DESIGN REPORT

PROJECT LOCATION
34 Park Street, East Gresford, NSW, 2311

CLIENT NAME
GRESFORD PARK LAND MANAGERS

DRB PROJECT NUMBER
221917

DISCLAIMER

Project Number: 221917

Client: Gresford Park Land Managers

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Report Issues

Revision	Date	Description	Author	Reviewer	Approver
A	15/03/24	ISSUED FOR DA	JT	CS	JT
B	13/08/24	ISSUED FOR DA	JT	CS	JT

Contents

1 INTRODUCTION

1.1 SCOPE AND REFERENCE DOCUMENTS SCOPE OF WORKS

The stormwater strategy outlined in this report has been prepared to support the DA submission for the proposed camping grounds and associated civil works at 34 Park Street, East Gresford. This report shows that there is a negligible increase in peak flows from the additional hardstand area and by collecting flows in swales and discharging over grass buffers that:

- A Neutral or Beneficial Effect (NorBE) result for Total Suspended Solids, Total Nitrogen, Total Phosphorous and Gross Pollutants have been achieved, and
- No OSD is required as the there is a negligible increase in the post-development peak flow rates compared to pre-developed peak flow rates.

1.2 SITE DESCRIPTION

The subject site is located at 34 Park Street, East Gresford and the location can be seen below in Figure 1. The development spans across both Lot 7002 DP 96464 & Lot 1 DP 11562, East Gresford and will be referred to as the subject site through the rest of this report. The subject site is located with Dungog Shire Council's LGA and is zoned RE1 – Public Recreation.

At the time of preparing this report the subject site was bordered by existing rural residential properties to the north, and south. The subject site is bordered by Park Street and residential properties to the west and the Allyn River to the east. The site is approximately 11.55 Ha in area. The subject site had moderate grass coverage, existing structures, grandstands, gravel roads and other fenced areas typically found at an existing rural showground. The subject site sloped approximately 5% from north to south. Stormwater flows across the site generally sheet flow to the south where flows would be discharge to either the Allyn River or the "blue line" that borders the south of the site.

