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Prepared for: Smith + Tracey Architects

SPAGS Drouin Campus P-2 and ELC - Stormwater Management Strategy

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Contents

Appendices

1 Introduction

CREO Consultants (CREO) has been engaged by Smith & Tracey Architects to produce a Stormwater Management Strategy (SWMS) for the proposed school development on the property located at Part Lot 2 McGlone Road, Drouin.

This document will outline the proposed drainage strategy to ensure that 'best practice' guidelines for qualitative and quantitative treatment are met, in accordance with relevant authority requirements.

2 Existing Conditions

2.1 Site Characteristics and Catchments

The proposed redevelopment of the property located at Part Lot 2 McGlone Road, Drouin will involve the construction of a new school over a number of stages. The current land is undeveloped farmland while the proposed development has a site fraction impervious of 10%. Overland flow for larger storm events will be directed around the building via the paved and landscaped areas to along the current flow paths.

The proposed layout can be found in Appendix A.

2.2 Existing Catchment

The existing site at Part Lot 2 McGlone Road, Drouin to be development is approximately 13,970 m2 and is bounded by a proposed residential development on the east and farmland on all other sides.

As indictaed above the exising site is farmland and will be developed as a new school over a number of stages. The site was analysed in its current developed state in order to ascertain the amount of flow that will be generated in its current condition using the AR&R Rational Method. This will set the benchmark in which an increase in flow from the developed scenario will result in a requirement to attenuate back to its pre-developed state. Table 1 below outlines the estimated flows for the 100 year predevlopment flow and the 100 year post development flow for the site.

Table 1 Estimated Peak Flows for the Pre-Developed Site

Parameter	100-year ARI	
	Pre-Development	Post Development
Peak Flows	699 l/s	1162 l/s

3 Stormwater Management Strategy

The stormwater management strategy proposed for the development at Part Lot 2 McGlone Road, Drouin has been developed to integrate the management of catchment run-off and the quality of the run-off in accordance with Section 53.18 of the Baw Baw Shire Planning Scheme Provisions. The primary objectives of this section relevant to this development focus on:

- Provide flood protection treatments for public safety and to protect downstream environments by retarding peak developed flows back to existing conditions; and
- Implementation of Water Sensitive Urban Design (WSUD) elements to treat post-developed pollutant-laden run-off to best practice guidelines

The stormwater drainage systems be designed to maximise benefits to the community based upon adequacy of design, the economy of construction and a high level of safety and amenity, including the provision to:

- Ensure hazardous situations do not arise on streets and footpaths;
- Ensure that all buildings in urban areas are protected against floodwaters;
- Limit rubbish and pollutants entering the stormwater drainage system;
- Integrate drainage works into urban planning development.

3.1 Requirements of Clause 56.07-4 Of The VPP

Clause 56.07-04 of the VPP requires urban runoff from new developments to meet best practice water quality and flow requirements. The objectives of Clause 56.07-4 of the VPP are:

1. To minimise damage to properties and inconvenience to residents from urban run-off.
2. To ensure that the street operates adequately during major storm events and provides for public safety.
3. To minimise increases in stormwater run-off and protect the environmental values and physical characteristics of receiving waters from degradation by urban run-off.

Standard C25 outlines the requirements to meet the Clause 56.07-4 of the VPP objectives and necessitates urban stormwater management systems must be designed and managed to the requirements of the relevant drainage authority.

In addition to other requirements, Standard C25 requires that urban stormwater management systems must be:

1. Designed to meet current best practice performance objectives for stormwater quality, as outlined in *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee 1999), as amended. The current water quality objectives are:

    a. 80 per cent retention of typical urban annual suspended solids load;

    b. 45 per cent retention of typical urban annual total phosphorus load; and

    c. 45 per cent retention of typical urban annual total nitrogen load.

2. Designed to ensure that flows downstream of the site are restricted to predevelopment levels unless increased flows are approved by the relevant drainage authority and there are no detrimental downstream impacts.

3.2 Proposed Concept

3.2.1 Catchment

The development will be served by an underground stormwater system that will be designed for the 1% storm event. This system will contain an underground detention system that will manage and limit the flow from the 1% storm event to the pre-development flows. The total detention system volume is to be 185m3.

