

Revised Hydraulic Design
(Revision A)
Including OSD Calculations-DRAINS,
Overland Flow Path Details,
Aboveground OSD/RWT Tanks Details,
Silt Arrestor Pit Details,
Elevation Details,
Roof Plan
and
Stormwater Systems
for
Proposed Single Residential Development at

Lot 7, DP 238331,
(H/No. 10) Courtley Road,
BEACON HILL

6 June 2023

Northern Beaches Council
Our Job Number: D3992
(DA2022/1978)

Nasseri Associates
Civil, Hydraulic and Structural Engineering
Suite 51, No. 14 Narabang Way, Belrose NSW 2085
P O Box 714, Balgowlah NSW 2093
Phone: (02) 9986 3875
Mobile: 0410 308 064
Email: nasseriassociates@bigpond.com
Web Site: www.nasseriassociates.com.au

- **OSD Calculation – DRAINS Modelling**

Hydraulic Details:

1. Notes, Calculations & Pit Details	1
2. Drainage Plan (1 in 200)	2
3. Elevation A & Roof Plan Details	3
4. OSD/RWT Tanks & Miscellaneous details	4

IMPORTANT NOTES:

The following hydraulic plans should be read in conjunction with:

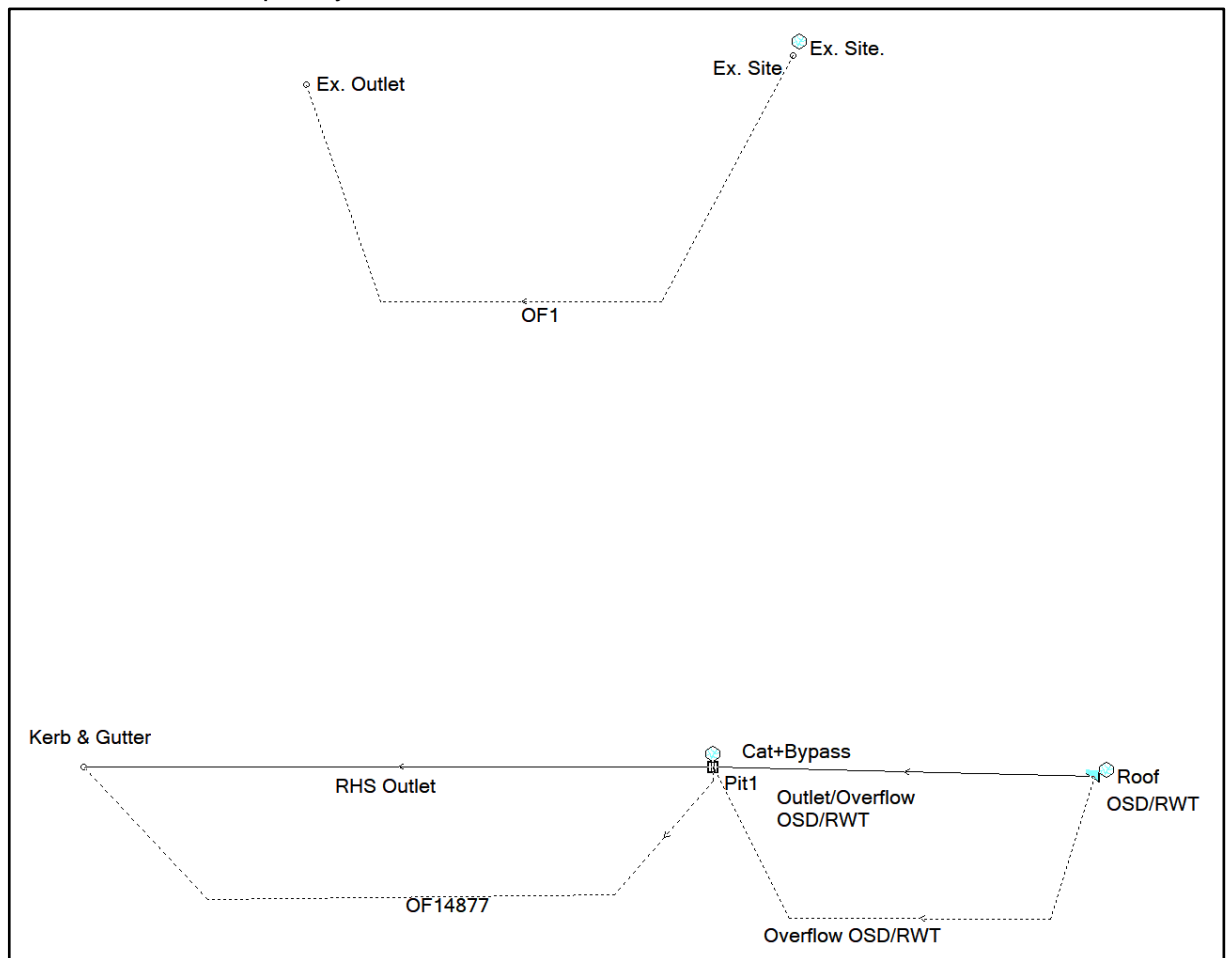
- 1. Architectural plans from Rawson Homes Pty. Ltd. Job No. A000350 Issue E dated 29 May 2023 (Phone: (02) 8765 5500).**
- 2. Northern Beaches Council's Policy on Stormwater Requirements for Residential Developments & BASIX Requirements.**

