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No.56 BEANE STREET, GOSFORD

Water Cycle Management Report/Strategy

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Dated 16th December 2019

REVISION A – DA SUBMISSION

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1 EXECUTIVE SUMMARY

As specified in Gosford City Council DCP 2013 Chapter 6.7 - Water Cycle Management", all developments are required to produce a Water Cycle Management Report.

The purpose of this report is to minimise the impact of development on the natural predeveloped water cycle. This will lead to more sustainable outcomes that will protect the environment.

The following items will be addressed in the Report:

- **Overland Flow & Flooding;**
- **Water saving targets;**
- **Retention targets;**
- **On-Site Detention targets;**
- **Stormwater Quality targets;.**

2 EXISTING SITE CONDITIONS

- **No.56 Beane Street, Gosford (lot 30 DP 125097)**
- **Subject Site is Zoned R1 general residential.**
- **Site falls to the North West.**
- **Existing council pit/pipe system located at western side of site on Beane Street.**

Refer Survey Plan below

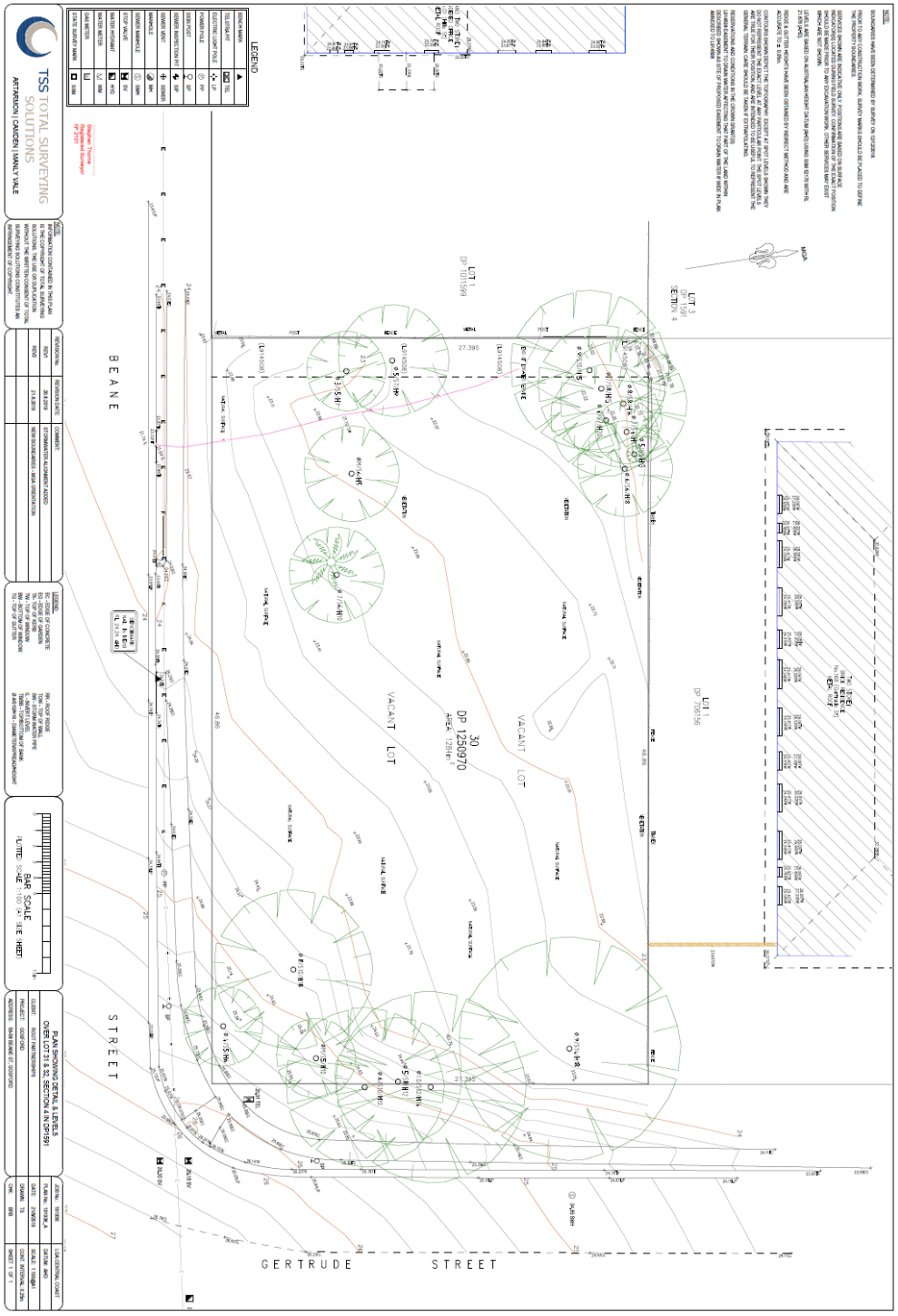


Figure 1 Survey Plan

3 PROPOSED DEVELOPMENT

Residential flat building comprising of 41 units over 7 storeys including two levels of basement carpark. The existing carpark are to be demolished to accommodate the proposed development.

