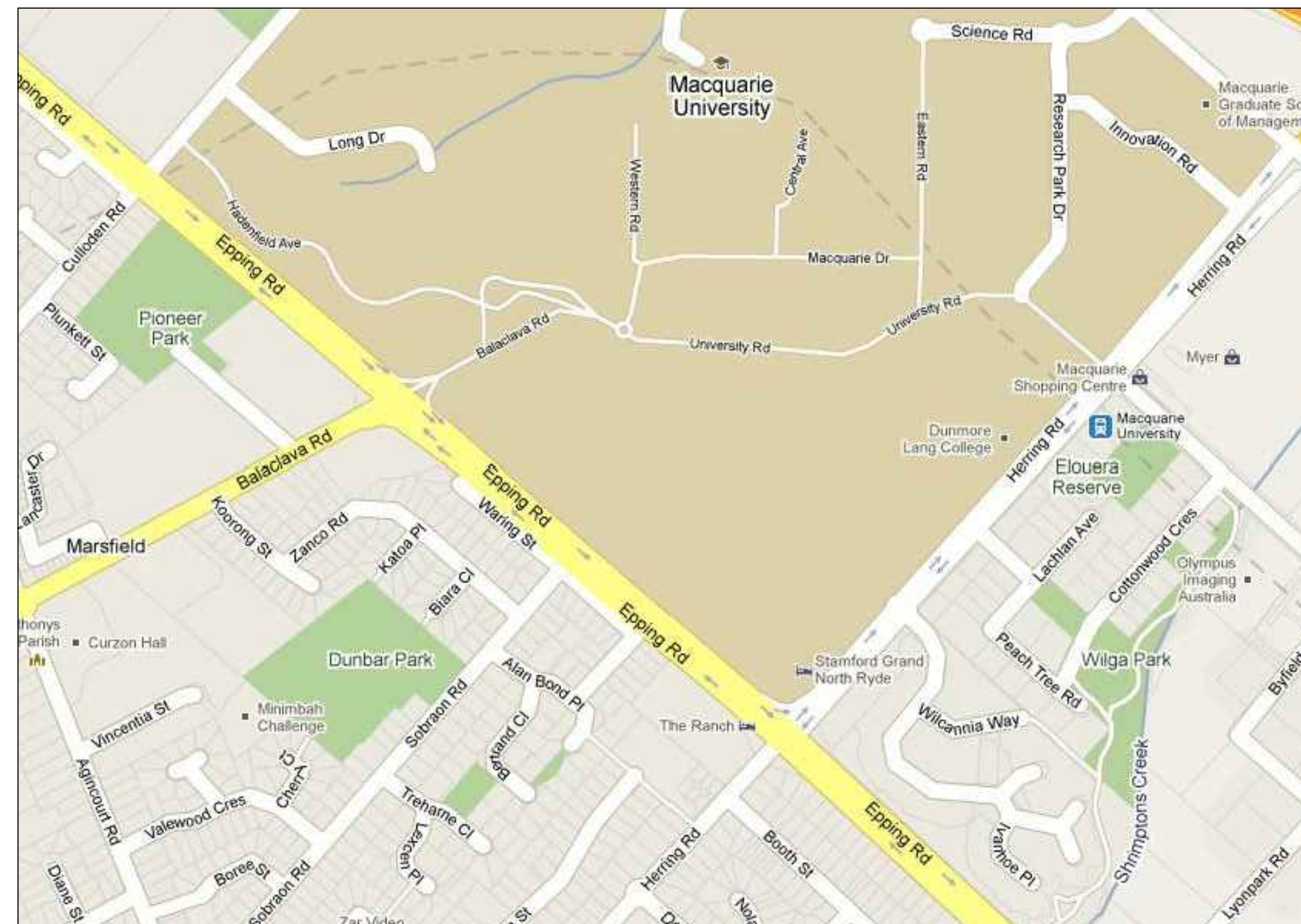


MACQUARIE VILLAGE - NORTH RYDE

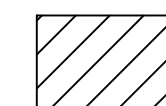
SITE CIVIL DRAWINGS
PROJECT NO. 106038-00

<u>DRAWING LIST</u>	
106038-00-MIE1000	COVER SHEET & LEGEND
106038-00-MIE1010	GENERAL ARRANGEMENT PLAN
106038-00-MIE1041	DETAIL CIVIL PLAN - SHEET 1
106038-00-MIE1042	DETAIL CIVIL PLAN - SHEET 2
106038-00-MIE1043	TYPICAL SITE SECTIONS
106038-00-MIE1121	DRAINAGE DETAILS - SHEET 1
106038-00-MIE1122	DRAINAGE DETAILS - SHEET 2
106038-00-MIE1123	WSUD DETAILS
106038-00-MIE1131	OSD PLAN & DETAILS



