WOOD & GRIEVE ENGINEERS

ENQUIRIES: IAN HARRIS
PROJECT NO: 30916-5-SYD-C

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RESIDENTIAL AGED CARE FACILITY, 290 AVOCA DRIVE, KINCUMBER, NSW –SITE STORMWATER MANAGEMENT

Wood & Grieve Engineers have been engaged by Lend Lease to provide stormwater management design in support of the Development Application associated with the proposed construction of a new aged care facility in Kincumber, NSW.

This report discusses the proposed stormwater management for the development which has been prepared in line with Central Coast Council's Development Control guidelines.

1.1 The Development Site

The development sites address is 290 Avoca Drive, Kincumber and is a part of Lot 103, DP707503 with the development site being subdivided from the existing overall lot. The proposed site area will be 12,137m² of the overall 27,864m² site.

The site is currently developed as a retirement village. The site's topography falls from north east to south west.

Figure 1 - Proposed Site Location

1.2 Flooding

Referencing the flood inundation mapping available on council's website it has been confirmed that the proposed development site is not currently impacted by flood water.

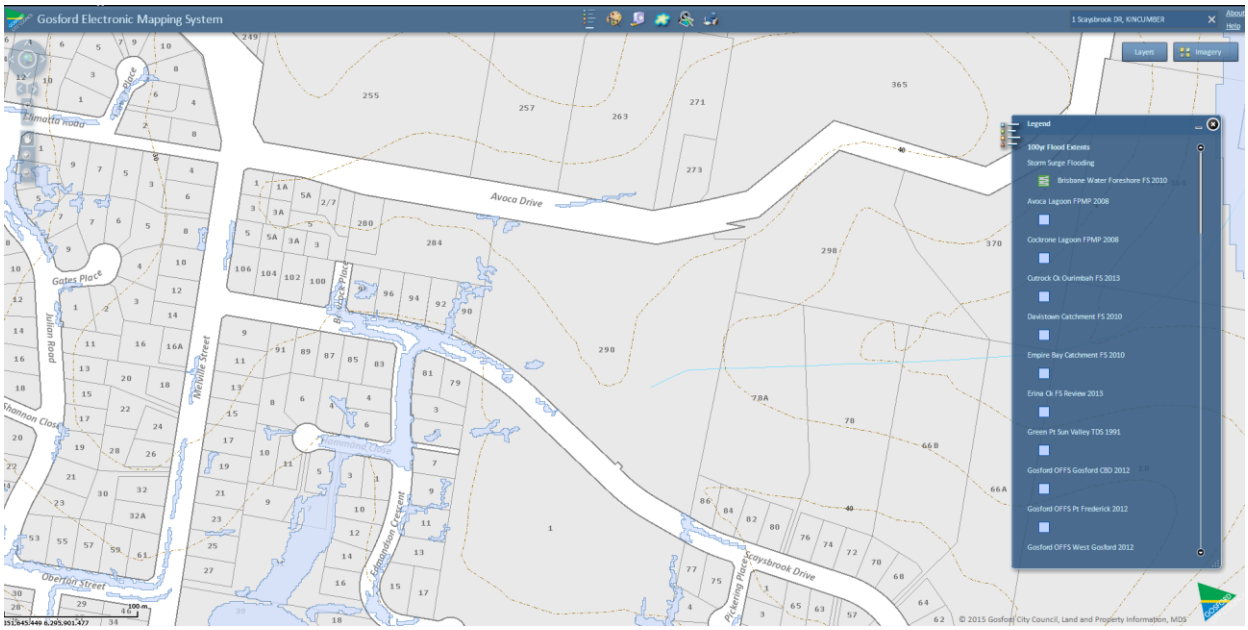


Figure 2 - Existing 100 Year Flood Extent (Source: Central Coast Council Mapping)

As the development site will not be flood impacted there are no flood protection measures proposed for the development.

