Oversby Consulting

Dardanup Park

Lot 2 Harold Douglas Dr and Lot 185 Venn Rd, Dardanup West

DRAINAGE REPORT

PREPARED FOR DARDANUP PARK P/L

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Oversby Consulting Pty Ltd
ABN 41 887 270 403

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ISSUE	DATE	ISSUE DETAILS	AUTHOR
1	January 2022	Submission for Project Team review	BCO
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1 INTRODUCTION

This Drainage Report has been prepared to specifically support the proposed rural residential development of the Dardanup Park project. It covers Lots 2 Harold Douglas Drive and Lot 185 Venn Road, Dardanup West.

The scope of work within this report includes:

- Review of existing site characteristics including landforms and discharge points that may affect drainage
- Summary of the pre-development network;
- Review of the proposed stormwater infrastructure and post-development layout
- Modelling of the post-development drainage
- Recommendations for the post-development drainage.

2 PROPOSED DEVELOPMENT

The subject land is approximately 84ha. It is located in Shire of Dardanup. It is bordered by the Dardanup townsite to the east, with rural properties to the north and south of the site. The western boundary is shared with small holding properties. The site location and proposed development is shown in Figure 1. The area is to be developed for 37 low density small holding lots 1 hectare and above. A reserve also is to be created over the onsite waterway and surrounding land. A balance lot of 29.78ha will also be created on the eastern portion, with a continuation of its current rural usage.

3 PRE-DEVELOPMENT CATCHMENT FEATURES

3.1 GENERAL SITE CHARACTERISTICS

The area is predominately cleared and used for low intensity agricultural activities with historical flood irrigation in the northern and eastern portions. There is some area of overstorey native trees however the understorey is predominately introduced pasture species

The soil type is generally loam/clays, on the flats with some raised sand dune areas. some small areas of low sand dunes in the northeast. The slopes are generally gentle. Gavin's Gully Main Drain, a degraded natural waterway, traverses the site, and forms the main drainage point for the subject land.

There is little surface run-off from the sandy portions of the site, except for the low sandy areas where groundwater rises close to the surface. The heavier soils on the flats will tend to run after moderate rainfall, noting that the pasture assists with capturing and slowing flow.

3.2 GAVIN'S GULLY FLOOD ANALYSIS

The subject land is located within the area affected by potential flooding of Gavin's Gully. There is no known flood modelling of the waterway, which is registered as a Water Corporation Main Drain. Technically the waterway has been cleaned out and deepened to accommodate the Water Corporation's management rate of 8.5m^3/s/1000ha. It is noted that at the point where the water turns westward the size of the channel width increases greatly, although it does maintain some characteristics of a natural waterway including a slightly meandering nature and isolated trees. Just downstream of the subject land, the waterway has been channelised into a typical drain.

Anecdotal evidence is that the waterway rarely floods outside of the main channel. The broad flat nature of the surrounding plain means that any flood waters are likely to spread sideways in a shallow flow. The sand dune along the eastern boundary also effectively protects the eastern portion of the proposed development from flooding out of the waterway. A conservative level of 0.3m above the top of the main channel bank has been assumed for the

1%AEP. A conservative level of 0.1m above the top of the main channel has been assumed for the 10% AEP, with the 20% being inside the channel itself.

The upstream catchment for Gavin's Gully stretches eastward, to the south of the Dardanup Townsite. It is likely that its peak flow for the 1% AEP would be more than 6 hours, given the flat nature of the contributing catchment. The peak flows for the subject land are all less than 30min. This means meaning that the peak flow for Gavin's Gully will arrive after peak flows from the subject land have exited the site.

4 STORMWATER MODELLING SUMMARY

The stormwater analysis has been completed using DRAINS modelling software utilising an ILSAX Hydrological model. DRAINS software is widely used to perform design and analysis calculations for industrial stormwater drainage systems. The ILSAX hydrological model uses a loss model involving depression storages and the Horton Infiltration model for pervious areas. The time area method is used as a routing model to convert rainfall hyetographs to runoff hydrographs (DRAINS, 2018).

The stormwater modelling utilises ARR 2016 procedures as presented in Chapter 5 of Book 2 of ARR 2016 and current rainfall data obtained from the ARR Data Hub (DRAINS, 2018). An analysis was undertaken for the pre and post-development scenario.

The general focus was that the overall post-development flow rate could not exceed the pre development rate for both the 20% AEP and 1% AEP events. Furthermore, for the road reserves, an analysis was undertaken to determine the level of storage that would be needed to choke flows back to the Water Corporations design rate of 8.5m^3/s/1000ha for all events up to and including the 1%AEP

4.1 PRE-DEVELOPMENT CATCHMENT MAPPING

The pre-development subject land has been divided into 8 sub-catchments. These catchments reflect where water generally flows towards. The catchments can be seen in Figure 2, while their areas and other details can be seen in Table 1.

Generally, there are:

- 2 catchments (1 and 2) that flow north to Harold Douglas Drive/Venn Road, where they enter existing roadside drains.
- 5 catchments contribute that flows to Gavin's Gully (3-7), with Catchment 6 flowing into catchment 5 before discharging into the gully.
- 1 Catchment (8) that currently flows completely southward, to discharge into neighbouring farmland and the unmade Shaw Road reserve.

It is also noted that Catchment 6 likely historically flowed southward too. A small rural drain, that is currently considerably blocked, diverts this flow into Catchment 5. It is likely however that from time to time, as the drain becomes even more blocked, that the flow turns south again. For this reason an analysis was undertaken of the likely total flow south under these conditions.

4.2 PRE-DEVELOPMENT MODELLING

The key modelling assumptions included:

- Areas containing standing surface water due to high groundwater were treated as impervious areas. They were assumed to have an Retardance coefficient of 0.019 to reflect some minor resistance to flows.
- Areas containing saturated pasture, but not inundated were considered supplementary impervious areas, as they are likely to contribute significant flows during the 20% and 1% AEP event situations.

- It was assumed that there was no back flow, as the flows off the subject land peak prior to the flow off Gavin's Gully and flows to the north and south were assumed to be at natural surface (rather than the base of any drains).
- No on-site storage volumes were modelled as investigations over the winter and spring show that all storages were full to the surface.
- The minor drains were not modelled, as they are generally less than 0.3m deep and much of the sites water does not directly flow to them.
- Non inundated grass areas were assumed to have a Retardance coefficient of 0.2
- Building roofs were assumed to have an Retardance coefficient of 0.013 to reflect the more likely rapid discharge during these larger events, when gutters overflow.
- Hardstand areas, and the inundated areas were assumed to have an Retardance coefficient of 0.019 to reflect some minor resistance to flows.

The storms modelled were the15min, 30min, 1 hr, 2hr, 6 hr, 12hr, 24hr and 48hr. These were modelled for the 20% AEP and 1%AEP.

The results are outlined in Table 1.

Table 1: Predevelopment Flow summary

Catchments	Area	Flow Discharge Direction	20% AEP max (m3/s)	1% AEP max (m3/s)	Comments
1	2.92	North	0.318	0.633	Harold Douglas road drain
2	3.2	North	0.35	0.695	Harold Douglas and Venn Road drain
3	5.5	Gavins Gully	0.614	1.21	Direct discharge, with some likely flow westward to adjoining development (Killarney Glen)
4	3.1	Gavins Gully	0.277	0.629	Direct discharge
5	15.5	Gavins Gully	2.59	6.41	Direct discharge
6	16.2	Cat 5	1.67	3.98	Flows into Cat 5 via small drain
7	3.26	Gavins Gully	0.035	0.286	East of main sand dune
8	3.2	South	0.197	0.576	Overland flow south
Total to Gavins Gully	43.56		3.516	8.535	Combine Catchments 3-7
Total	52.88		**4.381**	**10.439**	
Former catchment to south (or when drain blocked - currently partially blocked)	*19.4*	*South*	*1.87*	*4.56*	*Combines Catchments 8 and 6*

4.3 POST-DEVELOPMENT SCENARIO

The proposed development is designed to achieve a water sensitive design outcome for the 1EY, 20%AEP and 1% AEP. The system has been designed so that it achieves these outcomes while also controlling groundwater rise along the road network via roadside drains.

The post-development modelling for the development has been split into road and lot sub-catchments. Where possible these have been grouped to replicate the current pre-development catchments, so as to allow for comparisons.

33 internal sub-catchments were modelled. These were then grouped into catchments relevant to their discharge location. A full summary of the catchments can be seen in Table 3 and Figure 4. These catchments are as follows:

- 2 small catchments (HD1 and HDV2), composed solely of lots still discharge northwards.
- 1 small road catchment (2 sub-catchments, A1 & A2) has been designed to flow into the current swale on Killarney Road.
- 4 main catchments (B, C, D, E) discharge into Gavin's Gully (through 3 modelled outlets) with the sub-catchments being composed of both lot and road catchment types.
- 1 main catchment (F) discharges south, with flow assumed to be to spread into the unmade Shaw Road reserve. The contributing sub-catchments are composed of both lot and road catchment types.

The road catchments assume a sealed road, gravel verge and swales on either side. The lot catchments assumed some impervious areas (inundated areas and driveways, rooves etc) as well as supplementary areas that are waterlogged. Appropriate portions were also assumed for drier sand areas that include the natural dunes as well as likely imported sand around buildings.

Flows off lots were either directed to the roadside swales, or where relevant, directly to Gavin's Gully of the downstream receiving body. The storage breakdown for each catchment can be seen in Table 2 and 3.

4.4 POST-DEVELOPMENT MODELLING

The key modelling assumptions and characteristics are as follows:

- Catchments were designed to be logical areas of stormwater capture and discharge.
- The catchments were split into paved/impervious surfaces and pervious surfaces.
- Paved and impervious (inundated) areas had an assumed retardance coefficient of 0.013, while pervious surfaces (eg areas of non-inundated sand) were assumed to have a retardance coefficient of 0.2.
- Swales are generally assumed to be 0.5m deep to the invert of the overflow. A further 0.1m is assumed to be available until it floods into adjoining paddocks. The sides are assumed to be sloped at 1:4 approximately. The initial overflow is assumed to be directed by pipe to the downstream swale/basin/discharge location as relevant. The outlets were assumed to be at the base of the swales. The exception is Catchment F where the swales were assumed to have a1m flat base to assist with storage requirements.
- Basins were assumed to be a maximum of 1m deep. They have flat bases and side slopes between 1:4 and 1:6.
- The swales and basins for catchments C, D and F were sized to achieve the required storage (in conjunction with the upstream swales) to accommodate the Water corporations required flow rate of 8.5m^3/s/1000ha for the actual road reserve (not lots). Small orifices were incorporated into the base to match the flows allowed. A summary of the results can be seen in Table 2.
- To be conservative, no infiltration is assumed from the base of the swales or basins as for most of the catchments there is unlikely to be any appreciable infiltration during winter/early spring. Catchment E infiltration may be revisited as part of detailed design, as the road through here is predominately in deep sand.
- All final discharge pipes area assumed to be a minimum of 300mm diameter. 375mm diameter have generally been used throughout the road network.
- The final storms modelled were the15min, 25min, 30min, 1 hr, 2hr, 6 hr, 9hr, 12hr, 24hr and 48hr.

Table 3 provides a breakdown of the 20% and 1% AEP flows for the post-development scenario.
A visual capture of the model with the 1% AEP results can be seen in Figure 4. This also shows the pre-development catchments modelled across the top.