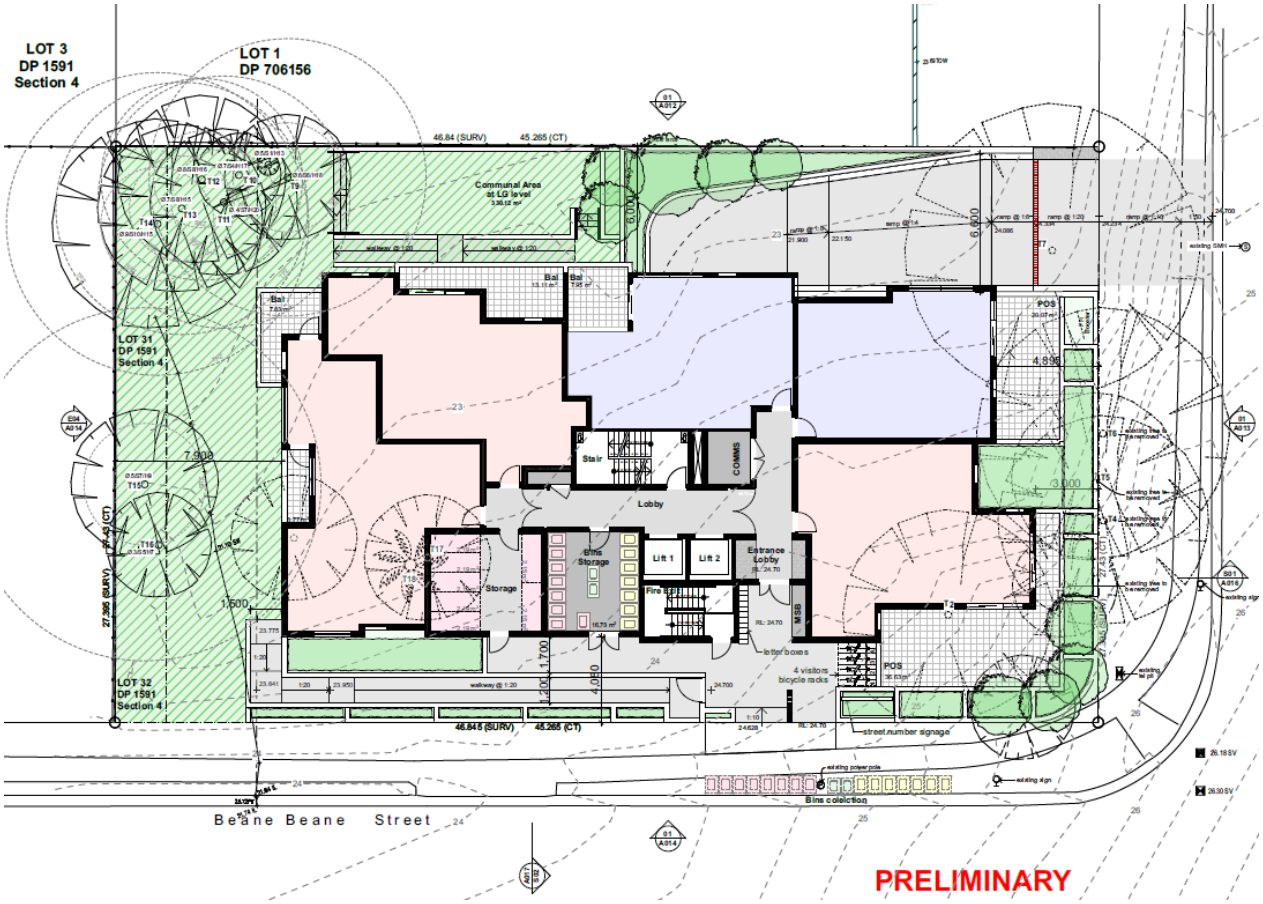


Figure 2 Site Plan

Figure 3 Front Elevation View

4 OVERLAND FLOW AND FLOODING

The site is affected by overland flooding from the local upstream catchment. The runoff from the localised upstream catchment traverses overland through the low-lying areas of the catchment until it reaches Beane Street.

The proposed development and driveway entry have been lifted to prevent flood water entering the site. The future footpath on Beane Street will be grading from the boundary levels towards street kerb to prevent flood water entering the building. On-Site detention has been introduced to limit the flow of water during peak storm events and reduce flooding to downstream properties.

