

August 25, 2025

Deana Burn

NSW Government Department of Planning, Housing and Infrastructure

Dear Deana,

I am writing regarding project **SSD-3846-Mod-1 – West Culburra**. I've raised the below concerns throughout the various stages of the proposed development (refer attached), however have seen minimal amendment to address the shortcomings of the proposed design. Subsequent to my previous submissions the following concerns are raised in relation to the proposed water quality treatment.

Overview

The water quality modelling that has been undertaken to assess runoff from the site has not been calibrated, peer reviewed, nor does it take into consideration future effects of climate change (Freeman, 2021). It underestimates the rainfall at the site by using outdated rainfall data and thus does not accurately estimate runoff volumes or pollution loads into the river. Furthermore, and more specifically, the concept design includes three proposed water quality control ponds (WQ Controls) located near Rocky Point, Curleys Bay, and Culburra Township. These ponds are intended to manage stormwater runoff and improve water quality prior to discharge into receiving environments.

Key Observations

The proposed water quality control ponds and biofiltration are situated close to or within the 1% Annual Exceedance Probability (AEP) flood level (RL3.0 – note the error on Allan Price drawings this should be RL3.6 as per the flood certificate), as indicated on the concept design. Pond areas range from 250 m² to 2204 m², with varying proximity to sensitive foreshore and reserve areas.

Potential Risks

Flood Inundation: The proximity to the 1% AEP flood line suggests a high likelihood of inundation during major storm events, which may compromise the ponds' ability to retain and treat stormwater effectively. The likelihood of inundation will increase as a result of climate change. If the Probable Maximum Flood level is adopted the ponds would be completely inundated.

Pollutant Resuspension: Flooding may lead to resuspension of captured sediments and nutrients, reducing treatment efficiency and potentially impacting downstream water quality i.e. sensitive coastal wetlands, marine and native vegetation of Curleys Bay and subsequently Crookhaven River.

Design Vulnerability: Without elevation or protective features, the ponds may not meet long-term performance objectives, especially under future climate scenarios.

Flood Exposure: Biofiltration A and C are within the 1% AEP flood zone, which may reduce treatment efficiency during flood events due to:

- Inundation and bypassing of filtration media.
- Potential resuspension of captured pollutants.

Maintenance Challenges: Flood-prone biofiltration systems may require more frequent maintenance and sediment removal to remain effective.

Recommendations

In order to address the shortcoming of the proposed design the following recommendations are made:

- **Hydrological Modelling:** Conduct detailed flood modelling to assess pond performance under various flood scenarios, including climate change projections. To date, consideration has been given to increase rainfall resultant from climate change.
- **Elevation Adjustments:** Evaluate the feasibility of raising the pond bases or embankments above the 1% AEP level to reduce inundation risk.
- **Overflow Management:** Design controlled overflow pathways to prevent untreated water from entering sensitive environments. The ponds are located directly adjacent to the waterway and will overflow untreated water into a pristine environment
- **Supplementary Treatment:** Consider integrating additional treatment systems (e.g., bioretention, constructed wetlands) in less flood-prone areas to provide redundancy. The concept has nominated biofiltration however the proposed location is within the flood effected area and will result in the biofiltration being ineffective.
- **Hydrological Flow Diagram:** A schematic showing how stormwater flows into and out of the ponds during typical and flood conditions. Include arrows for flow direction, treatment stages, and overflow pathways.
- **Water Quality Treatment Process:** A simplified diagram of the treatment process within the pond (e.g., sedimentation, filtration, nutrient uptake). Helps stakeholders understand the function and importance of maintaining pond integrity.
- **Alternative Treatment Layout:** A conceptual layout showing potential supplementary systems (e.g., bioretention basins, wetlands) in less flood-prone areas. Supports your recommendation for redundancy and resilience.

The introduction of hard surfaces in an area that is currently densely vegetated is going to see a significant increase in stormwater, sediment loads and freshwater quantities downstream of the subject site. The proposed water quality treatment devices are in low lying flood prone areas and will be inundated during a flood event and with the associated impacts of climate change (sea level rise - not currently considered in the design) which will release directly into the Nationally Significant Wetland of Crookhaven Estuary. This would have high ongoing impact to protected matters.

To proceed with a development such as the proposed without further review of the water quality controls could cause irreversible damage to two highly sensitive waterways. If developed, Council will likely be required to continually manage, maintain and deal with issues associated with inadequate design which is likely to have significant financial and environmental implications.

Yours Sincerely,

Libby Freeman

MPhil (Civil and Environmental Engineering) BE (Civil)

29 November 2024

Elizabeth Freeman
Tanya Plibersek

West Culburra Residential Subdivision, NSW (EPBC 2023/09524) – Notice for Public Information

Dear Tanya,

In regards to the latest notice published pursuant to Section 95B(1) and 95B(2) of the *Environment Protection and Biodiversity Conservation Act 1999*, in particular the information regarding the West Culburra Residential Subdivision and the flood impacts at the site, please refer below concerns.

