MUSIC MODEL ASSESSMENT

Proposed 12 Unit Seniors Living Development

LOT 17 DP 1210621
2 Caliope Street,
Kiama

Date: January 2022

Our Reference: 210067

Prepared on Behalf of: Saddleback Mountain Estates No. 2 Pty Ltd

LandTeam Australia Pty Ltd

Southern Tablelands Office
36 Montague Street
Goulburn NSW 2580
PH 02 4821 1033
FAX 02 4821 7238
goulburn@landteam.com.au

Southern Highlands Office
357 Bong Bong Street
Bowral NSW 2576
PH 02 4861 2467
FAX 02 4861 4975
bowral@landteam.com.au

Illawarra Office
Unit 5/97 Shellharbour Road
Warilla NSW 2528
PH 02 4296 7055
FAX 02 4297 1163
wollongong@landteam.com.au

Document Control

Revision No.	Date	Description	Prepared By:	Reviewed by:
A	06/12/2017	Initial issue	T Murphy	D Harrison
B	01/08/2018	Council Comment	T Murphy	D Harrison
C	29/1/2021	Layout Update	T Murphy	D Harrison
D	25/01/2022	Layout Update	T Murphy	D Harrison
E	01/02/2022	Updated catchments	T Murphy	D Harrison

This MUSIC Model Assessment Report provides a fair and true assessment of the proposed development on the site and its likely effects on water quality.

Parameters used for the input to MUSIC were determined for the site adopting the values outlined in Sydney Metropolitan Catchment Management Authority - *Draft New South Wales MUSIC Modelling Guidelines.*

This Report includes information on the proposed development and the catchment, an assessment of the potential impacts of the development and the proposed water quality controls that can be practically implemented on the site to ensure the development achieves a neutral or beneficial effect on water quality. The report is accompanied by modelling to validate the recommended treatment measures for the development.

This assessment relates only to the development and the site as described in the report. The recommendations are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of investigation. Interpretations of the modelling and assessment information should not be made including changes in the scope of the development or application to other projects.

Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.

Tim Murphy
BE Civil MIE Aust
February 2022

Contents

Tables and Figures

1 Assessment Summary and Recommendations

This report and accompanying development application has been prepared on behalf of Saddleback Mountain Estates No. 2 Pty Ltd in relation to the proposed subdivision development of the property located off Old Saddleback Road, Kiama. The land is identified as Lot 17, DP1210621.

Parameters used for the input to MUSIC were determined for the site adopting the values outlined in Sydney Metropolitan Catchment Management Authority - *Draft New South Wales MUSIC Modelling Guidelines.*

This assessment report contains:

(a) a detailed description of the site and catchment area,
(b) a description of the proposed development,
(c) an investigation into how the proposed development will affect the site
(d) recommended treatment measures to offset the potential impacts and address any major existing issues, and
(e) modelling to validate the proposed treatment measures

The results of the assessment and modelling conceptually indicate that Kiama Municipal Council water quality objectives can be achieved for the proposed development if the following recommended treatment measures are implemented as part of the development:

1. Rainwater tanks for future dwellings of 5KL

2. Bioretention with extended detention at end of drainage lines for each catchment,
   Catchment 1 25m² filter area.
   Catchment 2 130m² filter area.

3. GPT baskets in all pits within private road.

2 Site and Development Summary

2.1 Site Description

The site is located on the eastern side of Old Saddleback Road, Kiama and has a total area of approximately 5.5Ha. The site contains cleared land and areas of remnant vegetation.

The site slope averages between 5 - 30% consists of a single catchment. The land is predominantly cleared grassland and areas of trees. The soil profile is shown on soil mapping is 'Kiama' which is characterized by clay loam.

Under *Kiama Municipal Council Local Environment Plan 2011* the subdivision area is located within the RU2 Rural Landscape Zone. The property owners seek to create a total of 12 dwellings within the development. The objective is to construct the appropriate water quality treatments to accommodate for the proposed development.

2.2 Proposed Development

The site characteristics for this 12 lot development are summarized below in Table 1.

A site plan of the proposed development is provided in Section 6 of this report.

Table 1 – Site Characteristics

Site Location	Kiama
Rainfall and PET Zone	Port Kembla
Total Site Area	5.5 Ha
Developed Catchment Area	1.46 Ha
Pre-development site gradient	5-30%
Soil Profile	Mapping identifies the soil profile as clay loam. Soil Landscape 'Kiama".
Existing Watercourse	Yes but away from developed area
Overland flow draining onto site	No
Soils suitable for infiltration	Yes low potential

2.3 Catchment Details

The catchment area for the purpose of the MUSIC assessment is the 1.46ha of the site as developable area. The remaining 4.04ha is unchanged.

