



REF : M9323-704711-36491

STORMWATER DESIGN CALCULATIONS

AT 136 NARRABEEN PARK PARADE

MONA VALE

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Files On Disk

M9323-704711 -DRAINS.DRN

1.0 Detention System Requirements

1.1 Storage-Area calcs.

DATA:

Site Area Assessed due to easements

Site Area = 0.0594 ha 594 sq.m

Impervious Area Pre Development = 244.3 sqm

Percentage Impervious Pre Development = 35%

Impervious Area POST Development = 276.91 sqm

Percentage Impervious POST Development = 47%

Catchment directed through OSD = 224.2 sqm 81.0 %

OSD Bypass Areas : Impervious 52.71 sqm 14.3 %

Pervious 317.09 sqm 85.7 %

Total 369.8 sqm

Slope of Site = 0.2 % Time of Concentration t_c =

Effective Flow Length = 39 m 3 min. 1:5

Hortons n = 0.1 3 min. 1:100

FFL of house = 34.785 m

Roof Gutter Level = 40.125 m

Invert of Boundary Pit= 31.1 m

Invert of Outlet= 31 m

Detention A

Volume Required 6.15 cu.m

Total Area 4.58 sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
35.19	0	0	0.000
35.86	4.6	0.671	3.080
36.54	4.6	1.34	6.150

Invert of pit = 35.19 m

Orifice Dia. = 48 mm

Max. Water Level achieved = 36.520 m

Storage achieved 6.08 cu.m

$$Q = d^2 \sqrt{h} / 0.48$$

$$d = \sqrt{(0.48 * Q) / \sqrt{h}}$$

Basix Allowance

Raintank Basix = 2000 L

Raintank Provided = 2600 L

25% credit equivalent to 0.484 sqm

Raintank Pad Level = 34.625 m

Water Level in Tank RL for Basix = 35.19 m = orifice IL. Depth=0.57m

Total Effective Tank Required = 8685 L OK Max. WL.=36.52m

OSD Volume Available = 6150 L

Nominal tank Volume used = 8280 L

Total Tank Height = 2.020 m TOP OF TANK.=36.65m

1.2 DRAINS Data File for Pre & Post Developed Conditions

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	Part Full Shock Loss								
Pre	Node					10		0		256		-139	2								
Ground	Node					34.59		0		444		-153	8								
N1	Node					31.4		0		571		-185	12								
Outlet	Node					31.15		0		617.232		-211.091	45								
Roof	Node					40.13		0		440		-74	9								
DETENTION BASIN DETAILS																					
Name	Elev	Surf. Area	Init Vol. (cu.n	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest l id							
OSD Basin	35.19	4.5831	0	Orifice		48	35.2163005			558		-103 No			5						
	35.86	4.5831																			
	36.54	4.5831																			
SUB-CATCHMENT DETAILS																					
Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope	Gutter FlowFactor
Pre Site	Pre	0.0594	35	65	0	0	0	0	0	39	39	0	0.2	0.2	0	0.01	0.2	0	0		
Bypass	Ground	0.0370	14.3	85.7	0	0	0	0	0	39	39	0	0.2	0.2	0	0.01	0.2	0	0		
Roof Area	Roof	0.0224	100	0	0	0	0	0	0	21	0	0	20	0	0	0.01	0	0	0		
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	Chg From At	Chg Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)			
Pipe1	Roof	OSD Basin	20	35.39	35.19	3.6	uPVC, not un	150	154	0.03	NewFixed	1	Roof	0							
Pipe2	Ground	N1	39	34.34	31.1	8	uPVC, not un	150	154	0.03	New	1	Ground	0							
Pipe3	OSD Basin	N1	10	35.19	31.1	66	uPVC, not un	150	154	0.03	NewFixed	1	OSD Basi	0							
Pipe4	N1	Outlet	5	31.1	31	1	uPVC, not un	150	154	0.03	New	1	N1	0							
DETAILS of SERVICES CROSSING PIPES																					
Pipe	Chg (m)	Bottom Elev (m)	Height of Ser (m)	Chg (m)	Bottom Elev (m)	Height of (m)	Chg (m)	Bottom Elev (m)	Height of (m)	etc											
CHANNEL DETAILS																					
Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed								

1.3 DRAINS Summary of Pre & Post Developed Discharges

5 YEAR

DRAINS results prepared from Version 2019.09

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Ground	34.37		0.005				
N1	31.15		0				
Outlet	31.05		0				
Roof	35.85		0.01				