The document titled *Flood Impact Assessment West Culburra Beach Expansion Area* (Allan Price and Scarratts, 2020) contains the following errors and discrepancies:

- The report (Allan Price and Scarratts, 2020) and *Figure 2 – Approved Concept Plan Modification* reference the 1% AEP Flood Level of 3.0m AHD as the flood planning level at the site. This is the incorrect level to be adopted at the site. Reference should be made to the Flood Planning Level as shown on the Flood Planning Certificate provided by Shoalhaven City Council on the 1st March 2023. The projected Flood Planning Levels as shown on the Flood Planning Certificate are 4.0m AHD (2050) and 4.1m AHD (2100), approximately 1.1m higher than that adopted in assessing the impact of flooding on the development. The implications of this error are that the water quality treatment ponds will be inundated during a flood event thus releasing polluted water into the adjacent Crookhaven River (an area identified as high environmental value).
- There are discrepancies between the flood planning certificate provided by Shoalhaven City Council (March 2023) and the information contained within the report and *Figure 2 – Approved Concept Plan Modification* provided in response to submission (Refer Figure 1 and Figure 2). The consistent errors within the document raise concerns with the overall validity of the submission.

FLOOD CERTIFICATE

According to the *Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011)*, the *Lower Shoalhaven River Flood Study (2022)* and the *Lake Wollumboola Flood Study (2015)* this property, Culburra Rd, CULBURRA BEACH – LOT 2 DP 1279350, UPN – 1002539, comprises Flood Prone Land. This property is located below the Flood Planning Level and is affected by the 1% AEP flood event.

FLOOD INFORMATION

Year	Existing	Projected 2050	Projected 2100
Flood Planning Level (m AHD)	Not Applicable	4.0**	4.1**
Hazard and Hydraulic Category	High Hazard Flood Storage	High Hazard Flood Storage	High Hazard Flood Storage
Probable Max Flood Level (m AHD)	5.9	5.9	5.9
0.2% AEP Flood Level (m AHD)	3.8	3.9	3.9
1% AEP Flood Level (m AHD)	2.8	2.9	3.0
2% AEP Flood Level (m AHD)	2.4	2.4	2.4
5% AEP Flood Level (m AHD)	2.1	2.2	2.2
10% AEP Flood Level (m AHD)	1.6	1.7	1.8
Velocity (0.2% AEP flood event) (m/s)	0.2	0.2	0.2
Velocity (1% AEP flood event) (m/s)	0.2	0.2	0.2

* Refer to Standard Considerations in this Flood Certificate for further details.

** Flood Planning Levels obtained from the *Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011)* in accordance with the Flood Planning Level for the *Lower Shoalhaven River Floodplain Policy (2023)*. The hazard and hydraulic category, flood levels and flood velocities have been obtained from the *Lower Shoalhaven River Flood Study (2022)*.

Figure 1 Screenshot of Flood Planning Certificate Provided by Shoalhaven City Council

FLOOD CERTIFICATE

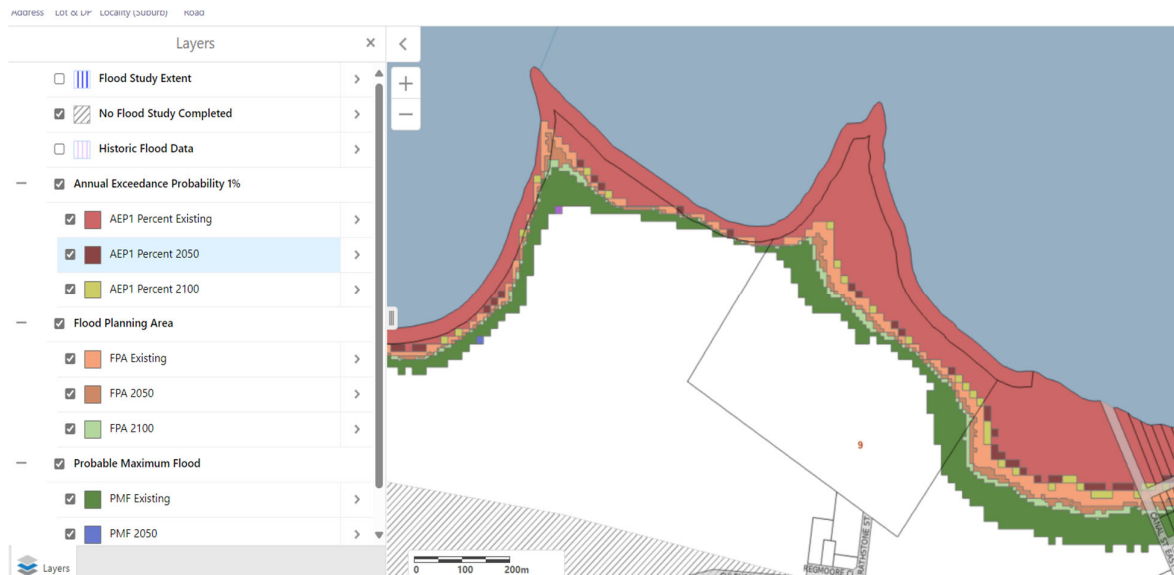
According to the Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011) and Lake Wollumboola Flood Study (2015) this property, Culburra Rd, CULBURRA BEACH - Lot 5 DP 1065111, is affected by the 1% AEP flood event.