Catchment areas have been defined primarily considering the drainage flow paths, locations of proposed treatment measures and surface type distribution. These sub-catchments were further divided or grouped based on the surface types and treatment measures proposed. Overland flow-paths will convey all run off from the site and the upstream catchment area. Hence all nodes have been directed to a single Post Development end node.

Table 2 – Site Development Summary

Land use / Surface type	**Total Area (ha)**
Developed Site	
Building roofs	0.36
private road	0.13
95% Pervious area	0.97
Total	**1.46**

2.4 Source Nodes and Associated Parameters for Post Development Case

Parameters used for the input to MUSIC were determined for the site adopting the values outlined in Sydney Metropolitan Catchment Management Authority - *Draft New South Wales MUSIC Modelling Guidelines.*

For the post-development model it was assumed that the roof areas have 100% Effective Impervious Area (EIA). The remaining areas of the site were calculated as a percentage of impervious/pervious with the sealed driveways calculated as 100% impervious and the remaining areas to be assumed completely pervious. Nodes were determined by common treatments and flow paths.

Rainfall-runoff parameters for the impervious surfaces (rainfall threshold) were determined for each surface from 3-6 of the *Draft New South Wales MUSIC Modelling Guidelines*. Pervious surface parameters were determined based on clay loam adopting an average depth of 0.5m.

The stormwater pollutant concentration parameters were adopted from Table 3-9 and Table 3-10 of the *Draft New South Wales MUSIC Modelling Guidelines*.

2.5 Proposed Treatment Measures for Post Development Cases

A conceptual plan of the proposed layout of treatment measures is shown in section 6.

2.5.1 Rainwater Tanks

Rainwater tanks are proposed for each new dwelling. The appropriate size of the tanks for the development site would typically be confirmed through discussions with the local authority. For the lot size and development type a rainwater tank size of 5kL was considered appropriate for each building.

In addition, the following assumptions were adopted:

- An impervious area of 100% was adopted for roofs. The rainfall threshold was adopted in accordance with Table 3-6 (NSW MUSIC Modelling Guidelines)
- The building roof area is on average 300m² for all new lots, and it was assumed that the roof drainage can be configured to direct all roof runoff to a tank for new lots.
- The estimated demand is in accordance with Table 3-12 (NSW MUSIC Modelling Guidelines) for a 4 bedroom urban dwelling (toilet, laundry, hotwater, & external reuse)

2.5.2 Bioretention Basin 1

Bioretention Basin is proposed at the end of the drainage reticulation. This will be located to the north of the development adjacent to dwelling 9.
The basin will have the following properties:

- Modelled surface area 25m²
- Filter surface area 25m²
- Extended detention depth 0.2m
- Filter Media depth 0.5m

2.5.3 Bioretention Basin 2

Bioretention Basin is proposed at the end of the drainage reticulation. This will be located to the north east of the development adjacent to dwelling 12.
The basin will have the following properties:

- Modelled surface area 130m²
- Filter surface area 130m²
- Extended detention depth 0.2m
- Filter Media depth 0.5m

It is intended that the basin would be constructed at the conclusion of the construction of the building and hardstand areas as applicable. Bioretention basins are to be constructed in accordance with the Adoption Guidelines for Stormwater Bio-filtration Systems published by the Facility for Advancing Water Bio- Filtration (FAWB) June 2009.

2.5.4 GPT Pit Inserts

All proposed grated pits within the development will contain a gross pollutant trap insert to treat all water draining to directly into pits.
The gpt input and output properties are modelled as per the below table.

GPT default treatment node inputs		
	Inlet properties	
Low flow by-pass	0	
High flow by pass	50% of peak 1-year ARI	
	Input (mg/L)	Outlet(mg/L)
TSS	0	0
	75	75
	1000	350
TP	0.00	0.00
	0.50	0.50
	1.00	0.85
TN	0.0	0.0
	0.5	0.5
	5.0	4.3
Gross pollutants	0	0
	15	1.5

3 Music Modelling & Assessment Results

3.1 Climate Data

Climate Template Data used for the MUSIC modelling was taken recorded rainfall from Port Kembla between January 1971 and December 1979.

3.2 MUSIC Model

The post development MUSIC model is illustrated below in Figure 1.