REVISED DRAINS ANALYSIS

Proposed Single Dwelling Residential Development at
LOT 7 (H/No. 10) Courtley Road, BEACON HILL
Council: Northern Beaches Council
Our Job Number: D3992
Revision A
Date: 6 June 2023

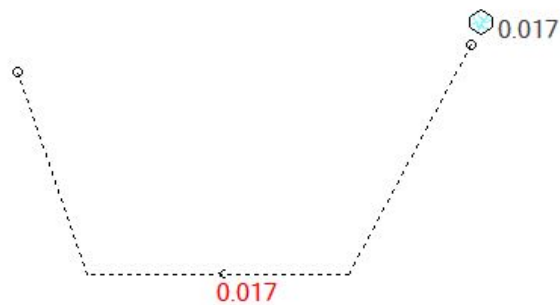
Objective of this report is to demonstrate that the OSD storage volume has been provided and the post development permissible site discharge (PSD) for the 20% AEP and 1% AEP storm events is restricted to the pre-development flows for the 20% AEP and 1% AEP storm events. DRAINS hydrological model was used with the ILSAX hydrological model. The model adopted ARR2019 procedures. IFD data was obtained from the Bureau of Meteorology and the temporal patterns were obtained from the ARR DataHub. These calculations should be read in conjunction with Warringah Council's OSD Technical Specification Section 4.30.

1. DRAINS Model input layout

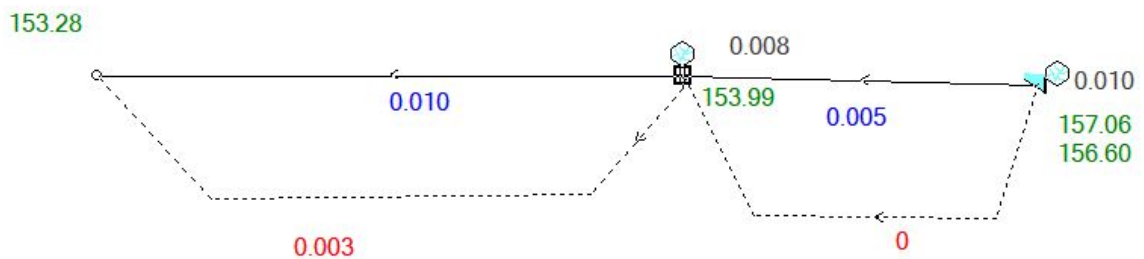


2. Drains Analysis for 20% AEP storm event

Results for median storm in critical 20% AEP ensembles using Lite hydraulic model.