Table 2 Summary of required storage to achieve Water Corporation run off rates for roads

Catchment	Sub-catchment	Area (ha)	Swale Storage (m3)	Basin Storage (m3)	Allowable WC flow (M3/s)	Orifice required (mm)	1% post achieved with orifice (m3/s)	Comments
A								
	A1	0.136	260					
	A2	0.136	260					
Total To Killarney		**0.271**			**0.0023**	**50**	**0.003**	
B								
	B1	0.351	900					
	B2	0.351	900					
		0.703			**0.0060**	**65**	**0.006**	
C								
	C1	0.385	880					
	C2	0.385	880					
	C3	0.462	1020					
	C4	0.308	680					
		1.541		3000	**0.0131**	**65**	**0.014**	
D								
	D1	0.305	700					
	D2	0.322	740					
	D3	0.244	625					
		0.871		1100	**0.0074**	**60**	**0.007**	
E								
	E1	0.085	250					
	E2	0.085	250					
		0.170		0	**0.0014**	**45**	**0.002**	Pre is Cat 7
Total to Gavin's Gully		**3.285**			**0.0279**		**0.0290**	All catchments combined that discharge to Gavin's Gully
F								
	F1	0.401	1057.5					F Catchments swales have been widened with 1m base.
	F2	0.479	1350					
	F3	0.234	675					
Total to South		**1.114**		2800	**0.0095**	**40**	**0.012**	
ROAD TOTAL		**4.670**			**0.0397**		**0.0440**	

Table 3: Post-development flow summary

Catchment	Subcatchment	Area (ha)	Swale Storage (m3)	Basin Storage (m3)	Pre dev 20% (m3/s)	Pre dev 1% (m3/s)	20% post (m3/s)	1% post (m3/s)	Comments
A									
	A1	0.136	260						
	A2	0.136	260						
Total To Kilarney		**0.271**			**0**	**0**	**0.039**	**0.078**	
B									
	B1	0.351	900						
	B2	0.351	900						
	GGB1	3.480							
		4.183			**0.277**	**0.629**	**0.096**	**0.155**	Pre is approx Cat 4
	GGA1	**6.187**			**0.614**	**1.21**	**0.641**	**1.31**	Pre is approx Cat 3
C									
	C1	0.385	880						
	C2	0.385	880						
	C3	0.462	1020						
	C4	0.308	680						
	GGC1	3.860							
	GGC2	2.800							
	GGC3	3.180							
	GGC4	4.010							
		15.391		3000	**2.59**	**6.41**	**0.365**	**0.897**	Combines Pre Cat 5 and 6
D									
	D1	0.305	700						
	D2	0.322	740						
	D3	0.244	625						
	GGD1	2.290							
	GGD2	2.090							
	GGD3	4.340							
		9.591		1100			0.341	0.9	
E									
	E1	0.085	250						
	E2	0.085	250						
	GGE1	1.040							
	GGE2	1.370							
		2.580		0	**0.035**	**0.695**	**0.042**	**0.279**	Pre is Cat 7
Total to Gavin's Gully		**37.932**			**3.516**	**8.535**	**1.485**	**3.541**	All catchments combined that discharge to Gavin's Gully
F									
	F1	0.401	1057.5						F Catchments swales have been widened with 1m base.
	F2	0.479	1350						
	F3	0.234	675						
	SF1	2.010							
	SF2	3.100							
	SF3	3.230							
Total to South		**9.454**		2800	**0.197**	**0.576**	**0.059**	**0.144**	Pre is Cat 8
HD1		2.500		0	0.318	0.633	0.271	0.541	Pre is Cat 1
HDV2		2.650		0	0.35	0.695	0.292	0.58	Pre is Cat 2
Total to North		**5.150**			**0.668**	**1.328**	**0.563**	**1.121**	
TOTAL		**52.807**			**4.381**	**10.439**	**2.146**	**4.884**	

5 RESULTS

5.1 PRE-DEVELOPMENT VS POST-DEVELOPMENT FLOWS

Table 3 provides a comparison of the pre-development and post-development flows for the subject land for the different catchments, with Table 4 summarising the entire development. It is noted that there is a lower peak outflow for the post-development for all major catchments. This is predominantly due the large volume of storage within the road reserve swale network, so as to accommodate the Water Corporation's run of rate. This storage significantly slows the rate of outflow compared to the pre-development scenario where there is no significant storage. The new road network also creates barriers to the current overland sheet flow, which also contributes to a reduced overall flow rate during larger events.

The final discharge pipes could be increased to allow more flow off the site, however the swales are likely to remain similar in size, due to the need to control groundwater. The decreased overall flow rate also assists with helping manage flows into Gavin's Gully and provides some conservative management until such time as there is more detailed modelling of the entire system.

The reduced flow to the south also assist with not causing undue issues for the currently undeveloped areas. Flows could potentially be increased back to pre-development flows once Shaw Road is constructed and there is a designated swale to take any generated flows.

There is some minor flow generated into the Killarney Road swale (39l/s and 78l/s for the 20% and 1% AEP events respectively). While there is no flow shown in the pre-development scenario, it is likely that in larger events there would currently be some flows overland, due to the way in which the Catchment 3 was levelled (which directs water to the boundary).

Table 4: Pre vs Post-development flow summary

Scenario	Area(ha)	20% AEP (m^3/sec)	Critical Storm	1%AEP (m^3/sec)	Critical Storm
Pre-development	52.8	4.381	15-30min	10.439	15-30min
Post-Development	52.8	2.146	15-30min	4.844	15-30min

6 CONCLUSION AND RECOMMENDATIONS

The Drainage modelling shows that the proposed drainage system is suitable to control flows for the subject lands intended use in both the 20% AEP and 1% AEP storm events. Furthermore, the extensive use of grassed swales and planted basins will also assist with improving water quality within the catchment. The modelling shows that the storage designed achieved sufficient volume to accommodate the Water Corporations flow rate for the road reserve, as well as significantly reducing peak flows off the entire site.

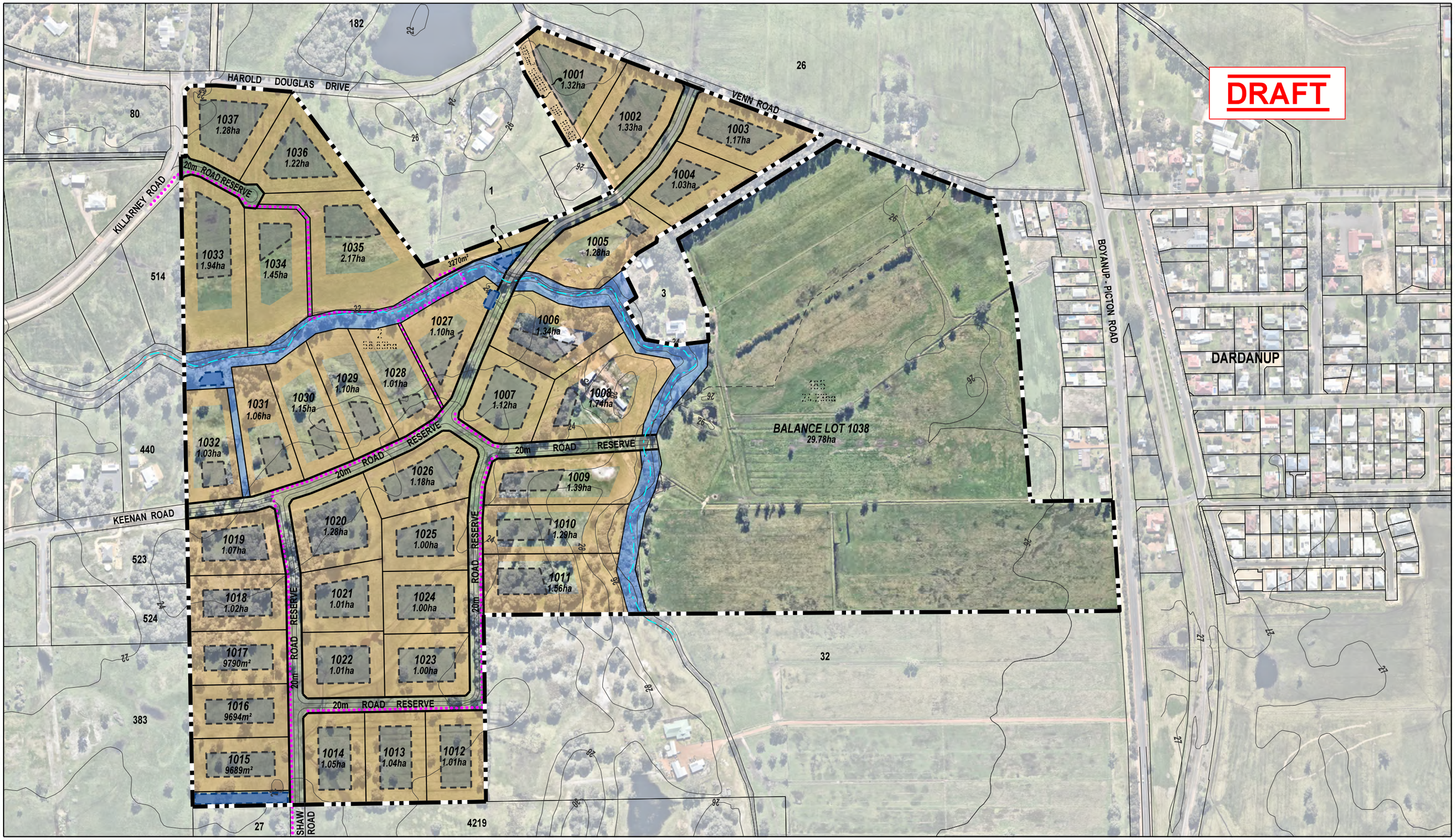
The model is to be refined for as part of future detailed design to accommodate the final areas available for storage and the exact road network, as well as agreed suitable outlet flows.

Future modelling as part of more detailed design may also look at the potential for some on-lot drains, where the lots may not have a clear flow path to their front road. This water is currently assumed to flow overland through adjoining blocks until it intercepts a roadside drain or Gavin's Gully.

7 REFERENCES

- WML Consulting Engineers (2021) Dardanup Park Lot 2 Harold Douglas Drive and Lot 185 Venn Road Dardanup West Site and Soil Evaluation
- WML Consulting Engineers (2021) Dardanup Park Lot 2 Harold Douglas Drive and Lot 185 Venn Road Dardanup Preliminary Geotechnical Investigation
- Oversby Consulting (2012) Lot 2 Harold Douglas Drive and Lot 185 Venn Road Dardanup Groundwater Monitoring Report
- Water Corporation email advice (October 2021)
- Shire and DWER email advice (October 2021)

Appendix A Figures



This plan has been prepared for planning purposes. Areas, contours and dimensions shown are subject to survey.