The new underground stormwater system will be connected to the LPOD as nominated by the Developer of the adjoining residential land. The underground stormwater system will be designed to service the planned development on the site. Due to site spatial constraints both the detention and proposed water treatment system will be inline underground systems. The external pavements will be designed to convey the 1% storm event to the LPOD as overland flow.

4 Stormwater Quality

4.1 Release Criteria

The objectives for on-site treatment relating to urban stormwater quality identify the best practice as the removal of Total Suspended Solids (TSS), Total Phosphorus (TP), Total Nitrogen (TN) and Gross Pollutants (GP). The values are set out in the Victorian Stormwater Committee (1999) *Urban Stormwater Best Practice Environmental Management Guidelines* and have been reproduced in Table 2. These stormwater quality objectives reflect the level of stormwater management necessary to meet the SEPP (Waters of Victoria) (EPA Victoria, 2003) requirements and have been adopted as the design criteria for WSUD treatments.

Table 2 Objectives for Environmental Management of Stormwater

Pollutant	Receiving Water Objective	Current Best Practice Performance Objective
Total Suspended Solids (TSS)	Comply with SEPP (e.g. not to exceed the 90th percentile of 80mg/L)	80% retention of the typical urban annual load
Total Phosphorus (TP)	Comply with SEPP (e.g. base flow concentration not to exceed 0.08mg/L)	45% retention of the typical urban annual load
Total Nitrogen (TN)	Comply with SEPP (e.g. base flow concentration to not exceed 0.09 mg/L)	45% retention of the typical urban annual load
Gross Pollutants (GP)	Comply with SEPP (e.g. no litter in waterways)	70% retention of the typical urban annual load

4.2 Stormwater Quality Strategy

To achieve the best practice objectives shown in the above table, and underground water treatment system will be installed on the outlet discharge pipe from the site.

4.3 Modelling Results

For the proposed design of the underground water treatment system, a MUSIC model has been designed which incorporates the entire catchment.

Table 3 Source, Residual and Removal Loads for Catchment

Pollutant	Source Load (kg/yr)	Residual Load (kg/yr)	Load Removed (kg/yr)	% Reduction
Total Suspended Solids (TSS)	3750	749	3001	80
Total Phosphorus (TP)	6.03	1.49	4.54	75.2
Total Nitrogen (TN)	25.4	11	14.4	56.6
Gross Pollutants (GP)	379	17.2	361.8	95.5

5 Conclusions and Recommendations

This document provides a holistic approach to managing the stormwater infrastructure to be implemented for the proposed redevelopment of the mixed-use development located at Part Lot 2 McGlone Road, Drouin.

The report addresses the following key aspects:

- Retardation of 1% AEP storm events exiting the site to match the existing pre-developed conditions.
- Compliance with best practice stormwater quality treatment requirements for discharge to the existing drainage.
- For the catchment, it is recommended that the following infrastructure is implemented:
    - Installation of an underground detention systems totalling 185m3.
    - Installation of a Altan Hydrosystem SHS.400/3 combined with a Altan Ecocepter Series 1500.