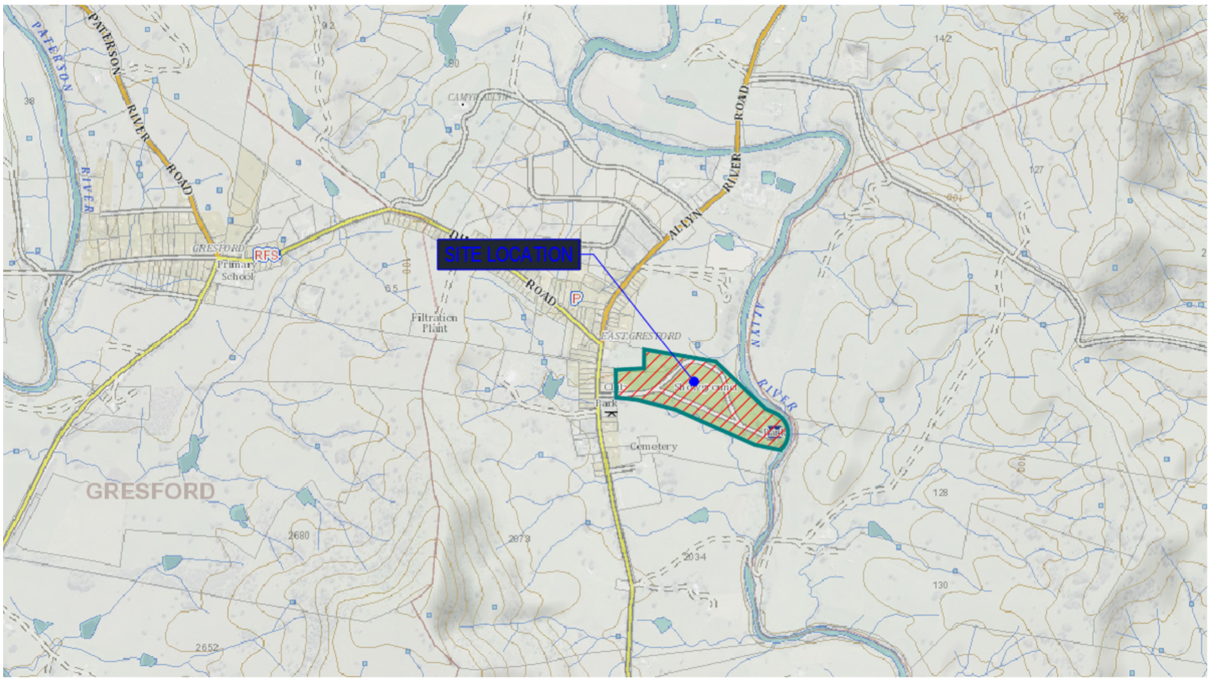

Figure 1: Subject Site

1.3 PROPOSED DEVELOPMENT

The proposed development will consist of the addition of 8 camping sites with associated carparking.

The proposed stormwater treatment devices including grassed lined swales and grass buffers will polish stormwater runoff to provide a NorBE result for the site. The additional hardstand area will result in a negligible increase in peak flow rates from the site and therefore it is deemed that water quantity requirements have been achieved.

The proposed layout of the site can be seen on the current civil drawings 221917 CIV-005.

2 Stormwater Management

2.1 DRAINS Model

A DRAINS model was developed to determine the pre and post-development peak flows rates for the site. The DRAINs model used the ARR 2019 Initial loss – Continuing Loss (IL-CL) hydrological model and 2016 IFD data. The Hydrological model parameters were determined using the ARR data hub and are shown below. Note the continuing loss has been factored by 0.4 in line with typical ARR guidance when more accurate data is not available. The model parameters can be seen below in Figure 2.