1.3 Stormwater Conveyance

All roof areas will be drained through a gravity system. The drainage system will be designed in accordance with AS3500.3:2003 to convey the minor design storm runoff from the roof to the in ground drainage system. Flows in excess of the design flows will surcharge the roof drainage system and discharge onto the surrounding ground where it will then be conveyed overland to the surrounding in ground drainage network.

The surface runoff will be drained through a combination of in ground gravity drainage system and infiltration through the landscaping to a subsoil drainage system which will convey the runoff to the in ground drainage system.

The in ground drainage has been designed to meet the following criteria:

- In the minor design storm event (20 year) there will be no surcharging of the in ground drainage system and;
- In the major design storm event (100 year) there will be no uncontrolled discharge from the site onto the residential properties surrounding the site.

1.4 Stormwater Retention

In line with Central Coast Council's Water Cycle Management Guidelines:

"Retention on residential development must have either rainwater tanks or stormwater retention tanks, at least of a size as set out in Appendix A, capturing water from at least 90% of the total roof area, that are connected to all toilet cisterns and cold washing machine taps, to create adequate draw down for OSD purposes."

In accordance with clause 6.7.7.2.4 in council's DCP stormwater retention volume is calculated using the following formula:

$V = 0.01A(0.02F)^2$

Where V = Required Retention Volume (m^3)
A = Total Site Area (m^2)
F = Fraction Impervious (%)

Based a total development site area of 12,132m^2 and a fraction impervious percentage of 57%.

$V = (0.01 \times 12{,}132) \times (0.02 \times 57)^2$
$V = 157.7m^3$

The design has made allowance for 158m^3 of retention in the form of a bio-detention basin being fed by the roof drainage system.

1.5 Legal Point of Discharge

The legal point of discharge for the development will be to an existing stormwater inlet pit on Scaysbrook Drive. The connection will be a direct connection to the back of the in ground pit.

1.6 Stormwater Treatment

There are a wide range of potential stormwater pollutant sources which occur from urbanised catchments, many which can be managed through appropriate stormwater quality treatment. Typical urban pollutants may include:

- Atmospheric deposition
- Erosion (including that from subdivision and building activities)
- Litter and debris
- Traffic emissions and vehicle wear
- Animal droppings
- Pesticides and fertilisers
- Application, storage and wash-off of car oil, detergents and other household and commercial solvents and chemicals
- Solids accumulation and growth in stormwater systems
- Weathering of buildings

These pollutants in urban stormwater can be placed into various categories as follows. The pollutants underlined below are able to be readily modelled:

- Suspended Solids
- Litter
- Nutrients such as Nitrogen and Phosphorous
- Biological oxygen demand (BOD) and chemical oxygen demand (COD) materials
- Micro-organisms
- Toxic organics
- Trace metals
- Oils and surfactants

While only the key pollutants underlined above will be examined within the modelling, the stormwater Quality Improvement Devices implemented are expected to assist in reducing a wide range of pollutants. For example, heavy metals are commonly associated with, and bound to fine sediments. Thus reducing the discharge of fine sediment during the construction and operational phases will also reduce the discharge of heavy metals to existing stormwater systems.

In order to achieve the pollutant reduction targets specified by Central Coast Council, the following treatment train to be provided. The diagram below illustrates the proposed treatment train for this development.