CONCEPT PLAN

Lot 2 Harold Douglas Drive and Lot 185 Venn Road, DARDANUP

LEGEND

- SUBJECT SITE
- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- PROPOSED DRAIN RESERVE
- LAND APPLICATION AREA (Secondary treated effluent)
- BUILDING EXCLUSION ZONE
- PROPOSED SUMP
- BRIDLE TRAIL
- 1.0m CONTOURS
- EXISTING DRAIN

Plan No. 21008-1-01a

DATE	3.12.2021
CO-ORDINATES	MGA 50
AERIAL	5.8.2021
REVISION	A

N

50m 0 50 100 150 200

1 : 2500 @ A1 or 1 : 5000 @ A3
ALL DISTANCES ARE IN METRES

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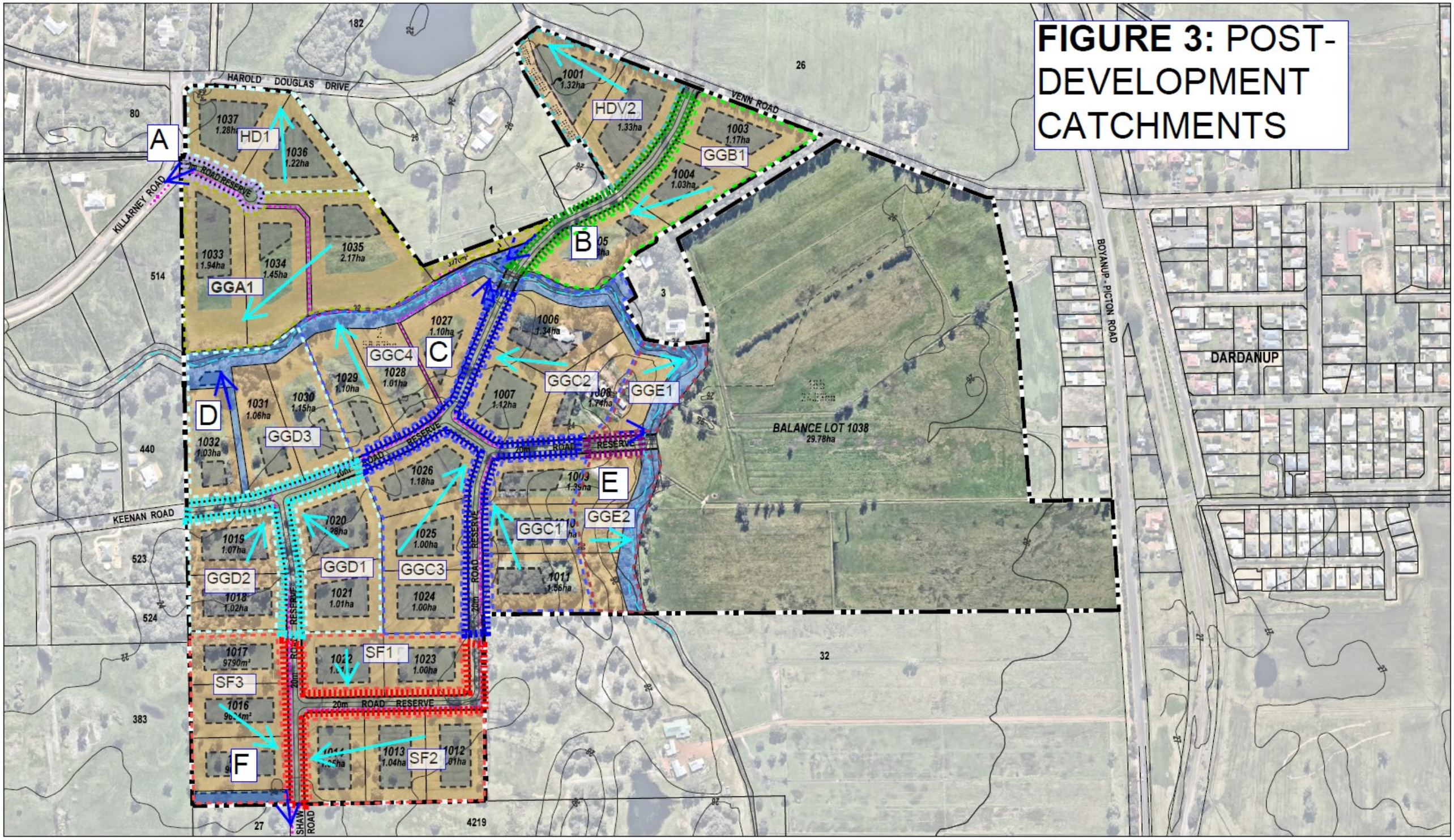
FIGURE 3: POST-DEVELOPMENT CATCHMENTS



LEGEND

- GGB1 — LOT CATCHMENT
- SUBJECT SITE
- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- PROPOSED DRAIN RESERVE
- LAND APPLICATION AREA (Secondary treated effluent)
- B — ROAD CATCHMENT
- LOT FLOW DIRECTION
- LOT CATCHMENTS BOUNDARY
- BUILDING EXCLUSION ZONE
- PROPOSED SUMP
- BRIDLE TRAIL
- 1.0m CONTOURS
- EXISTING DRAIN
- ROAD CATCHMENT BOUNDARY
- ROAD DISCHARGE LOCATIONS

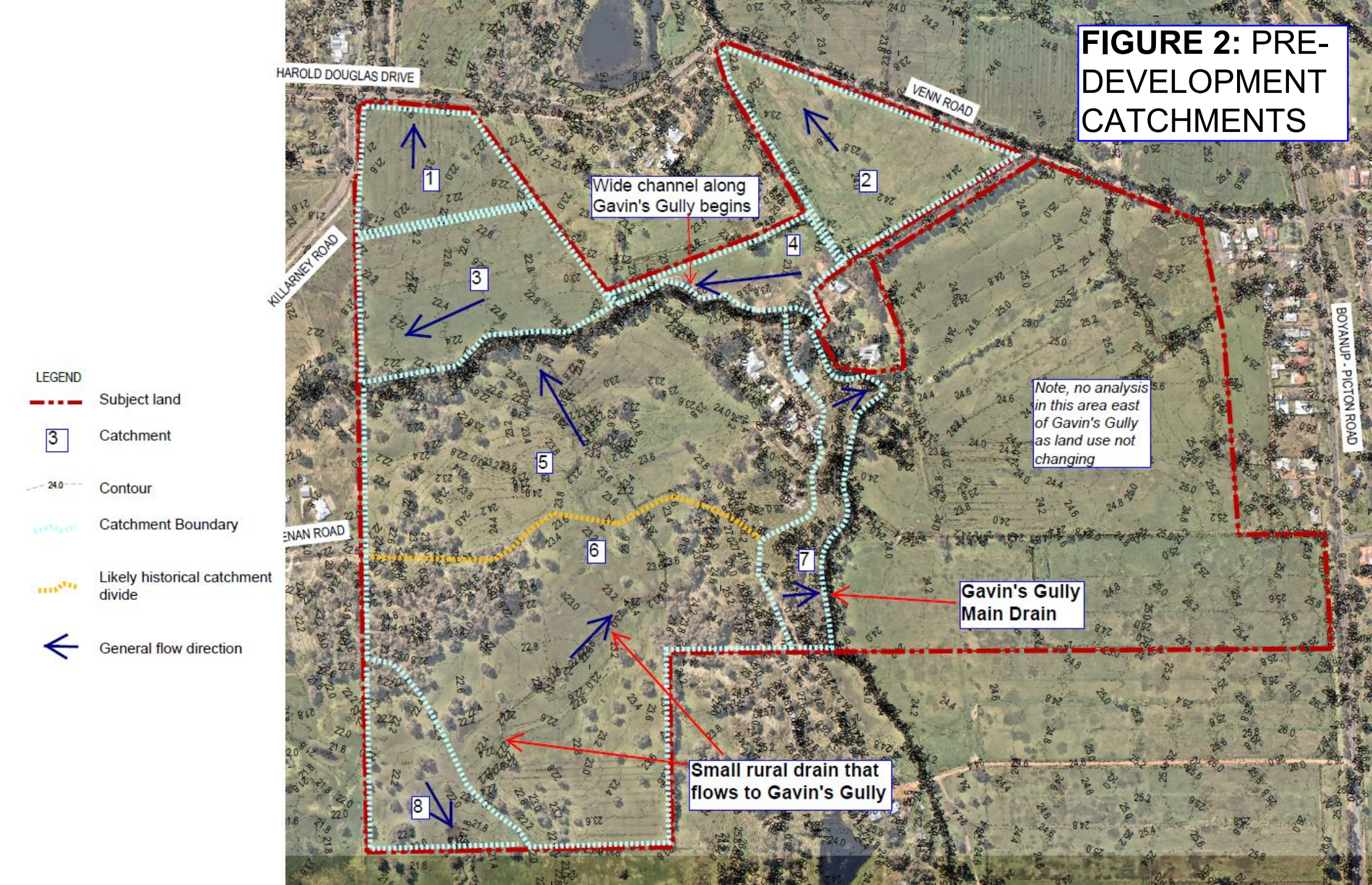
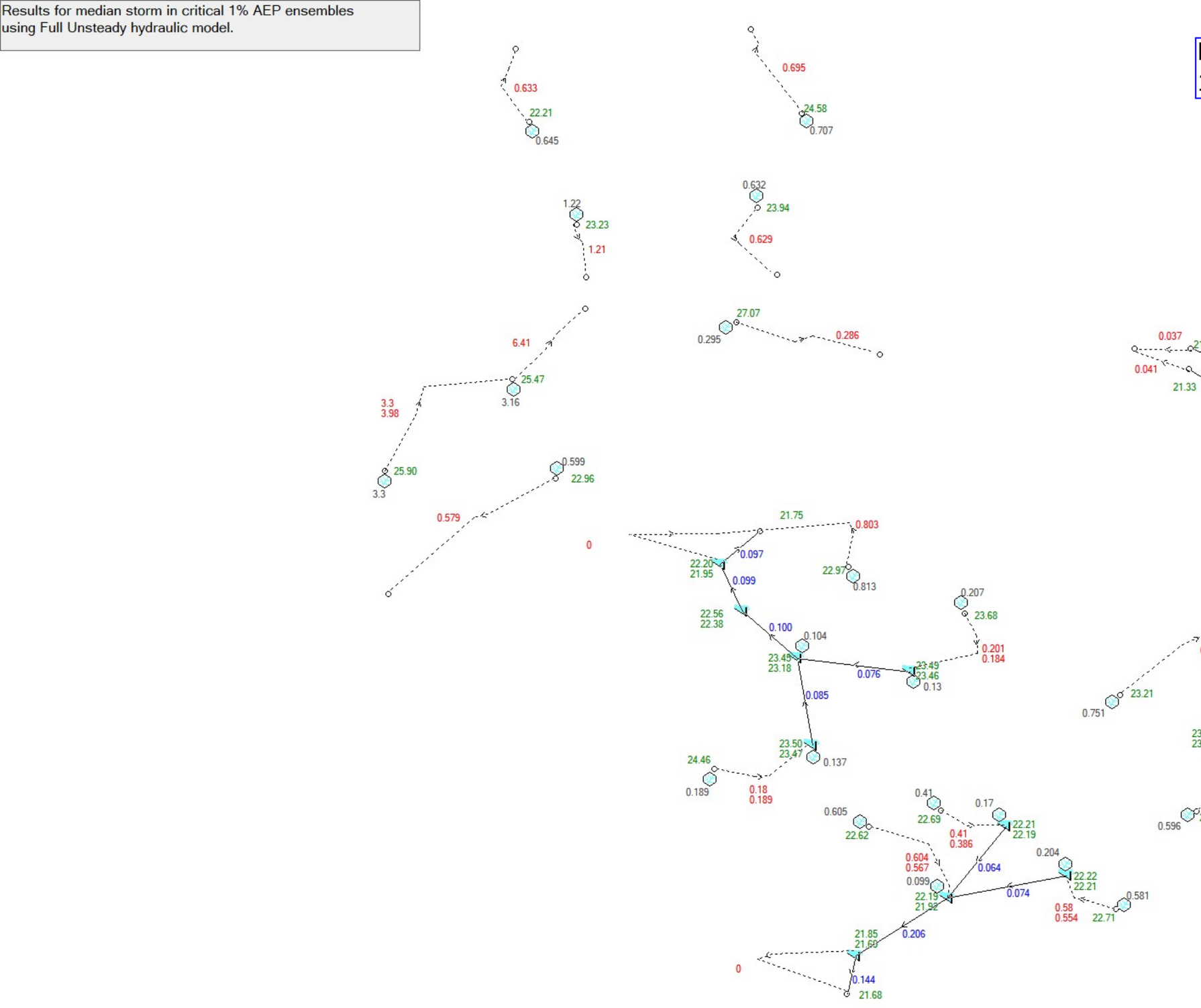


FIGURE 2: PRE-DEVELOPMENT CATCHMENTS
HAROLD DOUGLAS DRIVE
VENN ROAD
KILLARNEY ROAD
BOYANUP - PICTON ROAD
ENAN ROAD
1
2
3
4
5
6
7
8
Wide channel along Gavin's Gully begins
Note, no analysis in this area east of Gavin's Gully as land use not changing
Gavin's Gully Main Drain
Small rural drain that flows to Gavin's Gully
LEGEND
Subject land
Catchment
Contour
Catchment Boundary
Likely historical catchment divide
General flow direction

Results for median storm in critical 1% AEP ensembles using Full Unsteady hydraulic model.



