

Tuesday, 23 February 2021

To whom it may concern

We submit for your consideration the following:

Objection to West Culburra Mixed Use Subdivision – SSD-3846

This objection is made under all relevant Acts and regional plans.

Our objection(s) to proposal number SSD-3846 relates to the **water quality modelling** undertaken using MUSIC – a program utilised to simulate rainfall, stormwater runoff and pollution loads. The following concerns are raised:

- **MUSIC Model Calibration**

Model calibration and sensitivity analysis are required to assess model performance. As detailed by Dotto et al. (2015) *‘It is very unlikely that non-calibrated models will lead to reasonable results’*. The water quality modelling undertaken by Martens (2020) and presented as part of the proposal resubmission identifies that **calibration using stream flow data has not been undertaken and state the following** *‘The preferred method for adjusting rainfall-runoff parameters is to compare MUSIC model predictions to available stream flow data for the catchment, or in the absence of local data, compare to nearby catchments. This approach is not practical for the Concept Plan area because there are no available watercourses [gauged or ungauged] either within the Concept Plan area or in nearby similar sized catchments.’* **In order to accurately estimate the water quality pre and post development model calibration is required using either stream flow, or in the absence of this overland flow data obtained at the site or from a similar catchment.**

- **Climate Data**

A MUSIC model requires the user to input climate data (rainfall) for the area. For small developments a minimum of 10 years data should be adopted, for larger integrated water management strategies, water flow analysis and analysis of large pervious areas a data set of at least 20 years should be adopted with the data collected at 6 minute intervals (pluviograph data). Martens (2020) have adopted a period of 8 years using climate data from the Nowra RAN station (**1965-1973**). For a development of the size proposed a larger climate data set needs to be adopted in order to demonstrate climate variability (wet, dry and average). The Bureau of Meteorology, Nowra RAN Station has a complete

set of data available for the periods 1964 – 1983 and 1993 – 1997. The climate data used is outdated and of too short duration (8 years) from a station located in Nowra, 21km inland from Culburra Beach. This data does not sufficiently represent the present-day climate nor the rainfall of a coastal town. The closest coastal station with pluviograph data is Jervis Bay (Point Perpendicular ASW Station Number 068151) with data available between 2001-2018 (46% complete). Culburra Beach (Culburra Treatment Works Station #68083) reports daily rainfall totals which could be used for comparison. **For a development such as the proposed a more representative climate data set of longer duration (20 years) should be used to effectively estimate runoff quantities and exhibit climate variability.**

▪ Pollutant Loads

The MUSIC modelling results indicate a reduction in pollution loads post development (refer table below). The location of the proposed development as it stands is unurbanised bush with nearly 100% pervious surface. Achieving pollution loads that are 33% lower than the current loadings exposes the inaccuracy of the water quality modelling undertaken as part of the proposal.

Pollutant	Exfiltration Criteria (mm/hr)	Developed-treated (kg/year) (D-T1/D-T2) ¹	Pre-development – land use zoning (kg/year) (PD-LU)	Difference (kg/year) ²	Pre-development – current land cover (kg/year) (PD-LC1)	Difference (kg/year) ²	Pre-development – forest land cover (kg/year) (PD-LC2)	Difference (kg/year) ²
Gross Pollutants	0	0	35.5	-35.50	33.3	-33.30	33.3	-33.30
	0.25							
TSS	0	416	11,400	-10984	6,270	-5854	3,780	-3364
	0.25	376		-11024		-5894		-3404
TP	0	7.96	23	-15.04	10.9	-2.94	9.52	-1.56
	0.25	6.92		-16.08		-3.98		-2.60
TN	0	74.7	177	-102.3	93.5	-18.8	87	-12.3
	0.25	65.4		-111.6		-28.1		-21.6

The MUSIC modelling presented as part of the proposed West Culburra Development is inadequate. Modelling of highly pervious areas such as the current site, predominantly bush, should be completed by experienced users and the model results checked against gauged flows and/or typical water balance estimates for a site in a similar catchment. There is likely to be a lack of precision in an uncalibrated model. To approve a development such as the proposed based on the water quality modelling presented could cause irreversible damage to two highly sensitive waterway, Lake Wollumboola and Crookhaven River Estuary. An independent model should be developed to validate that provided by Martens (2020) prior to any form of development consent being given. A recent 20 year period of climate data from close to the development site or from a site of similar geography should be used to accurately model average

rainfall and periods of wet/dry and consideration needs to be given to the potential increase in rainfall as a result of climate change.

Yours Sincerely,