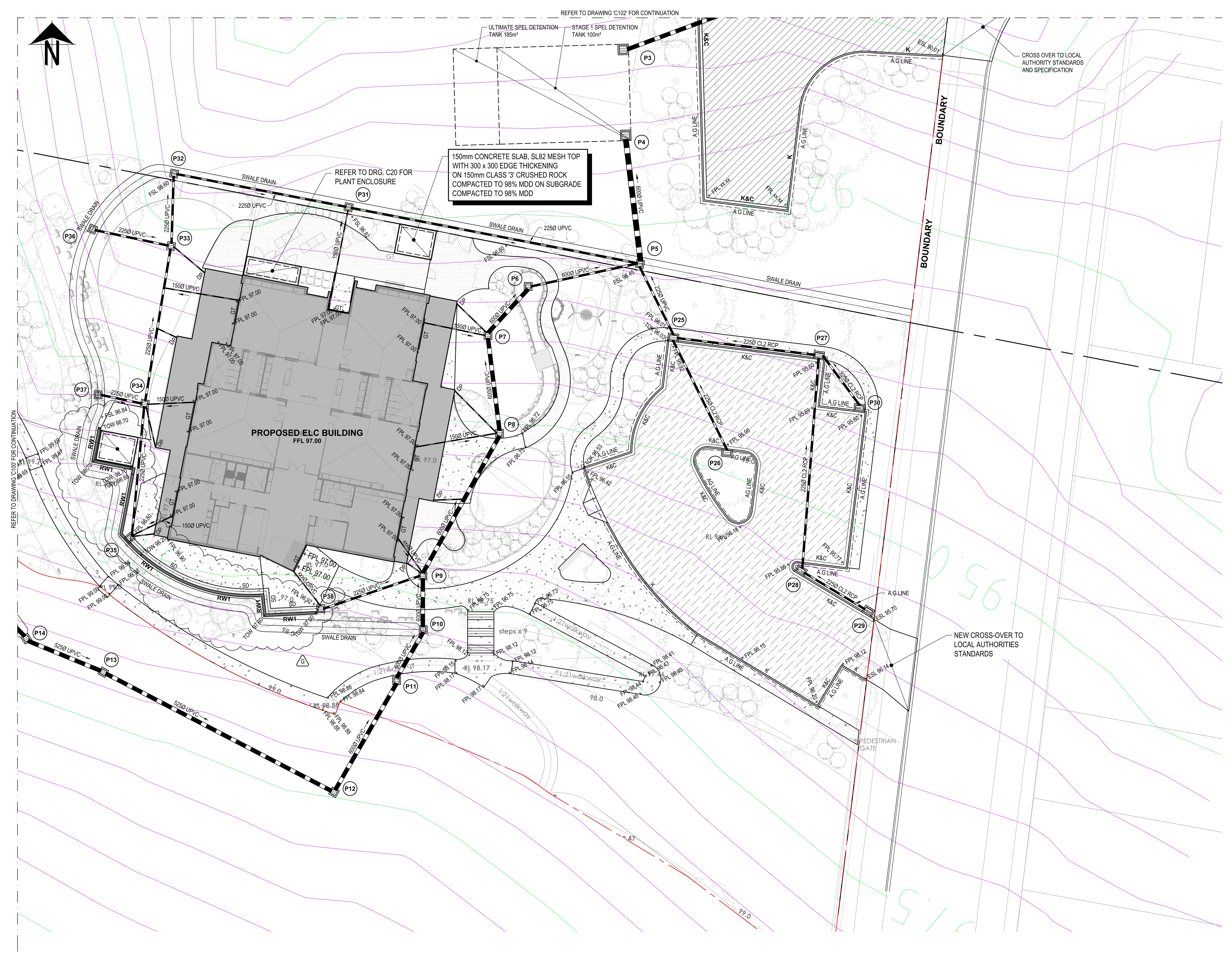
6 References

IEAust (2003), Australian Rainfall and Runoff Volume 2. Institute of Engineers Australia.

Melbourne Water Corporation (2010), MUSIC Guidelines: Recommended Input Parameters and modelling approaches for MUSIC Users.

Victorian Stormwater Committee (1999) Urban Stormwater Best Practice Environmental Management Guidelines.

Appendix A Plans



ADVERTISED PLAN

REV	DATE	REVISION DESCRIPTION	DRAWN	CHECKED	APPROVED
G	17/1123	TENDER ISSUE	HB	APS	APS
F	10/1123	TENDER ISSUE	LDC	APS	APS
E	30/10/23	TENDER ISSUE	MH	APS	APS
D	10/10/23	PRELIMINARY ISSUE	MH	APS	APS
C	13/09/22	PRELIMINARY ISSUE	MH	APS	APS
B	9/09/22	PRELIMINARY ISSUE	MH	APS	APS
A	1/08/22	PRELIMINARY ISSUE	MH	APS	APS

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PROJECT
SPAGS DROUIN
150 BOWEN STREET
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DRAWING TITLE
CIVIL LAYOUT PLAN SHEET 2

SCALE AT A1	DRAWN	DESIGNED
1:200	M HALL	A P SPENCER
PROJECT ENGINEER	**PROJECT MANAGER**	**DATE FIRST ISSUE**
A P SPENCER	A P SPENCER	1/08/22