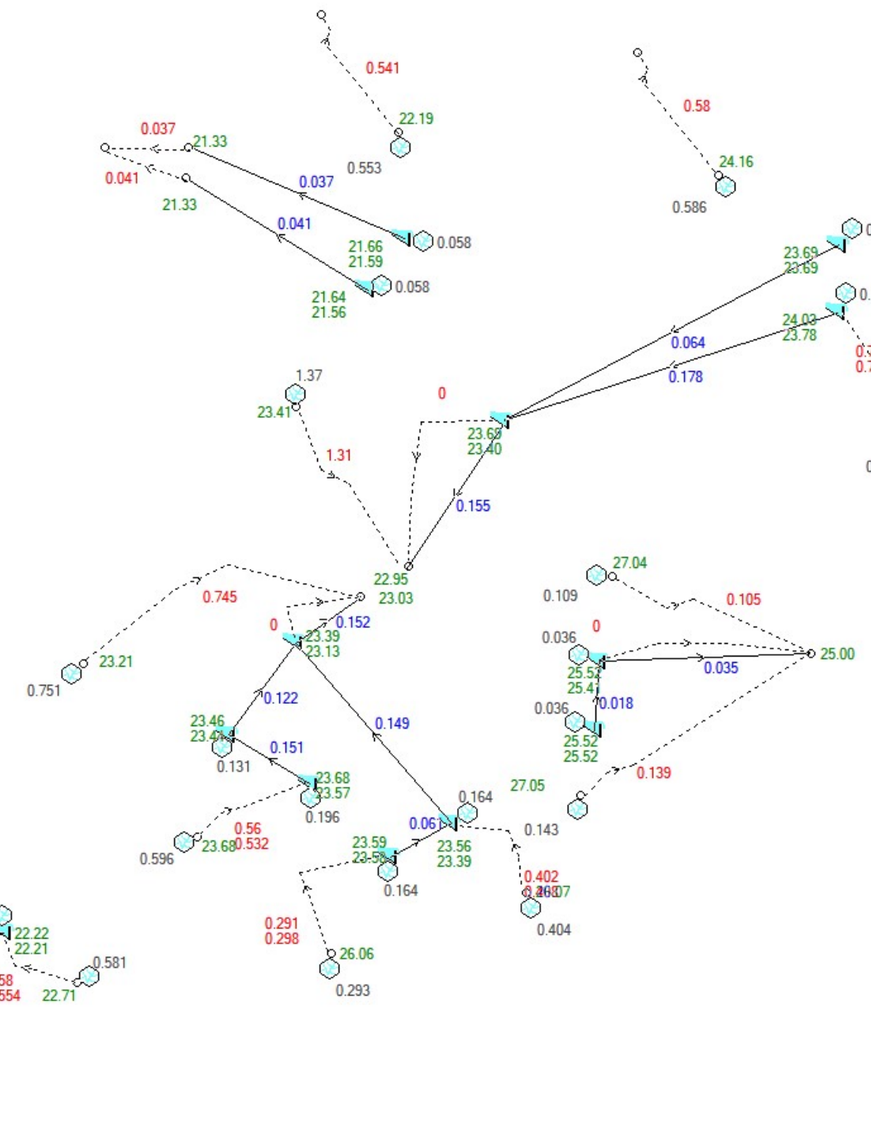


FIGURE 4: MODELLED RESULTS FOR 1% AEP PRE AND POST

Appendix B Modelling data

DRAINS results prepared from Version 2021.031

PIT / NODE DETAILS **Version 8**

Name	Max HGL	Max Pond	Max Surfa	Max Pond	Min	Overflow	Constraint
		HGL	Flow Arrivi	Volume	Freeboard	(cu.m/s)	
			(cu.m/s)	(cu.m)	(m)		
A1 outlet pit	21.69		0		0.31	0.003	Inlet Capacity
Gavins Gully C outlet	22.86		0				
Gavins Gully Cat E outl	25		0				
Gavins Gully D outlet	21.83		0				
Southern discharge	21.61		0				
Gavins Gully B Outlet	23		0				
Kilarney Rd outlet 1	21.4		0				

SUB-CATCHMENT DETAILS

Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm
	Flow Q	Max Q	Max Q	Tc	Tc	Tc	
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)	
Cat A1	0.028	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat A2	0.028	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat B1	0.072	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat B2	0.072	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat C2	0.078	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat C1	0.078	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat C3	0.094	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat C4	0.063	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat E2	0.017	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat E1	0.017	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat D1	0.062	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat D3	0.05	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat D2	0.066	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat F1	0.082	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat F3	0.048	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat F2	0.098	0	0	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9
Cat F Lots	0.948	0	0	5	15	10	20% AEP, 30 min burst, Storm 3

PIPE DETAILS

Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)	
Cat A1 outlet	0.005	0.06	21.695	21.695	20% AEP, 15 min burst, Storm 6
Cat A2 outlet pipe	0.004	0.05	21.695	21.695	20% AEP, 15 min burst, Storm 6
Cat B1 outlet pipe	0.037	0.59	23.509	23.481	20% AEP, 15 min burst, Storm 1
Cat B2 outlet pipe	0.037	0.59	23.509	23.481	20% AEP, 15 min burst, Storm 1
Cat C2 outlet pipe	0.04	0.61	23.316	23.278	20% AEP, 15 min burst, Storm 1
Cat C1 outlet pipe	0.062	0.72	23.276	23.271	20% AEP, 15 min burst, Storm 1
Cat C outlet Pipe	0.012	1.05	23.097	22.862	20% AEP, 15 min burst, Storm 5
Cat C3 outlet pipe	0.044	0.64	23.324	23.272	20% AEP, 15 min burst, Storm 1
Cat C4 outlet pipe	0.054	0.64	23.271	23.271	20% AEP, 15 min burst, Storm 1
Cat E2 outlet pipe	0.001	0.01	25.56	25.56	20% AEP, 12 hour burst, Storm 5
Cat E1 outlet Pipe	0.002	0.57	25.474	25.223	20% AEP, 2 hour burst, Storm 4
Cat D1 outlet pipe	0.036	0.58	23.304	23.274	20% AEP, 15 min burst, Storm 1
Cat D3a outlet pipe	0.068	1.71	23.189	23.045	20% AEP, 30 min burst, Storm 5
Cat D3b outlet pipe	0.062	0.99	22.425	22.308	20% AEP, 30 min burst, Storm 5
Cat D outlet pipe	0.004	0.9	22.173	21.833	20% AEP, 15 min burst, Storm 5
Cat D2 outlet pipe	0.037	0.59	23.307	23.274	20% AEP, 15 min burst, Storm 1
Cat F1 outlet pipe	0.048	0.43	22.002	22.108	20% AEP, 1 hour burst, Storm 9
Cat F outlet to final bas	0.186	1.88	21.908	21.765	20% AEP, 30 min burst, Storm 3
Cat F outlet pipe	0.08	1.28	21.725	21.606	20% AEP, 2 hour burst, Storm 3
Cat F2 outlet pipe	0.046	0.42	21.99	22.097	20% AEP, 2 hour burst, Storm 1

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
Cat A outlet orr	0.003	0.003						20% AEP, 2 hour burst, Storm 1
Cat B outlet orr	0.005	0.005						20% AEP, 2 hour burst, Storm 1
OF paddock F	0.888	0.833	0.642	0.685	0.25	4	1.61	20% AEP, 30 min burst, Storm 3

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q	Max Q	Max Q
			Total	Low Level	High Level
A1 swale	21.7	0	0.005	0.005	0
A2 swale	21.7	0	0.004	0.004	0
B1 Swale	23.51	0	0.037	0.037	0
Cat B final basin	23.48	0	0.005	0	0.005
B2 Swale	23.51	0	0.037	0.037	0
C2 Swale	23.32	0	0.04	0.04	0
C1 Swale	23.28	0	0.062	0.062	0
Cat C final basin	23.27	0	0.012	0.012	0
C3 swale	23.33	0	0.044	0.044	0
C4 swale	23.27	0	0.054	0.054	0
E2 Swale	25.55	0	0.001	0.001	0
E1 Swale	25.55	0	0.002	0.002	0
D1 Swale	23.3	0	0.036	0.036	0
D3 Swale	23.27	0	0.068	0.068	0
Connection swale Cat D	22.48	0	0.062	0.062	0
Cat D final basin	22.31	0	0.004	0.004	0
D2 Swale	23.31	0	0.037	0.037	0
F1 Swale	21.96	0	0.048	0.048	0
F3 Swale	22.09	0	0.186	0.186	0
Cat F final basin	21.72	0	0.08	0.08	0
F2 swale	21.96	0	0.046	0.046	0
Cat F lot depression	22.46	0	0.888	0	0.888

Run Log for Venn Road drainage model with full catchments added.drn run at 21:04:32 on 13/12/2021 using version 2021.031
No water upwelling from any pit. Freeboard was adequate at all pits.