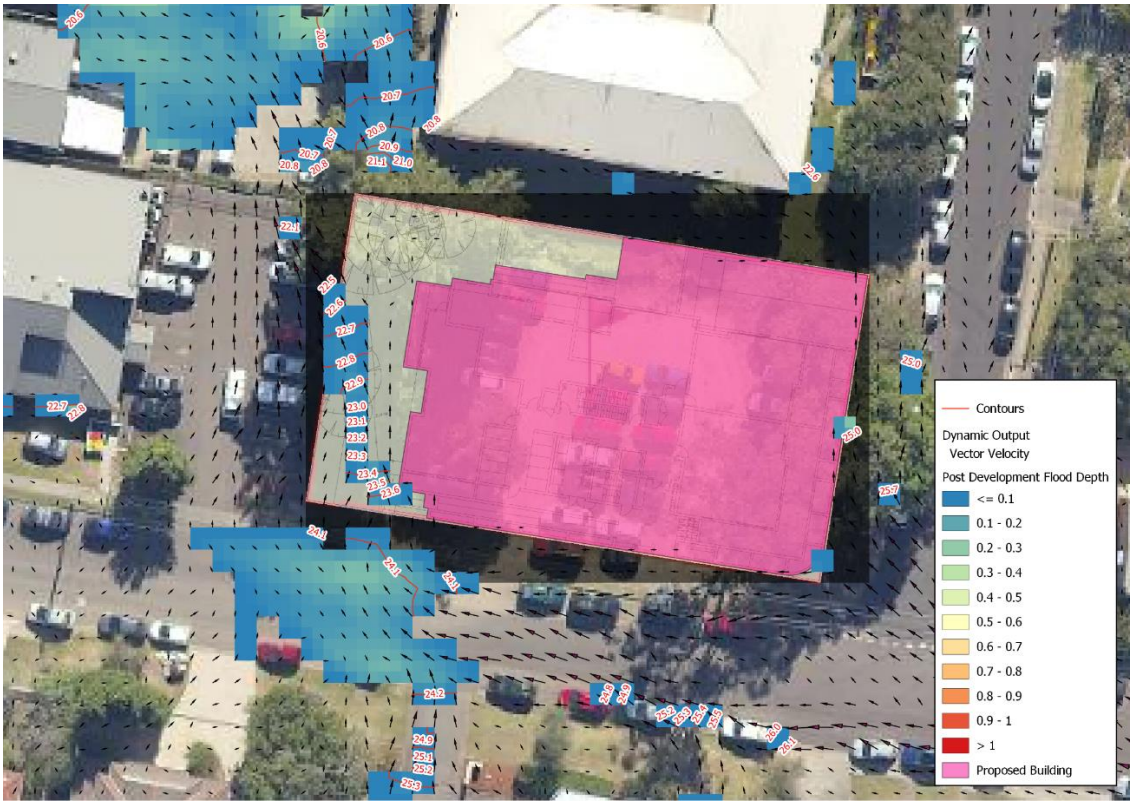


Figure 4 1% AEP Flood Level & Flood Depth – Post Development

5 WATER SAVING TARGETS

Proposed development to be in accordance with BASIX requirements including:

- **4 star toilet flushing systems**
- **3 star shower heads**
- **4 star kitchen taps**
- **5 star bathroom taps**
- **32,850L rainwater tank**
- **Rainwater used for toilet flushing, washing machine, irrigation & car washing.**

6 RAINWATER RETENTION REQUIREMENTS

Gosford Council 'deemed to comply' stormwater retention volume targets based on Table 2 of the Water Cycle Management Policy provides the following volumes:

V = Stormwater retention volume
A = total site area (1283.2m²)
F = 80% Fraction impervious (1026.4m²)

Therefore, $V = 0.01 \times A \times (0.02F)^2$
$V = 32.85m^3$

Therefore, the Total Stormwater Retention Volume = 32.85m³

Rainwater Re-Use shall be used for toilet flushing, washing machine, irrigation & car washing.

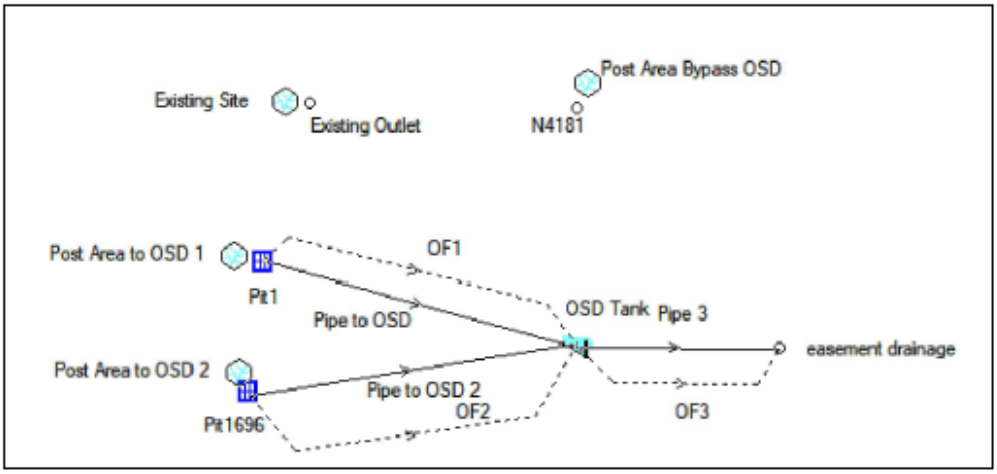
7 ON-SITE DETENTION TARGETS

On-Site Detention (OSD) has been provided to limit post development flows to less than pre-development (greenfield) flows for storm events ranging from 1:5yr to 1:100yr ARI.