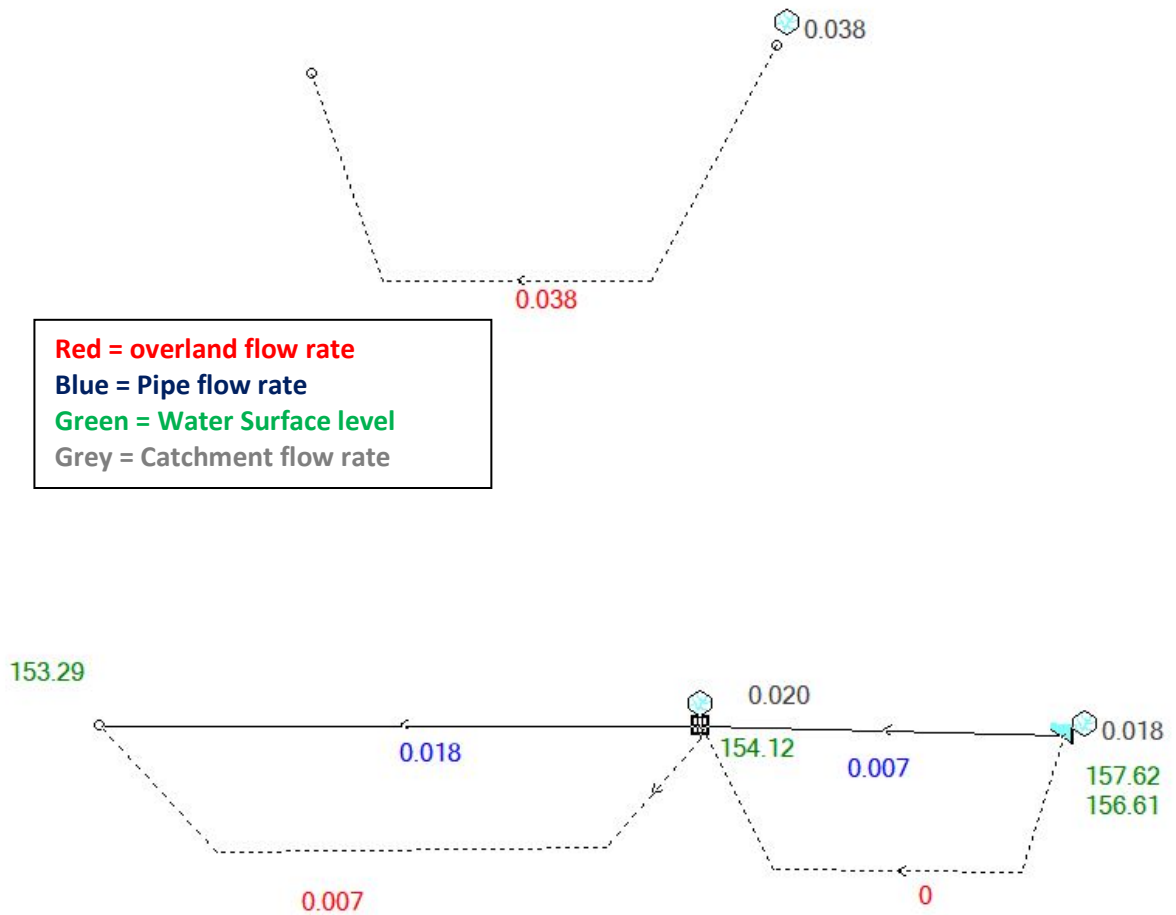
Red = overland flow rate
Blue = Pipe flow rate
Green = Water Surface level
Grey = Catchment flow rate



- Existing Site Discharged (20% AEP) = 17 l/s (Approx.)
- **Post Development Discharge (20% AEP) = (10 l/s Kerb Outlet + 3 l/s Overland runoff) = 13 l/s** (Approximate) < 17 l/s Existing Site Discharge (20% AEP)**OK**
- OSD/RWT Volume Required = 2.3 m³ (Approximate)
- Orifice OSD/RWT = 56 mm – Centre Orifice = 156.60 m AHD (Approximate)
- Max WL in OSD/RWT = 156.06 m (Approximate)

3. Drains Analysis for 1% AEP storm event

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



- Existing Site Discharged (1% AEP) = 38 l/s (Approx.)
- **Post Development Discharge (1% AEP) = (18 l/s Kerb Outlet + 7 l/s Overland runoff) = 25 l/s** (Approximate) < 38 l/s Existing Site Discharge (1% AEP)**OK**
- OSD/RWT Volume Required = 4.9 m³ (Approximate)
- Orifice OSD/RWT = 56 mm – Centre Orifice = 156.61 m AHD (Approximate)
- Max WL in OSD/RWT = 157.62 m (Approximate)