LOCALITY SKETCH

PROPOSED WORKS LOCATION SHOWN AS



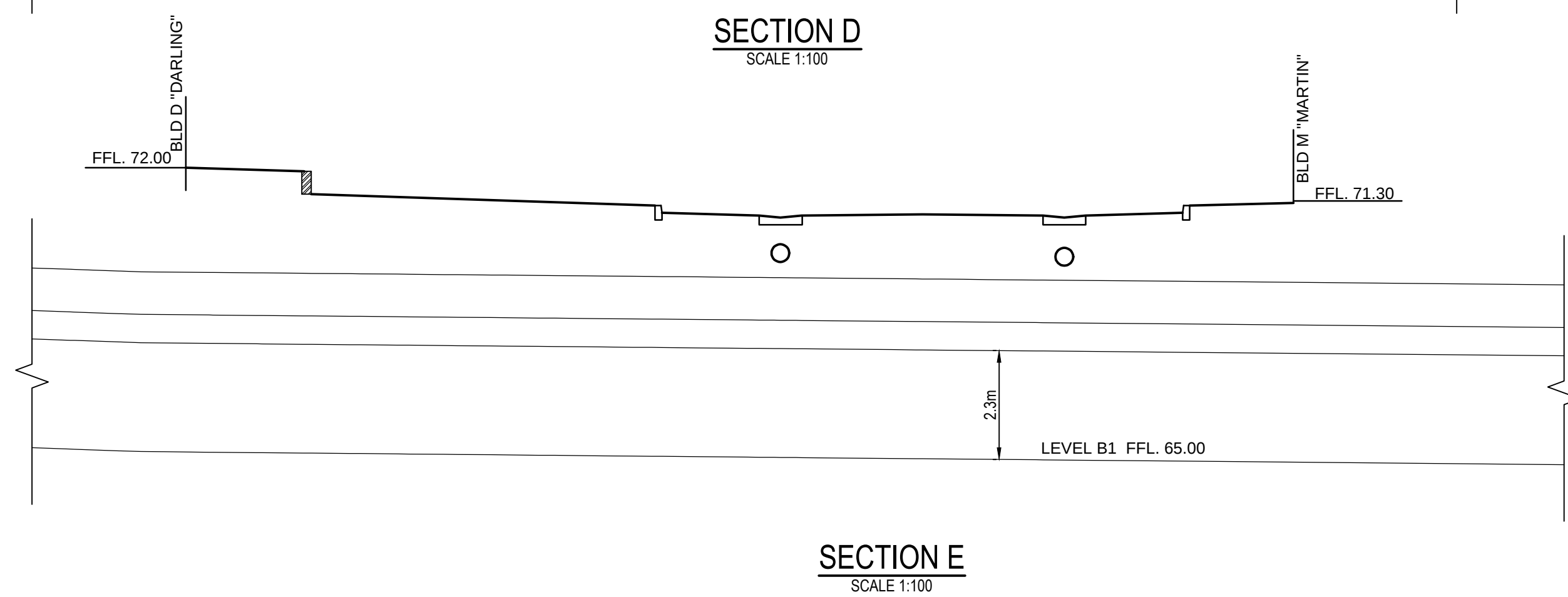
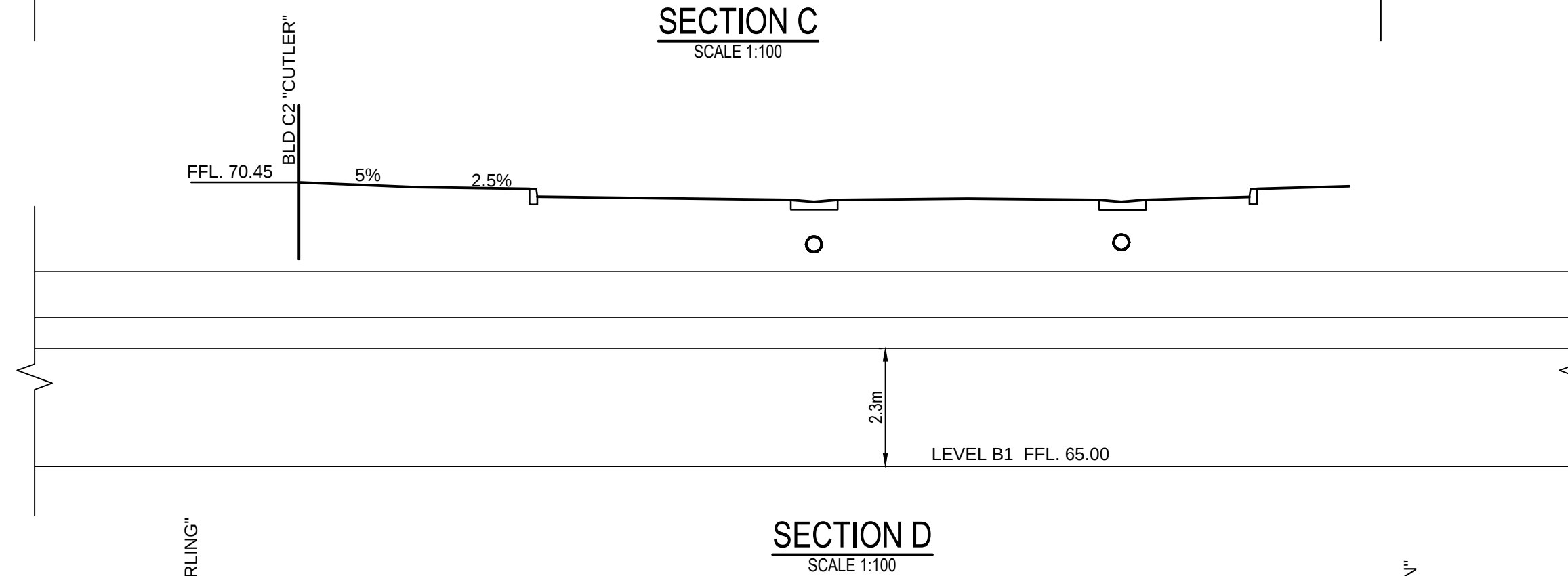
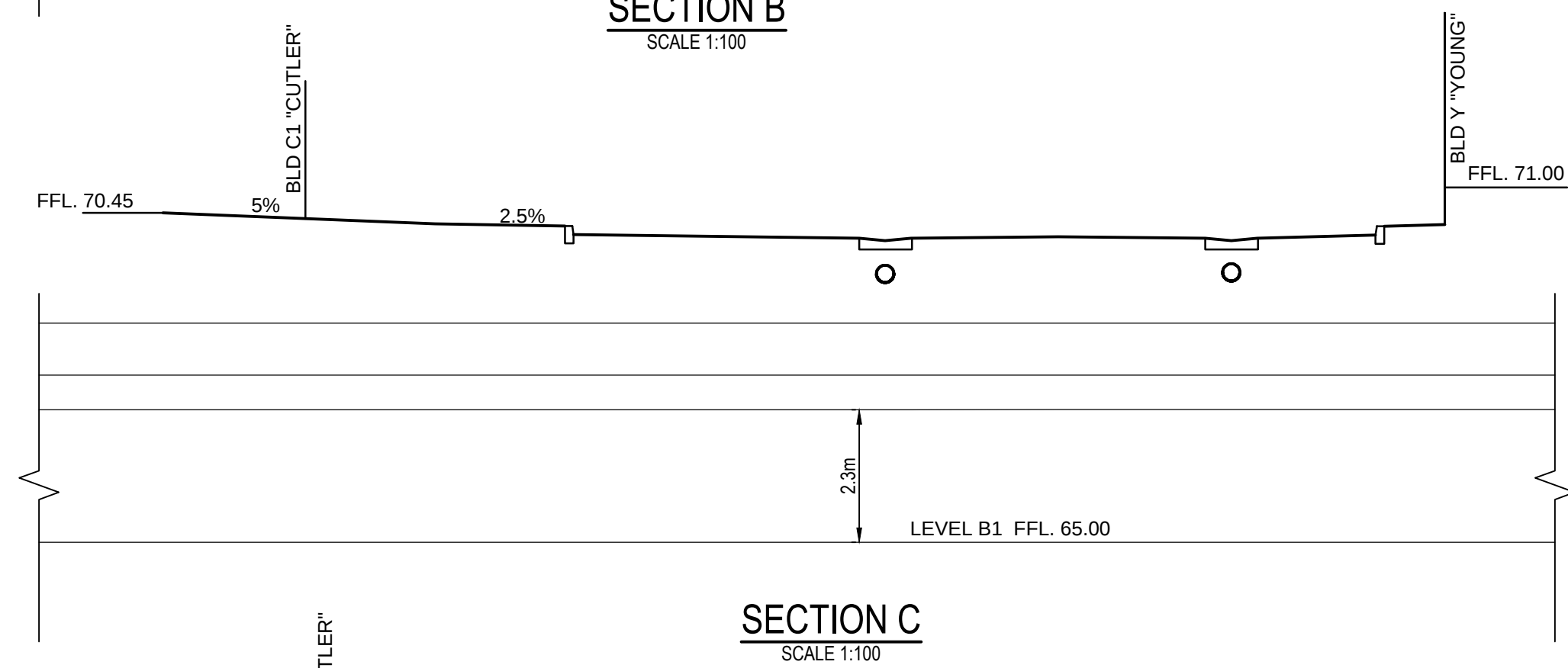
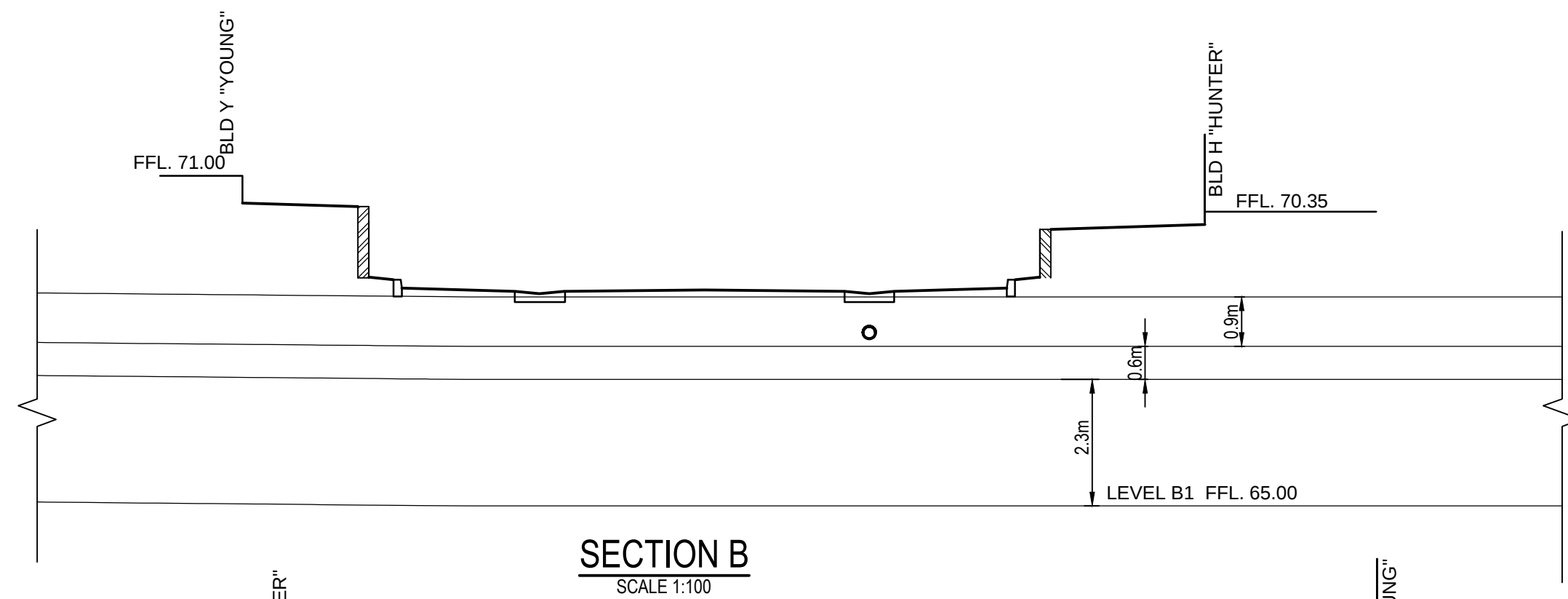
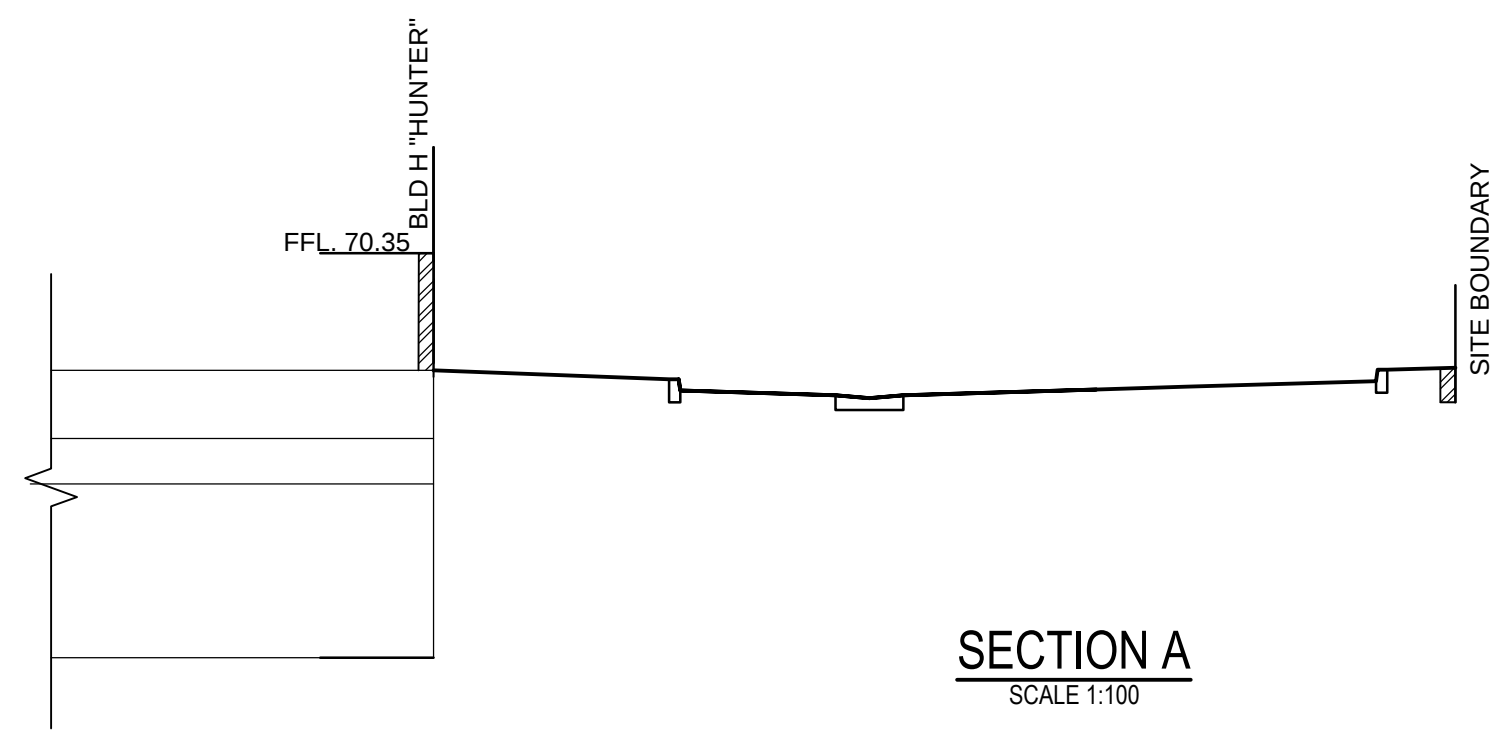
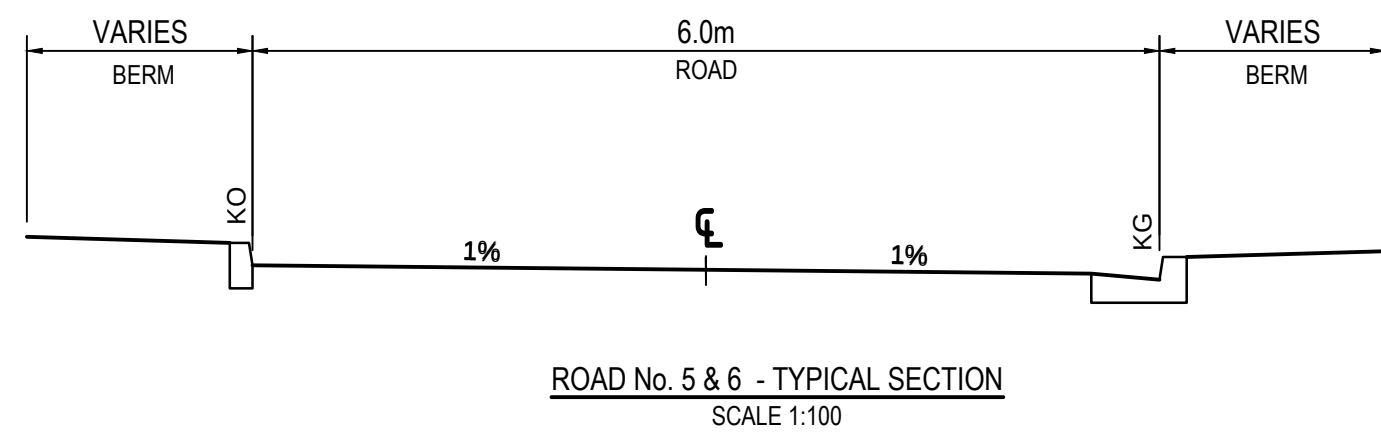
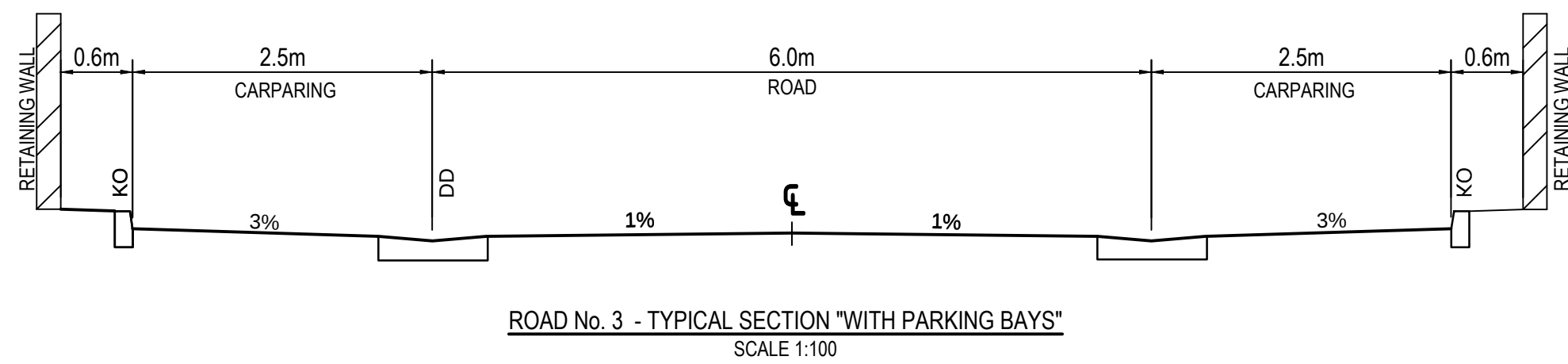
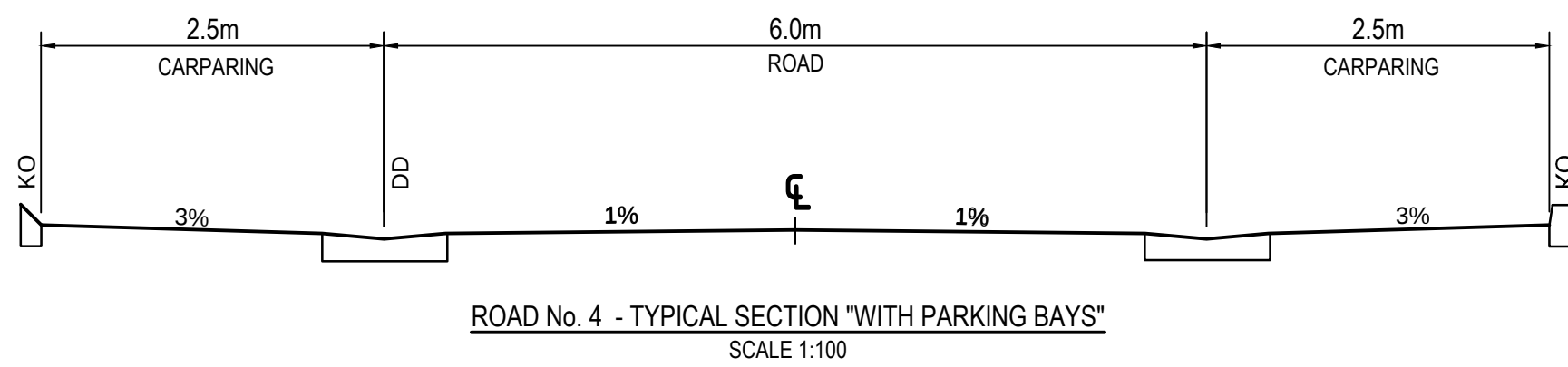
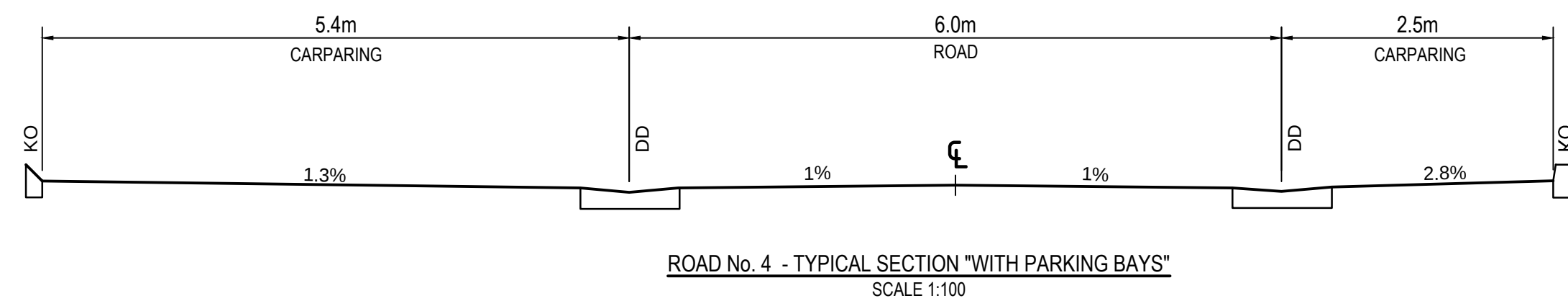
GENERAL 1:200 LEGEND	
SYMBOL	DESCRIPTION
<u>PROPOSED WORKS</u>	
	KERB INLET PIT (KIP)
	GRATED PIT (GP)
	JUNCTION PIT (JP)
	SAG KERB INLET PIT (KIP)
	RAINGARDEN
	PIT NUMBER
	STORMWATER PIPE
	FLUSHPOINT (FP) & SUBSOIL DRAINAGE
	TRENCH GRATE (TG)
	SWALE DRAIN & DIRECTION OF FLOW
	DIRECTION OF OVERLAND FLOW
	HEADWALL (HW) & RIPRAP SCOUR PROTECTION
	FINISHED SURFACE LEVELS
	BULK EARTHWORKS LEVEL
	RETAINING WALL (RW)
	KERB ONLY
	KERB AND GUTTER
	DISH DRAIN
	RADIUS TO FACE OF KERB
	BATTERS
	DIMENSION (UNITS - METRES)
<u>EXISTING WORKS</u>	
	FENCE
	EXISTING PIT
	GAS MAIN
	SEWER MAIN
	WATER MAIN
	ELECTRICITY SUPPLY
	TELECOMMUNICATION CABLES
	STORMWATER PIPE
	SERVICE TO BE DECOMMISSIONED
<u>ABBREVIATIONS</u>	
IL	INVERT LEVEL
RL	RELATIVE LEVEL (AHD)
FFL	FINISHED FLOOR LEVEL
VC	VEHICULAR CROSSING
PR	PRAM RAMP
DR	DRIVEWAY
FP	FOOTPATH
CH	CHAINAGE
UNO	UNLESS NOTED OTHERWISE
oP	DOWNPIPE