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
Pre Site	0.012	0.009	0.005	4.53	27.31		0 AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1
Bypass	0.005	0.002	0.004	4.53	27.31		0 AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1
Roof Area	0.01	0.01	0	0.73	0		0 AR&R 5 year, 20 minutes storm, average 91 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.05 impervious + 0.07 pervious = 0.12 total ha)

Storm	Total Rainfal cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 5 year, 10 min	24.35	14.58 (59.9%)	9.45 (95.1%)	5.12 (35.5%)
AR&R 5 year, 20 min	36.04	24.37 (67.6%)	14.22 (96.7%)	10.15 (47.6%)
AR&R 5 year, 30 min	44.55	31.02 (69.6%)	17.70 (97.3%)	13.33 (50.5%)
AR&R 5 year, 1 hour	61.78	44.68 (72.3%)	24.73 (98.1%)	19.96 (54.6%)
AR&R 5 year, 2 hours	82.45	60.09 (72.9%)	33.16 (98.6%)	26.93 (55.2%)
AR&R 5 year, 3 hours	97.3	71.36 (73.3%)	39.22 (98.8%)	32.14 (55.8%)
AR&R 5 year, 6 hours	128.3	92.12 (71.8%)	51.87 (99.1%)	40.25 (53.0%)

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
Pipe2	0.005		2.32	34.367	31.152 AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1
Pipe4	0.009		1.59	31.152	31.052 AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1
Pipe1	0.01		0.52	35.854	35.85 AR&R 5 year, 20 minutes storm, average 91 mm/h, Zone 1
Pipe3	0.004		3.81	35.206	31.152 AR&R 5 year, 2 hours storm, average 34.7 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD Basin	35.85		3	0.004	0.004
					0

CONTINUITY CHECK for AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Chang %	Difference
Pre	14.91	14.91		0	0
Ground	7.94	7.95		0	-0.1
N1	15.97	15.93		0	0.3
Outlet	15.93	15.93		0	0
Roof	8.18	8.21		0	-0.5
OSD Basin	8.21	8.02	0.35		-1.9

Run Log for Pittwater run at 01:10:22 on 29/1/2020

100 YEAR

DRAINS results prepared from Version 2019.09

PIT / NODE DETAILS

Version 8

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Ground	34.38			0.012			
N1	31.18			0			
Outlet	31.08			0			
Roof	36.54		0.015				

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
Pre Site	0.023	0.013	0.013	4.23	25.5		0 AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Bypass	0.012	0.003	0.011	4.23	25.5		0 AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Roof Area	0.015	0.015	0	0.59	0		0 AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.05 impervious + 0.07 pervious = 0.12 total ha)

Storm	Total Rainfal cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 10 m	40	30.38 (76.0%)	15.84 (97.0%)	14.54 (61.4%)
AR&R 100 year, 20 m	60.19	48.51 (80.6%)	24.08 (98.0%)	24.44 (68.6%)
AR&R 100 year, 30 m	74.84	61.15 (81.7%)	30.06 (98.4%)	31.09 (70.2%)
AR&R 100 year, 1 ho	105.73	88.21 (83.4%)	42.66 (98.9%)	45.55 (72.8%)
AR&R 100 year, 2 ho	140.18	117.42 (83.8%)	56.72 (99.2%)	60.69 (73.1%)
AR&R 100 year, 3 ho	162.52	135.63 (83.5%)	65.84 (99.3%)	69.79 (72.6%)
AR&R 100 year, 6 ho	210.99	172.74 (81.9%)	85.62 (99.4%)	87.12 (69.8%)

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
Pipe2	0.012	2.99	34.382	31.177	AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Pipe4	0.018	1.91	31.177	31.077	AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Pipe1	0.015	0.82	36.536	36.52	AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1
Pipe3	0.006	4.24	35.209	31.177	AR&R 100 year, 2 hours storm, average 59 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD Basin	36.52	6.1	0.006	0.006	0

CONTINUITY CHECK for AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Chang %	Difference
Pre	43.3	43.3	0		0
Ground	25.19	25.21	0		-0.1
N1	45.66	45.65	0		0
Outlet	45.65	45.65	0		0
Roof	19.71	19.8	0		-0.4
OSD Basin	19.8	20.45	0.18		-4.2

Run Log for Pittwater run at 01:10:22 on 29/1/2020