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CONCEPT STORMWATER MANAGEMENT REPORT

for

Proposed Seniors Community Development

at

83 Lakewood Dr, Merimbula NSW

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1. INTRODUCTION

Northrop Consulting Engineers Pty Ltd has been engaged to undertake the conceptual stormwater management design for the proposed development located at 3 Lakewood Dr, Merimbula.

The purpose of this report is to summarise the proposed design solutions for the stormwater management for a Development Application submission to Bega Valley Shire Council. The proposed design has been considered with regard to the Bega Valley DCP 2013 (amended January 2022), Bega Valley Shire Council Development Design Specification, as well as industry best practice.

We note the information contained in this report is not intended to present detailed design solutions but rather provide solutions commensurate with a conceptual design suitable for a Development Application assessment.

2. SITE DESCRIPTION

The subject site is contained within lot 106/DP1277714. The site is bound by Lakewood Drive to the south, residential properties to the east, existing gully to the north and holiday accommodation to the west.

The total development area is 1.4ha within the 3.0ha site. The majority of the proposed development site slopes from the south-east down to the north-west with elevations ranging from RL30.8 to RL8.0. There is a highpoint approximately a quarter of the way from the south-east corner with elevations ranging from RL30.8 down to RL21.5 at the south-east corner. An existing gully runs through the north-west area on the site where there is dense vegetation.

Figure 1 shows an aerial image of the site reflecting its current state. Lakewood Drive is misrepresented in the below image – the road and cul-de-sac are currently being formed.



Figure 1: Aerial Image (SIXMaps)



The site in its current state is majority grassed with dense vegetation to the north and a gully running from the north-east corner to the north-west corner of the site.

Based on geotechnical information from NSW eSPADe, the soil profile is believed to consist of silty sand.



3. PROPOSED DEVELOPMENT

The development of the site generally comprises of the following:

- 5 storey residential aged care facility (4 storey residential units & roof-top terrace and multi-use room)
- · Ground level parking within RACF
- External on-grade visitor and staff parking
- Outdoor above-ground pool
- Lawn bowling green

The layout of the proposed development has been illustrated in the concept engineering plans appended to the rear of this report.

4. PROPOSED STORMWATER MANAGEMENT STRATEGY

4.1 GENERAL STRATEGY

The onsite stormwater management system has been designed to replicate the processes which would occur naturally on site. The proposed development will incorporate a number of devices and measures aimed at providing adequate and responsible management of stormwater runoff for minor and major storm events.

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In line with Chapters D5 & D7 of Bega Vally Shire Council Development Design Specification, the stormwater management strategy has considered the following items which will be discussed in the following sections of this report:

- Water quality ;
- Stormwater detention;
- Local overland drainage.

4.2 WATER QUALITY

In order to minimise any adverse impacts upon the ecology of downstream watercourses, stormwater treatment devices have been incorporated into the design of the development. The adopted stormwater quality targets were as specified in Australian Runoff Quality (ARQ, 2006) and are summarised in Table 1:

Table 1 – Required Water Quality Reductions				
Pollutant Criteria	Required Reduction Target (%)			
Total Suspended Solids (TSS)	80			
Total Phosphorous (TP)	45			
Total Nitrogen (TN)	45			
Gross Pollutants	90			

The performance of the proposed stormwater management strategy was assessed against these targets using the conceptual design software MUSIC (Version 6). The MUSIC model was developed using parameters recommended in the document "NSW MUSIC Modelling Guidelines" (WBM, 2015).

The performance of the total catchment was modelled through the treatment train. A number of devices are to be implemented on site to achieve the water quality reduction targets, including a proprietary GPT device (Oceansave OS0606 or equivalent) and a biofiltration basin.

A schematic of the MUSIC model is provided in Figure 2.



Figure 2 – MUSIC Model Schematic

The biofiltration basin has a plan area of 100 m², an extended detention depth of 200 mm, and a 400 mm filtration layer with a hydraulic conductivity of 200 mm/hr. The filter material is required to have a total nitrogen content of 80 mg/kg, more than 3% organic material and less than 50 mg/kg of



orthophosphate content. The basin also has a 100 mm transition layer and a 100 mm (minimum) drainage layer comprising clean, fine gravel.