[illegible]

STATUS

PRELIMINARY
NOT FOR CONSTRUCTION

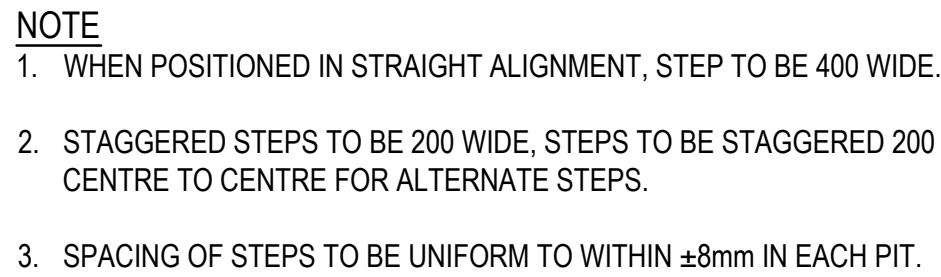
	Level 4, 66 Clarence Street Sydney NSW 2000 Telephone: (02) 9699 3068 Fax: (02) 9319 1508 www.mainardtgroup.com A.C.N. 051 627 591 ©Copyright		
PROJECT MACQUARIE VILLAGE NORTH RYDE SITE CIVIL WORKS			
CLIENT STAMFORD PROPERTY			
TITLE COVER SHEET & LEGEND - - - NORTH 			
DESIGNED LD	DRAWN RL/LC	APPROVED -	SCALE @ A1 N.T.S.
PROJECT No DRAWING No		REV	
106038-00- MIE1000		B	

[illegible]

STATUS

PRELIMINARY
NOT FOR CONSTRUCTION

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PROJECT MACQUARIE VILLAGE NORTH RYDE SITE CIVIL WORKS			
CLIENT STAMFORD PROPERTY -			
TITLE TYPICAL SITE SECTIONS - - -			
			
DESIGNED LD	DRAWN RL/LC	APPROVED -	SCALE @ A1 1:100
PROJECT No		REV	
106038-00-MIE1043		B	



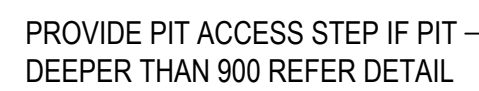
SCALE 1:10
(FOR PITS DEPTH $\geq 1200\text{mm}$)



SECTION 1
SCALE 1:20



PROVIDE PIT ACCESS STEP IF PIT -
DEEPER THAN 900 REFER DETAIL



PIT NOTES:

1. CAST IN SITU CONCRETE PITS MAY BE SUBSTITUTED WITH APPROVED PRE-CAST CONCRETE PITS IF APPROVED IN WRITING
2. PRECAST CONCRETE PITS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION



DEPTH	THICKNESS "T"	REINFORCEMENT "A"	HAUNCH DETAIL
0m - 3m	150mm	N12 - 300	"A"



