge. A complementary function to the flood conveyance task is its WSUD role (where the vegetation in the base acts as a treatment swale).
TSS	Total Suspended Solids – a term for a particular stormwater pollutant parameter
TP	Total Phosphorus – a term for a particular stormwater pollutant parameter
TN	Total Nitrogen – a term for a particular stormwater pollutant parameter
WSUD - Water Sensitive Urban Design	Term used to describe the design of drainage systems used to: Convey stormwater safely Retain stormwater pollutants Enhance local ecology Enhance the local landscape and social amenity of built areas
Wetland	WSUD element, which is used to collect TSS, TP and TN. Usually incorporated at normal water level (NWL) below which the system is designed as shallow marsh, marsh, deep marsh and open water areas.

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Appendix A – Layout Plan

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Signature / Date 29/03/23

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REVISION	DESCRIPTION	DATE
-	INITIAL DESIGN	MAR 23

	NAME	DATE
DESIGN	-	-
DRAWN	-	-
CHECKED	-	-
APPROVED		

CAD FILE 22-101 CONCEPT PLAN.dwg

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PROPOSED DEVELOPMENT
ANNE STREET - KOROIT
CONCEPT PLAN

SIZE A3 | SCALE 1 : 2000 | PROJECT No. 22-101 | SHEET No. 1 OF 1 | REV -

Appendix B – Catchment Plan

EASTERN CATCHMENT

WESTERN CATCHMENT

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Signature [signature] Date 29/03/23
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REVISION	DESCRIPTION	DATE
-	INITIAL DESIGN	MAR 23

	NAME	DATE
DESIGN	-	-
DRAWN	-	-
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CAD FILE 22-101 CONCEPT PLAN.dwg

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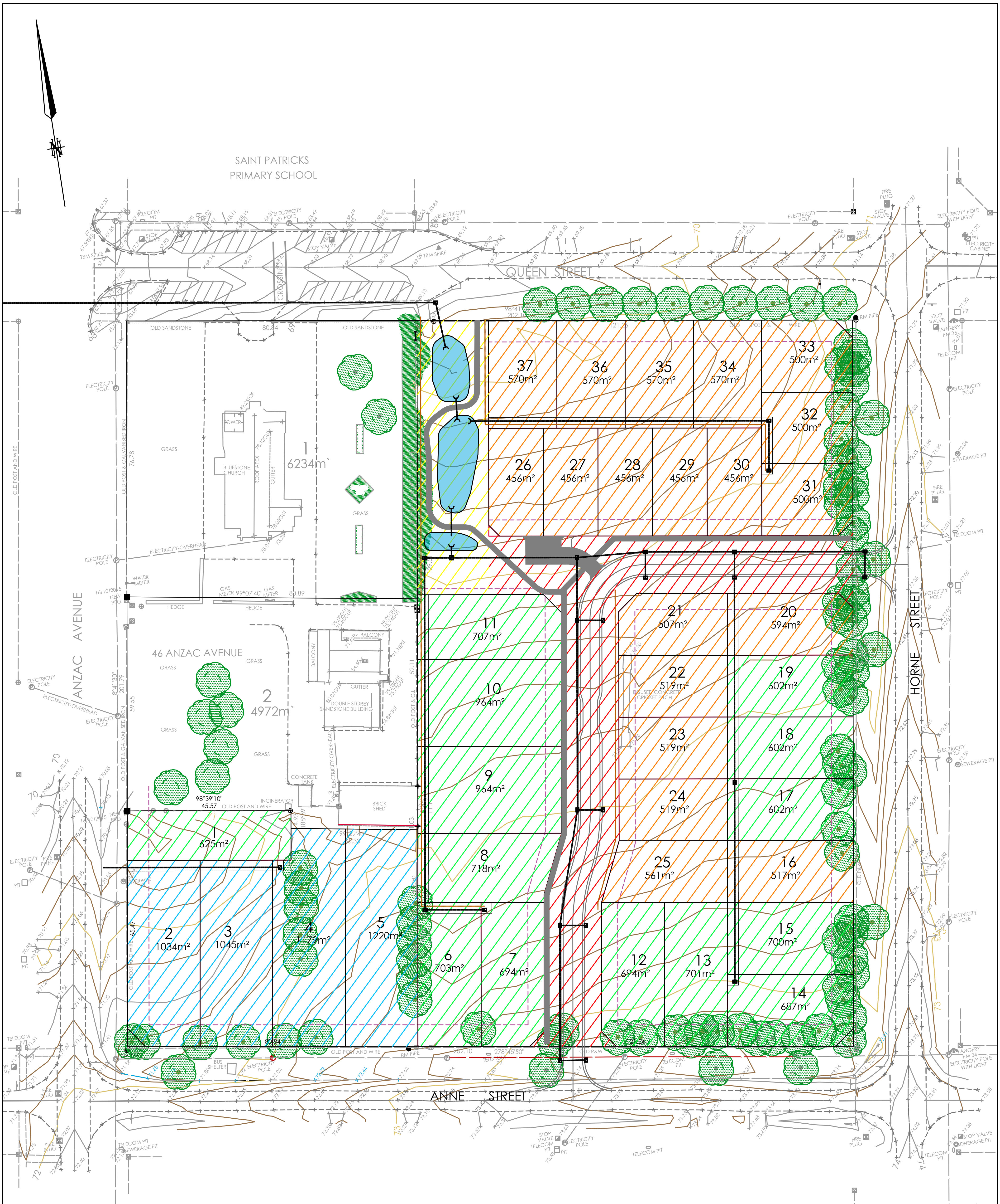
PROPOSED DEVELOPMENT
ANNE STREET - KOROIT
CONCEPT PLAN