FLOOD INFORMATION

Year	Existing	Projected 2050	Projected 2100
Flood Planning Level	Not applicable	3.9m AHD	4.1m AHD
Hazard Category	High Hazard	High Hazard	High Hazard
Hydraulic Category	Flood Storage	Flood Storage	Flood Storage
Probable Maximum Flood Level	4.9m AHD	4.9m AHD	5.0m AHD
1% AEP Flood Level	3.2m AHD	3.4m AHD	3.6m AHD
2% AEP Flood Level	2.8m AHD	3.0m AHD	3.3m AHD
5% AEP Flood Level	2.3m AHD	2.6m AHD	2.9m AHD
10% AEP Flood Level	2.0m AHD	2.2m AHD	2.7m AHD
Velocity (1% AEP flood event)	Not Available	Not Available	Not Available

Figure 2 Screenshot of Flood Planning Certificate Included in Flood Impact Assessment Report Prepared by Allen Price and Scarratts

- The report provides a figure of the flood hazard mapping however contains no reference to the flood planning maps provided on Shoalhaven City Council's Interactive Mapping website to be used for development. This results in the impact assessment underestimating the extent of flooding at the subject site (Figure 3). The areas identified as flood prone on the mapping are within the location of the proposed water quality detention ponds which if inundated will result in water quality issues to the adjacent waterways.



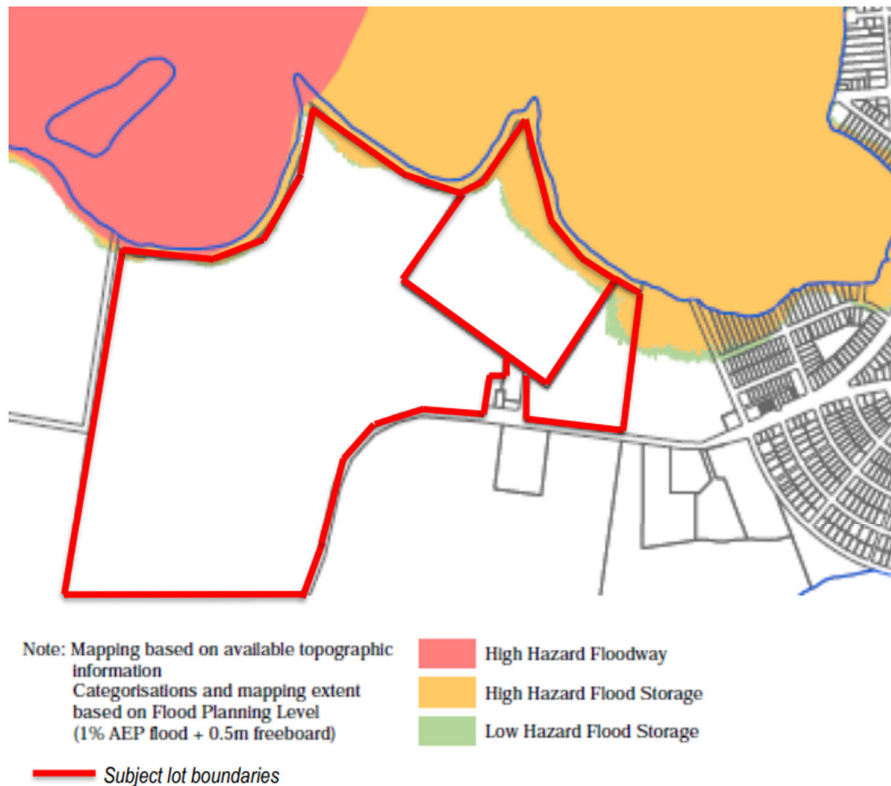


Figure 3 Figure Showing Comparison of Flood Mapping as Provided on Shoalhaven City Council Website and the Figure Provided Within Allan Price and Scarratts Flood Impact Assessment Report.

- The Flood Impact Assessment report provides no analysis on the potential impacts of tidal inundation nor climate change affects which will exacerbate the present-day scenario. The implications of this omission will be the need for Council to invest in future methods of asset protection to alleviate the impacts of flooding and tidal inundation.
- The most recent Lower Shoalhaven River CMP (Rhelm, 2024) depicts *Coastal Wetland Proximity Area* and areas identified as containing environmental values (Figure 4) which are going to be directly impacted by the proposed development.

7th November 2023

epbc.referrals@dccew.gov.au

To whom it may concern

WEST CULBURRA RESIDENTIAL DEVELOPMENT EPBC ACT REFERRAL – SUPPORTING
DOCUMENTATION (EPBC 2023/09524)

This letter relates to the proposed action, classified as a Controlled Action under the *Environment Protection and Biodiversity Conservation Act (1999)*, and the impact it will have on protected matters at the project site and surrounding areas. This letter has been set out to address inaccuracies and misinformation contained within the document prepared by Eco Logical (June 2023) *West Culburra Residential Development EPBC Act Referral – Supporting Documentation*.

