



REF : M9319-36491

STORMWATER DESIGN CALCULATIONS

AT 128 ELANORA ROAD

ELANORA HEIGHTS

FOR MR & MRS REES

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Files On Disk

M9319-702879-calcs.xls -DRAINS.DRN

1.0 Detention System Requirements

1.1 Storage-Area calcs.

DATA:

Site Area Assessed due to easements

Site Area = **0.0663** ha **663** sq.m

Impervious Area Pre Development = **0** sqm

Percentage Impervious Pre Development = **0%**

Impervious Area POST Development = **356.91** sqm

Percentage Impervious POST Development = **54%**

Catchment directed through OSD = **276.61** sqm **77.5 %**

OSD Bypass Areas : Impervious **80.3** sqm **20.8 %**

Pervious **306.09** sqm **79.2 %**

Total **386.39** sqm

Slope of Site = **0.2 %** Time of Concentration t_c =

Effective Flow Length = **39.48** m **3 min. 1:5**

Hortons n = **0.1** **3 min. 1:100**

FFL of house = **106.41** m

Roof Gutter Level = **109.16** m

Invert of Boundary Pit = **103.65** m

Invert of Outlet = **103.3** m

Detention A

Volume Required **10.61** cu.m

Total Area **6.16** sq.m

Stage Storage-Discharge Relationship

Stage	Storage Area	Avg. Depth	Storage
(m)	(sq.m)	(m)	(cu.m)
106.20	0	0	0.000
107.06	6.2	0.862	5.310
107.93	6.2	1.72	10.610

Invert of pit = **106.20** m

Orifice Dia. = **48** mm

Max. Water Level achieved = **107.870** m

Storage achieved **10.27** cu.m

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

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

Basix Allowance

Raintank Basix = **3000** L

Raintank Provided = **3920** L

Raintank Pad Level = **105.57** m

Water Level in Tank RL for Basix = **106.20** m = orifice IL. Depth = **0.64** m

Total Effective Tank Required = **14193** L OK Max. WL = **107.87** m

OSD Volume Available = **10610** L

Nominal tank Volume used = **15209** L

Total Tank Height = **2.470** m TOP OF TANK = **108.04** m

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					106.21		0		444	-153	8										
N1	Node					103.95		0		571	-185	12										
Outlet	Node					103.45		0		617.232	-211.091	45										
Roof	Node					109.16		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 Lid								
OSD Basin	106.20	6.1575	0	Orifice		48	106.22562			558	-103	No		5								
	107.06	6.1575																				
	107.93	6.1575																				
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	0.0663	0	100	0	0	0	0	0	39.48	39.48	0	0.2	0.2	0	0.01	0.2	0	0			
Bypass	Ground	0.0386	20.8	79.2	0	0	0	0	0	39.48	39.48	0	0.2	0.2	0	0.01	0.2	0	0			
Roof Area	Roof	0.0277	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	106.40	106.20	3.6	uPVC, not ui	150	154	0.03	NewFixed	1	Roof	0								
Pipe2	Ground	N1	39.48	105.96	103.65	8	uPVC, not ui	150	154	0.03	New	1	Ground	0								
Pipe3	OSD Basin	N1	10	106.20	103.65	66	uPVC, not ui	150	154	0.03	NewFixed	1	OSD Basi	0								
Pipe4	N1	Outlet	5	103.65	103.3	1	uPVC, not ui	150	154	0.03	New	1	N1	0								
DETAILS of SERVICES CROSSING PIPES																						
Pipe	Chg (m)	Bottom Elev (m)	Height of Ser Chg (m)	Bottom Elev (m)	Height of Chg (m)	Bottom Elev (m)	Height of S etc (m)															
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	105.99			0.006			
N1	103.69			0			
Outlet	103.34			0			
Roof	107.1		0.012				