The effectiveness of the modelled treatment train by comparison of pollutant load reduction is outlined below in Table 3.

Table 3 – MUSIC Modelling Results

Pollutant Criteria	Reduction Target (%)	Sources (kg/yr)	Residual Load (kg/yr)	Achieved Reduction (%)
Total Suspended Solids (TSS)	80	1280	148	88.4
Total Phosphorous (TP)	45	2.05	0.532	74
Total Nitrogen (TN)	45	14.7	4.07	72.2
Gross Pollutants	90	203	21.5	90

Note: The MUSIC model can be provided to Council upon request.

Table 3 shows that the proposed stormwater quality management strategy will achieve the required load reduction targets. A copy of the MUSIC Link report has been appended to the rear of this report.

4.3 STORMWATER DETENTION

In accordance with Bega Valley Shire Council Design Specification Chapter D5, on-site detention will be required to be investigated to limit post development flows from the proposed development site to less than or equal to pre-development flows for all storm events up to and including the 100 year ARI storm event. Runoff from the proposed development was modelled using the runoff routing software DRAINS incorporating an on-site detention facility. This was compared to the pre-developed site in its existing state with an impervious percentage of 0%.

The ILSAX hydrological model in DRAINS was used to generate runoff hydrographs for the pre-developed and post-developed site. Data from the Bureau of Meteorology (BOM) was used to generate design storms. Runoff parameters were selected to replicate the site conditions that will be present in the post-developed case and that which currently occur in the pre-developed case. A summary of parameters used for the model are shown below:

Impervious depression storage	= 1 mm
Pervious depression storage	= 5 mm
Time of concentration	= 3 minutes
Soil type	= 3

Storm durations ranging from 5 minutes to 120 minutes were investigated for each of the design storm events that were analysed for a site area of 1.4ha.

A screenshot of the DRAINS model for the 1% AEP storm event is displayed in Figure 3.



Figure 3 – DRAINS Model Schematic

The OSD basin has been modelled to include 200mm extended detention for the biofiltration basin as well as a 225 dia outlet pipe. The overflow weir is 10m wide with maximum water level 85mm above the weir level.

A comparison between the pre-development and post-development flows from the site for the critical storm duration for each of the design storm events, up to and including the 100 year ARI is presented in Table 4.

AEP	Pre-Developed Peak Flow (L/s)	Post-Developed Peak Flow (L/s)
1%	671	603
2%	551	447
5%	365	238
10%	272	167
20%	171	151

Table 4: DRAINS output comparing pre-development and post-development flows.

As shown in Table 4, the peak post-development flows for storm events up to the 100 year ARI have been detained to less than that for the pre-development site. Confirming the OSD provided will achieve the design intent to limit post-development flows to that of the pre-development state.

4.3 LOCAL OVERLAND DRAINAGE

Local overland flow paths are provided from the highpoint along the western boundary to the north and south following existing overland flow routes. It is not anticipate that there will be overfland flow from neighbouring properties affecting our site due to the existing topography of the land.



5. CONCLUSION

The proposed stormwater management design presented above has been prepared to comply with Bega Valley Shire Council's DCP and Development Design Specification as well as industry best practice. The design philosophy is based on the principle of at source treatment, to reduce conveyance infrastructure and manage water quantity and quality aspects.

At a concept level the system has been designed to cater for frequent and infrequent storm events.

Based on the above, our investigation and concept designs indicate the proposed development can adequately manage and address all items surrounding stormwater runoff. Should you have any queries, please feel free to contact the undersigned on (02) 4365 1668.

Bar

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REFERENCES:

BMT WBM Pty Ltd, Draft New South Wales MUSIC Modelling Guidelines, August 2010

Bega Valley Shire Council, Development Design Specification, January 2002

Bega Valley Development Control Plan 2013, January 2022



LIMITATION STATEMENT:

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APPENDIX A – SUPPLEMENTARY INFORMATION

- Concept Stormwater Management Plans