STATUS
ISSUED FOR TENDER
NOT FOR CONSTRUCTION

CIVIL LAYOUT PLAN - SHEET 2
SCALE 1:200

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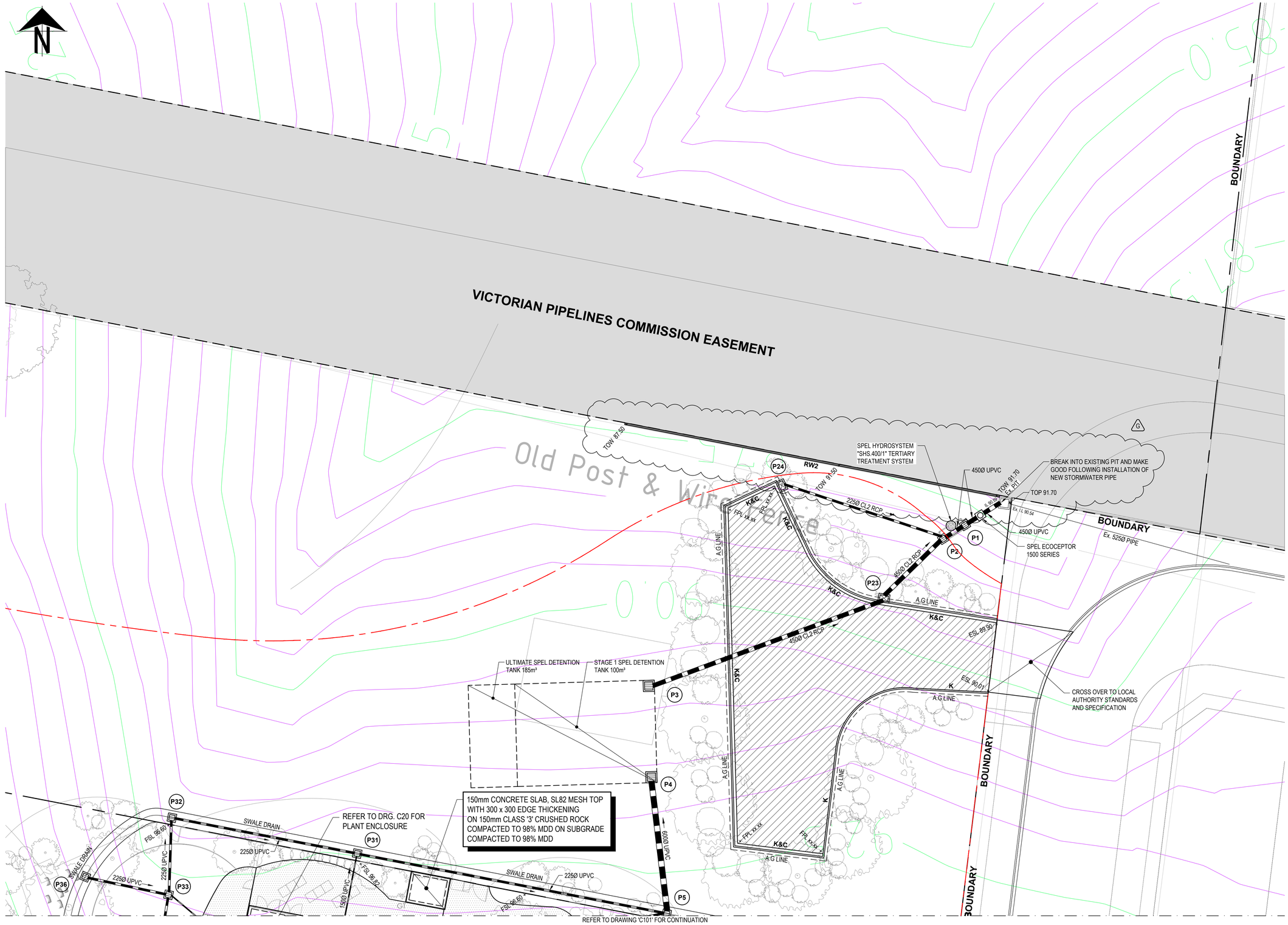
SCALE: 1:200