Report Section 1.2.1 Provide an Overview of the Proposed Action, Including all Proposed Activities

This section provides inadequate information on the proposed action and activities. Dot points on the proposed activities is provided which is not enough detail to ascertain impacts on the Project Area.

There is no mention of Construction Environmental Management Plans, Operational Environmental Management Plan, Water Quality Monitoring, Flora and Fauna Monitoring, Estuary Monitoring, Vegetation Management Plans, Traffic Management Plans, Stormwater Management Plans all of which would be actions required as part of the proposed project and should be detailed in the submission.

The action area of 65.8 ha underestimates the extent and impact of the development. The further statement that 46.27 ha of native vegetation would be affected through clearing also underestimates the extent of the impact given there would be indirect impact to foreshore and surrounding areas which should be quantified.

This section provides no reference to relevant documentation with detail of the proposed action or activities. Further details of the stages of the proposed action and a summary of the activities within each stage would need to be provided to ascertain the level impact on the immediate and surrounding area. Without such information an assessment cannot be made.

Report Section 3.1 Describe the Current Condition of the Project Area's Environment

This section of the report is missing significant information including mention of the Biodiversity, Geology, Heritage, Land Use, Air Quality, Traffic and Socio-Economic attributes of the project area. Desktop and field investigations should be referenced to provide up to date information on the current condition of the environment of the project site.

The first paragraph states the majority of the land is zoned as a Deferred Matter under the Shoalhaven Local Environmental Plan (2014). Running a report from the Shoalhaven SLEP (2014) the subject site is zoned C2, DM, E1, E4 and SP2. Adjoining land is zoned C2 (Conservation). Subject site is also classified as Significant Vegetation (Biodiversity), Riparian Land, Bushfire Prone, as obtaining Threatened Flora and Fauna and Flood affected all of which are not provided in the report section 3.1.

There is minimal description of the project areas environment. There is no mention of the EPBC Act Protected Matters currently identified at the project site. The Protected Matters search identified 5 Threatened Ecological Communities (3 of which are likely at the subject site), 78 Threatened Species

(18 known to occur), 61 Migratory Species (31 known to occur), 74 Marine Species, 2 Nationally Important Wetlands (Wollumboola Lake and Shoalhaven/Crookhaven Estuary) and 3 Biologically Important Areas as shown in Figure 1.

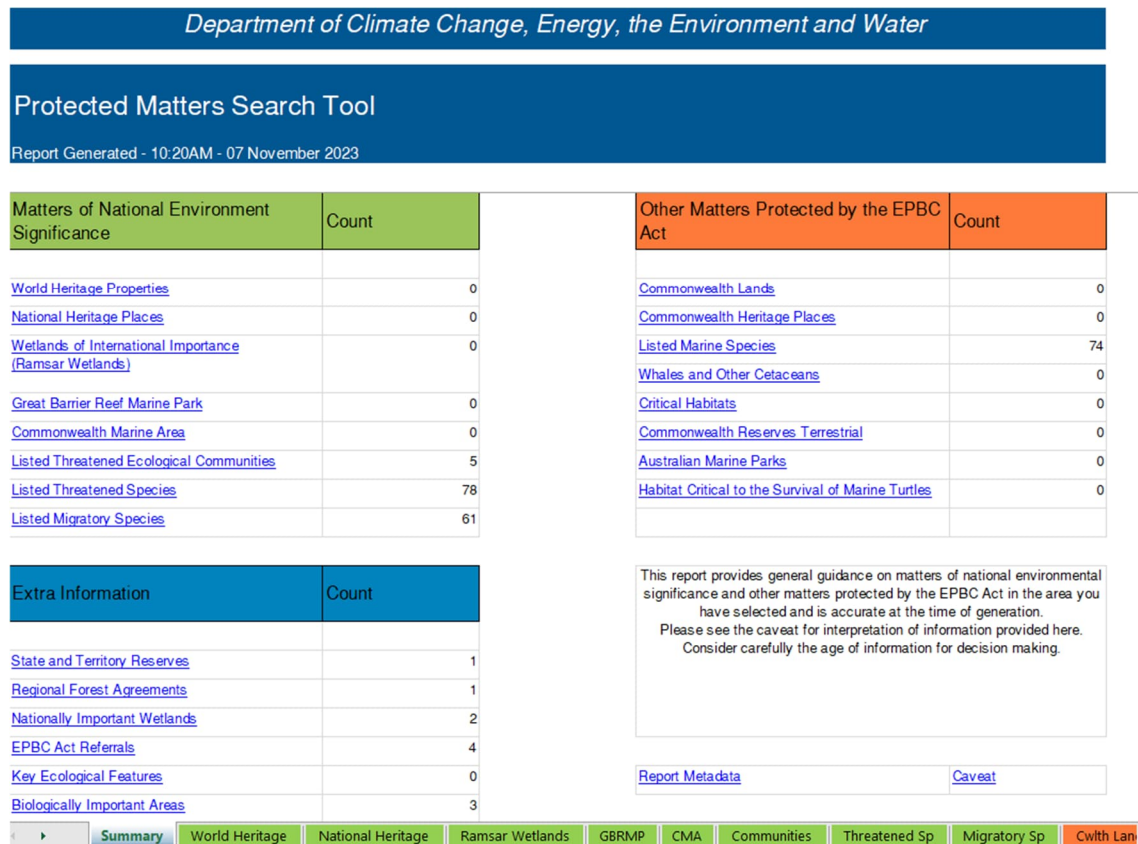


Figure 1 EPBC Protected Matters Search Results at the Subject Site

This section of the report contains no information regarding the NSW DPI mapping that indicates significant extent of Estuarine Macrophytes adjacent to the project site including Mangroves, Saltmarsh and Zostera as shown in Figure 2.