SIZE	SCALE	PROJECT No.	SHEET No.	REV
A3	1 : 2000	22-101	1 OF 1	-



RESIDENTIAL LOTS 450m2 - 600m2 C:0.75

ROAD RESERVE C:0.75

RESIDENTIAL LOTS 600m2 - 1000m2 C:0.70

LANDSCAPE AREA C:0.25

RESIDENTIAL LOTS 600m2 - 1000m2 C:0.5

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REVISION	DESCRIPTION	DATE		NAME	DATE
			DESIGN	-	-
			DRAWN	-	-
			CHECKED	-	-
			APPROVED		
-	INITIAL DESIGN	DEC 23			

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PROPOSED DEVELOPMENT
ANNE STREET - KOROIT
CONCEPT PLAN

SIZE	SCALE	PROJECT No.	SHEET No.	REV
A3	1 : 2000	22-101	1 OF 1	-

Appendix C – Hydrologic Modelling

The hydrologic calculations will be undertaken below on the proposed subdivision. The rational method (with current BoM rainfall intensity) and Boyd's method (or similar) can be used to define flood storage requirements. The storage indicated by these methods suggest it will be required to fit on site and consideration has been given to how the outlet may be configured. As there has been a basic initial concept layout plan already designed for the site, the development site conditions can be utilised to better design the storage and treatment assets. Typically used to determine the storage requirements, the Boyds formula utilises the IDM coefficients (table 10 Runoff Coefficients – road reserve and residential lots).

Predevelopment Flows

Upstream Catchment

The predevelopment flows for the upstream catchment will be eliminated from the calculations as there are table drains in the surrounding road reserves that direct overland flows away from the development site.