4. IFD Design Rainfall Depth (mm)

	Annual Exceedance Probability (AEP)						
Duration	63.2%	50%#	20%*	10%	5%	2%	1%
1 min	2.51	2.80	3.75	4.41	5.07	5.96	6.66
2 min	4.22	4.67	6.10	7.09	8.07	9.43	10.5
3 min	5.82	6.46	8.49	9.90	11.3	13.2	14.8
4 min	7.27	8.09	10.7	12.5	14.3	16.8	18.7
5 min	8.57	9.56	12.7	14.9	17.1	20.1	22.4
10 min	13.5	15.1	20.3	24.0	27.6	32.5	36.3
15 min	16.9	18.9	25.5	30.0	34.6	40.7	45.5
20 min	19.4	21.8	29.3	34.5	39.7	46.7	52.2
25 min	21.5	24.0	32.2	38.0	43.7	51.3	57.3
30 min	23.2	25.9	34.7	40.8	46.9	55.1	61.5
45 min	27.1	30.3	40.3	47.2	54.1	63.6	71.0
1 hour	30.1	33.5	44.4	51.9	59.5	69.8	78.0
1.5 hour	34.7	38.5	50.6	59.1	67.7	79.5	88.8
2 hour	38.3	42.4	55.6	64.9	74.3	87.3	97.7
3 hour	44.1	48.7	63.7	74.5	85.5	101	113
4.5 hour	50.9	56.3	73.8	86.5	99.6	118	132
6 hour	56.7	62.6	82.5	97.0	112	133	150
9 hour	66.2	73.3	97.4	115	134	159	180
12 hour	74.0	82.3	110	131	152	182	206
18 hour	86.8	97.1	132	157	184	221	250
24 hour	97.1	109	149	179	210	252	286
30 hour	106	119	164	197	231	278	315
36 hour	113	127	176	212	249	300	340
48 hour	125	141	197	237	278	335	379
72 hour	141	161	225	270	317	379	427
96 hour	152	174	242	290	339	404	454
120 hour	160	183	254	303	353	418	468
144 hour	166	189	261	311	361	426	475
168 hour	171	194	266	316	365	429	477

(For more information and OSD/RWT details refer to the hydraulic design from Nasser Associates, Job no. D3992).

PIT / NODE DETAILS			Version 15																	
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	id	Part Full Shock Loss	Inflow Hydrograph	Pit is	Internal Width (mm)	Inflow is Misaligned	Minor Safe Pond Depth (m)	Major Safe Pond Depth (m)
Ex. Site	Node					8		0		195.81	-271.503		921870		No					
Ex. Outlet	Node					153.3		0		195.768	-271.506		921874		No					
Pit1	OnGrade	GRATED Pit	600sq		1.5	154.2		0	0	195.803	-271.565	No	1668533	1 x Ku	No	New				
Kerb & Gut	Node					153.4		0		195.749	-271.565		1694423		No					

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
OSD/RWT	156.57	4.6		Orifice		56	156.62			195.836	-271.565	No			1934393
	156.59	4.6													
	157.63	4.6													
	157.74	4.6													

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	Rainfall Multiplier
Ex. Site	Ex. Site	0.0557	46	54	0	2	3	0											0			1
Roof	OSD/RWT	0.024	100	0	0	3	0	0											0			1
Cat+Bypass	Pit1	0.0317	20	80	0	2	3	0											0			1

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)
Outlet/Over	OSD/RWT	Pit1	16	156.57	153.9	16.69	uPVC, not t	100	105	0.012	NewFixed	1	OSD/RWT		0				
RHS Outlet	Pit1	Kerb & Gut	6	153.86	153.25	10.17	RHS SECTIC	0.15W x 0.075H		0.009	NewFixed	1	Pit1		0				

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S Chg (m)	Bottom Elev (m)	Height of S 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
------	------	----	------	------------	------------	------------	-----------	----------------	------------------	------------------	-----------	-----------	--------