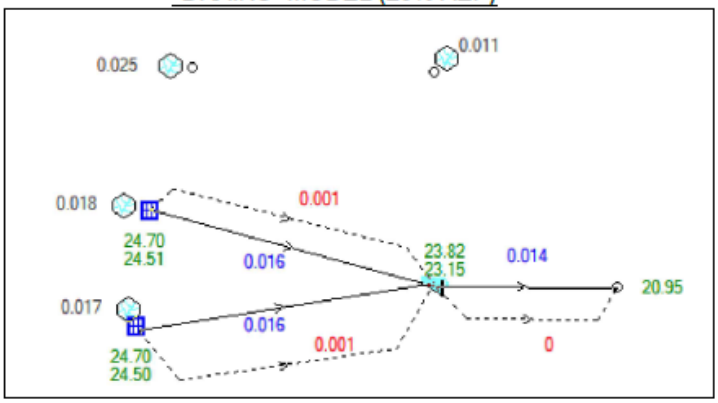
Refer following DRAINS data and summary sheet

PSD COMPUTATION SUMMARY			
LGA:	*CENTRAL COASTE COUNCIL*		
DURATION: 100 YEAR ARI	PRE-DEVELOPMENT FLOW:	0.0470	m^3/s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0200	m^3/s
	Hence, PERMISSIBLE SITE DISCHARGE:	**27.00**	***L/s***
	DRAINS' MODELLING - resulting discharge rate	***20.00***	***L/s***
DURATION: 50 YEAR ARI	PRE-DEVELOPMENT FLOW:	0.0410	m^3/s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0180	m^3/s
	Hence, PERMISSIBLE SITE DISCHARGE:	**23.00**	***L/s***
	DRAINS' MODELLING - resulting discharge rate	***18.00***	***L/s***
DURATION: 20 YEAR ARI	PRE-DEVELOPMENT FLOW:	0.0360	m^3/s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0160	m^3/s
	Hence, PERMISSIBLE SITE DISCHARGE:	**20.00**	***L/s***
	DRAINS' MODELLING - resulting discharge rate	***17.00***	***L/s***
DURATION: 10 YEAR ARI	PRE-DEVELOPMENT FLOW:	0.0300	m^3/s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0130	m^3/s
	Hence, PERMISSIBLE SITE DISCHARGE:	**17.00**	***L/s***
	DRAINS' MODELLING - resulting discharge rate	***16.00***	***L/s***
DURATION: 5 YEAR ARI	PRE-DEVELOPMENT FLOW:	0.0250	m^3/s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0110	m^3/s
	Hence, PERMISSIBLE SITE DISCHARGE:	**14.00**	***L/s***
	DRAINS' MODELLING - resulting discharge rate	***14.00***	***L/s***
HENCE, OSD REQUIRED VOLUME =29.7m3/s			
and			
Orifice Diameter = 92mmdia			

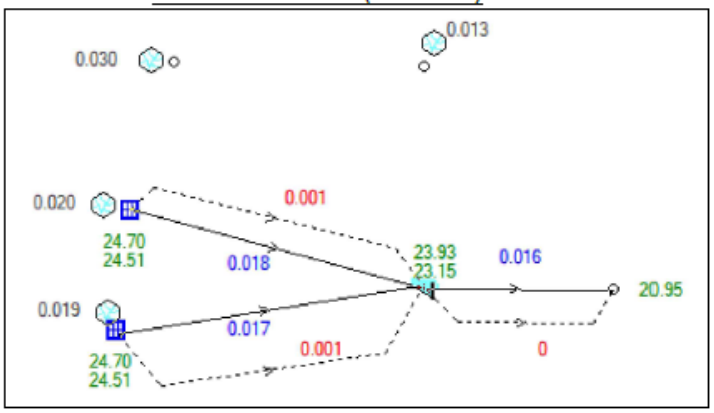
'DRAINS' LAYOUT



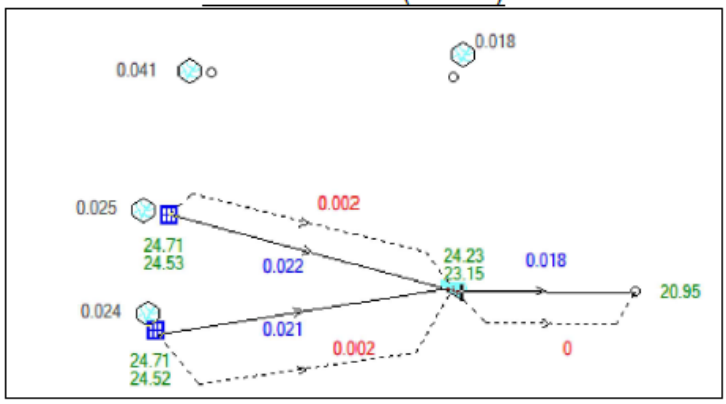
"DRAINS" MODEL (20% AEP)



