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**ADVERTISED
PLAN**

Preliminary Drainage Strategy

for

Solar Farm Barnawartha North VIC

Stormwater Drainage and Detention Works

REVISION A

Job Ref: 700568

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1. INTRODUCTION

This Stormwater Management Plan has been prepared for the proposed Barnawartha North Solar Farm located at Murray Valley Highway, Barnawartha.

This report will discuss conceptual stormwater quantity and stormwater quality requirements.

This report has been prepared for the Development Application and provides conceptual information in relation to identifying potential stormwater runoff for particular storm events and strategies to ensure that the proposed development will mitigate against any potential impacts on the neighboring properties and environment.

2. PROPOSED DEVELOPMENT

The proposed development is located at Murray Valley Highway, Barnawartha. The site is located on the eastside of Margerys Road, Barnawartha- TP962006.

The development proposed is a solar farm which will be located in the property. Refer Figure 1 for the property boundary, solar farm layout and location.

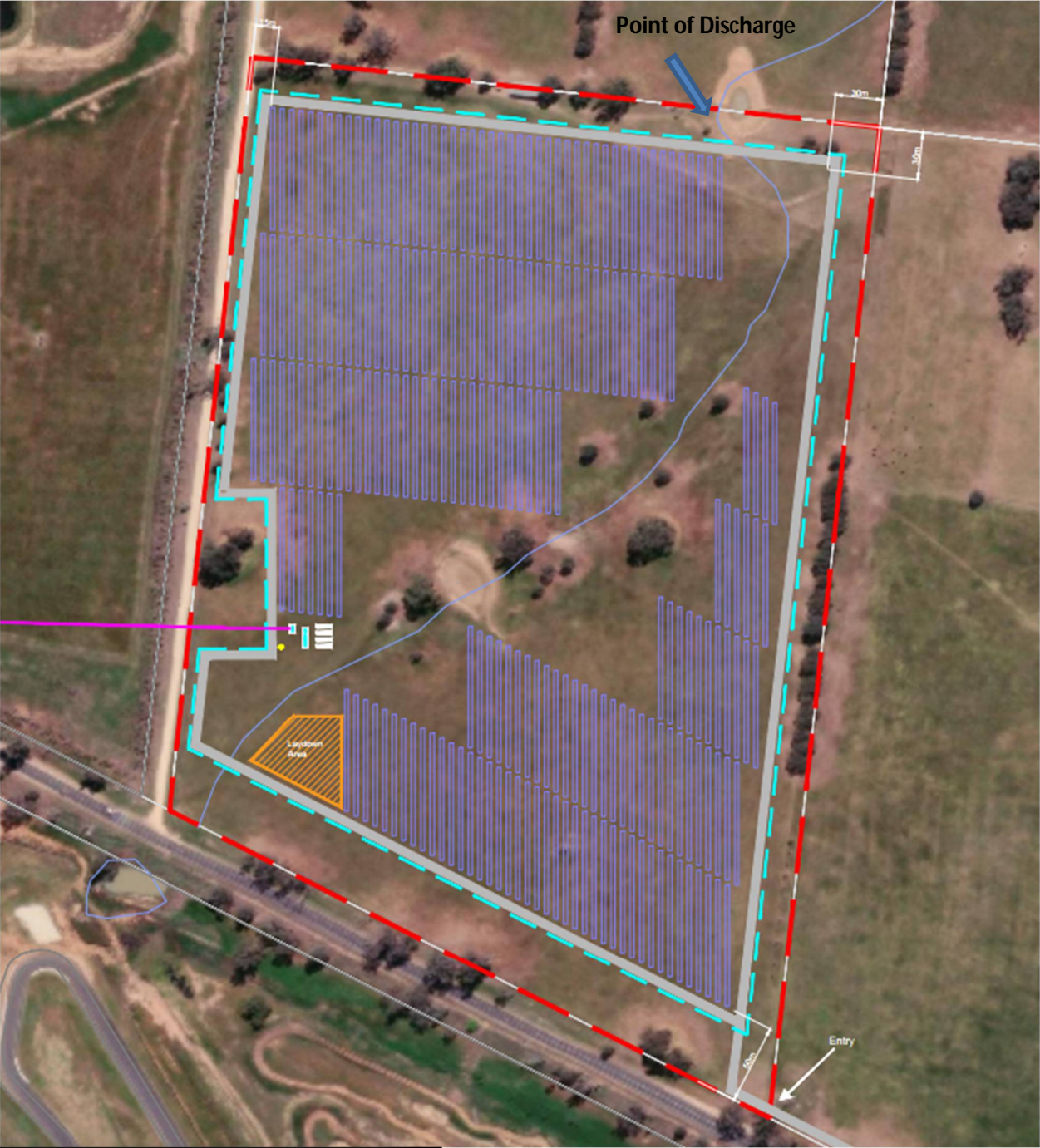
Key Points to be noted:

1. The solar panel array arrangement ensures that works do not impact on drainage and conveyance functions of waterways and no structures have been installed within the waterways on the site.
2. The point of discharge as in Figure 1 to adjacent property is not altered.
3. Grass to be retained to reduce the impact of rill erosion. The orientation of the solar panels with respect to the swale prevents sheet flow. The surface grade of the site allows for infiltration to further reduce rill erosion.