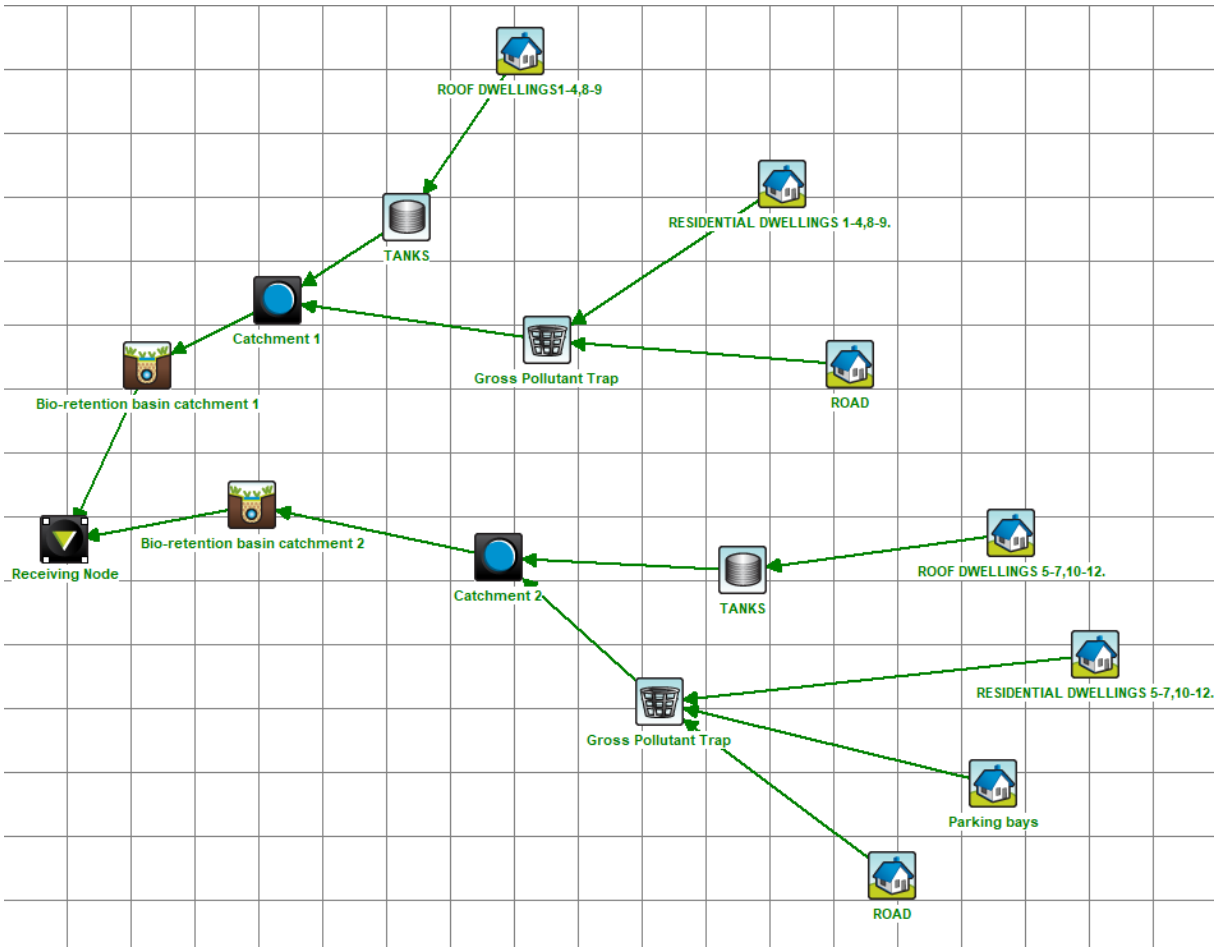

Figure 1 – MUSIC Model for pre and post development

3.3 Results

The model results for the pollutant loads are presented in Table 3 below.

Table 3: Results

Treatment train effectiveness				
Pollutant	**Source Load**	**Residual Load**	**% Reduction**	**Achieves Target?**
Total Suspended Solids (kg/yr)	1410	228	83.9	yes
Total Phosphorus (kg/yr)	2.85	1.15	59.6	yes
Total Nitrogen (kg/yr)	23.1	11.3	51.2	yes
Gross Pollutants (kg/yr)	159	0	100	yes

4 Conclusion

The MUSIC model results conceptually show the pollutant reduction targets described in section 1 would be achieved for the proposed post development scenario given the treatment measures described in sections 2.5.1, 2.5.2 and 2.5.3.
The modelled post development TSS, TP, TN and gross pollutant loads were reduced by a minimum of 80%, 45%, & 45% respectively.

5 References

Facility for Advancing Water Bio-Filtration, 2009, *Adoption Guidelines for Stormwater Bio-Filtration Systems*

Landcom (2004). *Managing Urban Stormwater: Soils and Construction.* 4th Edition. NSW Government.