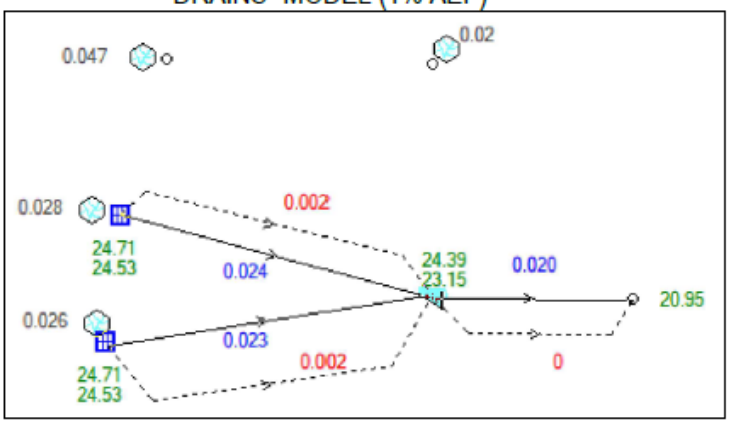
"DRAINS" MODEL (10% AEP)



"DRAINS" MODEL (2% AEP)



"DRAINS" MODEL (1% AEP)



8 STORMWATER QUALITY TARGETS

Water Quality improvement measures are required to improve the quality of stormwater runoff, which will also improve the health of creeks/waterways and enhance urban amenity.

The proposed development achieves the minimum reductions in total pollutant load listed below:

- *80% reduction in solids- Suspended solids & gross pollutants*
- *45% reduction in nutrients- total phosphorus & total nitrogen*

The following **Water Sensitive Urban design (WSUD)** measures are proposed for the subject site:

- 2 x Tall(690) PSorb cartridge StormFilter system within a 2.0m^2 StormFilter chamber, inside an OSD (**refer to detail in Appendix A**)
- 1 x OceanGuard with 200micron mesh bags (OG-200) for the driveway area only.
- 1 x OceanGuard with 200micron mesh bags (OG-200) for bypass landscape and bypass paved ground areas (**refer to detail in Appendix A**)

MUSIC Modelling

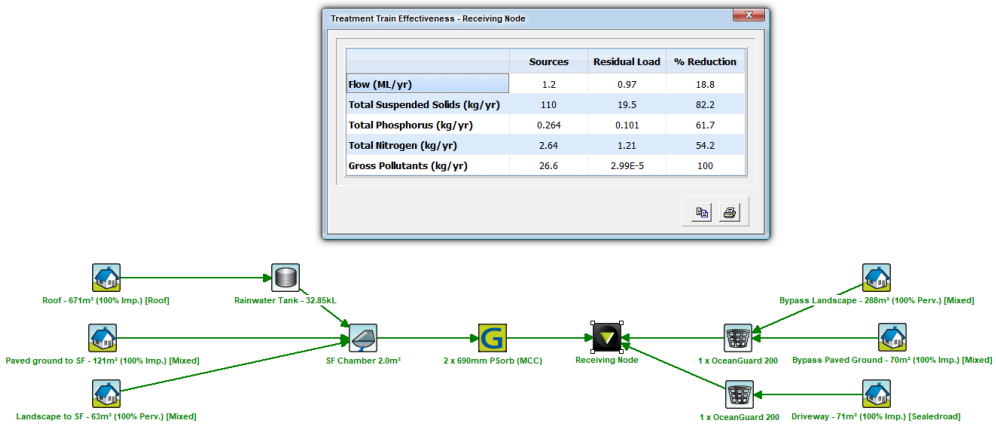
The Water Quality modelling for the proposed development was undertaken using MUSIC v6.3.0.

MUSIC (Model for Urban Stormwater Improvement Conceptualisation) was developed by the Co-operative Research Centre (CRC) for Catchment Hydrology and is designed to evaluate conceptual stormwater treatment designs by simulating the performance of stormwater quality improvement measures and comparing with water quality targets.

The adopted MUSIC parameters were as follows:

- Rainfall Station 059040 Coffs Harbour MO, 6 Minute Time Step From 1999 to 2003
- Water by Design's MUSIC Modelling Guidelines Version 1.0 - 2010 utilizing modified % impervious area, rainfall threshold, soil properties & pollutant concentration
- No drainage routing between nodes.

MUSIC modelling results are presented in the following Image.



9 OPERATION & MAINTENANCE

The primary purpose of the media filtration system is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, these pollutants must be periodically removed to restore the system to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site.

Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. Similarly, the system should be inspected after major storm events. Ocean Protect selects easy-to-access treatment systems that have been designed for minimal maintenance. However regular cleaning and device maintenance are necessary to remove pollutants and ensure the proper performance of your stormwater management system and compliance with the local regulations.

Recommended maintenance:

- **StormFilter – 12 months**
- **OceanGuard – 4 months**

Appendix A

- ***MUSIC link Report***
- ***Ocean Protect Specification Drawings***

MUSIC-*link* Report

Project Details		Company Details	
Project:	13624 - 56-58 Beane St, Gosford (Cnr Gertrude)	**Company:**	QUANTUM ENGINEERS
Report Export Date:	3/12/2019	**Contact:**	Jason Li
Catchment Name:	13624 - 56-58 Beane St	**Address:**	Suite 1A, Level 2, 2 Rowe Street, Eastwood NSW 2122
Catchment Area:	0.128ha	**Phone:**	p: 02 9807 7800
Impervious Area*:	72.65625%	**Email:**	jason.l@quantumengineers.com.au
Rainfall Station:	66062 SYDNEY		
Modelling Time-step:	6 Mnutes		
Modelling Period:	1/01/1974 - 31/12/1993 11:54:00 PM		
Mean Annual Rainfall:	1297mm		
Evapotranspiration:	1261mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.32		
Study Area:	Upland		
Scenario:	Central Coast Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Receiving Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	18.8%	Sedimentation Basin Node	1	Urban Source Node	6
TSS	82.2%	Rain Water Tank Node	1		
TP	61.7%	Generic Node	1		
TN	54.2%	GPT Node	2		
GP	100%				

Comments

- GPT reflects Ocean Protect's OceanGuard and has the correct values.