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stor (m)	SafeDepth Minor Stor (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF1	Ex. Site	Ex. Outlet	0.6				Dummy us	0.2	0.05	0.6	0.1	0	921877
Overflow C	OSD/RWT	Pit1	0.1	157.63	0.11	1.7	Dummy us	0.2	0.05	0.6	1	0	1934428
OF14877	Pit1	Kerb & Gut	0.3				Footpath	0.1	0.1	0.6	1	0	1668536

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover	Cover (m)
Outlet/Over	uPVC, not t	105	0.3	-0.11 Unsafe
RHS Outlet	RHS SECTIC	0	1	0.07 Unsafe

This model has no pipes with non-return valves

DRAINS results prepared from Version 2023.02.8444.20204

PIT / NODE DETAILS		Version 8					
Name	Max HGL	Max Pond HGL	Max Surface Flow (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit1	153.99		0.013			0.21	0.003 Inlet Capacity
Kerb & Gut	153.28		0.004				

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
Ex. Site.	0.017	0.011	0.006	2	3	3	0 20% AEP, 5 min burst, Storm 1
Roof	0.01	0.01	0	3	0	0	0 20% AEP, 5 min burst, Storm 1
Cat+Bypass	0.008	0.002	0.006	2	3	3	0 20% AEP, 20 min burst, Storm 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	
Outlet/Ove	0.005	0.57	156.814	153.991	20% AEP, 20 min burst, Storm 4	
RHS Outlet	0.01	2.52	153.935	153.275	20% AEP, 20 min burst, Storm 2	

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

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
OF1	0.017	0.017	0.115	0.024	0	11.33	0.12	20% AEP, 5 min burst, Storm 1
Overflow C	0	0	0.362	0	0	0	0	
OF14877	0.003	0.003	0.169	0.008	0	2.8	0.11	20% AEP, 10 min burst, Storm 4

DETENTION BASIN DETAILS					
Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD/RWT	157.06	2.2	0.005	0.005	0

Run Log for (REV A) 10 Courtley Rd
 {\colortbl;\red0\green0\blue0;\red192\green0\blue0;}Run Log for (REV A) 10 Courtley Rd .drn - DRAINS run at 11:10:37 on 6/6/2023 using Watercom Drains v2023.02.8444.20204

No water upwelling from any pit. Freeboard was adequate at all pits.
 Flows were safe in all overflow routes.

DRAINS results prepared from Version 2023.02.8444.20204

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Version 8		Min Freeboard (m)	Overflow (cu.m/s)	Constraint
			Max Surfac Flow (cu.m/s)	Max Pond Volume (cu.m)			
Pit1	154.12		0.026			0.08	0.007 Inlet Capacity
Kerb & Gut	153.29		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
Ex. Site.	0.038	0.019	0.019	2	3	3	0 1% AEP, 5 min burst, Storm 1
Roof	0.018	0.018	0	3	0	0	0 1% AEP, 5 min burst, Storm 1
Cat+Bypass	0.02	0.005	0.016	2	3	3	0 1% AEP, 5 min burst, Storm 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
Outlet/Ove	0.007	0.77	157.339	154.124	1% AEP, 20 min burst, Storm 8
RHS Outlet	0.018	3.07	153.935	153.288	1% AEP, 5 min burst, Storm 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
------	----------------	-------------	--------------

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
OF1	0.038	0.038	3.451	0.032	0	14.48	0.15	1% AEP, 5 min burst, Storm 1
Overflow C	0	0	10.912	0	0	0	0	
OF14877	0.007	0.007	0.169	0.015	0	2.8	0.17	1% AEP, 5 min burst, Storm 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
OSD/RWT	157.62	4.8	0.007	0.007	0

Run Log for (REV A) 10 Courtley Rd

{\colortbl;\red0\green0\blue0;\red192\green0\blue0;}Run Log for (REV A) 10 Courtley Rd .drn - DRAINS run at 10:33:59 on 6/6/2023 using Watercom Drains v2023.02.8444.20204

No water upwelling from any pit.

Freeboard was less than 0.15m at Pit1Flows were safe in all overflow routes.