Site Catchment

The predevelopment flows for the site will be calculated using the rational method:

$$\boldsymbol{Q_{PRE-DEV}} = \frac{CAI_{20\%}}{360}$$

Where:

$Q_{PRE-DEV}$	= Pre development discharge (*m³/s*)
C	= Run off co-efficient = 0.30
A	= Total Area (*Ha*) = 2.943 Ha
$I_{20\%}$	= 20% AEP Rainfall Intensity (mm/hr)

To calculate the 20% AEP Intensity, the Time of Concentration is calculated using iterations of the Kinetic Wave method:

- $T_c = \frac{6.94\,(L\,F_R)^{0.6}}{I^{0.4}S^{0.3}}$

  Where:

  T_c = Time of concentration

L	= Length of Overland Flow	*= 237m*
F_R	= Retardance Factor (VicRoads Manual)	= 0.1
I	= Rainfall Intensity for 5yr storm (Koroit)	*= 25.36 mm/hr*
S	= Slope of Hydraulic Grade line	*= 1.56m/m*

T_c = 44.31minutes

I_{20} = 25.36mm/hr

$$\boldsymbol{Q_{PRE-DEV}} = \frac{0.3 \times 2.943 \times 25.36}{360} = 0.062m^3/s$$

This yields a total of $\boldsymbol{Q_{PRE-DEV}}$ = **0.062 *m³/s*** of flow from the development site. These flows must be catered for in the drainage networks for the subdivision and conveyed to the discharge points.

Post-development

Site Catchment

The post development flows for the site will be calculated using the rational method:

$$\boldsymbol{Q_{Post-DEV}} = \frac{CAI_{20\%}}{360}$$

Where:

$Q_{Post-DEV}$ = Post development discharge (*m³/s*)

C = Run off co-efficient = 0.75 (Road Reserve)
= 0.75 (Residential 400-600)
= 0.70 (Residential 600-1000)
= 0.50 (Residential 1000-2000)
= 0.25 (Landscape Areas)

A = Total Area (*Ha*) = 1.02 Ha (Residential 400-600)
+ 0.98Ha (Residential 600-1000)
+ 0.43 (Residential 1000-2000)
+ 0.36 (Road Reserve)
+ 0.14 (Landscape Areas)

$I_{20\%}$ = 20% AEP Rainfall Intensity (mm/hr)) = 25.36 mm/hr

$$A \times I_{20\%} = 1.978m^2$$

T_c = 44.99 minutes
I_{20} = 25.36 mm/hr

$$\boldsymbol{Q_{Post-DEV}} = \frac{(0.75 \times 1.02 + 0.7 \times 0.98 + 0.5 \times 0.43 + 0.75 \times 0.36 + 0.25 \times 0.14) \times 25.36}{360}$$
$$= 0.139m^3/s$$

West Catchment

The post development flows for the site will be calculated using the rational method:

$$\boldsymbol{Q_{Post-DEV}} = \frac{CAI_{10\%}}{360}$$

Where:

$Q_{Post-DEV}$ = Post development discharge (*m³/s*)

C = Run off co-efficient = 0.70 (Residential 600-1000)
= 0.50 (Residential 1000-2000)

A = Total Area (*Ha*) = 0.0625 Ha (Residential 600-1000)
+ 0.3185 Ha (Residential 1000-2000)

$I_{20\%}$ = 20% AEP Rainfall Intensity (mm/hr) = 25.36 mm/hr

$$\boldsymbol{Q_{Post-DEV}} = \frac{(0.0625 \times 0.7 + 0.3185 \times 0.5) \times 25.36}{360} = 0.014m^3/s$$

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This yields a total of $Q_{Post-DEV}$ = 0.014 m^3/s of flow from the western catchment. These flows must be catered for in the drainage networks for the subdivision and conveyed to the discharge points. As this catchment will discharge its stormwater at post development flows, the eastern catchment will contain extra to compensate. The eastern catchments allowable outfall flow rate will be the entire sites predevelopment flow rate of 0.062m3/sec minus the western catchments post developments flow rate of 0.014m3/sec. This results in an allowable flowrate of 0.48m3/sec to discharge from the eastern catchment.