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LEGEND	
	Solar Farm Boundary
	Substation Area
	Vegetation Screening
	Security Perimeter Fence
	Access Tracks
	PV Arrays
	AC Cable
	Water Tank

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3. WATER QUANTITY

To assess the stormwater runoff for the site an assessment has been carried out using Boyd's formula to determine the predeveloped flow for the site and the post developed flow for the developed site.

The aim is to discharge the site to predeveloped flows.

The predeveloped flow has been calculated using the following parameters and based on the property as existing rural land.

A = 12.5 ha

C = 0.30

Tc = 65 min

STORM EVENT	FLOW (m3/s)
5	0.272
10	0.315
20	0.370
50	0.446
100	0.508

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The post developed flows have been calculated based on the following parameters and the developed site containing impervious areas including solar panels and gravel access roads.

A = 12.5 ha

C = .45

Tc = 60 min

STORM EVENT	FLOW (m3/s)
5	0.430
10	0.498
20	0.586
50	0.708
100	0.806

The Volume required for the retention basin will be 1073m³ (See Appendix A). This could be either site of the existing drainage or in the open drainage depending on Council and NECMA requirements.

4. WATER QUALITY

A stormwater quality analysis has been undertaken using the MUSIC software.

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The aim is to discharge water quality to pre developed levels. The targets for this are based on 'best practice' Water Sensitive Design which are;

Nutrient	Reduction Target (%)
Total suspended solids	80
Total phosphorus	45
Total nitrogen	45
Gross pollutants	70

It is proposed for the solar panels to discharge to the natural ground and for runoff to be dissipated into the natural ground. The runoff from the gravel access roads will be collected in the swale drain that's flowing through the farm as shown in figure 1. The swale drain will discharge into an onsite detention basin.

Refer Figure 2 for MUSIC Model which contains the swales and detention basin.

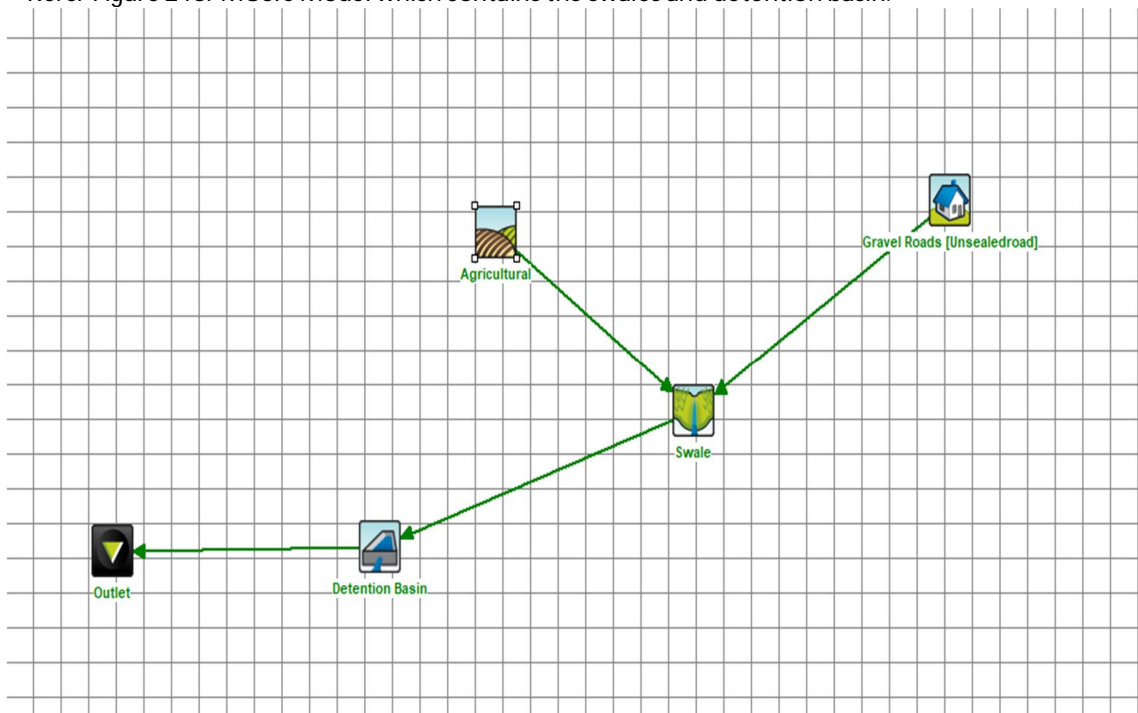


Figure 2 – MUSIC mode

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Inputs for the MUSIC mode include detention basin and swales. Refer Figure 3 for MUSIC inputs.