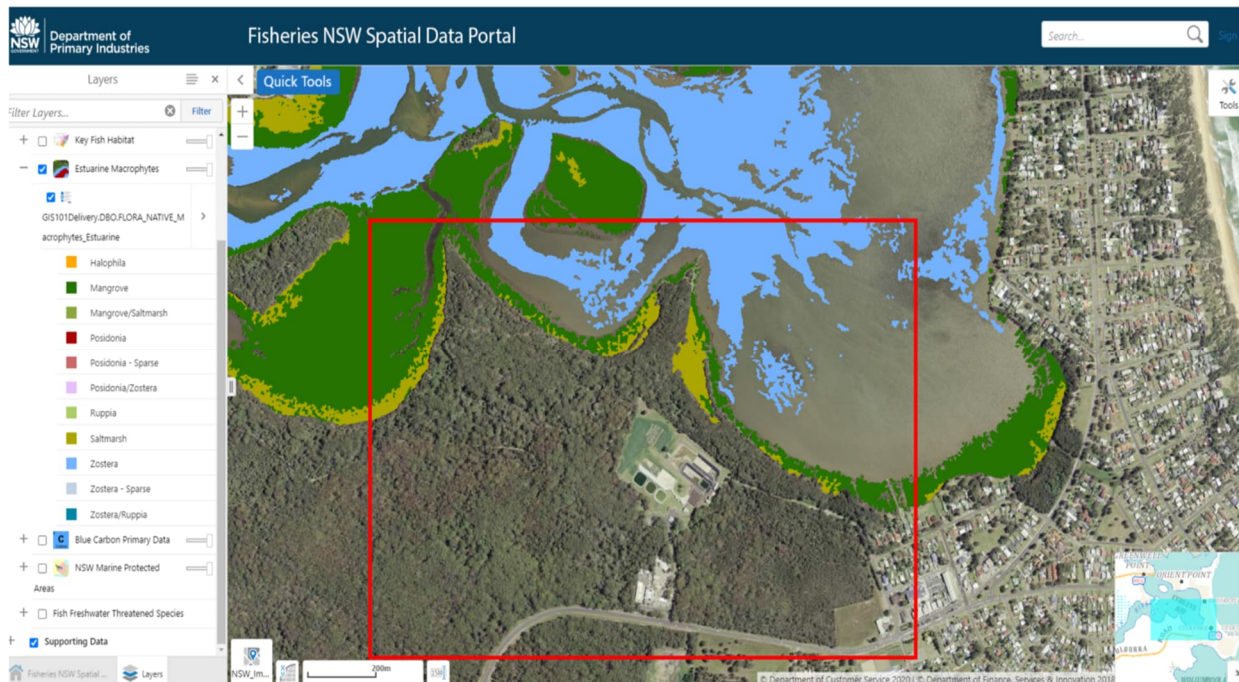


Figure 2 Estuarine Macrophytes Adjacent to Proposed Development Site

Report Section 3.3 Describe any Outstanding Natural Features and/or other Important or Unique Values that Applies to the Project Area

This section of the report makes no mention of the Biodiversity Value Area (Figure 3, Coastal Management Act, Wetlands) adjacent to the proposed Project Area. This would be classified as an outstanding natural feature.