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Stormwater Detention - Boyds Formula (20% AEP)
Boyds Formula (20% AEP)

Project: Koroit - Anne Street
Job No: 22-101

IFD Region= Koroit
Catchment Area (A) = 1.97958 ha

Runoff Coefficient = 1

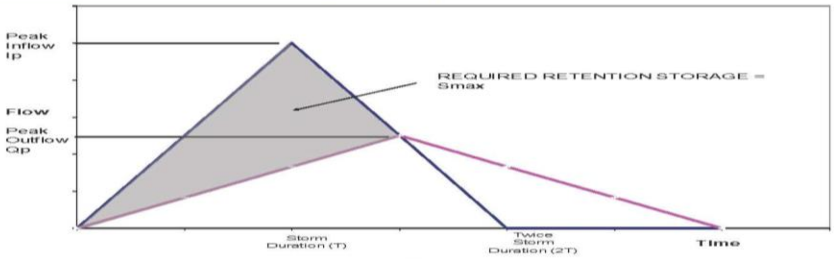
Effective Catchment Area = ∑CA = 1.980 ha

Restricted outflow requirement = 0.062 m^3/s

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)	20% AEP Intensity (mm/hr)	I_p (m^3/s)	Q_p (m^3/s)	V_1 (m^3)	S_{max} (m^3)
20	42.3	0.23	0.062	279.121	204.721
25	36.9	0.20	0.062	304.360	211.360
30	32.8	0.18	0.062	324.651	213.051
31	32.1	0.18	0.062	328.313	212.993
32	31.5	0.17	0.062	332.569	213.529
33	30.8	0.17	0.062	335.341	212.581
34	30.2	0.17	0.062	338.772	212.292
35	29.65	0.16	0.062	342.385	212.185



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

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)

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Sedimentation Basin Sizing

Sediment Basin Sizing

Project: Anne Street Koroit
Job No: 22-101
Descritpion: Sizing Sedimentation Basins
WSUD Procedures: stormwater - Section 4.3.2

$$R = 1 - \left(1 + \frac{1}{n} \times \frac{v_s}{Q/A} \times \frac{(d_e + d_p)}{(d_e + d^*)}\right)^{-n}$$

R =	fraction of target sediment removed (Design for 95% retention of target particle range for a 4EY event)
d_p=	Depth of Permanent pool (1.0m < dp < 1.6m)
d_e=	Extended detention depth above permanent pool
d*=	Depth below permanent pool sufficient to retain particles (greater of 1.0m or d_p)
Q =	Design flow (typically (4EY)) = (Ae * I)/360
A =	Basin Surface Area of Normal Water Level
n =	turbulence or short-circuiting parameter = 1/(1-ʎ)
v_s =	Setting velocity for particles (Usual target very fine sand, 125 µm, with a settling velocity of 0.011m/s)
Ae =	Effective Area of the site
I =	Intensity for a 4EY storm (assumed 6min Tc)

d_p=	1	
d_e=	0.35	
d*=	1	
Q =	0.125	
A =	170	Update area until R > or = 0.95
n =	1.123596	
v_s =	0.011	
Ae =	1.978	
I =	78.45	
ʎ=	0.11	
R =	0.95	

Annual cleanout frequency

Annual cleanout frequency required $= \frac{R \times (SL + GPL) \times A_{catchment}}{Volume\ Sump}$

A = Catchment Area (Ha)
R = Fraction of initial Solids Removed
SL = Sediment load = 1.6 m^3/ha/yr (Willing and Partners 1992)
GPL = Gross Pollutant Load = 0.4m^3/ha/yr (0.4 Alison et al 1998)
Volump Sump = minimum allowable volume >500mm below NWL

A =	2.56	
R =	0.949722	
SL =	1.6	
GPL =	0.4	
V_{sump} =	25	= Update volume until cleanout frequency once every 5 years

Annual Cleanout frequency required = 0.194503
once every 5.14 years

Appendix *D* – Music Modelling

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC, Version 6.3.0) has been used to assess the proposed design regarding the stormwater pollutant retention benefits of the proposed treatment train. MUSIC has also been used to assess the 1.5-year ARI retardation requirements to meet BPEMG.