DRAINS results prepared from Version 2021.031

PIT / NODE DETAILS **Version 8**

Name	Max HGL	Max Pond HGL	Max Surfa Flow Arriv (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)
Kilarney Rd outlet 1	21.32		0			
Kilarney Rd Outlet 2	21.32		0			
Gavins Gully C outlet	22.86		0.408			
Gavins Gully Cat E outlet	25		0.035			
Gavins Gully D outlet	21.83		0.439			
Southern discharge	21.58		0			
SF3 node	22.57		0.332			
SF1 node	22.66		0.24			
SF2 node	22.66		0.319			
GGE2 node	27.01		0.025			
GGE1node	27.01		0.019			
HDV2 node	24.11		0.345			
HD1 node	22.13		0.325			
CGA1 node	23.27		0.805			
GGB2 node	24.51		0.453			
GGD3 node	22.9		0.447			
GGD2 node	24.42		0.03			
GGD1	23.63		0.033			
GGC1 node	26.02		0.072			
CGC2 node	26.02		0.052			
GGC3 node	23.5		0.327			
GGC4	23.12		0.413			
Pre 2 node	24.52		0.416			
Pre 1 node	22.14		0.38			
Pre 3 node	23.16		0.715			
Pre 4 node	23.89		0.37			
Pre 5 node	25.27		3.586			
Pre 6 node	25.6		1.933			
Pre 7 node	27.02		0.046			
Pre 8 node	22.89		0.329			
Gavins Gully B Outlet	22.8		0.769			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm	
Cat A1	0.028	0.014	0.014	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat A2	0.028	0.014	0.014	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat B1	0.072	0.036	0.035	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat B2	0.072	0.036	0.035	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat C2	0.078	0.04	0.039	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat C1	0.078	0.04	0.039	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat C3	0.094	0.048	0.046	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat C4	0.063	0.032	0.031	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat E2	0.017	0.009	0.009	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat E1	0.017	0.009	0.009	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat D1	0.062	0.032	0.031	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat D3	0.05	0.025	0.024	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat D2	0.066	0.033	0.032	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat F1	0.082	0.042	0.04	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat F3	0.048	0.024	0.023	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat F2	0.098	0.05	0.048	0.61	2.47	0.52	20% AEP, 15 min burst, Storm 9	
Cat SF3 Lots	0.213	0.032	0.201	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat SF1	0.185	0.019	0.175	5	15	10	20% AEP, 30 min burst, Storm 5	
Cat SF2	0.204	0.031	0.193	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat GGE2	0.016	0.016	0	5	15	10	20% AEP, 15 min burst, Storm 9	
Cat GGE1	0.012	0.012	0	5	15	10	20% AEP, 15 min burst, Storm 9	
Cat HDV2	0.3	0.026	0.289	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat HD1	0.283	0.025	0.272	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat GGA1	0.7	0.062	0.674	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat GGB2	0.393	0.035	0.379	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat GGD3	0.286	0.043	0.271	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat GGD2	0.024	0.024	0	5	15	10	20% AEP, 15 min burst, Storm 9	
CatGGD1	0.026	0.026	0	5	15	10	20% AEP, 15 min burst, Storm 9	
CatGGC1	0.044	0.044	0	5	15	10	20% AEP, 15 min burst, Storm 9	
Cat GGC2	0.032	0.032	0	5	15	10	20% AEP, 15 min burst, Storm 9	
Cat GGC3	0.209	0.032	0.198	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat GGC4	0.264	0.04	0.25	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat Pre 2	0.362	0.032	0.349	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat Pre 1	0.33	0.029	0.318	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat Pre 3	0.622	0.055	0.599	5	15	10	20% AEP, 30 min burst, Storm 3	
Cat Pre 4	0.285	0.029	0.27	5	15	10	20% AEP, 30 min burst, Storm 5	
Cat Pre 5	1.423	0.143	1.352	5	15	10	20% AEP, 30 min burst, Storm 5	
Cat Pre 6	1.488	0.15	1.413	5	15	10	20% AEP, 30 min burst, Storm 5	
Cat Pre 7	0.037	0.037	0	5	15	10	20% AEP, 15 min burst, Storm 9	
Cat Pre 8	0.211	0.032	0.2	5	15	10	20% AEP, 30 min burst, Storm 3	

PIPE DETAILS

Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm	
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)		
Cat A1 outlet	0.021	0.95	21.574	21.475	20% AEP, 15 min burst, Storm 3	
Cat A2 outlet pipe	0.018	0.81	21.595	21.478	20% AEP, 15 min burst, Storm 1	
Cat B1 outlet pipe	0.037	0.49	23.547	23.546	20% AEP, 15 min burst, Storm 1	
Cat B2 outlet pipe	0.154	1.44	23.702	23.546	20% AEP, 30 min burst, Storm 3	
Cat C2 outlet pipe	0.046	0.61	23.345	23.331	20% AEP, 15 min burst, Storm 1	
Cat C1 outlet pipe	0.078	0.76	23.331	23.331	20% AEP, 30 min burst, Storm 5	
Cat C outlet Pipe	0.012	1.06	23.129	22.861	20% AEP, 15 min burst, Storm 5	
Cat C3 outlet pipe	0.092	0.91	23.422	23.346	20% AEP, 30 min burst, Storm 3	
Cat C4 outlet pipe	0.065	0.62	23.339	23.331	20% AEP, 30 min burst, Storm 8	
Cat E2 outlet pipe	0.008	0.1	25.548	25.548	20% AEP, 48 hour burst, Storm 9	
Cat E1 outlet Pipe	0.002	0.86	25.474	25.217	20% AEP, 2 hour burst, Storm 4	
Cat D1 outlet pipe	0.037	0.58	23.312	23.292	20% AEP, 15 min burst, Storm 1	
Cat D3a outlet pipe	0.072	1.75	23.195	23.05	20% AEP, 30 min burst, Storm 5	
Cat D3b outlet pipe	0.068	0.84	22.459	22.399	20% AEP, 30 min burst, Storm 3	
Cat D outlet pipe	0.005	0.86	22.181	21.836	20% AEP, 6 hour burst, Storm 7	
Cat D2 outlet pipe	0.043	0.63	23.324	23.292	20% AEP, 15 min burst, Storm 1	
Cat F1 outlet pipe	0.052	0.52	21.915	21.898	20% AEP, 1 hour burst, Storm 8	
Cat F outlet to final basin	0.141	1.62	21.789	21.725	20% AEP, 1 hour burst, Storm 5	
Cat F outlet pipe	0.059	1.15	21.676	21.576	20% AEP, 2 hour burst, Storm 4	
Cat F2 outlet pipe	0.045	0.46	21.911	21.898	20% AEP, 30 min burst, Storm 3	

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF Kil 1	0.021	0.021	0.642	0.029	0.02	4	1.28	20% AEP, 15 min burst, Storm 3
OF Kil 2	0.018	0.018	0.642	0.028	0.02	4	1.31	20% AEP, 15 min burst, Storm 1
OF Cat B basin	0	0	0.908	0	0	0	0	
Cat B outlet orr	0.112	0.112						20% AEP, 1 hour burst, Storm 2
OF Cat C basin	0	0	0.908	0	0	0	0	
OF Cat E final	0	0	0.908	0	0	0	0	
OF Cat D basin	0	0	0.908	0	0	0	0	
OF Cat F basin	0	0	0.908	0	0	0	0	
OF lot SF3	0.211	0.202	0.642	0.498	0.07	4	1	20% AEP, 30 min burst, Storm 3
OF lot SF1	0.184	0.182	0.642	0.52	0.06	4	1	20% AEP, 30 min burst, Storm 5
OFlot SF2	0.203	0.197	0.642	0.517	0.07	4	1.03	20% AEP, 30 min burst, Storm 3
OFlot GGE2	0.014	0.014	0.642	0.024	0.02	4	1.95	20% AEP, 15 min burst, Storm 5
OFlot GGE1	0.011	0.009	0.642	0.022	0.02	4	2.1	20% AEP, 15 min burst, Storm 4
OF lot HDV2	0.292	0.293	0.642	0.111	0.08	4	0.77	20% AEP, 30 min burst, Storm 3
OF lot HD1	0.271	0.265	0.642	0.129	0.08	4	0.6	20% AEP, 30 min burst, Storm 3
OFlot CGA1	0.641	0.612	0.642	0.266	0.17	4	0.64	20% AEP, 30 min burst, Storm 3
OFlot GGB2	0.391	0.36	0.642	0.462	0.11	4	1	20% AEP, 30 min burst, Storm 3
OF lot GGD3	0.279	0.279	0.642	0.097	0.08	4	0.86	20% AEP, 30 min burst, Storm 3
OF lot GGD2	0.021	0.031	0.642	0.227	0.02	4	1.43	20% AEP, 15 min burst, Storm 7
OF lot GGD1	0.023	0.031	0.642	0.213	0.01	4	0.57	20% AEP, 15 min burst, Storm 2
OF lGGC1	0.041	0.054	0.642	0.331	0.04	4	2.08	20% AEP, 15 min burst, Storm 5
OF lot GGC2	0.03	0.043	0.642	0.249	0.04	4	2.16	20% AEP, 15 min burst, Storm 5
OF5743	0.192	0.173	0.642	0.347	0.06	4	0.59	20% AEP, 30 min burst, Storm 3
OF5752	0.26	0.259	0.642	0.119	0.07	4	0.63	20% AEP, 30 min burst, Storm 3
OF Pre 2	0.35	0.352	0.642	0.121	0.1	4	0.84	20% AEP, 30 min burst, Storm 3
OFPre 1	0.318	0.313	0.642	0.14	0.09	4	0.64	20% AEP, 30 min burst, Storm 3
OF Pre 3	0.614	0.618	0.642	0.157	0.17	4	1.09	20% AEP, 30 min burst, Storm 3
OF Pre 4	0.277	0.277	0.642	0.091	0.08	4	0.92	20% AEP, 30 min burst, Storm 5
OF Pre 5	2.589	2.6	0.642	0.27	0.69	4	2.55	20% AEP, 30 min burst, Storm 3
OF Pre 6	1.426	1.674	0.642	0.499	0.44	4	1.6	20% AEP, 30 min burst, Storm 3
OF Pre 7	0.035	0.034	0.642	0.03	0.03	4	1.63	20% AEP, 15 min burst, Storm 5
OF Pre 8	0.197	0.196	0.642	0.091	0.06	4	0.67	20% AEP, 30 min burst, Storm 3

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q	Max Q	Max Q
			Total	Low Level	High Level
A1 swale	21.57	4.9	0.021	0.021	0
A2 swale	21.6	6.6	0.018	0.018	0
B1 Swale	23.55	32.3	0.037	0.037	0
Cat B final basin	23.55	149	0.112	0	0.112
B2 Swale	23.76	229.3	0.154	0.154	0
C2 Swale	23.35	33.5	0.046	0.046	0
C1 Swale	23.33	81.5	0.078	0.078	0
Cat C final basin	23.33	1037.9	0.012	0.012	0
C3 swale	23.45	107.2	0.092	0.092	0
C4 swale	23.35	111.6	0.065	0.065	0
E2 Swale	25.55	15.3	0.008	0.008	0
E1 Swale	25.55	15.3	0.002	0.002	0
D1 Swale	23.31	18.8	0.037	0.037	0
D3 Swale	23.29	39.7	0.072	0.072	0
Connection swale Cat D	22.49	23.8	0.068	0.068	0
Cat D final basin	22.4	317	0.005	0.005	0
D2 Swale	23.33	23.1	0.043	0.043	0
F1 Swale	21.92	163	0.052	0.052	0
F3 Swale	21.9	206.6	0.141	0.141	0
Cat F final basin	21.68	622.9	0.059	0.059	0
F2 swale	21.91	189.1	0.045	0.045	0

Run Log for Venn Road drainage model with full lot catchments added.drn run at 16:05:05 on 9/1/2022 using version 2021.031