SCALE 1:20



STATUS

PRELIMINARY
NOT FOR CONSTRUCTION

STATUS

PRELIMINARY
NOT FOR CONSTRUCTION



CLIENT
STAMFORD PROPERTY

TITLE NORTH
DRAINAGE DETAILS
- SHEET 1

DESIGNED	DRAWN	APPROVED	SCALE @ A1
LD	RL/LC	-	AS SHOWN

PROJECT No.	DRAWING No.	REV.
-------------	-------------	------

106038-00-MIE1121 B



PROVIDE INTERMEDIATE
SUB-SOIL DRAINAGE RISERS
AT MAX 30m CENTRES



NOT TO SCALE

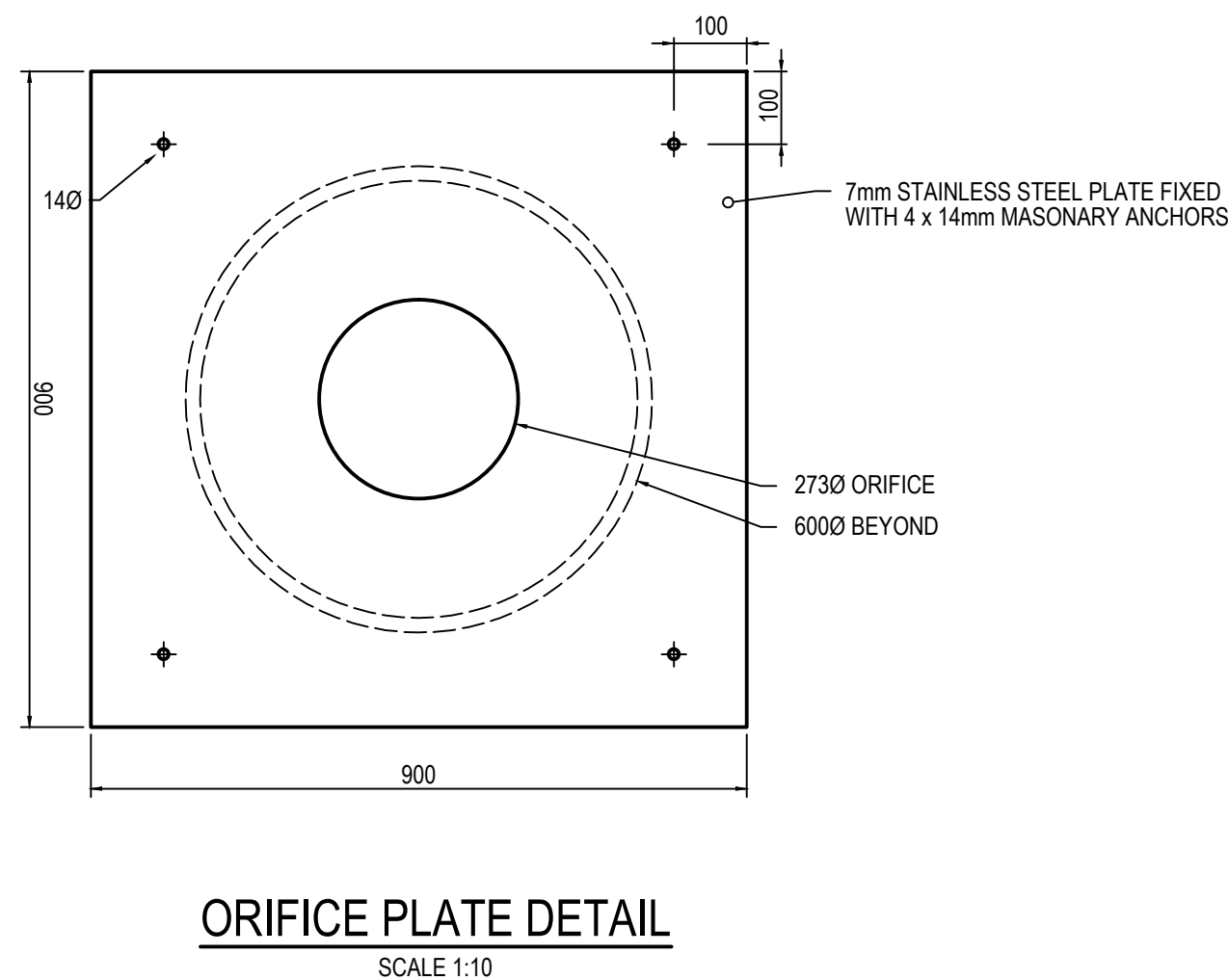
1. AUSTRALIAN STANDARDS AS 3725-1989 LOADS ON BURIED CONCRETE PIPES
2. RTA QA MODEL SPECIFICATION PART R11 STORMWATER DRAINAGE.

OVERLAY ZONE F = 300mm MINIMUM



SUB-SOIL DRAIN UNDER KERB DETAIL

SCALE 1:10

[illegible]

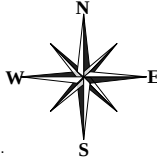
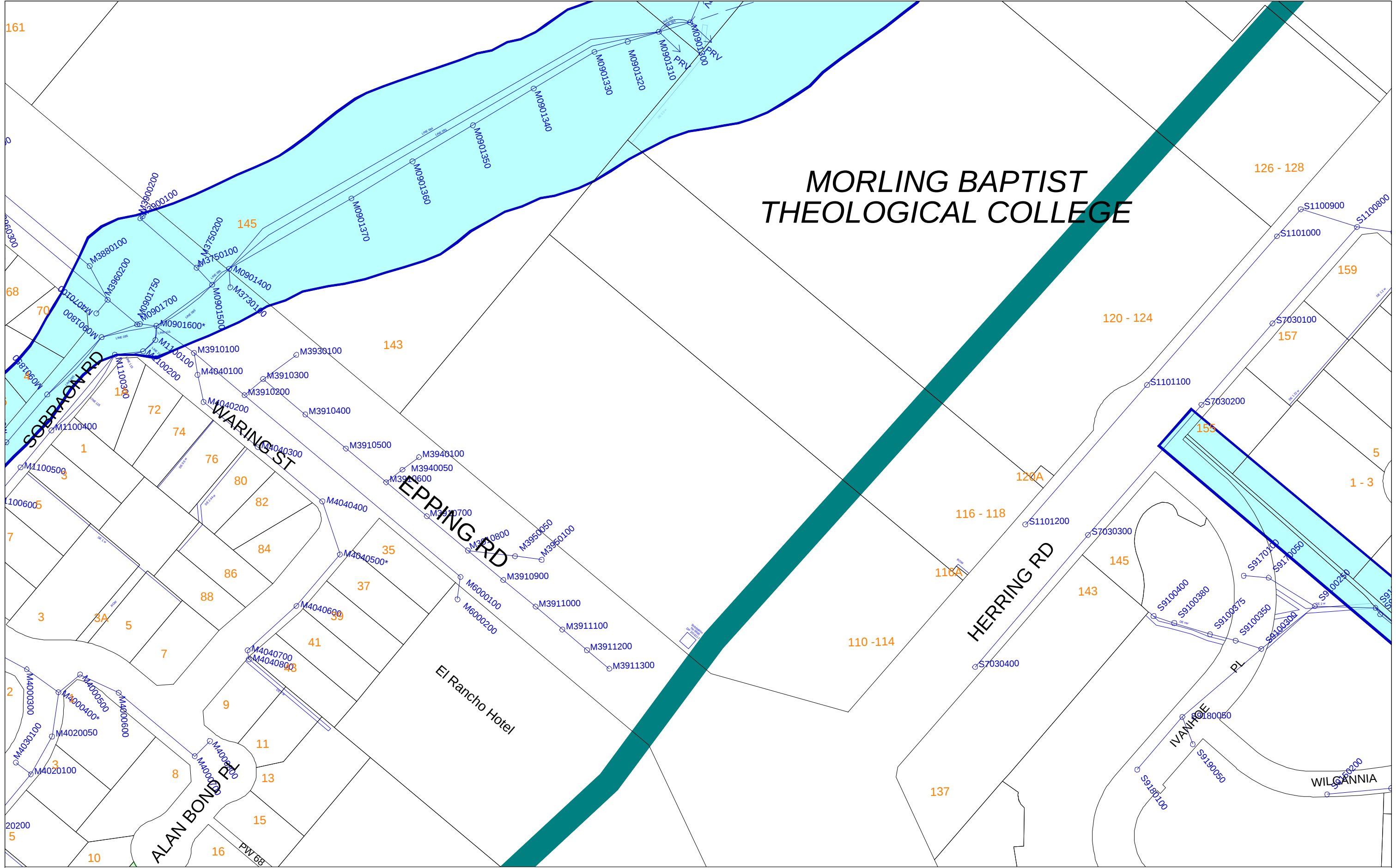
STATUS

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	PROJECT		
	MACQUARIE VILLAGE NORTH RYDE SITE CIVIL WORKS		
	CLIENT		
	STAMFORD PROPERTY		
TITLE			
OSD PLAN & DETAILS			
-			
-			
-			
DESIGNED		DRAWN	APPROVED
LD		RL/LC	-
SCALE @ A1		AS SHOWN	
PROJECT No		DRAWING No	REV
106038-10-MIE1131			B

5 APPENDIX B – COUNCIL FLOOD MAP

MORLING BAPTIST THEOLOGICAL COLLEGE



File Name:	
Date:	04/11/2010
Scale:	1:1500

6 APPENDIX C1 – DRAINS ANALYSIS

6.1 Drains Model

DRAINS is a windows based full simulation model, capable of describing the behaviour of a catchment and pipe system for real storm events, as well as statistically - based design storms. It generates full hydrographs of flows arriving at each pit, and routes then through the pipe network and over catchment surfaces, combining them where appropriate.

For this analysis eleven 1in 100-year ARI statistically - based design storms were used, being storms of duration:

5 minutes	25 minutes	90 minutes
10 minutes	30 minutes	120 minutes
15 minutes	45 minutes	180 minutes
20 minutes	60 minutes	

The following parameters were used in the DRAINS Rainfall Data:-

Colebrook-White roughness height for: RCP	0.6 mm
PVC	0.03mm
Paved area initial loss	1 mm
Grassed area initial loss	5 mm
Soil Group Type	3.0 (moderate to slow infiltration)
Antecedent moisture content	3.0 (rather wet conditions)

The average rainfall intensities were taken from AR&R Volume 2, and the DRAINS input data files are shown in Appendix C2.

6.2 Permissible Site Discharge (PSD)

Following consultation with Council's development engineers we have established that On-site Stormwater Detention is to be provided to on the basis of attenuating to post-development 1 in 100 year ARI site discharge to that of green fields pre-development conditions (Permissible Site Discharge (PSD))

Refer Table 6.1 below for a summary of the 1 in 100-year ARI pre-development catchment discharges in their green fields states. These pre-development catchment flows have been adopted as the PSD for the respective catchments

Catchment	Pre- Development 1 in 100-year ARI Peak Flow (l/s)
Pre-Development West	609
Pre-Development East	96

Table 6.1 – PSD Flow Rates

6.3 Development On-Site Detention (OSD)

OSD for the development will be provided in the form of a concrete tank on the western edge of the underground carpark between the ground floor slab and first basement level.

The tank will be comprised of an irregular shape to conform with the car-park structure with an approximate surface area of 170m² and internal height of 2.7m. Its final shape, position and configuration will be subject to detailed design at the Construction Certificate stage and coordination with the Architect and Hydraulic consultant.

The proposed OSD tank's Elevation v Surface Area relationship is shown in Table 6.2 below.

RL	Surface Area (m ²)
65.3	0
65.4	1
65.6	1
65.7	35
65.8	70
65.9	105
66.0	140
66.1	170
67.0	170
68.0	170
69.0	170

Orifice Size – 273mm

Centre Line RL – 65.60

Table 6.2 – RL v S.A.

6.4 DRAINS Analysis

Refer Figure 6.1 below for DRAINS results and corresponding data files in Appendix C2.