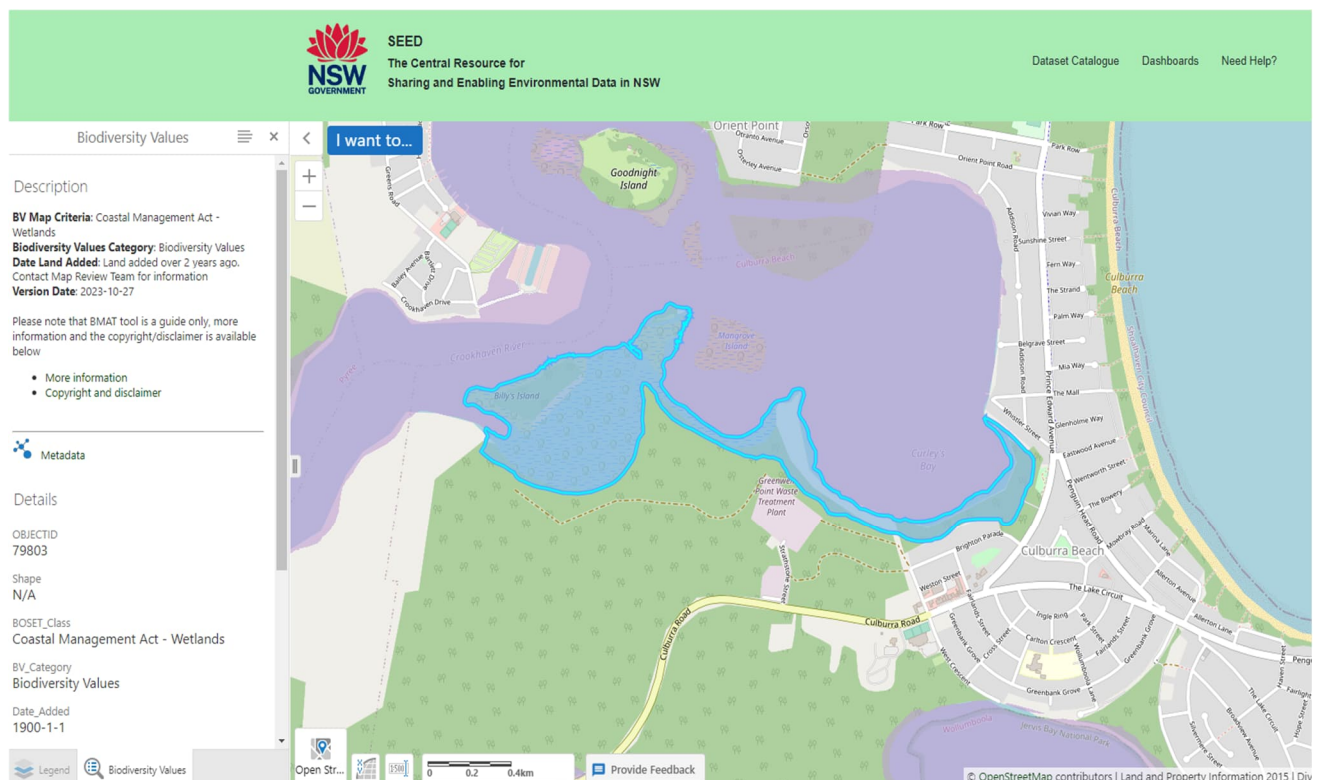


Figure 3 Biodiversity Value Area at Project Area

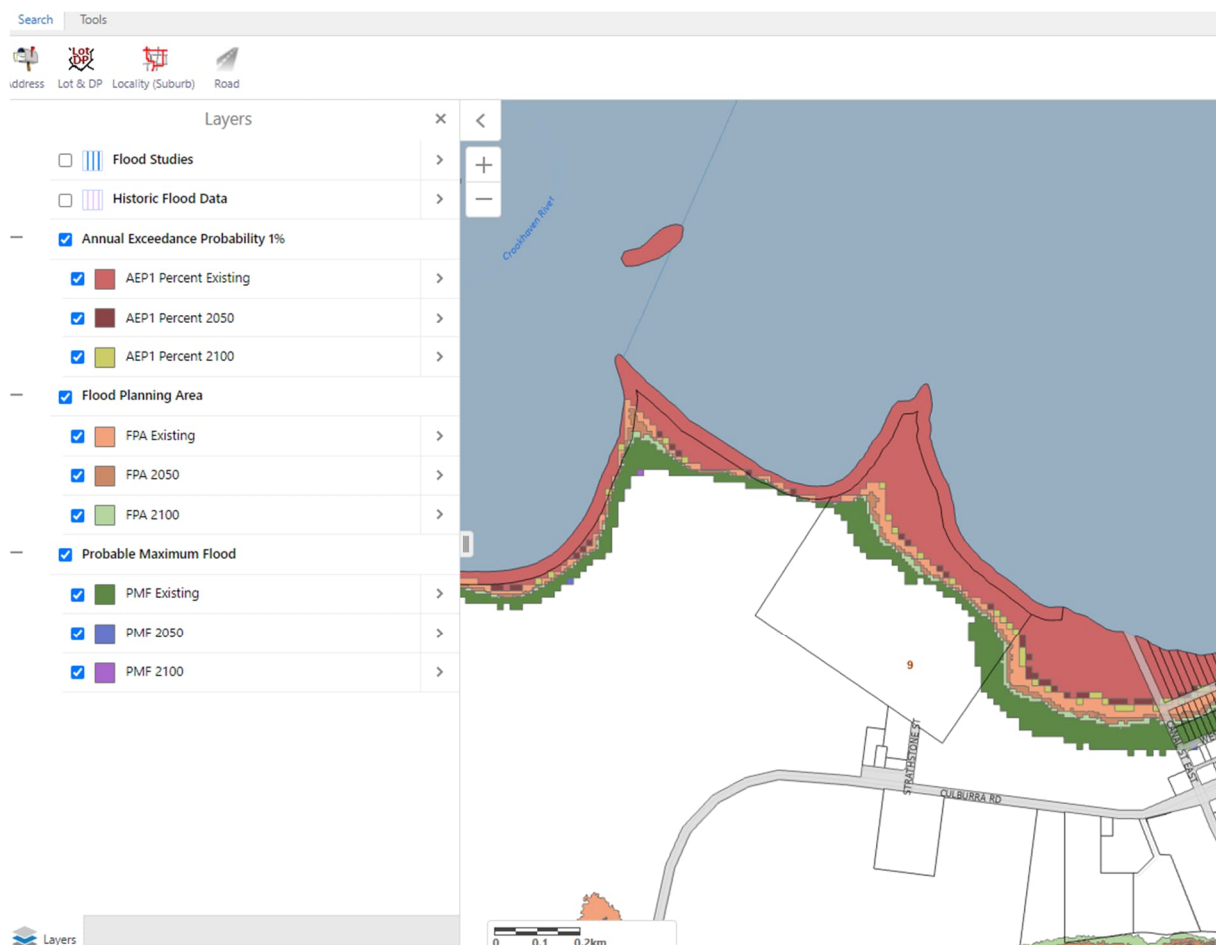
Report Section 3.9 Describe the Hydrology Characteristics that Apply to the Project Area and Attach any Hydrological Investigations or Surveys if Applicable