PIT / NODE DETAILS			Version 15												
Name	Type	Family	Size	Ponding	Pressure	Surface	Max Pond	Base	Blocking	x	y	Bolt-down	id	Part Full	Inflow
				Volume	Change	Elev (m)	Depth (m)	Inflow	Factor			lid		Shock Loss	Hydrograph
				(cu.m)	Coeff. Ku			(cu.m/s)							
Kilarney Rd outle	Node					21.3		0		531.667	-216.667		11		No
Kilarney Rd Outle	Node					21.3		0		532.667	-207		153285		No
Gavins Gully B Ou	Node					22.8		0		602.381	-339.486		2229		No
Gavins Gully C ou	Node					22.8		0		586.976	-349.064		8687		No
Gavins Gully Cat	Node					25		0		729.308	-366.948		27157		No
Gavins Gully D ou	Node					21.6		0		329.774	-292.802		32741		No
Southern dischar	Node					21.4		0		370.766	-511.021		39711		No
SF3 node	Node					22.5		0		381	-432		100000		No
SF1 node	Node					22.6		0		415.133	-424.537		104340		No
SF2 node	Node					22.6		0		497.357	-470.833		104498		No
GGE2 node	Node					27		0		656.501	-411.757		109214		No
GGE1node	Node					27		0		666.628	-342.795		109454		No
HDV2 node	Node					24		0		700.289	-215.625		114532		No
Venn Rd outlet	Node					23		0		674.537	-177.141		114673		No
HD1 node	Node					22.2		0		599.016	-202.025		114825		No
HD road outlet	Node					21.5		0		574.421	-164.988		114976		No
CGA1 node	Node					23		0		566.609	-289.12		115003		No
GGB2 node	Node					24.4		0		764.525	-295.486		115061		No
GGD3 node	Node					22.8		0		371.296	-309.954		115100		No
GGD2 node	Node					24.4		0		308.218	-405.15		115137		No
GGD1	Node					23.2		0		426.273	-331.944		115189		No
GGC1 node	Node					26		0		639.525	-442.766		115226		No
CGC2 node	Node					26		0		577.604	-461.863		115262		No
GGC3 node	Node					23.4		0		535.359	-425.116		115303		No
GGC4	Node					23.2		0		499.479	-370.139		115363		No
Pre 2 node	Node					24.4		0		349.5	-96		122593		No
Pre Venn Rd outl	Node					23		0		325.5	-56.5		122685		No
Pre 1 node	Node					22.2		0		221	-100		122895		No
Pre Harold outle	Node					21.5		0		214.5	-66		122928		No
Pre 3 node	Node					23		0		243.5	-148.5		122947		No
Gavins Gully Pre	Node					21.8		0		248	-173.5		122955		No
Pre 4 node	Node					23.8		0		328.5	-140.5		123003		No
Gavins Gully Pre	Node					21.9		0		338	-172		123010		No
Pre 5 node	Node					25		0		213	-221.5		123058		No
Gavins Gully Pre	Node					21.8		0		247.5	-188		123064		No
Pre 6 node	Node					25.1		0		153	-264.5		123116		No
Pre 7 node	Node					27		0		318.5	-194.5		123155		No
Gavins Gully Pre	Node					25		0		386.308	-209.948		123170		No
Pre 8 node	Node					22.8		0		233.5	-268		123215		No
Pre 8 south outle	Node					21.4		0		154.766	-322.521		123225		No
Final Kilarney Rd	Node					21.28		0		506.333	-207		153295		No

DETENTION BASIN DETAILS															
Name	Elev	Surf. Area	Not Used	Outlet Typ	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id
A1 swale	21.4	3		Culvert	0.5					589	-252	No			7
	21.45	10													
	21.9	520													
	22	600													
A2 swale	21.4	3		Culvert	0.5					600.609	-235.671	No			22
	21.45	10													
	21.9	520													
	22	600													
B1 Swale	23.3	3		Culvert	0.5					738.015	-237.677	No			2191
	23.35	10													
	23.8	1800													
	23.9	2000													
Cat B final basin	23.2	50		Culvert	0.5					631.852	-293.27	No			2221
	23.3	400													
	23.8	1000													
	23.9	1010													
B2 Swale	23.3	3		Culvert	0.5					737.68	-259.111	No			2197
	23.35	10													
	23.8	1800													
	23.9	2000													
C2 Swale	21.4	0.1		Culvert	0.5					596.292	-431.017	No			8070
	23.1	3													
	23.15	10													
	23.6	1760													
	23.7	1900													
C1 Swale	21.4	0.1		Culvert	0.5					615.442	-420.532	No			7760
	23	3													
	23.05	10													
	23.5	1760													
	23.6	1900													
Cat C final basin	22.9	50		Orifice		375	22.865			566.212	-363.599	No			7838
	23	2500													
	23.4	3364													
	23.45	4000													
C3 swale	21.4	0.1		Culvert	0.5					570.989	-408.003	No			8226
	23.1	3													
	23.15	10													
	23.6	2040													
	23.7	2100													
C4 swale	21.4	0.1		Culvert	0.5					545.148	-392.525	No			8439
	23	3													
	23.05	10													
	23.4	1360													
	23.5	1500													
E2 Swale	21.4	0.1		Culvert	0.5					660.988	-391.061	No			26694
	25.3	3													
	25.35	10													
	25.8	400													

	25.9	500													
E1 Swale	21.4	0.1		Culvert	0.5					662.328	-369.292	No			26762
	25.3	3													
	25.35	10													
	25.8	400													
	25.9	500													
	29.95	510													
D1 Swale	21.4	0.1		Culvert	0.5					400.577	-359.081	No			32006
	23.1	3													
	23.15	10													
	23.6	1400													
	23.7	1500													
D3 Swale	21.4	0.1		Orifice		300	23.15			347.127	-352.651	No			32345
	23	3													
	23.05	10													
	23.5	1160													
	23.6	1250													
Connection swal	22.2	10		Culvert	0.5					321.335	-330.578	No			32952
	22.7	400													
	22.8	500													
	21.8	50													
Cat D final basin	22.2	800		Orifice		300	22.05			310.886	-308.475	No			32587
	22.7	1300													
	22.8	1310													
D2 Swale	23.1	3		Culvert	0.5					354.289	-393.673	No			32211
	23.15	10													
	23.6	1480													
	23.15	10													
	23.6	1480													
	23.7	1600													
F1 Swale	21.6	3		Culvert	0.5					445.515	-431.851	No			39587
	21.65	10													
	21.66	235													
	22.1	2115													
	22.2	2250													
F3 Swale	21.5	3		Culvert	0.5					418.187	-465.609	No			39558
	21.55	10													
	21.56	270													
	22	1350													
	22.1	1500													
	21.4	50													
Cat F final basin	21.45	2432		Culvert	0.5					374.785	-492.937	No			39703
	22	3000													
	22.2	3100													
	21.4	0.1													
F2 swale	21.6	3		Culvert	0.5					474.048	-455.16	No			39617
	21.65	10													
	21.66	285													
	22.1	2560													
	22.2	2700													

SUB-CATCHMEN	Pit or	Total																		
Name	Node	Area	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass	Supp	Lag Time	Gutter	Gutter
		(ha)	Area	Area	Area	Time	Time	Time	Length	Length	Length	Slope(%)	Slope	Slope	Rough	Rough	Rough	or Factor	Length	Slope
	A1 swale	**0.1355**	%	%	%	(min)	(min)	(min)	(m)	(m)	(m)	%	%	%					(m)	%
Cat A1	A2 swale	0.1355	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat A2	B1 Swale	0.3514	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat B1	B2 Swale	0.3514	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat B2	C2 Swale	0.3852	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat C2	C1 Swale	0.3852	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat C1	C3 swale	0.4622	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat C3	C4 swale	0.3082	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat C4	E2 Swale	0.0851	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat E2	E1 Swale	0.0851	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat E1	D1 Swale	0.3048	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat D1	D3 Swale	0.244	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat D3	D2 Swale	0.3222	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat D2	F1 Swale	0.4012	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat F1	F3 Swale	0.234	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat F3	F2 swale	0.4792	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat F2	SF3 node	3.23	45	15	40	0	0	0	3	2	1	2	2	2	0.013	0.2	0.03	0		
Cat SF3 Lots	SF1 node	2.01	5	35	60	5	15	10										0		
Cat SF1	SF2 node	3.1	5	25	70	5	15	10										0		
Cat SF2	GGE2 node	1.37	5	35	60	5	15	10										0		
Cat GGE2	GGE1node	1.04	5	75	20	5	15	10										0		
Cat GGE1	HDV2 node	2.65	5	75	20	5	15	10										0		
Cat HDV2	HD1 node	2.5	5	15	80	5	15	10										0		
Cat HD1	CGA1 nod	6.187	5	15	80	5	15	10										0		
Cat GGA1	GGB2 node	3.48	5	15	80	5	15	10										0		
Cat GGB2	GGD3 node	4.34	5	15	80	5	15	10										0		
Cat GGD3	GGD2 node	2.09	5	35	60	5	15	10										0		
Cat GGD2	GGD1	2.29	5	85	10	5	15	10										0		
CatGGD1	GGC1 node	3.86	5	85	10	5	15	10										0		
CatGGC1	CGC2 node	2.8	5	75	20	5	15	10										0		
Cat GGC2	GGC3 node	3.18	5	75	20	5	15	10										0		
Cat GGC3	GGC4	4.01	5	35	60	5	15	10										0		
Cat GGC4	Pre 2 node	3.2	5	35	60	5	15	10										0		
Cat Pre 2	Pre 1 node	2.92	5	15	80	5	15	10										0		
Cat Pre 1	Pre 3 node	5.5	5	15	80	5	15	10										0		
Cat Pre 3	Pre 4 node	3.1	5	15	80	5	15	10										0		
Cat Pre 4	Pre 5 node	15.5	5	25	70	5	15	10										0		
Cat Pre 5	Pre 6 node	16.2	5	25	70	5	15	10										0		
Cat Pre 6	Pre 7 node	3.26	5	25	70	5	15	10										0		
Cat Pre 7	Pre 8 node	3.2	5	85	10	5	15	10										0		
Cat Pre 8			5	35	60	5	15	10										0		

PIPE DETAILS	From	To																
Name			Length	U/S IL	D/S IL	Slope	Type	Dia	I.D.	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg	Rl	Chg	RL	etc
	A1 swale	Kilarney Rc	(m)	(m)	(m)	(%)		(mm)	(mm)						(m)	(m)	(m)	(m)	(m)
Cat A1 outlet	A2 swale	Kilarney Rc	10	21.42	21.38	0.4	Concrete, u	375	375	0.3	NewFixed	1	A1 swale	0					
Cat A2 outlet pip	B1 Swale	Cat B final	25	21.45	21.38	0.28	Concrete, u	375	375	0.3	NewFixed	1	A2 swale	0					
Cat B1 outlet pip	Cat B final	Gavins Gul	25	23.3	23.2	0.4	Concrete, u	375	375	0.3	NewFixed	1	B1 Swale	0					
Cat B outlet pipe	B2 Swale	Cat B final	10	23.25	22.8	4.5	Concrete, u	375	375	0.3	NewFixed	1	Cat B final	0					
Cat B2 outlet pip	C2 Swale	C1 Swale	25	23.3	23.2	0.4	Concrete, u	375	375	0.3	NewFixed	1	B2 Swale	0					
Cat C2 outlet pip	C1 Swale	Cat C final	25	23.1	23	0.4	Concrete, u	375	375	0.3	NewFixed	1	C2 Swale	0					
Cat C1 outlet pip	Cat C final	Gavins Gul	25	23	22.95	0.2	Concrete, u	375	375	0.3	NewFixed	1	C1 Swale	0					
Cat C outlet Pipe	C3 swale	C4 swale	10	22.9	22.8	1	Concrete, u	375	375	0.3	NewFixed	1	Cat C final	0					
Cat C3 outlet pip	C4 swale	Cat C final	25	23.1	23	0.4	Concrete, u	375	375	0.3	NewFixed	1	C3 swale	0					
Cat C4 outlet pip	E2 Swale	E1 Swale	10	23	22.95	0.5	Concrete, u	375	375	0.3	NewFixed	1	C4 swale	0					
Cat E2 outlet pip	E1 Swale	Gavins Gul	25	25.3	25.2	0.4	Concrete, u	375	375	0.3	NewFixed	1	E2 Swale	0					
Cat E1 outlet Pip	D1 Swale	D3 Swale	10	25.3	25.2	1	Concrete, u	300	300	0.3	NewFixed	1	E1 Swale	0					
Cat D1 outlet pip	D3 Swale	Connection	25	23.1	23	0.4	Concrete, u	375	375	0.3	NewFixed	1	D1 Swale	0					
Cat D3a outlet pi	Connection	Cat D final	10	23	22.9	1	Concrete, u	375	375	0.3	NewFixed	1	D3 Swale	0					
Cat D3b outlet pi	Cat D final	Gavins Gul	10	22.2	22.1	1	Concrete, u	375	375	0.3	NewFixed	1	Connection	0					
Cat D outlet pipe	D2 Swale	D3 Swale	10	21.8	21.6	2	Concrete, u	375	375	0.3	NewFixed	1	Cat D final	0					
Cat D2 outlet pip	F1 Swale	F3 Swale	25	23.1	23	0.4	Concrete, u	375	375	0.3	NewFixed	1	D2 Swale	0					
Cat F1 outlet pip	F3 Swale	Cat F final	25	21.6	21.5	0.4	Concrete, u	375	375	0.3	NewFixed	1	F1 Swale	0					
Cat F outlet to fir	Cat F final	Southern d	10	21.5	21.45	0.5	Concrete, u	375	375	0.3	NewFixed	1	F3 Swale	0					
Cat F outlet pipe	F2 swale	F3 Swale	10	21.41	21.4	0.1	Concrete, u	375	375	0.3	NewFixed	1	Cat F final	0					
Cat F2 outlet pipe			25	21.6	21.5	0.4	Concrete, u	375	375	0.3	NewFixed	1	F2 swale	0					