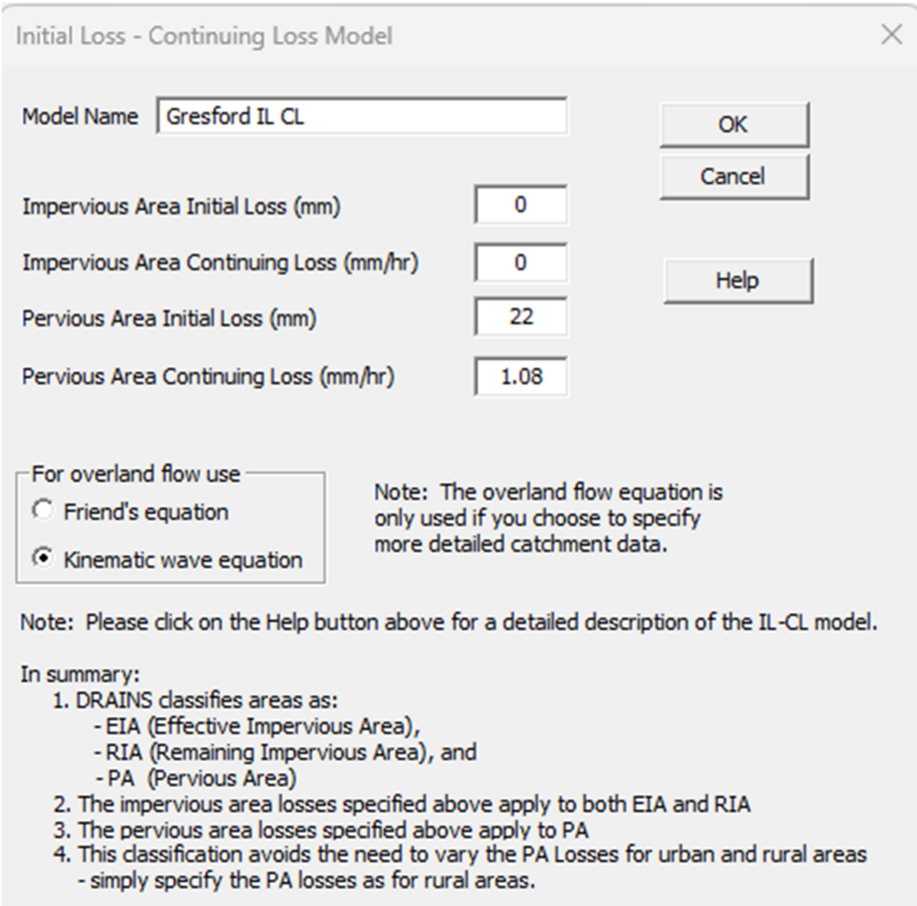

Figure 2: Hydrological Model Parameters

The model was developed for following storm durations:

5 minutes	45 minutes	6 hours
15 minutes	1.5 hours	12 hours
25 minutes	3 hours	24 hours

2.2 WATER QUANTITY/ OSD

2.2.1 PRE-DEVELOPMENT PEAK FLOWS

The pre-developed site conditions have been modelled based on the catchment characteristics seen below in Table 1.

Construction Stage	***Parameter***	
Pre-Development	Sub-Catchment Area	11.55 Ha
	Percentage Impervious	0 %
	Flow path Length	100.0 m
	Flow path Slope	5 %
	Retardance Coefficient ‘n’	0.12

Table 1 – Existing Catchment Parameters

The model was analysed for the 10% AEP (Annual Exceedance Probability), and 1% AEP events and the peak flow rates for each storm event can be seen below in Table 2.

Storm Event (Exceedance Probability / Annual Exceedance Probability)	***Peak Flow***
10% AEP	3.27 m^3/s
1% AEP	6.94 m^3/s

Table 2 – Pre-development peak flow rates

2.2.2 POST-DEVELOPMENT PEAK FLOWS

The post-developed site conditions have been modelled based on the proposed site layout. The post developed site conditions include the addition of hardstand for access roads and carparking areas. This additional hardstand is small compared to the total site and therefore has been modelled as discharging freely to adjacent swales and grass buffers with no OSD provide.

The impervious catchment areas can be idealised as captured and bypass. The catchment characteristics for the post-development catchment area can be seen below in Table 3.

Catchment	***Parameter***	
Post-Development	Sub-Catchment Area	11.55 Ha
	Impervious Area	555.00 m^2
	Percentage Impervious	4.8 %
	Flow path Length (Impervious)	3.0 m
	Flow path Length (Pervious)	100.0 m
	Flow path Slope (Impervious)	5 %
	Flow path Slope (Pervious)	5 %
	Retardance Coefficient ‘n’ (Impervious)	0.012
	Retardance Coefficient ‘n’ (Pervious)	0.1

Table 3: Post Development Catchment Parameters

A screenshot of the post-development DRAINS model can be seen below in Figure 3.

Figure 3: Hydrological Model Parameters

The Results of the DRAINs model can be seen below in Table 3.

Storm Event	Pre-Development Peak Flow	Post-Development Peak Flow	Difference
10% AEP	3.27 m³/s	3.27 m³/s	0.00 m³/s
1% AEP	6.94 m³/s	6.88 m³/s	-0.08 m³/s

Table 3 – Post-Development Peak Flow

It is noted that in the 10% AEP storm event there is a 0.00m³/s increase in the peak flow rate leaving the site.

It is noted that in the 1% AEP there is a reduction in the peak flow rate leaving the site. Which can likely be attributed to a minor change in the runoff hydrograph for the site as discussed below.

The hydrographs for both the pervious and impervious areas for the 1% storm event are shown below in Figure 4 and 5 respectively.