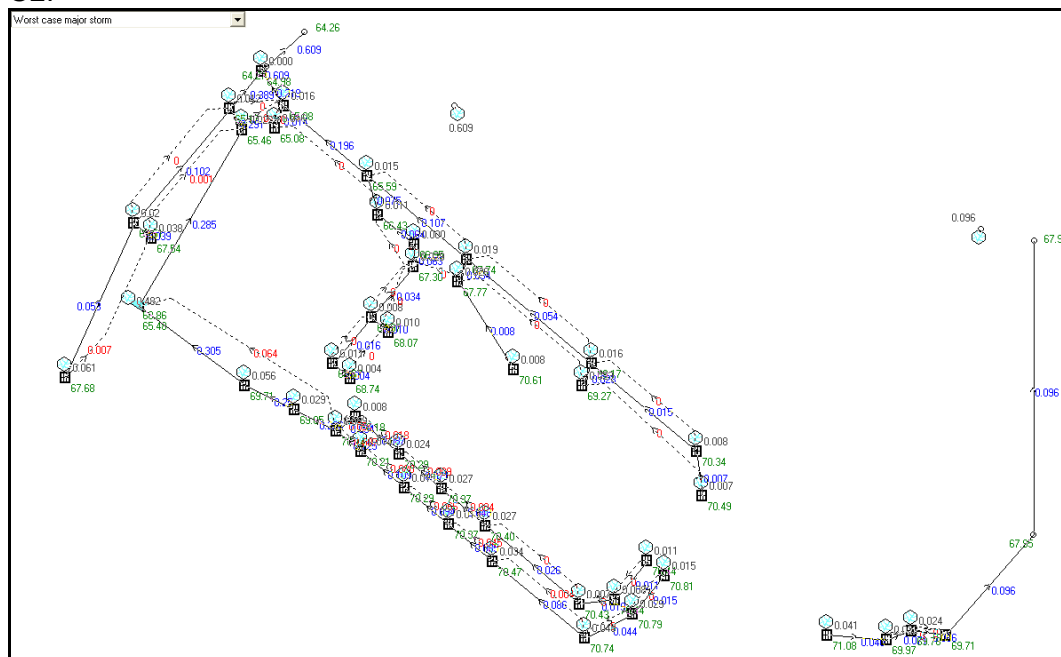


Figure 6.1 – DRAINS Results

6.5 Compliance with Council Requirements

The calculations performed in the DRAINS program indicate that following construction of the proposed OSD basin within the basement carpark (as described in Section 6.3 above), the post-development stormwater flows generated by the developed site for the 1 in 100-year ARI storm event are less than or equal to the pre-development 1 in 100-year ARI flows for the western and eastern catchments. Refer Table 5.5 below for a summary of these post development flows.

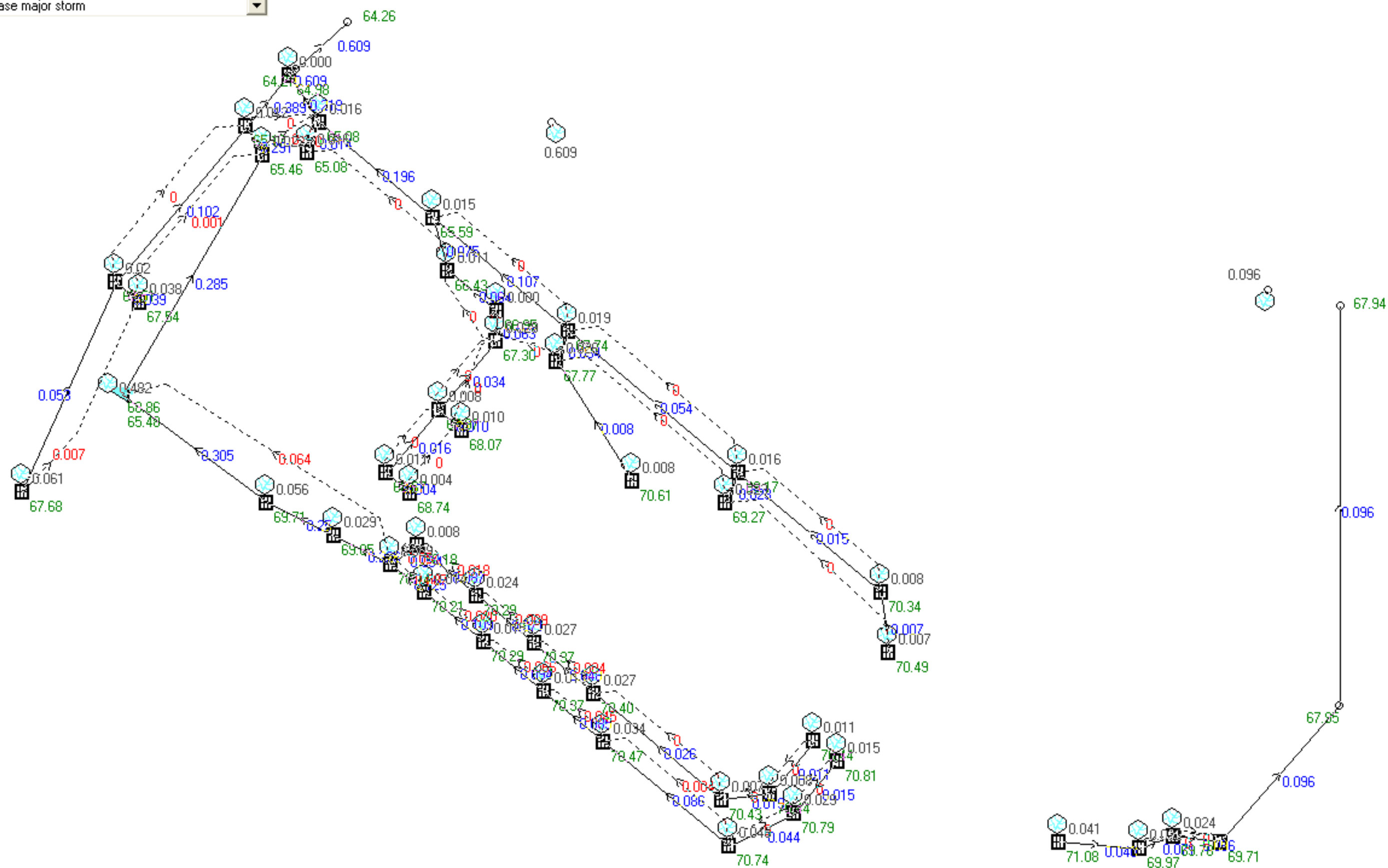
Catchment	1 in 100-year ARI Peak Flow (l/s)	
	Pre- Development	Post- Development
Pre-Development West	609	609
Pre-Development East	96	96

Table 6.1 – Post-Development Flow Rates

On this basis, we assert that the proposed development complies with City of Ryde Council's OSD requirements.

7 APPENDIX C2 – DRAINS DATA

Worst case major storm



DRAINS INPUT DATA**PIT / NODE DETAILS**

Version 9

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid
A.11	OnGrade	NSW Dept	1.8 m lintel (all grades		4.5	70.975		0	0.2	325329.3	6260577	No
A.10	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	70.85		0	0.2	325320.8	6260566	No
A.9	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	70.717		0	0.2	325311.4	6260565	No
A.8	OnGrade	NSW Dept	RM.7 Grated Accessw		0.5	70.446		0	0.2	325286.8	6260586	No
A.7	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	70.366		0	0.2	325275.2	6260596	No
A.6	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	70.29		0	0.2	325264.1	6260605	No
A.5	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	70.175		0	0.2	325252.6	6260614	No
A.4	OnGrade	NSW Dept	1.8 m lintel (all grades		2.5	70.144		0	0.2	325247.4	6260611	No
A.3	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	69.982		0	0.2	325236.4	6260616	No
A.2	OnGrade	Industrial	1 Industrial 1200x1200		0.5	70.116		0	0.2	325223.5	6260623	No
8.1	OnGrade	NSW Dept	1.8 m lintel (all grades		4.5	65.917		0	0.2	325222.6	6260690	No
1.3	OnGrade	NSW Dept	1.8 m lintel (all grades		2	65.777		0	0.2	325219.5	6260696	No
1.2	OnGrade	NSW Dept	1.8 m lintel (all grades		2.5	65.16		0	0.2	325227.8	6260705	No
N59	Node					65.5		0		325228.9	6260707	
N72	Node					69.5		0		325377.4	6260693	
Easement	Node					69.5		0		325384.2	6260702	
B.7	OnGrade	NSW Dept	1.8 m lintel (all grades		4.5	70.975		0	0.2	325333.9	6260573	No
B.6	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	70.85		0	0.2	325325.4	6260563	No
B.5	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	70.744		0	0.2	325312.9	6260556	No
B.4	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	70.468		0	0.2	325288.6	6260577	No
B.3	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	70.37		0	0.2	325277	6260586	No
B.2	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	70.291		0	0.2	325265.5	6260596	No
B.1	OnGrade	NSW Dept	1.8 m lintel (all grades		0.5	70.212		0	0.2	325254	6260605	No
C.2	OnGrade	NSW Dept	1.8 m lintel (all grades		2.5	70.227		0	0.2	325176.1	6260625	No
1.4	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	68.11		0	0.2	325194.2	6260665	No
NE Corner	Node					66.5		0		325279.3	6260692	
1.5	OnGrade	NSW Dept	1.8 m lintel (all grades		4.5	68.11		0	0.2	325198.8	6260662	No
2.6	OnGrade	NSW Dept	1.8 m lintel (all grades		4.5	71.342		0	0.2	325343.7	6260594	No
2.5	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	71.203		0	0.2	325342.3	6260605	No
2.4	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	69.918		0	0.2	325314.7	6260629	No
2.3	OnGrade	NSW Dept	1.8 m lintel (all grades		1.5	68.304		0	0.2	325281.9	6260656	No

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid
2.2	OnGrade	NSW Dept	1.8 m lintel	(all grades	1.5	66.578			0	0.2	325255.6	6260678 No
2.1	Sag	NSW Dept	1.8 m lintel	10	1.5	65.229	0.15		0	0.5	325233.6	6260696 No
4.1	OnGrade	NSW Dept	1.8 m lintel	(all grades	4.5	69.987			0	0.2	325312.2	6260623 No
5.2	OnGrade	NSW Dept	1.8 m lintel	(all grades	1.5	71.185			0	0.2	325294.3	6260627 No
5.1	OnGrade	NSW Dept	1.8 m lintel	(all grades	4.5	68.384			0	0.2	325279.6	6260650 No
6.6	OnGrade	NSW Dept	1.8 m lintel	(all grades	4.5	69.56			0	0.2	325251.1	6260625 No
6.5	OnGrade	NSW Dept	1.8 m lintel	(all grades	1.5	69.37			0	0.2	325246.5	6260629 No
6.4	OnGrade	NSW Dept	1.8 m lintel	(all grades	1.5	68.603			0	0.2	325256.7	6260641 No
6.3	OnGrade	NSW Dept	1.8 m lintel	(all grades	2	67.944			0	0.2	325267.8	6260654 No
6.2	OnGrade	NSW Dept	1.8 m lintel	(all grades	2	67.699			0	0.2	325268	6260660 No
6.1	OnGrade	NSW Dept	1.8 m lintel	(all grades	2.5	67.058			0	0.2	325258.5	6260668 No
13.1	OnGrade	NSW Dept	1.8 m lintel	(all grades	4.5	68.609			0	0.2	325261.2	6260637 No
7.1	Sag	NSW Dept	1.8 m lintel	10	4.5	65.248	0.15		0	0.5	325231.3	6260690 No
3.5	OnGrade	NSW Dept	1.8 m lintel	(all grades	4.5	71.388			0	0.2	325376.6	6260557 No
3.4	OnGrade	NSW Dept	1.8 m lintel	(all grades	4.5	70.44			0	0.2	325392.3	6260556 No
3.3	OnGrade	NSW Dept	1.8 m lintel	(all grades	1.5	70.407			0	0.2	325398.7	6260558 No
3.2	OnGrade	NSW Dept	1.8 m lintel	(all grades	2.5	70.31			0	0.2	325407.9	6260557 No
N65	Node					69.5			0		325430.9	6260584
Herring Ro	Node					69.5			0		325430.9	6260661
Herring	Node					66.5			0		325406.4	6260597