DETAILS of SERVI	Chg	Bottom										
Pipe	(m)	Elev (m)	Height of S	Chg	Bottom	Height of S	Chg	Bottom	Height of S	etc		
			(m)	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	etc		

CHANNEL DETAIL	From	To										
Name			Type	Length	U/S IL	D/S IL	Slope	Base Width	L.B. Slope	R.B. Slope	Manning	Depth	Roofed
				(m)	(m)	(m)	(%)	(m)	(1:?)	(1:?)	n	(m)	

OVERFLOW ROU	From	To														
Name			Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stor (m)	Safe Depth Minor Stor (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)
	Kilarney Rc	Final Kilarn														
OF Kil 1	Kilarney Rc	Final Kilarn	0.1				4 m wide p	0.3	0.15	0.4	0.5	1	153317	21.3	21.28	2
OF Kil 2	Cat B final	Gavins Gul	0.1				4 m wide p	0.3	0.15	0.4	0.5	1	153298	21.3	21.28	2
OF Cat B basin	Cat C final	Gavins Gul	0.2	23.8	4	1.45	4 m wide p	0.3	0.15	0.4	1	5	140958	23.8	22.8	30
OF Cat C basin	E1 Swale	Gavins Gul	0.2	23.4	4	1.45	4 m wide p	0.3	0.15	0.4	1	5	140929	23.4	22.8	30
OF Cat E final	Cat D final	Gavins Gul	0.2	25.9	4	1.45	4 m wide p	0.3	0.15	0.4	1	5	140986	25.9	25	30
OF Cat D basin	Cat F final	Southern d	0.2	23.4	4	1.45	4 m wide p	0.3	0.15	0.4	1	5	141009	22.7	21.6	30
OF Cat F basin	SF3 node	F3 Swale	0.2	23.4	4	1.45	4 m wide p	0.3	0.15	0.4	1	5	141054	22.15	21.4	30
OF lot SF3	SF1 node	F1 Swale	1				4 m wide p	0.3	0.15	0.4	0.5	20	83380	22.5	21.4	100
OF lot SF1	SF2 node	F2 swale	1				4 m wide p	0.3	0.15	0.4	0.5	20	104265	22.6	21.4	100
OFlot SF2	GGE2 node	Gavins Gul	1				4 m wide p	0.3	0.15	0.4	0.5	20	104569	22.6	21.4	100
OFlot GGE2	GGE1node	Gavins Gul	1				4 m wide p	0.3	0.15	0.4	0.5	20	109284	27	25	100
OFlot GGE1	HDV2 node	Venn Rd ou	1				4 m wide p	0.3	0.15	0.4	0.5	20	109523	27	25	100
OF lot HDV2	HD1 node	HD road ou	3.1				4 m wide p	0.3	0.15	0.4	0.5	20	114602	24	23	300
OF lot HD1	CGA1 nod	Gavins Gul	3.1				4 m wide p	0.3	0.15	0.4	0.5	20	114966	22	21.5	300
OFlot CGA1	GGB2 node	B2 Swale	3.1				4 m wide p	0.3	0.15	0.4	0.5	20	115028	23	22.8	300
OFlot GGB2	GGD3 node	Gavins Gul	2				4 m wide p	0.3	0.15	0.4	0.5	20	115073	24.4	23.3	200
OF lot GGD3	GGD2 node	D2 Swale	2				4 m wide p	0.3	0.15	0.4	0.5	20	115108	22.8	21.8	200
OF lot GGD2	GGD1	D1 Swale	1				4 m wide p	0.3	0.15	0.4	0.5	20	115149	24.4	23.1	100
OF lot GGD1	GGC1 node	C1 Swale	1				4 m wide p	0.3	0.15	0.4	0.5	20	115198	23.6	23.1	100
OF lGGC1	CGC2 node	C2 Swale	1				4 m wide p	0.3	0.15	0.4	0.5	20	115238	26	23	100
OF lot GGC2	GGC3 node	C3 swale	1				4 m wide p	0.3	0.15	0.4	0.5	20	115278	26	23.1	100
OF5743	GGC4	Gavins Gul	1				4 m wide p	0.3	0.15	0.4	0.5	20	115310	23.4	23.1	100
OF5752	Pre 2 node	Pre Venn R	1				4 m wide p	0.3	0.15	0.4	0.5	20	115377	23	22.8	100
OF Pre 2	Pre 1 node	Pre Harold	4.1				4 m wide p	0.3	0.15	0.4	0.5	20	122455	24.4	23	400
OFPre 1	Pre 3 node	Gavins Gul	3.1				4 m wide p	0.3	0.15	0.4	0.5	20	122908	22	21.5	300
OF Pre 3	Pre 4 node	Gavins Gul	3.1				4 m wide p	0.3	0.15	0.4	0.5	20	122969	23	21.8	300
OF Pre 4	Pre 5 node	Gavins Gul	3.1				4 m wide p	0.3	0.15	0.4	0.5	20	123019	23.8	21.9	300
OF Pre 5	Pre 6 node	Pre 5 node	3.1				4 m wide p	0.3	0.15	0.4	0.5	20	123081	25	21.8	300

OF Pre 6	Pre 7 node	Gavins Gul	4.1	4 m wide p	0.3	0.15	0.4	0.5	20	123127	25.1	25	400
OF Pre 7	Pre 8 node	Pre 8 south	1	4 m wide p	0.3	0.15	0.4	0.5	20	123178	27	25	100
OF Pre 8			4.1	4 m wide p	0.3	0.15	0.4	0.5	20	123232	22.8	21.4	400

DRAINS results prepared from Version 2021.031

PIT / NODE DETAILS **Version 8**

Name	Max HGL	Max Pond HGL	Max Surfa Flow Arriv (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)
Kilarney Rd outlet 1	21.33		0			
Kilarney Rd Outlet 2	21.33		0			
Gavins Gully B Outlet	22.95		1.529			
Gavins Gully C outlet	23.03		0.921			
Gavins Gully Cat E outlet	25		0.379			
Gavins Gully D outlet	21.75		0.997			
Southern discharge	21.68		0			
SF3 node	22.62		0.742			
SF1 node	22.69		0.488			
SF2 node	22.71		0.712			
GGE2 node	27.05		0.218			
GGE1node	27.04		0.166			
HDV2 node	24.16		0.683			
HD1 node	22.19		0.644			
CGA1 node	23.41		1.594			
GGB2 node	24.56		0.896			
GGD3 node	22.97		0.997			
GGD2 node	24.46		0.309			
GGD1	23.68		0.338			
GGC1 node	26.07		0.615			
CGC2 node	26.06		0.446			
GGC3 node	23.68		0.731			
GGC4	23.21		0.921			
Pre 2 node	24.58		0.824			
Pre 1 node	22.21		0.752			
Pre 3 node	23.23		1.417			
Pre 4 node	23.94		0.753			
Pre 5 node	25.47		7.321			
Pre 6 node	25.9		3.936			
Pre 7 node	27.07		0.482			
Pre 8 node	22.96		0.735			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat A1	0.058	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat A2	0.058	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat B1	0.149	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat B2	0.149	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat C2	0.164	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat C1	0.164	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat C3	0.196	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat C4	0.131	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat E2	0.036	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat E1	0.036	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat D1	0.13	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat D3	0.104	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat D2	0.137	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat F1	0.17	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat F3	0.099	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat F2	0.204	0	0	0.48	1.94	0.41	1% AEP, 15 min burst, Storm 9
Cat SF3 Lots	0.605	0	0	5	15	10	1% AEP, 30 min burst, Storm 5
Cat SF1	0.41	0	0	5	15	10	1% AEP, 30 min burst, Storm 6
Cat SF2	0.581	0	0	5	15	10	1% AEP, 30 min burst, Storm 5
Cat GGE2	0.143	0	0	5	15	10	1% AEP, 15 min burst, Storm 7
Cat GGE1	0.109	0	0	5	15	10	1% AEP, 15 min burst, Storm 7
Cat HDV2	0.586	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat HD1	0.553	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat GGA1	1.368	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat GGB2	0.769	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat GGD3	0.813	0	0	5	15	10	1% AEP, 30 min burst, Storm 5
Cat GGD2	0.189	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
CatGGD1	0.207	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
CatGGC1	0.404	0	0	5	15	10	1% AEP, 15 min burst, Storm 7
Cat GGC2	0.293	0	0	5	15	10	1% AEP, 15 min burst, Storm 7
Cat GGC3	0.596	0	0	5	15	10	1% AEP, 30 min burst, Storm 5
Cat GGC4	0.751	0	0	5	15	10	1% AEP, 30 min burst, Storm 5
Cat Pre 2	0.707	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat Pre 1	0.645	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat Pre 3	1.216	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat Pre 4	0.632	0	0	5	15	10	1% AEP, 30 min burst, Storm 6
Cat Pre 5	3.161	0	0	5	15	10	1% AEP, 30 min burst, Storm 6
Cat Pre 6	3.304	0	0	5	15	10	1% AEP, 30 min burst, Storm 6
Cat Pre 7	0.295	0	0	5	15	10	1% AEP, 15 min burst, Storm 6
Cat Pre 8	0.599	0	0	5	15	10	1% AEP, 30 min burst, Storm 5