Model Description

1. Catchments

Subareas and fraction imperviousness used in the MUSIC modelling are as detailed in the post-development catchment plan which equates to the same used in the computations and modelling.

Table 4 - MUSIC Model Catchment Details

MUSIC Node ID	MUSIC Node Type	Area (ha)	F_{imp}
Lot 1-4	Mixed	0.389	0.5
Lot 5-37 and Internal Road	Mixed	2.703	0.70

Note: The MUSIC node types, and rainfall-runoff parameters utilised are per MWC's Guidelines for the Use of MUSIC (Melbourne Water, 2018b).

2. Climate Data

For this region of the state, council has previously accepted the use of Camperdown's 1988 mean annual rainfall with a period of 6-minute intervals for use in the continuous simulation modelling. Camperdown is the closest set of data available to the site.

3. Treatment Elements

The proposed stormwater treatment train includes a sedimentation basin and a detention basin. These elements are discussed in more detail below:

Sedimentation Basin

A 28m3 sedimentation basin located at the low area of the subdivision will treat runoff from the subject site before discharging into the detention basin at an allowable flow rate into. The following properties were used in the MUSIC modelling:

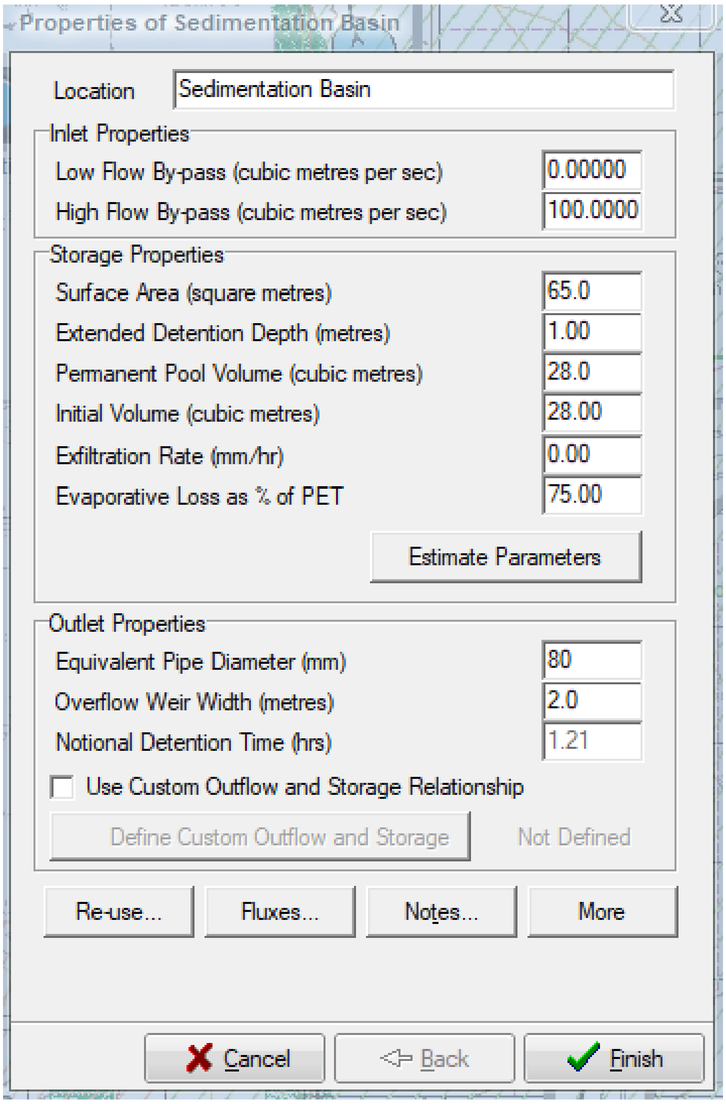

Figure 4 – Sedimentation Basin Properties

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Detention Basin

A minimum of 214m3 wetland basin located at the low area of the subdivision will treat and retain runoff from the subject site before discharging into the nearby stormwater network at the allowable flow rate. The following properties were used in the MUSIC modelling:

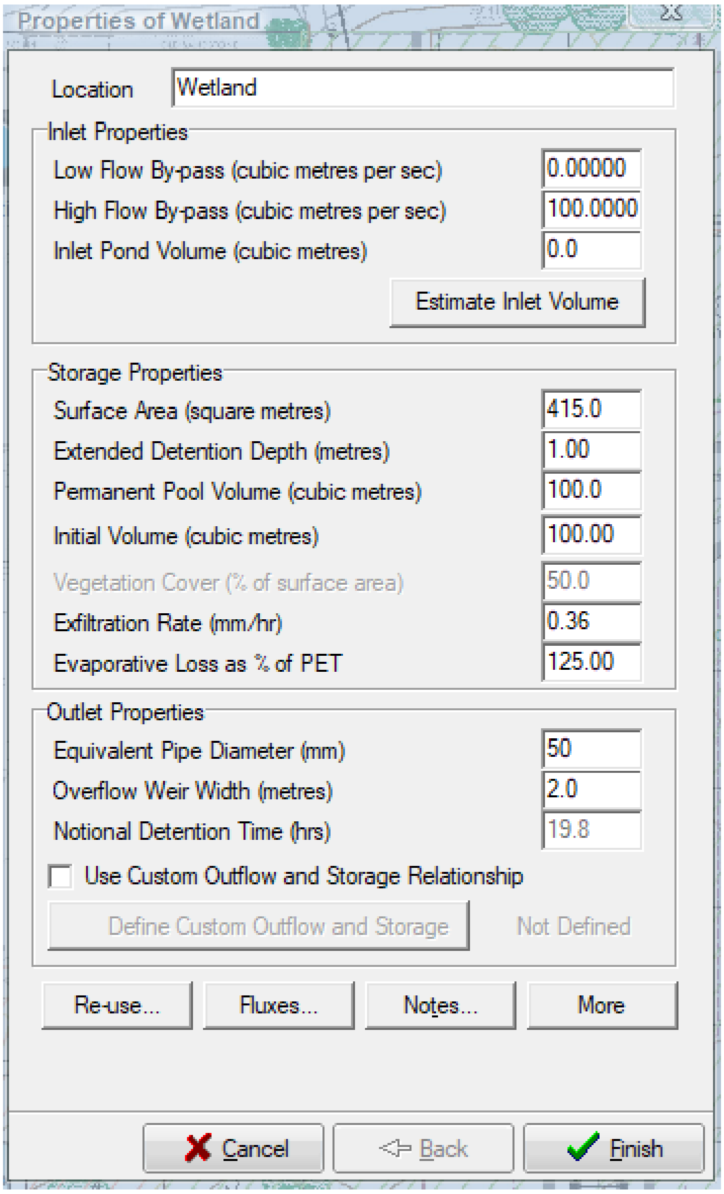

Figure 5 – Wetland Detention Properties

4. Model Schematic

Figure 6 - MUSIC Model Schematic

5. Model Results

The Best Practice Environmental Management Guidelines (BPEMG) objectives for environmental management of stormwater pollutants are:

- Total Suspended Solids (TSS) 80% retention of the typical urban annual load
- Total Phosphorus (TP) 45% retention of the typical urban annual load
- Total Nitrogen (TN) 45% retention of the typical urban annual load
- Gross Pollutants 70% retention of the typical urban annual load

Table 5 below details the expected pollutant retention results. Overall, the (simple) stormwater treatment train proposed is able to meet BPEMG.

Table 5 - Expected Stormwater Pollutant Retention from Site

Pollutant	Pollutants generated from Development (kg/yr)	Pollutants Retained in Treatment Elements (kg/yr)	% Pollutants withheld relative to pollutant generation from development (%)
Total Suspended Solids	2370	311	86.9
Total Phosphorus	3.94	1.04	73.6
Total Nitrogen	25.8	14.2	45
Gross Pollutants	555	61.9	88.8