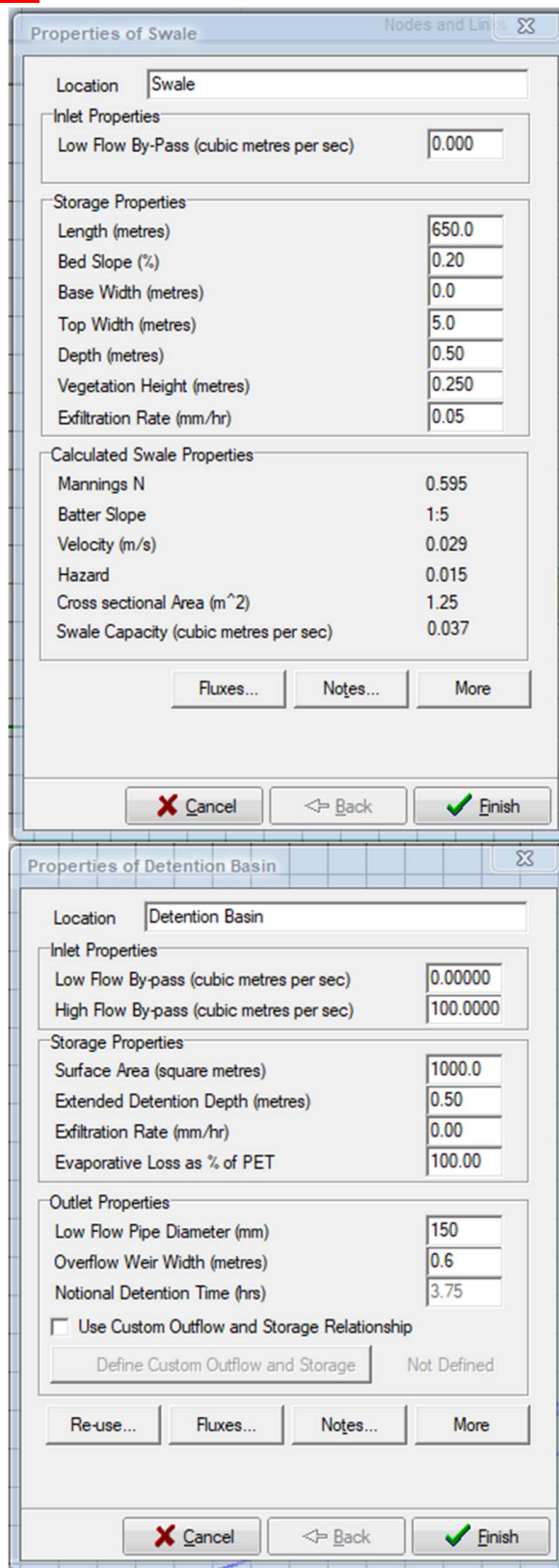


Figure 3 – MUSIC inputs

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MUSIC results shown in Figure 4 show the targets can be achieved. Refer Figure 4 for results.

	Sources	Residual Load	% Reduction
Flow (ML/yr)	3.9	3.32	14.9
Total Suspended Solids (kg/yr)	3110	66.7	97.9
Total Phosphorus (kg/yr)	2.38	0.434	81.8
Total Nitrogen (kg/yr)	13	4.69	63.9
Gross Pollutants (kg/yr)	176	0	100

Figure 4 – MUSIC results

5. CONCLUSION

The stormwater management plan for Crown Allotment 10, Section 29, and Allotment 6, Section 30 of the Parish of Barnawartha North shows that;

- Discharge from the developed site will be limited to predeveloped flows.
- The discharge to predeveloped flows is achieved by a detention basin that limits the discharge to predeveloped flows.
- The water quality targets can be achieved to 'best practice' targets.
- Solar panel arrangement does not impact drainage and conveyance functions of waterways.
- Rill erosion will be restricted, point of discharge and rate of flow of discharge to adjacent property is unaltered.

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6. APPENDIX

APPENDIX A

Drainage Retention Calculations- ATTACHED

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