PIPE DETAILS

Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)	
Cat A1 outlet	0.041	1.06	21.598	21.524	1% AEP, 15 min burst, Storm 8
Cat A2 outlet pipe	0.037	0.99	21.646	21.519	1% AEP, 15 min burst, Storm 8
Cat B1 outlet pipe	0.064	0.58	23.705	23.705	1% AEP, 15 min burst, Storm 5
Cat B outlet pipe	0.155	3.74	23.539	22.95	1% AEP, 2 hour burst, Storm 1
Cat B2 outlet pipe	0.178	1.61	23.934	23.697	1% AEP, 1 hour burst, Storm 10
Cat C2 outlet pipe	0.062	0.56	23.583	23.558	1% AEP, 30 min burst, Storm 2
Cat C1 outlet pipe	0.149	1.35	23.512	23.392	1% AEP, 30 min burst, Storm 2
Cat C outlet Pipe	0.152	2.12	23.216	23.032	1% AEP, 2 hour burst, Storm 6
Cat C3 outlet pipe	0.153	1.39	23.62	23.468	1% AEP, 1 hour burst, Storm 5
Cat C4 outlet pipe	0.122	1.1	23.464	23.414	1% AEP, 6 hour burst, Storm 9
Cat E2 outlet pipe	0.018	0.26	25.525	25.518	1% AEP, 15 min burst, Storm 8
Cat E1 outlet Pipe	0.035	1.46	25.444	25.312	1% AEP, 15 min burst, Storm 8
Cat D1 outlet pipe	0.076	0.68	23.48	23.455	1% AEP, 15 min burst, Storm 7
Cat D3a outlet pipe	0.1	1.92	23.231	23.079	1% AEP, 30 min burst, Storm 10
Cat D3b outlet pipe	0.099	1.91	22.429	22.278	1% AEP, 1 hour burst, Storm 3
Cat D outlet pipe	0.097	2.44	22.028	21.746	1% AEP, 15 min burst, Storm 5
Cat D2 outlet pipe	0.085	0.77	23.488	23.457	1% AEP, 15 min burst, Storm 10
Cat F1 outlet pipe	0.064	0.58	22.205	22.195	1% AEP, 2 hour burst, Storm 4
Cat F outlet to final basin	0.206	1.86	22.027	21.87	1% AEP, 2 hour burst, Storm 2
Cat F outlet pipe	0.144	1.63	21.785	21.679	1% AEP, 2 hour burst, Storm 3
Cat F2 outlet pipe	0.074	0.67	22.217	22.204	1% AEP, 2 hour burst, Storm 6

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF Kil 1	0.041	0.041	1.497	0.036	0.02	4	0.87	1% AEP, 15 min burst, Storm 8
OF Kil 2	0.037	0.037	1.497	0.034	0.02	4	0.91	1% AEP, 15 min burst, Storm 8
OF Cat B basin	0	0	1.479	0	0	0	0	
OF Cat C basin	0	0	1.479	0	0	0	0	
OF Cat E final	0	0	1.479	0	0	0	0	
OF Cat D basin	0	0	1.479	0	0	0	0	
OF Cat F basin	0	0	1.479	0	0	0	0	
OF lot SF3	0.604	0.567	1.497	0.795	0.17	4	1.48	1% AEP, 30 min burst, Storm 5
OF lot SF1	0.41	0.386	1.497	0.809	0.12	4	1.3	1% AEP, 30 min burst, Storm 6
OFlot SF2	0.58	0.554	1.497	0.825	0.17	4	1.49	1% AEP, 30 min burst, Storm 5
OFlot GGE2	0.139	0.137	1.497	0.05	0.05	4	1.14	1% AEP, 15 min burst, Storm 7
OFlot GGE1	0.105	0.103	1.497	0.044	0.04	4	1.11	1% AEP, 15 min burst, Storm 7
OF lot HDV2	0.582	0.583	1.497	0.161	0.16	4	1.01	1% AEP, 15 min burst, Storm 2
OF lot HD1	0.545	0.543	1.497	0.188	0.15	4	0.8	1% AEP, 15 min burst, Storm 10
OFlot CGA1	1.312	1.291	1.497	0.411	0.34	4	0.83	1% AEP, 30 min burst, Storm 6
OFlot GGB2	0.768	0.711	1.497	0.727	0.21	4	1.31	1% AEP, 15 min burst, Storm 6
OF lot GGD3	0.803	0.807	1.497	0.172	0.22	4	1.3	1% AEP, 30 min burst, Storm 5
OF lot GGD2	0.18	0.189	1.497	0.402	0.06	4	1.03	1% AEP, 15 min burst, Storm 8
OF lot GGD1	0.201	0.184	1.497	0.391	0.06	4	0.75	1% AEP, 15 min burst, Storm 7
OF lGGC1	0.402	0.408	1.497	0.558	0.13	4	1.73	1% AEP, 15 min burst, Storm 7
OF lot GGC2	0.291	0.298	1.497	0.492	0.1	4	1.56	1% AEP, 15 min burst, Storm 7
OF5743	0.56	0.532	1.497	0.58	0.15	4	0.53	1% AEP, 30 min burst, Storm 5
OF5752	0.745	0.746	1.497	0.213	0.2	4	0.95	1% AEP, 30 min burst, Storm 5
OF Pre 2	0.701	0.704	1.497	0.176	0.19	4	1.1	1% AEP, 15 min burst, Storm 2
OFPre 1	0.637	0.636	1.497	0.205	0.17	4	0.85	1% AEP, 15 min burst, Storm 10
OF Pre 3	1.212	1.223	1.497	0.231	0.33	4	1.42	1% AEP, 15 min burst, Storm 6
OF Pre 4	0.629	0.631	1.497	0.14	0.18	4	1.27	1% AEP, 30 min burst, Storm 6
OF Pre 5	6.406	6.421	1.497	0.469	1.66	4	3.54	1% AEP, 30 min burst, Storm 6
OF Pre 6	3.3	3.983	1.497	0.804	1.03	4	2.14	1% AEP, 30 min burst, Storm 6
OF Pre 7	0.286	0.283	1.497	0.069	0.09	4	1.35	1% AEP, 15 min burst, Storm 6
OF Pre 8	0.579	0.586	1.497	0.16	0.16	4	1.03	1% AEP, 30 min burst, Storm 5

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q	Max Q	Max Q
			Total	Low Level	High Level
A1 swale	21.64	0	0.041	0.041	0
A2 swale	21.66	0	0.037	0.037	0
B1 Swale	23.69	0	0.064	0.064	0
Cat B final basin	23.69	0	0.155	0.155	0
B2 Swale	24.03	0	0.178	0.178	0
C2 Swale	23.59	0	0.062	0.062	0
C1 Swale	23.56	0	0.149	0.149	0
Cat C final basin	23.39	0	0.152	0.152	0
C3 swale	23.68	0	0.153	0.153	0
C4 swale	23.46	0	0.122	0.122	0
E2 Swale	25.52	0	0.018	0.018	0
E1 Swale	25.52	0	0.035	0.035	0
D1 Swale	23.49	0	0.076	0.076	0
D3 Swale	23.45	0	0.1	0.1	0
Connection swale Cat D	22.56	0	0.099	0.099	0
Cat D final basin	22.2	0	0.097	0.097	0
D2 Swale	23.5	0	0.085	0.085	0
F1 Swale	22.21	0	0.064	0.064	0
F3 Swale	22.19	0	0.206	0.206	0
Cat F final basin	21.85	0	0.144	0.144	0
F2 swale	22.22	0	0.074	0.074	0

Run Log for Venn Road drainage model with full lot catchments added.drn run at 18:07:14 on 9/1/2022 using version 2021.031

Appendix C Emails from relevant authorities

Brendan Oversby

From: Ildiko Kaszaniczky <Ildiko.Kaszaniczky@watercorporation.com.au>
Sent: Tuesday, 19 October 2021 4:47 PM
To: Brendan Oversby
Subject: Gavins Gully main drain
Attachments: 21008-1-001a AP.pdf

Hello Brendan

I have forwarded you e-mail to the Principal Engineer at our Drainage & Liveable Communities and received the following advice:

- The future reserve over Gavins Gully MD should be either POS or a Drainage and Recreation Reserve vested in the Shire of Dardanup. The Water Corporation should have an easement over this reserve including 6m wide access tracks at the top of both banks to allow access for maintenance of the baseflow channel while the local authority maintains the actual reserve.

- DWER would need to advise on 10% and 1% AEP storm event flood levels in this area.

- Pre and post development flows from this development must be the same. In the absence of a DWER drainage/flood study, the Corporation uses the "PWD Manual of Standards for Rural Drainage" which specifies an area runoff rate of 8.5m3/s/1000ha for this development.

- Additional stormwater runoff from this development must be compensated on site up to and including the 1% AEP storm event.

- Indicative locations of post development connections into Gavins Gully MD from any on-site compensating basins needs to be discussed and agreed with the local authority.

I hope the above information is helpful.

Kind regards

Ildiko Kaszaniczky
Senior Land Servicing Advisor

Infill Developments
Development Services
Asset Planning & Delivery Group

E ildiko.kaszaniczky@watercorporation.com.au

T (08) 9420 3150
P PO Box 100, Leederville, WA 6902

watercorporation.com.au

Please consider the environment before printing this email.

From: Land Servicing <Land.Servicing@watercorporation.com.au>
Sent: Tuesday, 12 October 2021 11:15 AM
To: DSB.NE-SL <DSB.NE-SL@watercorporation.com.au>
Subject: FW: General Enquiries (CID:hwkh47lw64lrxvxlgg)

Jan Pryce
Support Officer - Business Services
Development Services

E Jan.Pryce@watercorporation.com.au
T (08) 9420 2099

watercorporation.com.au

Please Note: I work Part Time Monday to Wednesday

From: Brendan Oversby <Brendan@oversbyconsulting.com.au>
Sent: Tuesday, 12 October 2021 11:03 AM
To: Land Servicing <Land.Servicing@watercorporation.com.au>
Subject: FW: General Enquiries (CID:hwkh47lw64lrxvxlgg)

Hello Jan
As discussed on the phone this morning, here is my original enquiry with regard to the Gavins Gully main drain (may also be called Busher Main Drain).
If you are able to direct me to the best person to discuss this enquiry with, it would be much appreciated. Discussions have already begun with DWER and the Shire of Dardanup in relation to drainage and their current stance is for the post development flow rate to match the current predevelopment flow rate.
We would also like to confirm the indicative location for post development discharge points for water into the drain.
Happy to discuss any queries on the phone.
Regards

Brendan Oversby
Director
Oversby Consulting
044 761 4411
PO Box 369
Dardanup WA 6236
brendan@oversbyconsulting.com.au

From: Brendan Oversby
Sent: Tuesday, 12 October 2021 9:49 AM
To: Water Corporation <ContactUs@watercorporation.com.au>
Subject: RE: General Enquiries (CID:hwkh47lw64lrxvxlgg)

Thank you Debbi.
As this drain is a Water Corporation asset I also need to understand options for draining water to the drain from the subject land.
Who would be the best person to discuss this with?
Regards

Brendan Oversby
Director
Oversby Consulting
044 761 4411
PO Box 369
Dardanup WA 6236
brendan@oversbyconsulting.com.au

From: Water Corporation <ContactUs@watercorporation.com.au>
Sent: Tuesday, 12 October 2021 9:46 AM
To: Brendan Oversby <Brendan@oversbyconsulting.com.au>
Subject: RE: General Enquiries (CID:hwkh47lw64lrxvxlgg)

Hi Brendan,

Thanks for getting in touch.

I have forwarded your enquiry to the Department of Water as they are the correct contact relating to flood levels etc.

Regards

Debbi
Contact Centre Representative
Water Corporation

Reference Number:

Keep in touch _ . . . __ W: watercorporation.com.au

-----Original Message-----
From: contactus@watercorporation.com.au [mailto:contactus@watercorporation.com.au]
Sent: Monday, 11 October 2021 3:15 PM
To: Water Corporation
Subject: General Enquiries

First name:	Brendan
Last name:	Oversby
Telephone:	0447614411
Email:	brendan@oversbyconsulting.com.au
Account number:	
Street address:	Lot 2 Harold Douglas Drive and Lot 185 Venn Road,
Suburb:	West Dardanup
Postcode:	6236
Customer enquiry:	Looking for flood levels of Gully Gully main drain which flows through this property, including 10% and 1% AEP flood levels. Also need to determine appropriate run off rates into the drainage system. A draft layout is attached.
Contact customer:	Yes
Relevant attachments:	21008-1-001a AP.pdf

Contact Details

OVERSBY CONSULTING PTY LTD

PO Box 369
Dardanup WA 6236

Phone 044 761 4411