This section provides minimal information on the Hydrology of the Project Area.

The Project Area drains north through dense vegetation (to be cleared) to Curleys Bay and the identified Biodiversity Area, Conservation Zone (C2) and Nationally Important Wetland of Crookhaven Estuary. Similarly, a small section of the proposed development (Culburra Road Roundabout, biofiltration basin and section of road) would drain south to Lake Wollumboola a Nationally Important Wetland. The report makes no mention of the above.

This section of the report makes no mention of the potential flooding of the Project Area. Figure 4 shows the latest flood mapping from Shoalhaven City Council and then the flood mapping superimposed onto the proposed development. The existing Probable Maximum Flood (PMF) level would directly impact the foreshore area of the Project Area. The proposed water treatment ponds (designed to collect and treat runoff to ensure it does not enter or pollute waterway) would be inundated during a flood event with subsequent pollution impact on the surrounding environment and Threatened Ecological Communities, this would have a permanent impact on protected matters.

Whilst the stormwater scheme (not referenced) will have no direct piped drainage to Curleys Bay there will be treated water released to the buffer zone, which will impact riparian communities including saltmarsh, mangroves, mudflats and seagrass. The report does not mention this nor the impact which would be ongoing.



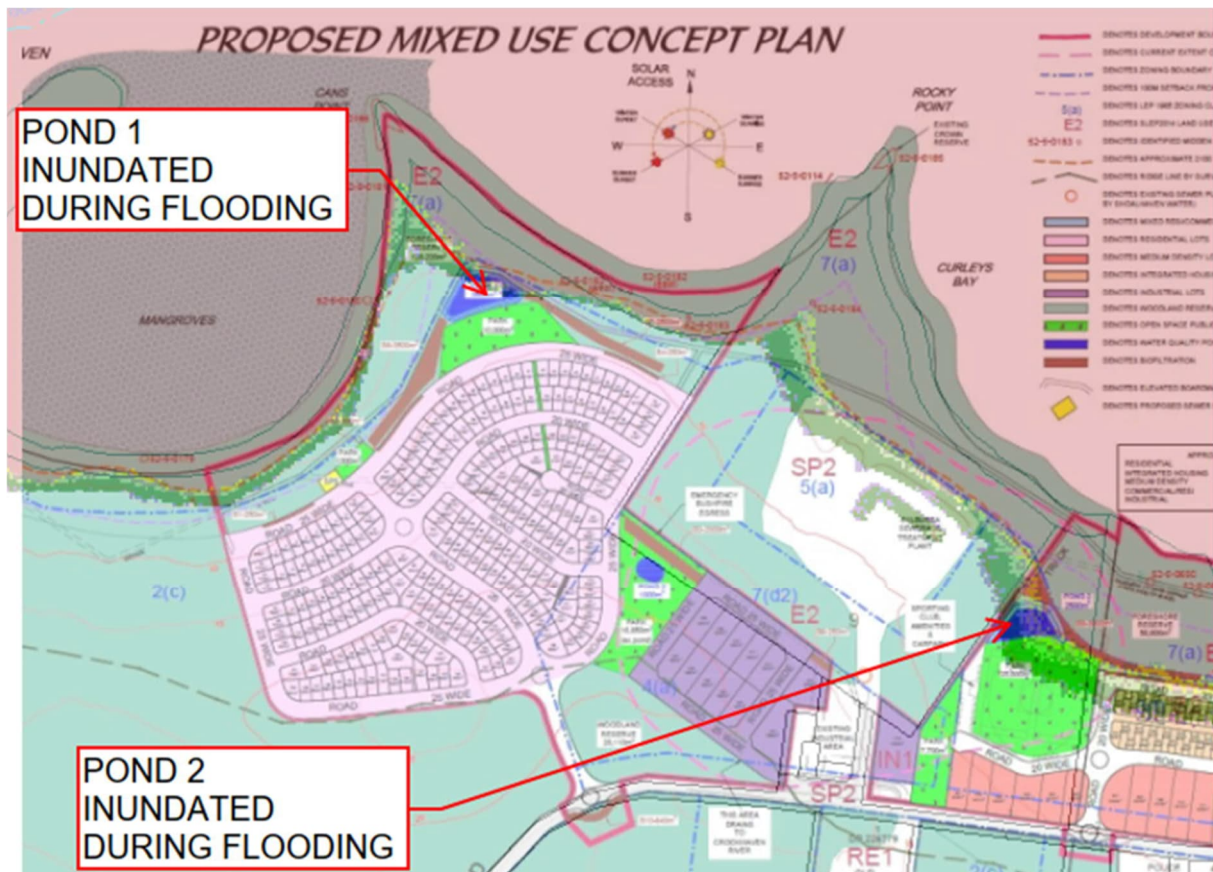


Figure 4 Flood Mapping of Project Area and Inundation of Proposed Water Treatment Pond

There is no detail provided of the changes in Hydrology as a result of sea level rise and the potential impact to the low-lying areas of the Project Area. Previous concerns relating to the water quality modelling and data used to assess water quality is provided in the attachment. In summary the modelling undertaken to date has not been calibrated and uses outdated data. If the water treatment devices are designed using inaccurate data/uncalibrated modelling there will be certain ongoing negative impacts to the nationally important wetland.

Report Section 4 Impact and Mitigation

MNES missing S20 Migratory Species of which 61 are identified.

Report identifies 0.28 ha of Coastal Swamp Oak would be removed and that the remaining 3.99 ha would not be impacted. Hydrology will be changed as a result of the proposed development and clearing of 028 ha which will subsequently impact the remaining 3.99 ha.

The action covers 65.85 hectares of which 47.96 is proposed for the development. Removal of this amount of habitat will have direct significant impact. The impact will affect both the 78 Threatened Species (18 of which are known to occur in the Project Area) and the 61 Migratory Species (31 of which are known to occur). The removal of critical habitat for threatened species is the reason for the EPBC Act and the impact of the Project Area on the potential impact of habitat loss should be quantified with up to date survey of threatened species.

4.13.2.2 missing response of alternatives considered.

Closing Remarks

The report prepared by Eco Logical (2023) is lacking information and reference to documentation required to adequately assess the impact the proposed development would have on Matters of National Environmental Significance.

Any clearing of habitat would directly impact known threatened and migratory species with permanent effect.