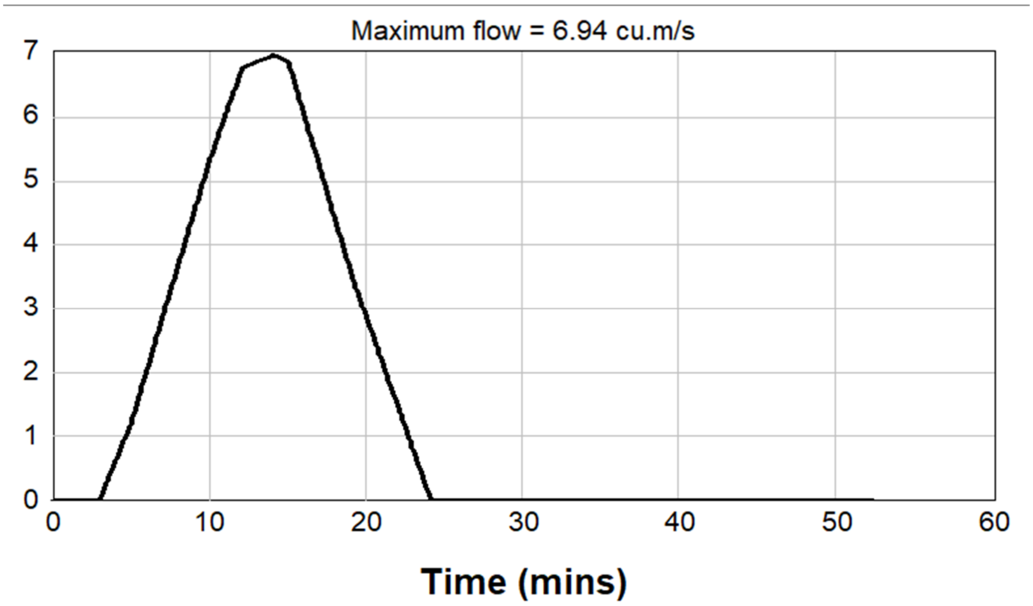

Figure 4: Post-development Pervious Area Hydrograph

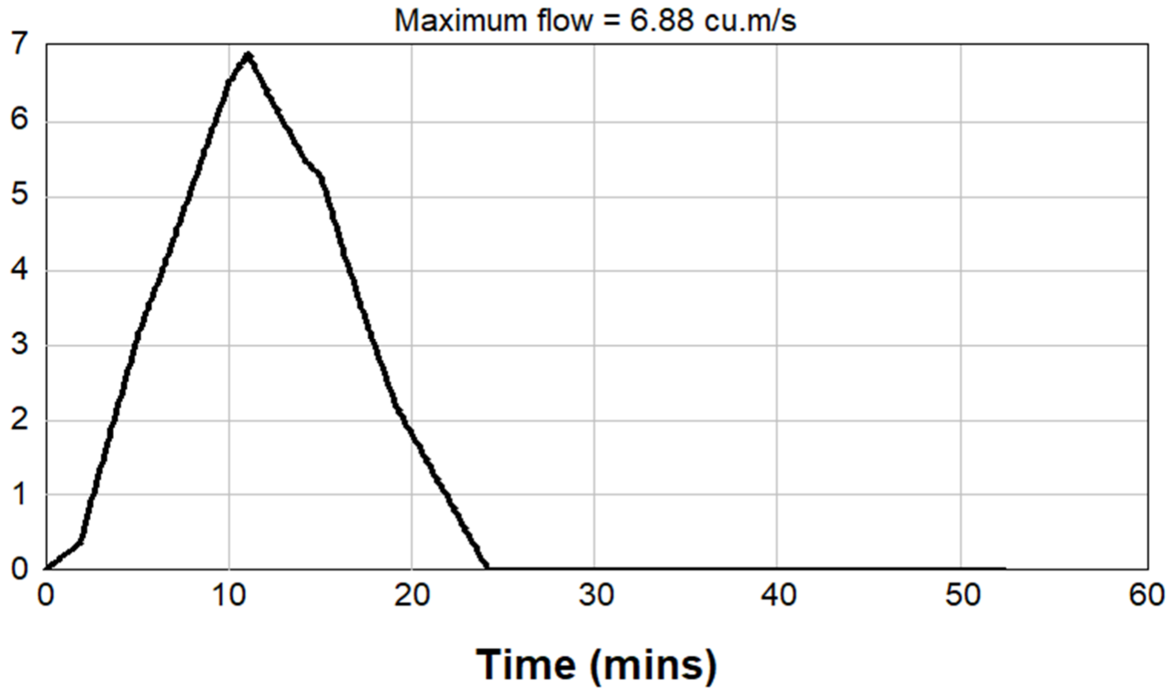

Figure 5: Post-development Impervious Area Hydrograph

As the flows from the impervious area are much smaller than (in the order of 4% of) the pervious area and reach a peak much earlier during the storm event, thus reducing the overall peak flows from the site during the 1% AEP (i.e. the peak flows from each hydrograph do not coincide).

2.2.3 Conclusion

By allowing runoff from the additional impervious area to discharge through the site unmitigated it shows no net increase in peak flows during the minor event and a decrease in the peak flows during the major event.

2.3 Water Quality

Stormwater quality treatment analysis was undertaken using the MUSICX software package to show the proposed development could adequately achieve a NorBE result for the site. As site specific soil data was not available the site was modelled utilising the nearest data available with MUSICX. MUSICX link data was used for the basis of the model and the rainfall data from William Town Raaf was used.

2.3.1 Music X Model & Assumptions

The MUSICX model was prepared based on the proposed layout for the subject site. In the post-developed state separate catchment areas were modelled, being the existing site area, and the multiple road and carparking areas.