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL
Basin2	65.3	0	0	Orifice		273	65.6
	65.4	1					
	65.5	1					
	65.6	1					
	65.7	35					
	65.8	70					
	65.9	105					
	66	140					
	66.1	170					
	66.2	170					
	66.3	170					
	66.4	170					
	66.5	170					
	66.6	170					
	66.7	170					
	66.8	170					
	66.9	170					
	67	170					
	67.1	170					
	67.2	170					
	67.3	170					
	67.4	170					
	67.5	170					
	67.6	170					
	67.7	170					
	67.8	170					
	67.9	170					
	68	170					
	68.1	170					
	68.2	170					
	68.3	170					
	68.4	170					
	68.5	170					
	68.6	170					

Name	Elev	Surf. Area
	68.7	170
	68.8	170
	68.9	170
	69	170
	69.1	170
	69.2	170
	69.3	170
	69.4	170
	69.5	170
	69.6	170
	69.7	170
	69.8	170
	69.9	170
	70	170

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Paved Time (min)	Grass Time (min)	Paved Length (m)	Grass Length (m)	Paved Slope(%)	Grass Slope %	Paved Rough	Grass Rough
C A.11	A.11	0.0167	100	0	5	0						
C A.10	A.10	0.0123	100	0	5	0						
C A.9	A.9	0.0103	100	0	5	0						
C A.8	A.8	0.0413	100	0	5	0						
C A.7	A.7	0.0417	100	0	5	0						
C A.6	A.6	0.0365	100	0	5	0						
C A.5	A.5	0.0125	100	0	5	0						
C A.4	A.4	0.0144	100	0	5	0						
C A.3	A.3	0.0436	100	0	5	0						
C A.2	A.2	0.0857	100	0	5	0						
ROOF	Basin2	0.81	100	0	7	0						
C 8.1	8.1	0.0332	100	0	5	0						
C 1.3	1.3	0.0188	100	0	5	0						
C 1.2	1.2	0.0001	100	0	5	0						
C B.7	B.7	0.0237	100	0	5	0						
C B.6	B.6	0.0439	100	0	5	0						
C B.5	B.5	0.0707	100	0	5	0						
C B.4	B.4	0.0519	100	0	5	0						
C B.3	B.3	0.0195	100	0	5	0						
C B.2	B.2	0.0222	100	0	5	0						
C B.1	B.1	0.0217	100	0	5	0						
C C.1	C.2	0.22	0	100	0	0	0	160	0	3.7	0	0.3
C 1.4	1.4	0.0306	100	0	5	0						
Predevelop	NE Corner	2.018	0	100	0	0	0	220	0	5.2	0	0.2
C 1.5	1.5	0.0584	100	0	5	0						
C 2.6	2.6	0.0113	100	0	5	0						
C 2.5	2.5	0.0118	100	0	5	0						
C 2.4	2.4	0.0243	100	0	5	0						
C 2.3	2.3	0.0291	100	0	5	0						
C 2.2	2.2	0.0231	100	0	5	0						
C 2.1	2.1	0.0239	100	0	5	0						
C 4.1	4.1	0.0358	100	0	5	0						

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Paved Time (min)	Grass Time (min)	Paved Length (m)	Grass Length (m)	Paved Slope(%) %	Grass Slope %	Paved Rough	Grass Rough	
C 5.2	5.2	0.0115	100	0	0	5	0						
C 5.1	5.1	0.0399	100	0	0	5	0						
C 6.6	6.6	0.0068	100	0	0	5	0						
C 6.5	6.5	0.0173	100	0	0	5	0						
C 6.4	6.4	0.0124	100	0	0	5	0						
C 6.3	6.3	0.0447	100	0	0	5	0						
C 6.2	6.2	0.0001	100	0	0	5	0						
C 6.1	6.1	0.0173	100	0	0	5	0						
C 13.1	13.1	0.0159	100	0	0	5	0						
C 7.1	7.1	0.0238	100	0	0	5	0						
C 3.5	3.5	0.062	100	0	0	5	0						
C 3.4	3.4	0.0487	100	0	0	5	0						
C 3.3	3.3	0.0371	100	0	0	5	0						
Predevelopment Herring		0.222	0	100	0	0	0	0	94	0	7.1	0	0.2

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes
P A.11	A.11	A.10	13.2	70.03	69.898		1 RCP C2	300	300	300	0.3 New	1
P A.10	A.10	A.9	9.527	69.878	69.783		1 RCP C2	300	300	300	0.3 New	1
P A.9	A.9	A.8	32.04	69.763	69.603		0.5 RCP C2	300	300	300	0.3 New	1
P A.8	A.8	A.7	15.15	69.583	69.507		0.5 RCP C2	300	300	300	0.3 New	1
P A.7	A.7	A.6	14.45	69.487	69.415		0.5 RCP C2	300	300	300	0.3 New	1
P A.6	A.6	A.5	14.996	69.395	69.32		0.5 RCP C2	300	300	300	0.3 New	1
P A.5	A.5	A.4	6.224	69.3	69.269		0.5 RCP C2	300	300	300	0.3 New	1
P A.4	A.4	A.3	12.348	69.249	69.187		0.5 RCP C2	450	450	450	0.3 New	1
P A.3	A.3	A.2	14.403	69.167	69.095		0.5 RCP C2	450	450	450	0.3 New	1
P A.2	A.2	Basin2	35.028	69.075	68.9		0.5 RCP C2	450	450	450	0.3 NewFixed	1
P 8.2	Basin2	8.1	6.146	65.3	65.095		3.34 RCP C2	600	600	600	0.3 NewFixed	1
P 8.1	8.1	1.3	6.448	64.695	64.631		0.99 RCP C2	675	675	675	0.3 New	1
P 1.3	1.3	1.2	12.922	64.5	63.995		3.91 RCP C2	675	675	675	0.3 New	1
P 1.2	1.2	N59	1.491	63.945	63.93		1.01 RCP C2	675	675	675	0.3 New	1
Pipe72	N59	N72	1	63.9	63.89		1 RCP C2	675	675	675	0.3 New	1
P88	N72	Easement	1	63.89	63.88		1 RCP C2	675	675	675	0.3 New	1
P B.7	B.7	B.6	13.2	70.107	69.975		1 RCP C2	300	300	300	0.3 New	1
P B.6	B.6	B.5	14.027	69.935	69.795		1 RCP C2	300	300	300	0.3 New	1
P B.5	B.5	B.4	31.619	69.775	69.617		0.5 RCP C2	300	300	300	0.3 New	1
P B.4	B.4	B.3	15	69.597	69.522		0.5 RCP C2	300	300	300	0.3 New	1
P B.3	B.3	B.2	15	69.502	69.427		0.5 RCP C2	300	300	300	0.3 New	1
P B.2	B.2	B.1	15	69.407	69.332		0.5 RCP C2	300	300	300	0.3 New	1
P B.1	B.1	A.4	8.59	69.312	69.269		0.5 RCP C2	300	300	300	0.3 New	1
P C.2	C.2	1.4	5.217	67.376	67.324		1 RCP C2	375	375	375	0.3 NewFixed	1
P 1.4	1.4	1.3	39.362	67.068	64.85		5.63 RCP C2	375	375	375	0.3 New	1
P 1.5	1.5	1.4	6	67.178	67.118		1 RCP C2	375	375	375	0.3 New	1
P 2.6	2.6	2.5	11.698	70.372	70.255		1 RCP C2	375	375	375	0.3 New	1
P 2.5	2.5	2.4	35.997	70.205	68.955		3.47 RCP C2	375	375	375	0.3 New	1
P 2.4	2.4	2.3	42.767	68.905	67.35		3.64 RCP C2	375	375	375	0.3 New	1
P 2.3	2.3	2.2	34.236	67.3	65.63		4.88 RCP C2	375	375	375	0.3 New	1
P 2.2	2.2	2.1	28.722	65.03	64.152		3.06 RCP C2	450	450	450	0.3 New	1
P 2.1	2.1	1.2	10.739	64.102	63.995		1 RCP C2	525	525	525	0.3 New	1
P 4.1	4.1	2.4	6.279	69.048	68.982		1.05 RCP C2	375	375	375	0.3 New	1

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes
P 5.2		5.2	5.1	27.543	70.516	67.715	10.17 RCP C2	300	300	300	0.3 New	1
P 5.1		5.1	2.3	6.329	67.44	67.378	0.98 RCP C2	375	375	375	0.3 New	1
P 6.6		6.6	6.5	6.001	68.64	68.58	1 RCP C2	300	300	300	0.3 New	1
P 6.5		6.5	6.4	15.835	68.53	67.819	4.49 RCP C2	300	300	300	0.3 New	1
P 6.4		6.4	6.3	17.362	67.769	67.035	4.23 RCP C2	375	375	375	0.3 New	1
P 6.3		6.3	6.2	5.768	66.985	66.837	2.57 RCP C2	375	375	375	0.3 New	1
P 6.2		6.2	6.1	12.288	66.637	66.11	4.29 RCP C2	375	375	375	0.3 New	1
P 6.1		6.1	2.2	10.695	66.06	65.632	4 RCP C2	375	375	375	0.3 New	1
P 13.1		13.1	6.4	5.999	67.897	67.837	1 RCP C2	225	225	225	0.3 New	1
P 7.1		7.1	2.1	6.337	64.466	64.402	1.01 RCP C2	375	375	375	0.3 New	1
P 3.5		3.5	3.4	15.698	70.712	69.763	6.05 RCP C2	300	300	300	0.3 New	1
P 3.4		3.4	3.3	6.892	69.501	69.432	1 RCP C2	375	375	375	0.3 New	1
P 3.3		3.3	3.2	9.266	69.382	69.289	1 RCP C2	375	375	375	0.3 New	1
P 3.2		3.2 N65		34.971	69.239	67.78	4.17 RCP C2	375	375	375	0.3 New	1
P81	N65	Herring Ro	1		67.78	67.77	1 RCP C2	375	375	375	0.3 New	1

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stor	SafeDepth Minor Stor	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %
F A.11	A.11	A.10		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F A.10	A.10	A.9		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F A.9	A.9	A.8		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F A.8	A.8	A.7		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F A.7	A.7	A.6		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F A.6	A.6	A.5		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
OF23	A.5	A.4		0.1			8 m wide r	0.3	0.15	0.6	0.5	0
F A.4	A.4	Basin2		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 12.1		8.1	2.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 8.6		1.3	2.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F B.7	B.7	B.6		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F B.6	B.6	B.5		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F B.5	B.5	B.4		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F B.4	B.4	B.3		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F B.3	B.3	B.2		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F B.2	B.2	B.1		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F B.1	B.1	A.4		0.1			8 m wide r	0.14	0.14	0.6	0.5	0
OF36	C.2		1.5	0.1			8 m wide r	0.3	0.15	0.4	1	0
F 8.4		1.4	1.3	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 1.5		1.5	8.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 1.1		2.6	4.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 1.2		2.5	2.4	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 1.4		2.4	2.3	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 1.6		2.3	2.2	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 4.1		4.1	5.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 5.1		5.1	6.3	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 6.1		6.6	13.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 6.2		6.5	6.4	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 6.3		6.4	6.3	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 6.4		6.3	6.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 6.6		6.1	7.1	0.1			8 m wide r	0.14	0.14	0.6	0.5	0
F 13.1		13.1	6.3	0.1			8 m wide r	0.14	0.14	0.6	0.5	0