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	0.01	0	0.01	5.28	31.85		0 AR&R 5 year, 1 hour storm, average 52 mm/h, Zone 1
Bypass	0.006	0.003	0.004	4.56	27.51		0 AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1
Roof Area	0.012	0.012	0	0.73	0		0 AR&R 5 year, 20 minutes storm, average 91 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.04 impervious + 0.10 pervious = 0.13 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 5 year, 10 min	27.18	14.01 (51.6%)	6.97 (95.1%)	7.05 (35.5%)
AR&R 5 year, 20 min	40.22	24.44 (60.8%)	10.48 (96.7%)	13.96 (47.5%)
AR&R 5 year, 30 min	49.72	31.39 (63.1%)	13.04 (97.3%)	18.34 (50.5%)
AR&R 5 year, 1 hour	68.95	45.71 (66.3%)	18.22 (98.1%)	27.49 (54.6%)
AR&R 5 year, 2 hours	92.02	61.53 (66.9%)	24.44 (98.6%)	37.09 (55.2%)
AR&R 5 year, 3 hours	108.6	73.18 (67.4%)	28.90 (98.8%)	44.27 (55.8%)
AR&R 5 year, 6 hours	143.21	93.67 (65.4%)	38.23 (99.1%)	55.44 (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	0.006		2.15	105.993	103.69 AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1
Pipe4	0.01		2.67	103.69	103.34 AR&R 5 year, 30 minutes storm, average 75 mm/h, Zone 1
Pipe1	0.012		0.64	107.097	107.09 AR&R 5 year, 20 minutes storm, average 91 mm/h, Zone 1
Pipe3	0.005		3.36	106.219	103.69 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	107.09		5.5	0.005	0.005
					0

CONTINUITY CHECK for AR&R 5 year, 20 minutes storm, average 91 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Chang (cu.m)	Difference %
Pre	9.55	9.55	0	0
Ground	6.76	6.77	0	-0.1
N1	14.77	14.75	0	0.1
Outlet	14.75	14.75	0	0
Roof	8.13	8.16	0	-0.4
OSD Basin	8.16	8	0.16	0

Run Log for Pittwater run at 00:11:31 on 31/1/2020

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	106.01		0.013				
N1	103.71		0				
Outlet	103.36		0				
Roof	107.9		0.019				

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	0.023	4.26	25.69		0 AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Bypass	0.013	0.005	0.011	4.26	25.69		0 AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Roof Area	0.019	0.019	0	0.59	0		0 AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1

Outflow Volumes for Total Catchment (0.04 impervious + 0.10 pervious = 0.13 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m (Runoff %)	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year, 10 min	44.64	31.68 (71.0%)	11.67 (97.0%)	20.01 (61.3%)
AR&R 100 year, 20 min	67.18	51.39 (76.5%)	17.75 (98.0%)	33.64 (68.5%)
AR&R 100 year, 30 min	83.54	64.97 (77.8%)	22.15 (98.4%)	42.81 (70.2%)
AR&R 100 year, 1 hour	118.01	94.18 (79.8%)	31.44 (98.9%)	62.74 (72.8%)
AR&R 100 year, 2 hours	156.47	125.41 (80.1%)	41.80 (99.2%)	83.60 (73.1%)
AR&R 100 year, 3 hours	181.4	144.67 (79.8%)	48.52 (99.3%)	96.15 (72.6%)
AR&R 100 year, 6 hours	235.5	183.12 (77.8%)	63.10 (99.4%)	120.02 (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	0.013		2.65	106.007	103.705 AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Pipe4	0.019		3.16	103.705	103.355 AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
Pipe1	0.018		0.99	107.896	107.87 AR&R 100 year, 10 minutes storm, average 202 mm/h, Zone 1
Pipe3	0.006		3.7	106.223	103.705 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	107.87	10.3	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 Chang (cu.m)	Difference %
Pre	42.94	42.94	0	0
Ground	26.86	26.88	0	-0.1
N1	50.97	50.94	0	0
Outlet	50.94	50.94	0	0
Roof	24.38	24.49	0	-0.5
OSD Basin	24.49	24.08	0.41	0

Run Log for Pittwater run at 00:11:31 on 31/1/2020