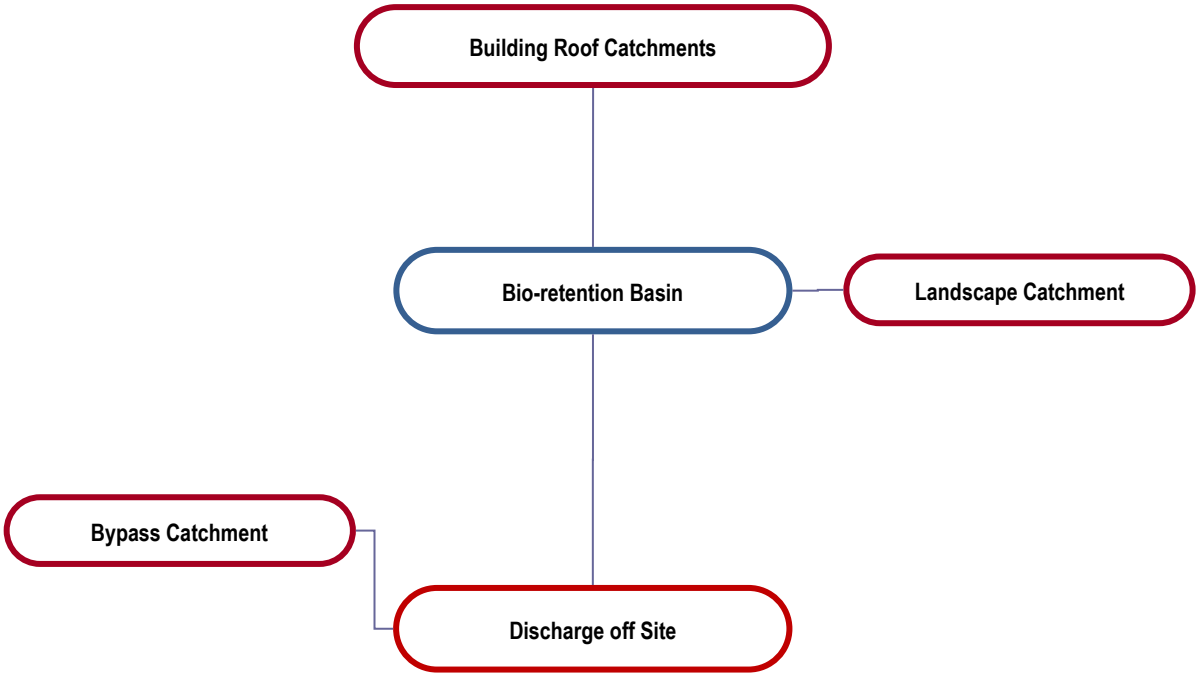


Figure 3 - Proposed Water Quality Treatment Train

In order to demonstrate that the proposed treatment train meets the required reduction targets, pollutant reduction modelling is proposed using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Software program Version 6.3 by eWater CRC. Pollutant export rates are currently only available for Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorous (TP) and Gross Pollutants (GP). Therefore, only quantitative modelling for TSS, TN, TP & GP has been undertaken using MUSIC.

For Music Modelling (using MUSIC 6.3.0) the following parameters have been used:

Table 1: MUSIC modelling parameters

Model Parameters	
Meteorological Data:	Sydney 1959
Evaporation Data:	Sydney 1959
Time Step:	6 minute

Table 2: Catchment modelling parameters

Node Description	Area (Ha)	Percentage Impervious (%) / Area Impervious (Ha)		Land Use Rainfall and Pollutant Parameters
Building Catchment	0.3	100	0.3	Urban Residential
Landscape Catchment	0.75	50	0.375	Urban Residential
Bypass Catchment	0.250	0	0	Urban Residential
	Total: 1.3Ha	Effective FI 52%		