PROJECT No.	DRAWING No.	REVISION
220065	C101	G



CIVIL LAYOUT PLAN - SHEET 3

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SCALE: 1:200

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G	17/11/23	TENDER ISSUE	HB	APS	APS
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STATUS

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PROJECT No.	DRAWING No.	REVISION
220065	C102	G

Appendix B Detention Calculation

STORMWATER DETENTION CALCULATOR

CREO CONSULTANTS PTY LTD

Client:	Smith & Tracey
Project:	SPAGS Drouin

IFD STORM DATA

IFD IMPORTED CORRECTLY

COEFFICIENTS IMPORTED CORRECTLY

https://data.arr-software.org/

Engineer:	T Spencer
Job Number:	220065
Date:	5/12/2023
Revision:	A

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Predeveloped Conditions:

Catchment Area (ha)	13.97
Time of Concentration (min)	7
Fraction Impervious	0%

Fraction Impervious Calculator	
Impervious Area (m²)	10
Pervious Area (m²)	13740
Total Area (m²)	13750
Fraction Impervious	0%

	Annual Exceedence Probability						
	63.2%	50.0%	20.0%	10.0%	5.0%	2.0%	1.0%
Intensity (mm/hr)	46.45	52.60	72.32	86.10	99.88	118.64	133.41
Coefficient of Runoff	0.090	0.096	0.107	0.113	0.118	0.129	0.135
Q (m3/s)	0.162	0.195	0.300	0.376	0.458	0.596	0.699

Developed Conditions:

Catchment Area (ha)	13.97
Time of Concentration (min)	7
Fraction Impervious	10%

Fraction Impervious Calculator	
Impervious Area (m²)	13300
Pervious Area (m²)	126450
Total Area (m²)	139750
Fraction Impervious	10%

	Annual Exceedence Probability						
	63.2%	50.0%	20.0%	10.0%	5.0%	2.0%	1.0%
Intensity (mm/hr)	46.45	52.60	72.32	86.10	99.88	118.64	133.41
Coefficient of Runoff	0.150	0.159	0.178	0.187	0.196	0.215	0.224
Q (m3/s)	0.270	0.324	0.499	0.625	0.761	0.990	1.162