- The 'SF Chamber' detention node (sedimentation basin) has been modified to represent a tank to hold volume for use with the Ocean Protect filter. k values has been set to 1 to prevent the tank from "treating" the flow as it would within a grassed above ground OSD.

- The 'Generic Node' represents Ocean Protect's Stormfilter Cartridge and has the correct values.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	1 x OceanGuard 200	Hi-flow bypass rate (cum/sec)	None	99	0.02
GPT	1 x OceanGuard 200	Hi-flow bypass rate (cum/sec)	None	99	0.02
Receiving	Receiving Node	% Load Reduction	None	None	18.8
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	54.2
Receiving	Receiving Node	TP % Load Reduction	45	None	61.7
Receiving	Receiving Node	TSS % Load Reduction	80	None	82.2
Sedimentation	SF Chamber 2.0m◆	Exfiltration Rate (mm/hr)	0	0	0
Sedimentation	SF Chamber 2.0m◆	Extended detention depth (m)	0.25	1	0.77
Sedimentation	SF Chamber 2.0m◆	High Flow Bypass Out (ML/yr)	None	None	0
Urban	Bypass Landscape - 288m◆ (100% Perv.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Bypass Landscape - 288m◆ (100% Perv.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Bypass Landscape - 288m◆ (100% Perv.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Bypass Landscape - 288m◆ (100% Perv.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Bypass Landscape - 288m◆ (100% Perv.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	Bypass Landscape - 288m◆ (100% Perv.)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	Bypass Paved Ground - 70m◆ (100% Imp.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Bypass Paved Ground - 70m◆ (100% Imp.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Bypass Paved Ground - 70m◆ (100% Imp.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Bypass Paved Ground - 70m◆ (100% Imp.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Bypass Paved Ground - 70m◆ (100% Imp.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	Bypass Paved Ground - 70m◆ (100% Imp.)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	Driveway - 71m◆ (100% Imp.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Driveway - 71m◆ (100% Imp.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Driveway - 71m◆ (100% Imp.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Driveway - 71m◆ (100% Imp.)	Stormflow Total Nitrogen Mean (log mg/L)	0.34	0.34	0.34
Urban	Driveway - 71m◆ (100% Imp.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.3	-0.3	-0.3
Urban	Driveway - 71m◆ (100% Imp.)	Stormflow Total Suspended Solids Mean (log mg/L)	2.43	2.43	2.43
Urban	Landscape to SF - 63m◆ (100% Perv.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Landscape to SF - 63m◆ (100% Perv.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Landscape to SF - 63m◆ (100% Perv.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Landscape to SF - 63m◆ (100% Perv.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Landscape to SF - 63m◆ (100% Perv.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	Landscape to SF - 63m◆ (100% Perv.)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	Paved ground to SF - 121m◆ (100% Imp.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Paved ground to SF - 121m◆ (100% Imp.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Paved ground to SF - 121m◆ (100% Imp.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Paved ground to SF - 121m◆ (100% Imp.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Roof - 671m2 (100% Imp.)	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0.32
Urban	Roof - 671m2 (100% Imp.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	-0.82
Urban	Roof - 671m2 (100% Imp.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	1.1
Urban	Roof - 671m2 (100% Imp.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Roof - 671m2 (100% Imp.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.89	-0.89	-0.89
Urban	Roof - 671m2 (100% Imp.)	Stormflow Total Suspended Solids Mean (log mg/L)	1.3	1.3	1.3

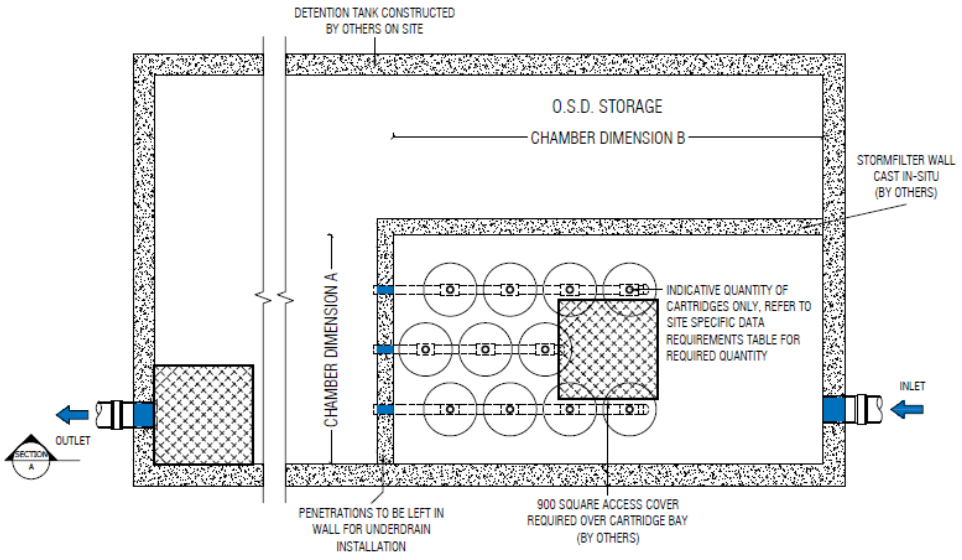
Only certain parameters are reported when they pass validation