MUSIC Model

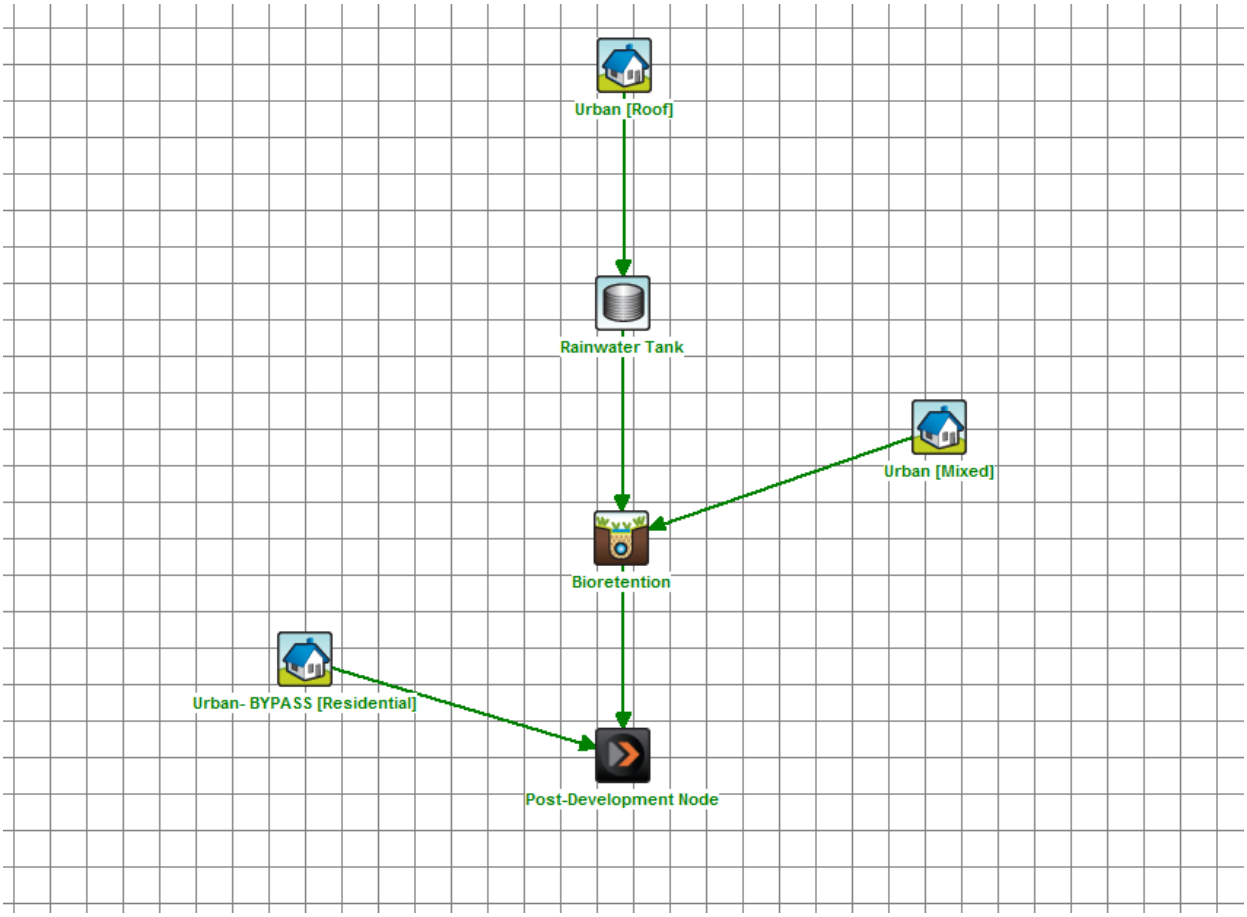


Figure 4 - MUSIC Model

MUSIC Runoff Generation Parameters

The following properties have been used in the MUSIC Modelling based on the Land Use Rainfall and Pollutant Parameters.