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stor	SafeDepth Minor Stor	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %
F 7.1	7.1	2.1	0.1				8 m wide r	0.14	0.14	0.6	0.5	0
F 3.4	3.4	3.2	0.1				8 m wide r	0.14	0.14	0.6	0.5	0
F 2.4	3.3	3.2	0.1				8 m wide r	0.14	0.14	0.6	0.5	0

DRAINS RESULTS

DRAINS results prepared 30 January, 2011 from Version 2009.05

PIT / NODE DETAILS

Version 8						
Name	Max HGL	Max Pond HGL	Max Surface Flow Arrivals (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s) Constraint
A.11	70.44		0.011		0.53	0 None
A.10	70.44		0.008		0.41	0 None
A.9	70.43		0.007		0.29	0 None
A.8	70.4		0.027		0.04	0.004 Inlet Capacity
A.7	70.37		0.032		0	0.009 Outlet System
A.6	70.29		0.033		0	0.018 Outlet System
A.5	70.18		0.026		0	0.054 Outlet System
A.4	70.14		0.15		0	0.064 Outlet System
A.3	69.85		0.029		0.13	None
A.2	69.71		0.056		0.41	None
8.1	65.46		0.022		0.45	0 None
1.3	65.17		0.012		0.6	0 None
1.2	64.98		0		0.18	None
N59	64.27		0			
NE Corner	64.26		0			
B.7	70.81		0.015		0.17	0 None
B.6	70.79		0.029		0.06	0 None
B.5	70.74		0.046		0	0.004 Outlet System
B.4	70.47		0.038		0	0.045 Outlet System
B.3	70.37		0.058		0	0.066 Outlet System
B.2	70.29		0.081		0	0.08 Outlet System
B.1	70.21		0.094		0	0.087 Outlet System
C.2	67.68		0.061		2.55	0.007 Inlet Capacity
1.4	67.51		0.02		0.6	0 None
1.5	67.54		0.04		0.57	0.001 Inlet Capacity
2.6	70.49		0.007		0.85	0 None
2.5	70.34		0.008		0.87	0 None
2.4	69.17		0.016		0.75	0 None

Name	Max HGL	Max Pond HGL	Max Surface Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
2.3	67.74		0.019		0.56	0	None
2.2	65.59		0.015		0.99		None
2.1	65.08	65.27	0.016	1.1	0.15		None
4.1	69.27		0.023		0.72	0	None
5.2	70.61		0.008		0.57		None
5.1	67.77		0.026		0.61	0	None
6.6	68.74		0.004		0.82	0	None
6.5	68.67		0.011		0.7	0	None
6.4	67.97		0.008		0.63	0	None
6.3	67.3		0.029		0.65	0	None
6.2	66.95		0		0.75		None
6.1	66.43		0.011		0.63	0	None
13.1	68.07		0.01		0.54	0	None
7.1	65.08	65.29	0.016	1.1	0.17	0	None
3.5	71.08		0.041		0.3		None
3.4	69.97		0.032		0.47	0	None
3.3	69.78		0.024		0.62	0	None
3.2	69.71		0		0.6		None
N65	67.95		0				
Herring Ro	67.94		0				

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
C A.11	0.011	0.011	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.10	0.008	0.008	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.9	0.007	0.007	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.8	0.027	0.027	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.7	0.027	0.027	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.6	0.024	0.024	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.5	0.008	0.008	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.4	0.009	0.009	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.3	0.029	0.029	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C A.2	0.056	0.056	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
ROOF	0.482	0.482	0	7	0	0	0 AR&R 100 year, 20 minutes storm, average 144.1 mm/h, Zone 1
C 8.1	0.022	0.022	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 1.3	0.012	0.012	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 1.2	0	0	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C B.7	0.015	0.015	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C B.6	0.029	0.029	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C B.5	0.046	0.046	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C B.4	0.034	0.034	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C B.3	0.013	0.013	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C B.2	0.015	0.015	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C B.1	0.014	0.014	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C C.1	0.061	0	0.061	0	32.53	0	0 AR&R 100 year, 1 hour storm, average 82.9 mm/h, Zone 1
C 1.4	0.02	0.02	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
Predevelop	0.609	0	0.609	0	27.87	0	0 AR&R 100 year, 1 hour storm, average 82.9 mm/h, Zone 1
C 1.5	0.038	0.038	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 2.6	0.007	0.007	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 2.5	0.008	0.008	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 2.4	0.016	0.016	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 2.3	0.019	0.019	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 2.2	0.015	0.015	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 2.1	0.016	0.016	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 4.1	0.023	0.023	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1

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
C 5.2	0.008	0.008	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 5.1	0.026	0.026	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 6.6	0.004	0.004	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 6.5	0.011	0.011	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 6.4	0.008	0.008	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 6.3	0.029	0.029	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 6.2	0	0	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 6.1	0.011	0.011	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 13.1	0.01	0.01	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 7.1	0.016	0.016	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 3.5	0.041	0.041	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 3.4	0.032	0.032	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
C 3.3	0.024	0.024	0	5	0	0	0 AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
Predevelop	0.096	0	0.096	0	12.22		0 AR&R 100 year, 20 minutes storm, average 144.1 mm/h, Zone 1

Outflow Volumes for Total Catchment (2.02 impervious + 2.46 pervious = 4.48 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m	Impervious Runoff cu.m	Pervious Runoff cu.m	Runoff %
AR&R 100	922.9	632.15	68	395.57	(95 236.58 (46.6%)
AR&R 100	1438.45	1095.93	(7 627.80	(96 468.12	(59.2%)
AR&R 100	1830.89	1449.30	(7 804.58	(97 644.72	(64.1%)
AR&R 100	2150.21	1736.21	(8 948.43	(97 787.78	(66.7%)
AR&R 100	2421.04	1968.07	(8 1070.42	(9 897.65	(67.5%)
AR&R 100	2659.04	2174.92	(8 1177.63	(9 997.29	(68.2%)
AR&R 100	3243.22	2684.61	(8 1440.79	(9 1243.82	(69.8%)
AR&R 100	3711.02	3094.05	(8 1651.52	(9 1442.53	(70.7%)
AR&R 100	4458.59	3744.02	(8 1988.26	(9 1755.77	(71.7%)
AR&R 100	5058.44	4258.11	(8 2258.50	(9 1999.61	(71.9%)
AR&R 100	6029.85	5085.86	(8 2696.24	(9 2389.62	(72.1%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P A.11	0.011	0.2	70.439	70.437	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.10	0.019	0.3	70.432	70.429	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.9	0.026	0.4	70.419	70.403	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.8	0.048	0.7	70.391	70.366	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.7	0.071	1	70.341	70.29	AR&R 100 year, 1 hour storm, average 82.9 mm/h, Zone 1
P A.6	0.087	1.2	70.252	70.175	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.5	0.094	1.3	70.159	70.144	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.4	0.226	1.4	69.897	69.847	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.3	0.25	1.6	69.784	69.71	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P A.2	0.305	2.1	69.617	69.28	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 8.2	0.285	3.9	65.485	65.464	AR&R 100 year, 2 hours storm, average 56.5 mm/h, Zone 1
P 8.1	0.291	0.9	65.311	65.175	AR&R 100 year, 2 hours storm, average 56.5 mm/h, Zone 1
P 1.3	0.389	1.4	64.998	64.979	AR&R 100 year, 1.5 hours storm, average 66.4 mm/h, Zone 1
P 1.2	0.609	3	64.61	64.301	AR&R 100 year, 1.5 hours storm, average 66.4 mm/h, Zone 1
Pipe72	0.609	3	64.272	64.262	AR&R 100 year, 1.5 hours storm, average 66.4 mm/h, Zone 1
P B.7	0.015	0.2	70.796	70.794	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P B.6	0.044	0.6	70.764	70.744	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P B.5	0.086	1.2	70.631	70.468	AR&R 100 year, 20 minutes storm, average 144.1 mm/h, Zone 1
P B.4	0.085	1.2	70.436	70.37	AR&R 100 year, 10 minutes storm, average 192.8 mm/h, Zone 1
P B.3	0.094	1.3	70.345	70.291	AR&R 100 year, 45 minutes storm, average 96.6 mm/h, Zone 1
P B.2	0.109	1.5	70.266	70.212	AR&R 100 year, 10 minutes storm, average 192.8 mm/h, Zone 1
P B.1	0.125	1.8	70.181	70.144	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P C.2	0.053	1.6	67.506	67.506	AR&R 100 year, 1 hour storm, average 82.9 mm/h, Zone 1
P 1.4	0.102	3.7	67.179	65.175	AR&R 100 year, 1.5 hours storm, average 66.4 mm/h, Zone 1
P 1.5	0.039	0.4	67.508	67.506	AR&R 100 year, 1.5 hours storm, average 66.4 mm/h, Zone 1
P 2.6	0.007	1	70.418	70.336	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 2.5	0.015	1.9	70.252	69.167	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 2.4	0.054	2.8	68.992	67.744	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 2.3	0.107	3.5	67.419	65.749	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 2.2	0.196	3.4	65.206	65.076	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 2.1	0.219	1	64.998	64.979	AR&R 100 year, 1.5 hours storm, average 66.4 mm/h, Zone 1
P 4.1	0.023	0.8	69.167	69.167	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 5.2	0.008	1.9	70.547	67.773	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
P 5.1	0.034	0.3	67.744	67.744	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 6.6	0.004	0.9	68.678	68.674	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 6.5	0.016	2.3	68.576	67.972	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 6.4	0.034	2.7	67.834	67.296	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 6.3	0.063	2.5	67.091	66.948	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 6.2	0.064	3.1	66.727	66.426	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 6.1	0.075	3.1	66.162	65.734	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 13.1	0.01	0.9	67.972	67.972	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 7.1	0.014	0.1	65.076	65.076	AR&R 100 year, 25 minutes storm, average 129.8 mm/h, Zone 1
P 3.5	0.04	3.2	70.782	69.971	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 3.4	0.071	0.7	69.813	69.784	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 3.3	0.096	0.9	69.726	69.708	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P 3.2	0.096	3.3	69.356	67.955	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
P81	0.096	1.9	67.955	67.945	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 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
F A.11	0	0	0.134	0	0	0	0	
F A.10	0	0	0.134	0	0	0	0	
F A.9	0	0	0.134	0	0	0	0	
F A.8	0.004	0.004	0.134	0.048	0.02	0.4	0.45	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F A.7	0.009	0.009	0.134	0.062	0.03	0.72	0.55	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F A.6	0.018	0.018	0.134	0.077	0.04	1.2	0.58	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
OF23	0.054	0.054	1.797	0.107	0.07	2.2	0.67	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F A.4	0.064	0.064	0.134	0.112	0.08	2.38	0.68	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F 12.1	0	0	0.134	0	0	0	0	
F 8.6	0	0	0.134	0	0	0	0	
F B.7	0	0	0.134	0	0	0	0	
F B.6	0	0	0.134	0	0	0	0	
F B.5	0.004	0.004	0.134	0.049	0.02	0.4	0.45	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F B.4	0.045	0.045	0.134	0.101	0.07	2.01	0.64	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F B.3	0.066	0.066	0.134	0.113	0.08	2.4	0.69	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F B.2	0.08	0.08	0.134	0.12	0.08	2.65	0.7	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
F B.1	0.087	0.087	0.134	0.123	0.09	2.74	0.71	AR&R 100 year, 5 minutes storm, average 247.4 mm/h, Zone 1
OF36	0.007	0.007	1.19	0.051	0.03	0.43	0.67	AR&R 100 year, 1 hour storm, average 82.9 mm/h, Zone 1
F 8.4	0	0	0.134	0	0	0	0	
F 1.5	0.001	0.001	0.134	0.026	0.01	0.21	0.3	AR&R 100 year, 1.5 hours storm, average 66.4 mm/h, Zone 1
F 1.1	0	0	0.134	0	0	0	0	
F 1.2	0	0	0.134	0	0	0	0	
F 1.4	0	0	0.134	0	0	0	0	
F 1.6	0	0	0.134	0	0	0	0	
F 4.1	0	0	0.134	0	0	0	0	
F 5.1	0	0	0.134	0	0	0	0	
F 6.1	0	0	0.134	0	0	0	0	
F 6.2	0	0	0.134	0	0	0	0	
F 6.3	0	0	0.134	0	0	0	0	
F 6.4	0	0	0.134	0	0	0	0	
F 6.6	0	0	0.134	0	0	0	0	
F 7.1	0	0	0.134	0	0	0	0	
F 3.4	0	0	0.134	0	0	0	0	
F 2.4	0	0	0.134	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin2	68.86	512.6	0.285	0.285	0