Failing Parameters

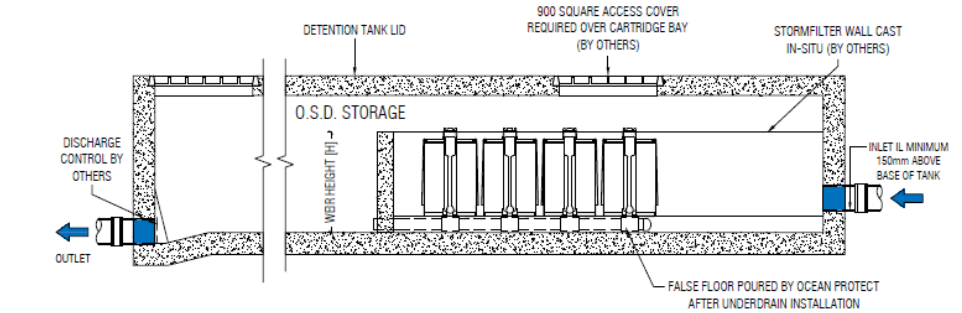
Node Type	Node Name	Parameter	Min	Max	Actual
Sedimentation	SF Chamber 2.0m◆	Notional Detention Time (hrs)	8	12	0.154
Sedimentation	SF Chamber 2.0m◆	Total Nitrogen - k (m/yr)	500	500	1
Sedimentation	SF Chamber 2.0m◆	Total Phosphorus - k (m/yr)	6000	6000	1
Sedimentation	SF Chamber 2.0m◆	Total Suspended Solids - k (m/yr)	8000	8000	1

Only certain parameters are reported when they pass validation

NOT FOR CONSTRUCTION



PLAN LAYOUT



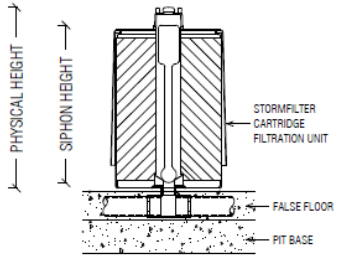
SECTION A

LAST MODIFIED: 07-03-19

STORMFILTER DESIGN TABLE

- STORMFILTER TREATMENT CAPACITY VARIES BY NUMBER OF FILTER CARTRIDGES INSTALLED.
- THE STANDARD CONFIGURATION IS SHOWN. ACTUAL CONFIGURATION OF THE SPECIFIED STRUCTURE(S) PER CERTIFYING ENGINEER WILL BE SHOWN ON SUBMITTAL DRAWING(S).
- FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF-CLEANING. RADIAL MEDIA DEPTH SHALL BE 178mm.

CARTRIDGE NAME / SIPHON HEIGHT (mm)	690	460	310
CARTRIDGE PHYSICAL HEIGHT (mm)	840	600	600
TYPICAL WEIR HEIGHT **[H]** (mm)	920	690	540
CARTRIDGE FLOW RATE FOR ZPG MEDIA (L/s)	1.6	1.1	0.7
CARTRIDGE FLOW RATE FOR PSORB MEDIA (L/s)	0.9	0.46	0.39



STORMFILTER CARTRIDGE DETAIL

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	[ ]
NUMBER OF CARTRIDGES REQ'D	[ ]
SIPHON HEIGHT (310 / 460 / 690)	[ ]
MEDIA TYPE (ZPG / PSORB)	[ ]
WATER QUALITY FLOW RATE (L/S)	[ ]
DIMENSION A	[ ]
DIMENSION B	[ ]