Table 3: Recommended MUSIC Runoff Generation Parameters

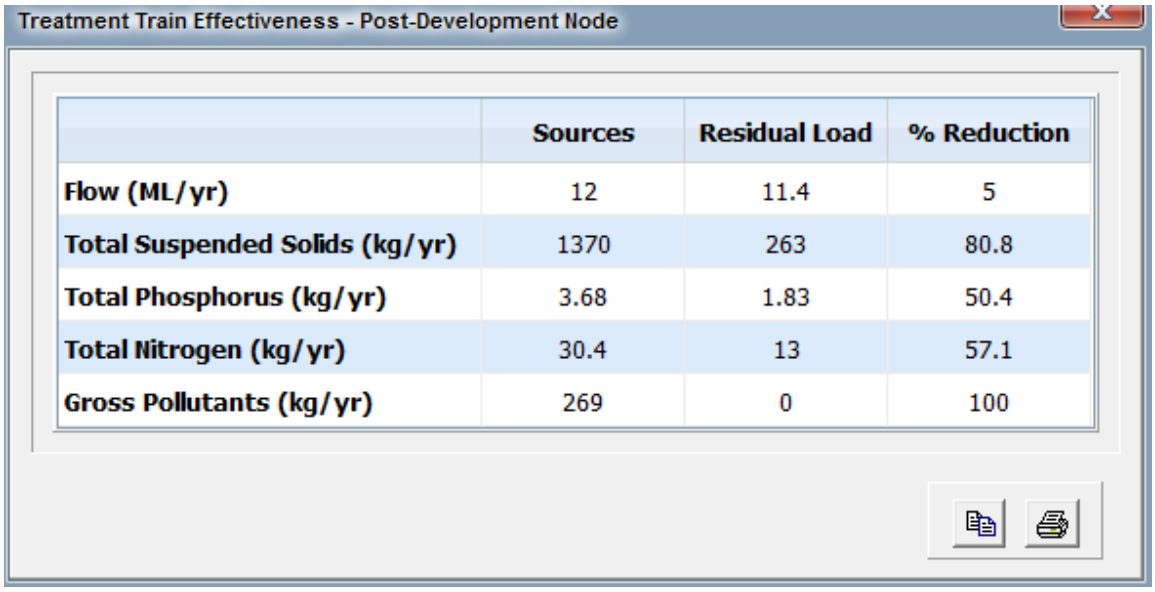
Parameter	Urban Residential
Rainfall Threshold (mm)	1
Soil Capacity (mm)	120
Initial Storage (%)	20
Field Capacity	80
Infiltration Capacity Coefficient a	200
Infiltration Capacity Coefficient b	1
Initial Depth (mm)	10
Daily Recharge Rate (%)	25
Daily Drainage Rate (%)	5
Daily Deep Seepage Rate (%)	0

MUSIC Concentration Parameters

Table 4: MUSIC Concentration Parameters for Sydney Catchments

Land-use Type	Parameters	TSS Log10 mg/L		TP Log10 mg/L		TN Log10 mg/L	
		Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow
Urban Residential	Mean	1.1	2.2	-0.82	-0.45	0.32	0.42
	STD Dev	0.17	0.32	0.19	0.25	0.12	0.19

MUSIC Output



	Sources	Residual Load	% Reduction
Flow (ML/yr)	12	11.4	5
Total Suspended Solids (kg/yr)	1370	263	80.8
Total Phosphorus (kg/yr)	3.68	1.83	50.4
Total Nitrogen (kg/yr)	30.4	13	57.1
Gross Pollutants (kg/yr)	269	0	100

Figure 5 - MUSIC Results

Table 5: Treatment Train Efficiencies

Indicator	Total Site Reduction	Site Targets	Target Achieved
Gross Pollutants	100.0%	80%	Yes
Total Suspended Solids (TSS)	80.8%	80%	Yes
Total Phosphorus (TP)	50.4%	45%	Yes
Total Nitrogen (TN)	57.1%	45%	Yes

From the results presented above it can be seen that the proposed stormwater quality treatment meets with the reduction targets set for the development by Central Coast Council.

1.7 Sediment & Erosion Control

The control of erosion and sedimentation describes the measures incorporated during and following construction of a new development to prevent the pollution and degradation of the downstream watercourse.

A Soil and Water Management Plan has prepared as part of the development application documentation.

Common control measures adopted are:

- Sedimentation fences;
- Sedimentation basins;
- Stormwater drainage inlet protection;
- Overland flow diversion swales;
- Shaker Grids and wash downs for vehicles leaving the construction site;
- Dust control measures.

The maintenance of these control measures throughout their intended lifespan will ensure that the risk of erosion and sedimentation pollution of the downstream watercourse will be minimized.

We trust that this information is sufficient for your purposes, however should you have any queries in regards to this report please feel free to contact me.

Yours faithfully

Ian Harris
for **Wood & Grieve Engineers**
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