The parameters and source nodes associated with each area are outlined below in Table 4. The source node parameters can be seen below in Tables 5 and 6.

LAND USE	SOURCE NODE	TOTAL AREA	% IMPERVIOUS	% PERVIOUS
PREDEVELOPMENT	Urban – Mixed	11.55 ha	0 %	100 %
ROADWAY	Urban - Sealed Road	0.055 ha	100 %	0 %

Table 4: Impervious Area's Parameters and Source Nodes

SOIL PARAMETER	VALUE
IMPERVIOUS AREA PROPERTIES	
Rainfall threshold (mm/day)	1.40
PERVIOUS AREA PROPERTIES	
Soil Storage Capacity (mm)	120
Initial Storage (% of Capacity)	30
Field Capacity (mm)	85
Infiltration Capacity Coefficient – a	150.0
Infiltration Capacity Exponent – b	3.50
GROUNDWATER PROPERTIES	
INITIAL DEPTH (MM)	10
Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	5.00
Daily Deep Seepage Rate (%)	0.00

Table 5: MUSIX X Source Node Soil Properties

CATCHMENT	FLOW	TSS		TP		TN	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
MIXED	Base Flow	1.20	0.17	-0.85	0.19	0.11	0.12
	Storm Flow	2.15	0.32	-0.60	0.25	0.30	0.19
SEALED ROAD	Base Flow	1.20	0.17	-0.85	0.19	0.11	0.12
	Storm Flow	2.43	0.17	-0.30	0.25	0.34	0.19

Table 6: MUSIX Source Node Base Flow and Storm Flow Pollutant Mean Concentration Values

A screenshot of the MUSICX model can be seen below in Figure 6.