TOTAL CARTRIDGE BAY AREA (A x B) TO MATCH AREA REQUIRED BY MUSIC MODELLING OR COUNCIL SPECIFIC REQUIREMENTS

GENERAL NOTES

1. INLET AND OUTLET PIPES TO BE IN ACCORDANCE WITH APPROVED PLANS.
2. A HIGH FLOW BYPASS ARRANGEMENT OR DISSIPATION STRUCTURE MAY BE REQUIRED TO MINIMISE RE-SUSPENSION OF SOLIDS OR ANY SIGNIFICANT INERTIAL FORCES ON THE CARTRIDGES.
3. ALL WATER QUALITY TREATMENT DEVICES REQUIRE PERIODIC MAINTENANCE. REFER TO OPERATION AND MAINTENANCE MANUAL FOR GUIDELINES AND ACCESS REQUIREMENTS.
4. SITE SPECIFIC PRODUCTION DRAWING WILL BE PROVIDED ON PLACEMENT OF ORDER.
5. THE INVERT LEVEL OF THE INLET PIPE MUST BE GREATER THAN THE RL OF THE FALSE FLOOR WITHIN THE CARTRIDGE CHAMBER.
6. CONCRETE STRUCTURE AND ACCESS COVERS DESIGNED AND PROVIDED BY OTHERS. ACCESS COVERS TO BE A MINIMUM 900 X 900 ABOVE CARTRIDGES. OH&S REGARDING ACCESS COVERS AND TANK ACCESS TO BE ASSESSED BY OTHERS ON SITE.
7. THE STRUCTURE THICKNESSES SHOWN ARE FOR REPRESENTATIONAL PURPOSES.
8. DRAWINGS NOT TO SCALE.

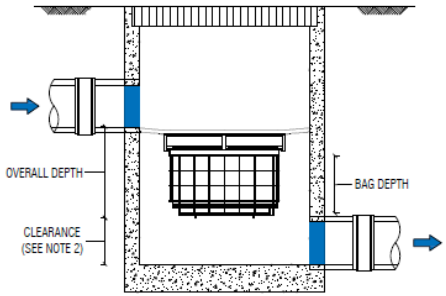
INSTALLATION NOTES

1. UNDERDRAIN AND FALSE FLOOR INSTALLED BY OCEAN PROTECT.

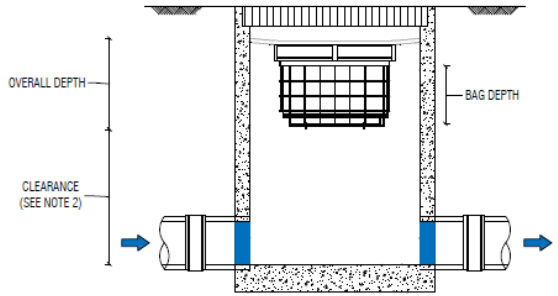
OCEAN PROTECT

PHONE: 1300 354 722 www.oceanprotect.com.au

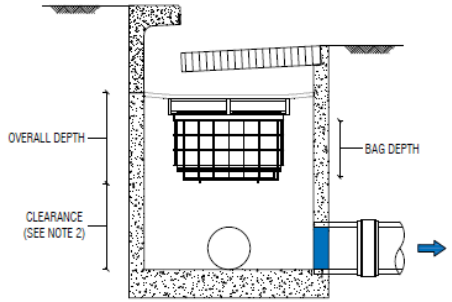
OCEAN PROTECT
STORMFILTER SYSTEM
DETENTION TANK ARRANGEMENT
SPECIFICATION DRAWING



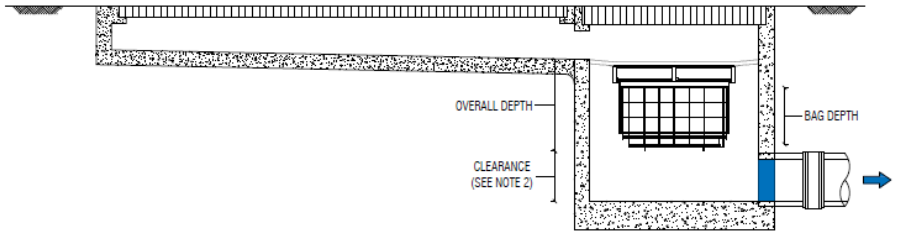
PIPE FLOW CONFIGURATION



SURFACE FLOW CONFIGURATION



SURFACE FLOW CONFIGURATION



GRATED STRIP DRAIN CONFIGURATION

LAST MODIFIED: 15-10-19

PLAN ID	MAXIMUM PIT PLAN DIMENSIONS
S	450mm x 450mm
M	600mm x 600mm
L	900mm x 900mm
XL	1200mm x 1200mm

DEPTH ID	BAG DEPTH	OVERALL DEPTH
1	170	270
2	300	450
3	600	700

		DEPTH ID		
		1	2	3
PLAN ID	S	■		
	M	■	■	
	L	■	■	■
	XL	■	■	■

GENERAL NOTES

1. THE MINIMUM CLEARANCE DEPENDS ON THE CONFIGURATION (SEE NOTE 2) AND THE LOCAL COUNCIL REQUIREMENTS.
2. CLEARANCE FOR ANY PIT WITHOUT AN INLET PIPE (ONLY USED FOR SURFACE FLOW) CAN BE AS LOW AS 50mm. FOR OTHER PITS, THE RECOMMENDED CLEARANCE SHOULD BE GREATER OR EQUAL TO THE PIPE OBVERT SO AS NOT TO INHIBIT HYDRAULIC CAPACITY.
3. OCEAN PROTECT PROVIDES TWO FILTRATION BAG TYPES:- 200 MICRON BAGS FOR HIGHER WATER QUALITY FILTERING AND A COARSE BAG FOR TARGETING GROSS POLLUTANTS.
4. DRAWINGS NOT TO SCALE.

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