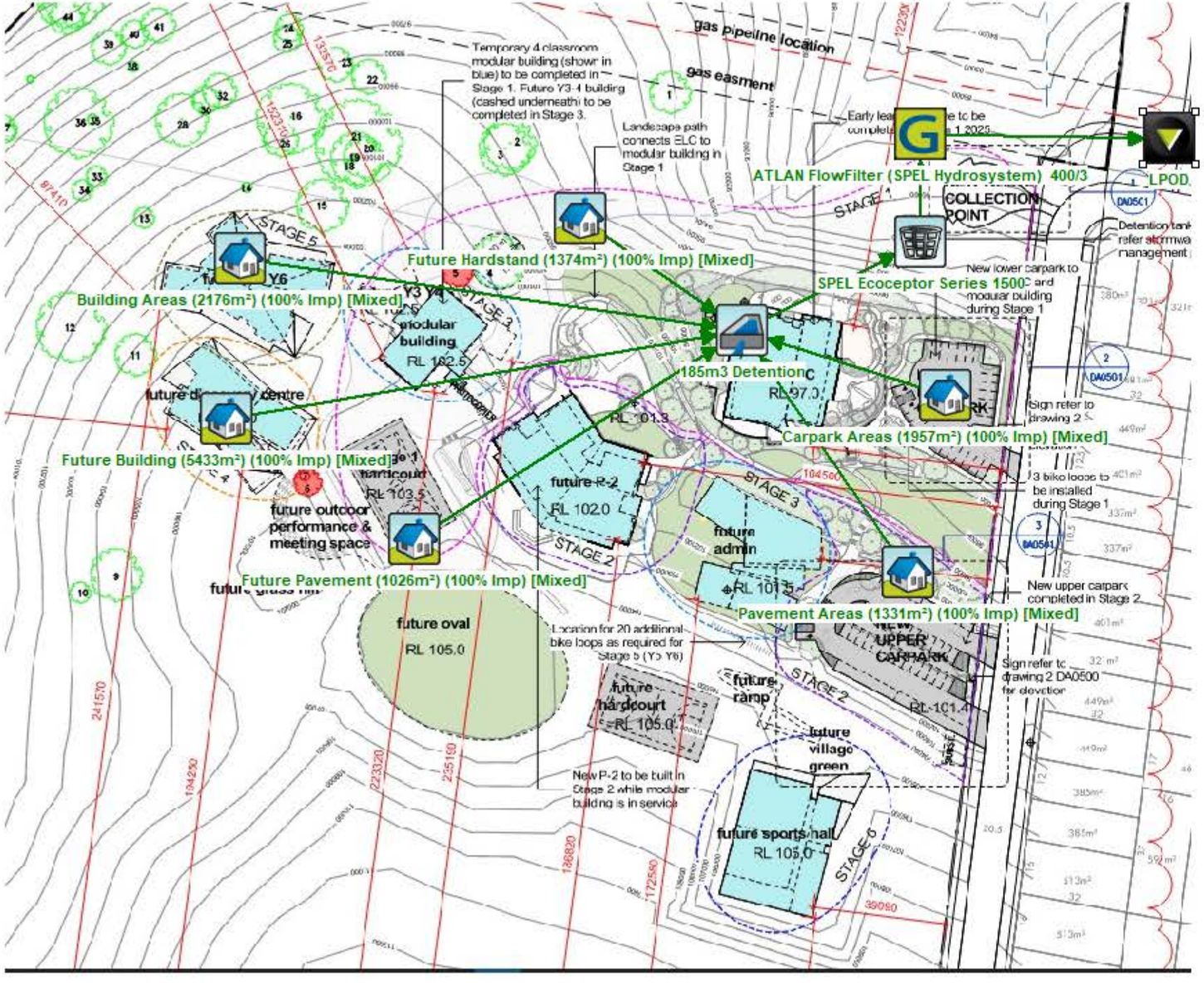
STORAGE CALCULATION

Retard Flows up to:	1%	AEP
Predeveloped Flow:	0.699	m³/s
OR Restrict flows to:		m³/s

FROM TABLE BELOW: **STORAGE REQUIRED (m³): 186.453** *Using the* **Boyd's Method**

Storm Duration (min)	Flow Rate In (l/s)	Volume In (m³)	Volume Out (m³)	Storage Required (m³)
1	2055.013	123.301	41.960	81.341
2	1602.214	192.266	83.920	108.345
3	1462.891	263.320	125.880	137.440
4	1375.814	330.195	167.841	162.355
5	1297.445	389.233	209.801	179.433
10	1010.091	606.055	419.601	186.453
15	823.747	741.372	629.402	111.970
20	700.098	840.117	839.203	0.914
25	611.279	916.919	1049.003	-132.084
30	544.230	979.614	1258.804	-279.190
45	416.227	1123.814	1888.206	-764.393
60	343.083	1235.098	2517.608	-1282.511
90	261.230	1410.645	3776.413	-2365.768
120	215.951	1554.844	5035.217	-3480.373
180	167.188	1805.625	7552.825	-5747.200
270	131.486	2130.073	11329.238	-9199.164
360	111.458	2407.500	15105.650	-12698.150
540	89.689	2905.928	22658.475	-19752.547
720	76.889	3321.598	30211.300	-26889.702
1080	61.650	3994.946	45316.951	-41322.005
1440	52.333	4521.586	60422.601	-55901.015
1800	45.715	4937.256	75528.251	-70590.995
2160	40.665	5270.169	90633.901	-85363.733
2880	33.438	5778.001	120845.202	-115067.201
4320	24.556	6364.829	181267.803	-174902.974
5760	19.157	6620.626	241690.404	-235069.778
7200	15.674	6771.095	302113.005	-295341.910
8640	13.149	6816.235	362535.606	-355719.371
10080	11.320	6846.329	422958.207	-416111.878

Appendix C MUSIC Model



Treatment Train Effectiveness - LPOD

	Sources	Residual Load	% Reduction
Flow (ML/yr)	10.4	10.4	0
Total Suspended Solids (kg/yr)	3730	625	83.2
Total Phosphorus (kg/yr)	6.05	1.05	82.6
Total Nitrogen (kg/yr)	25.6	10.6	58.7
Gross Pollutants (kg/yr)	379	0	100