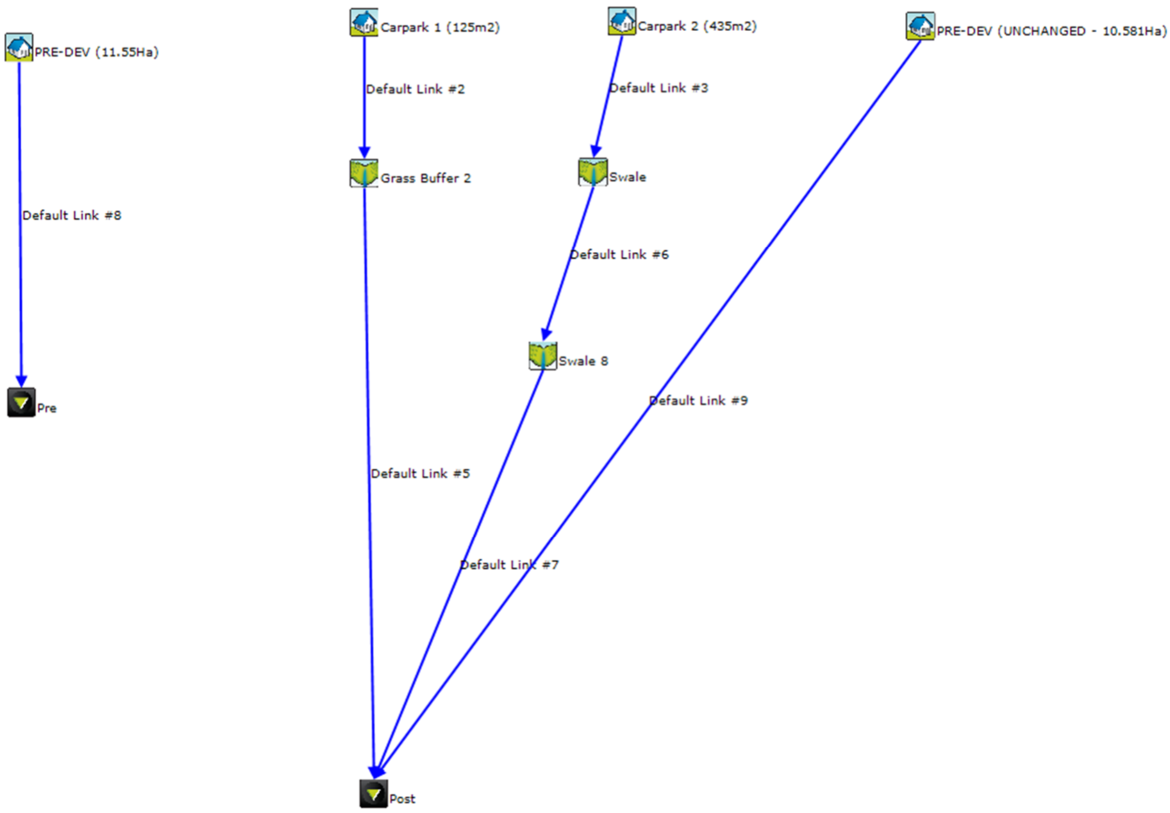

Figure 6: MUSICX Model.

2.3.2 TREATMENT TRAIN MEASURES

The stormwater quality treatment train for the subject site consisted of the following:

i) Grass lined swales. Portion of the carparking areas have been discharged to grassed line swales.

ii) Grass buffers. Portions of roadways and carparking areas have been allowed to sheet flow over grass buffers.

2.3.3 MUSICX RESULTS

The results of the music model can be seen in Table 7 below. These results show how a NorBE result has been achieved for the site.

	SOURCES		RESIDUAL		ACHEIVED	
	Pre	**Post**	**Pre**	**Post**	**Post-Pre**	**Achieved**
TSS (kg/yr)	2819	2776	2819	2583	- 193	YES
TP (kg/yr)	8.635	8.217	8.635	7.953	-0.264	YES
TN (kg/yr)	83.11	77.08	83.11	76.51	-0.57	YES
GP (kg/yr)	0	15.29	0	0	-15.29	YES

Table 7 – MUSICX Results

3 CONCLUSION

DRB Consulting Engineers has prepared this stormwater management report to outline the drainage strategy for the site. It found that a NorBE result could be achieved through the combination of grass lined swales and grass buffers. The minimal increase in impervious area creates a negligible or a reduction in peak flows.

Should you require any further advice or clarification of any of the above, please do not hesitate to contact us.

Yours faithfully

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<u>Reference</u>

Civil Drawings 221917.CIV-000-030