CONTINUITY CHECK for AR&R 100 year, 1 hour storm, average 82.9 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch (cu.m)	Difference %
A.11	13.68	13.68	0	0
A.10	23.75	23.75	0	0
A.9	32.18	32.18	0	0
A.8	66.01	66	0	0
A.7	100.15	100.11	0	0
A.6	130.01	129.99	0	0
A.5	140.22	140.21	0	0
A.4	359.67	359.67	0	0
A.3	391.92	391.89	0	0
A.2	462.08	461.97	0	0
Basin2	1128.82	1128.48	0.3	0
8.1	1155.67	1155.67	0	0
1.3	1372.38	1372.38	0	0
1.2	1658.26	1657.84	0	0
N59	1657.84	1657.84	0	0
NE Corner	1657.84	1657.84	0	0
B.7	19.41	19.41	0	0
B.6	55.36	55.36	0	0
B.5	113.27	113.26	0	0
B.4	155.76	155.75	0	0
B.3	171.72	171.72	0	0
B.2	189.9	189.89	0	0
B.1	207.66	207.66	0	0
C.2	128.44	128.43	0	0
1.4	201.31	201.31	0	0
NE Corner	1182.65	1182.65	0	0
1.5	55.19	55.18	0	0
2.6	9.25	9.25	0	0

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ctr (cu.m)	Difference %
2.5	18.92	18.92	0	0
2.4	68.14	68.14	0	0
2.3	134.07	134.07	0	0
2.2	246.76	246.76	0	0
2.1	285.83	285.81	0	0
4.1	29.32	29.32	0	0
5.2	9.42	9.42	0	0
5.1	42.1	42.1	0	0
6.6	5.57	5.57	0	0
6.5	19.74	19.74	0	0
6.4	42.92	42.92	0	0
6.3	79.52	79.52	0	0
6.2	79.61	79.61	0	0
6.1	93.78	93.78	0	0
13.1	13.02	13.02	0	0
7.1	19.49	19.49	0	0
3.5	50.78	50.75	0	0.1
3.4	90.64	90.64	0	0
3.3	121.02	121.02	0	0
3.2	121.02	121.02	0	0
N65	121.02	121.02	0	0
Herring Ro	121.02	121.02	0	0
Herring Rd	131.44	131.44	0	0

Run Log for Stamford Nth Ryde OSD 2011 run at 12:39:55 on 30/1/2011

Upwelling occurred at B.3, B.4, A.5

Freeboard was less than 0.15m at B.1, B.2, B.5, B.6, A.3, A.4, A.6, A.7, A.8

8 APPENDIX D – MUSIC MODELLING

8.1 Aims

The aims of MUSIC modelling undertaken at the Macquarie Village site were to assess the:

- Stormwater quality and pollutant exports under existing conditions;
- Impacts of the proposed development on stormwater quality; and
- If best current practice is not met then identify and assess additional supporting measures to meet the objectives.

8.2 Rainfall and Evapo-Transpiration Data

The pluviograph rainfall data was sourced from the Sydney Observatory Hill rainfall gauge (Station No 66062). This gauge was found to be representative of the rainfall patterns occurring at Ryde.

This gauge includes 88 years of rainfall data from 1913 to 2001

Monthly evapo-transpiration for Sydney (Source: Music Tool Kit) is tabulated in Table 8.1

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
180	135	128	85	58	43	43	58	88	127	152	163	1260

Table 8.1 - Monthly Average Potential Evapo-Transpiration (mm) for Sydney

8.3 Catchments

MUSIC sub-catchments for proposed developed Macquarie Village are shown in the catchment map below (Figure 8.1).

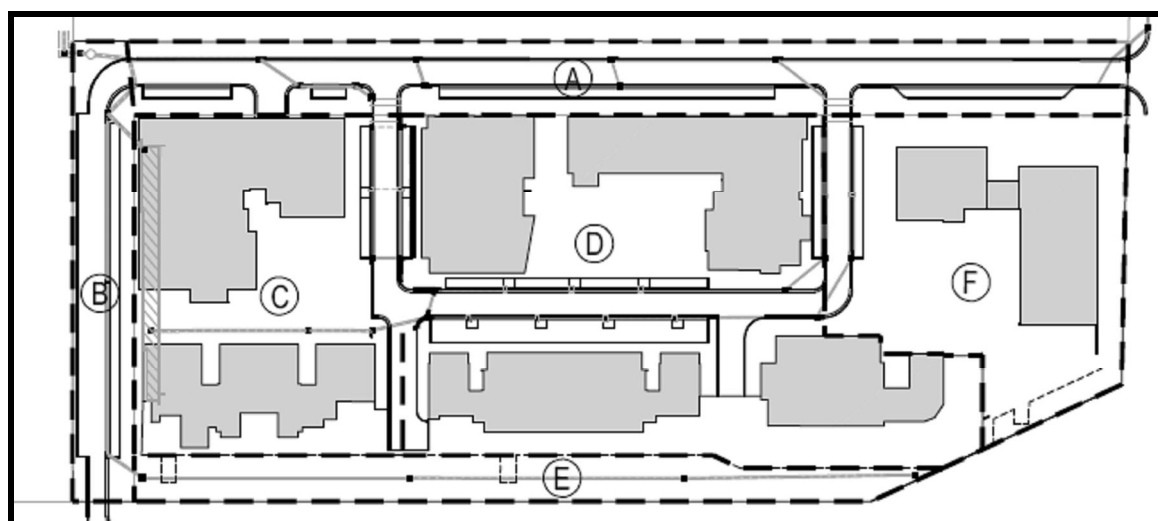


Figure 8.1 - Catchment Map (MUSIC - Macquarie Village Sub Catchments)

8.4 Land Use and Surface Types

For each subcatchment in MUSIC (Catchment's A, B, C, D, E & F), three surface types were adopted: roof, road and open space. The "road" surface type also includes driveways, walkways and non-pervious car parks. The "open space" surface type includes all landscaped areas.

Refer Table 8.2 below for the estimated area of each surface type for each subcatchment.

Sub Catchment	Roof (ha)	Road (ha)	Open Space (ha)
A	-	0.351	-
B	-	0.135	-
C	0.258	0.190	-
D	0.454	0.375	-
E	-	-	0.158
F	0.126	0.226	-

Table 8.2 – Land Use and Surface Types

8.5 MUSIC Rainfall/ Runoff Parameters

The adopted rainfall/runoff parameter values used in the modelling are shown in Table 8.3 below:

Parameters	Open Space	Roof	Road
Imperviousness	0%	100%	100%
Field capacity (mm)	80	80	80
Pervious area infiltration cap coeff - a	200	200	200
Pervious area infiltration cap exp - b	1	1	1
Impervious area rain threshold (mm/d)	1	1	1
Pervious area soil storage cap (mm)	120	120	120
Pervious area soil initial storage (% cap)	30	30	30
Groundwater initial depth (mm)	10	10	10
Groundwater daily recharge rate (%)	25	25	25
Groundwater daily baseflow rate (%)	1	1	1
Groundwater daily deep seep rate (%)	1	1	1

Table 8.3 – MUSIC Rainfall/ Runoff Parameters

8.6 MUSIC Water Quality Parameters

The pollutants of concern that were assessed include total suspended solids (TSS), total phosphorous (TP) and total nitrogen (TN). The quality of stormwater runoff is characterised by inputting event mean concentrations (EMCs) for storm flow and base flow conditions as well as the standard deviation of each EMC.

The 2006 Australian Runoff Quality (ARQ) Guidelines summarises the findings of a detailed analysis of available EMCs by surface type and land use under Australian and overseas conditions. In this study, the EMC values for the adopted surface types were guided by the EMCs given in the 2006 ARQ Guidelines (Engineers Australia, 2006). Refer Table 8.4 below.

Item	Open Space	Roof	Road
Stormflow TSS Mean (mg/L)	120.0	35.0	250.0
Stormflow TP Mean (mg/L)	0.60	0.18	0.26
Stormflow TN Mean (mg/L)	3.5	1.4	2.0
Baseflow TSS Mean (mg/L)	25.1	12.6	12.6
Baseflow TP Mean (mg/L)	0.13	0.1	0.15
Baseflow TN Mean (mg/L)	1.19	1.26	1.26

Table 8.4 – MUSIC Water Quality Parameters

8.7 WSUD Measures

In order to treat stormwater quality discharging from site it is proposed to install several WSUD treatment measures in a treatment train configuration to achieve the Pollutant reduction objectives outlined in 2006 Australian Runoff Quality (ARQ).

These pollutant reduction targets are as follows - 80%, 45% and 45% reduction for TSS, TP and TN respectively.

The proposed WUSD treatment measures at Macquarie Village include:

- Hydrodynamic Separator – Humeceptor STC9 (80% TSS, 30% TP and 30% TN treatment efficiency from manufacturer)
- Vegetated Swale (190m Long x 1.8m Wide x 100mm Deep with 250mm high vegetation)
- Bio-Retention System (1.0m Deep Filter medium with 5mm Median particle size)
- Rain Garden (2.5m Wide x 2.5m Long x 1.0m Deep Filter medium with 5mm Median particle size)

8.8 MUSIC Modelling Results

Using the Treatment Train Effectiveness module within MUSIC model the results of the site Water Quality modelling are shown in Table 8.5 below.

WQ Parameters	Sources Load	Residual Load	% Reduction
Total Suspended Solids - TSS (kg/yr)	4340	318	92.7
Total Phosphorus - TP (kg/yr)	6.53	3.05	53.3
Total Nitrogen - TN (kg/yr)	49.3	26.8	45.5

Table 8.5 – MUSIC Modelling Results

As can be seen from the table above, as a result of incorporating the WSUD measures described above the developed Macquarie Village Site will achieve the pollutant reduction objectives outlined in ARQ.