Sydney Metropolitan Catchment Management Authority - *Draft New South Wales MUSIC Modelling Guidelines.*

6 Supporting Plans and Information

Refer to LandTeam drawings:

Reference	Document	Prepared by	Date
DWG NUMBER 210067-DA04	WATER QUALITY & CATCHMENT PLAN	LandTeam Australia	01.02.2022 Issue G

MGA

CONCEPT - NOT FOR CONSTRUCTION

DIRECT CONNECTION TO PROPOSED DRAINAGE PIT CONSTRUCTED OVER EXISTING LINE

DIRECT CONNECTION TO EXISTING DRAINAGE PIT

BASIN 1 - OSD TANK UNDER DRIVEWAY (15.4m³).

BASIN 2 - BIO-RETENTION

BASIN 3 - COMBINED BIO-RETENTION AND OSD BASIN (15.2m³).

STREET

CALIOPE

ROAD

OLD SADDLEBACK

CATCHMENT 1
4950m²
2300m² IMPERVIOUS

CATCHMENT 2
9620m²
2600m² IMPERVIOUS

DWELLING 1
DWELLING 3
DWELLING 4
DWELLING 5
DWELLING 6
DWELLING 7
DWELLING 8
DWELLING 9
DWELLING 10
DWELLING 11
DWELLING 12

RESIDUE LOT

LEGEND

- PROPOSED BOUNDARY LINES
- ADJOINING BOUNDARY LINES
- PROPOSED EASEMENTS
- 643.0 EXISTING CONTOURS
- 632.5 PROPOSED CONTOURS
- PROPOSED STOWMWATER PIPES
- EXISTING STOWMWATER PIPES
- PROPOSED BIO RETENTION BASIN

OSD ANALYSIS

BASIN 1

SITE AREA	= 4950 m²	L	= 118m
% THROUGH OSD	= 78%	S_0	= 9.1%
%IMP. PRE-DEV'T	= 0%	n	= 0.035
%IMP. POST-DEV'T	= 47%		
Q_{OUT} - 5 YEAR	= 111 L/s	VOLUME - 5 YEAR	= 7.7m³
Q_{OUT} - 100 YEAR	= 224 L/s	VOLUME - 100 YEAR	= 15.4m³

BASIN 3

SITE AREA	= 9620 m²	L	= 294m
% THROUGH OSD	= 100%	S_0	= 8.9%
%IMP. PRE-DEV'T	= 0%	n	= 0.035
%IMP. POST-DEV'T	= 27%		
Q_{OUT} - 5 YEAR	= 293 L/s	VOLUME - 5 YEAR	= 13.6m³
Q_{OUT} - 100 YEAR	= 630 L/s	VOLUME - 100 YEAR	= 15.2m³

WATER QUALITY NOTES

ALL FUTURE DWELLING TO HAVE A 5kL RAINWATER TANK.

ALL PITS TO HAVE A LITTER BASKET.

BIO-RETENTION BASIN 2 DETAILS:

- 25m² FILTER AREA
- 0.5m FILTER DEPTH
- 0.2m EXTENDED DETENTION DEPTH
- 0.1m UNDER DRAIN

BIO-RETENTION BASIN 3 DETAILS:

- 130m² FILTER AREA
- 0.5m FILTER DEPTH
- 0.2m EXTENDED DETENTION DEPTH
- 0.1m UNDER DRAIN

(A) - PROPOSED EASEMENT FOR DRAINAGE OF WATER 1.5 WIDE
(B) - PROPOSED EASEMENT FOR BIO RETENTION AND/OR OSD BASIN (VARIABLE WIDTH)
(C) - PROPOSED EASEMENT FOR DRAINAGE OF WATER 3.0 WIDE

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A	INITIAL ISSUE	MR	11.08.2017
B	UPDATED LAYOUT	AG	12.12.2017
C	CATCHMENTS UPDATED	AG	01.08.2018
D	LAYOUT ALTERED	AG	29.01.2021
E	REVISED TO SUIT UPDATED LAYOUT	AG	25.01.2022
F	MINOR AMENDMENT	AG	27.01.2022
G	DRIVEWAY ALTERED	AG	01.02.2022

LandTeam Australia Pty Ltd
ABN 35 300 283 592
Wollongong Office
5/97 Shellharbour Road
Postal: PO Box 353
WARILLA NSW 2528
p: (02) 4296 7055
f: (02) 4297 1163
e: wollongong@landteam.com.au
www.landteam.com.au

A1 SHEET

SADDLEBACK MOUNTAIN ESTATES No. 2 Pty Ltd

PROPOSED SUBDIVISION OF LOT 17, DP 1210621
2 CALIOPE STREET, KIAMA

KIAMA MUNICIPAL COUNCIL

WATER QUALITY & CATCHMENT PLAN

DESIGNED: AG | ISSUE
DRAWN: MR | G
CHECKED: DH

DRAWING No.
210067 DA04
SHEET 4 OF 5 SHEET(S)

DATUM: AHD | CONTOUR INTERVAL: 0.5m | DATE: 11.08.2017