Clearing of the project area will increase stormwater, sediment loads and freshwater quantities downstream of the Project Area. The proposed water treatment ponds are in low lying areas and will be inundated resultant from flooding/sea level rise and release directly to the Nationally Significant Wetland of Crookhaven Estuary in flood events increasing sediment loads and deteriorating water quality. This would have a high ongoing impact to protected matters.

A 100m foreshore buffer has been proposed however there has been no discussion around the likelihood of informal access tracks / boat launching and recreational activities that are likely to occur and the potential ongoing and permanent impact this would have on the known Threatened Ecological Communities.

Construction noise, spills, litter etc. will impact on the surrounding habitat and threatened species. The report provides no detail on the management of impact during construction or the risk to threatened species.

The referral decision to classify the proposed development as a Controlled Action assessed by preliminary documentation underestimates both the impact the development would have on protected matters and the level of public interest. Assessing under this method assumes certainty on the level (medium) of impact and that it would be short term. To date the documentation is inadequate to assess the level and the ongoing impact the development would have. This assessment process also assumes public interest is low. To date, public interest relating to this project has been high and contentious. The referral decision and approval pathway more appropriate for this proposed action would have been a Public Environment Report or Environmental Impact Statement given the impact and level of public interest. Further consideration needs to be given to the referral process, the impact the development would have on protected matters and the level of public interest in the proposed action.

Consideration needs to be given to the importance of this proposed development relative to the potential impact on protected matters at the project site.

Yours faithfully

A handwritten signature in cursive script, appearing to read 'Elizabeth Freeman'.

Elizabeth Freeman
(MPhil (Civil Engineering), BEng (Civil/Environmental), MIEAUST)

ATTACHMENT (Objection to West Culburra Mixed Use Subdivision SSD 3846)

26 October 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.

Further to our previous submission (contained below) we provide the following concerns in relation to the proposed mixed-use subdivision at West Culburra. In summary the water quality modelling that has been undertaken to assess runoff from the site has not been calibrated, peer reviewed nor does it take into consideration future effects of climate change. It underestimates the rainfall at the site by using outdated rainfall data, and thus does not accurately estimate runoff volumes or pollution loads into the river. Further, the existing flood maps of the Shoalhaven (Figure 1) have been superimposed onto the proposed development and indicate that two out of three of the nominated sediment ponds are going to be inundated during a flood event. The function of the ponds is to store and treat runoff to ensure it does not enter or pollute the waterways. This function will not be achieved if the ponds are inundated during flooding. This will only get worse with increase in sea level rise and rainfall due to climate change. The obvious issues associated with the nominated locations of the ponds is concerning and highlights the inadequate assessment that has been undertaken in relation to the water quality implications resulting from the development.

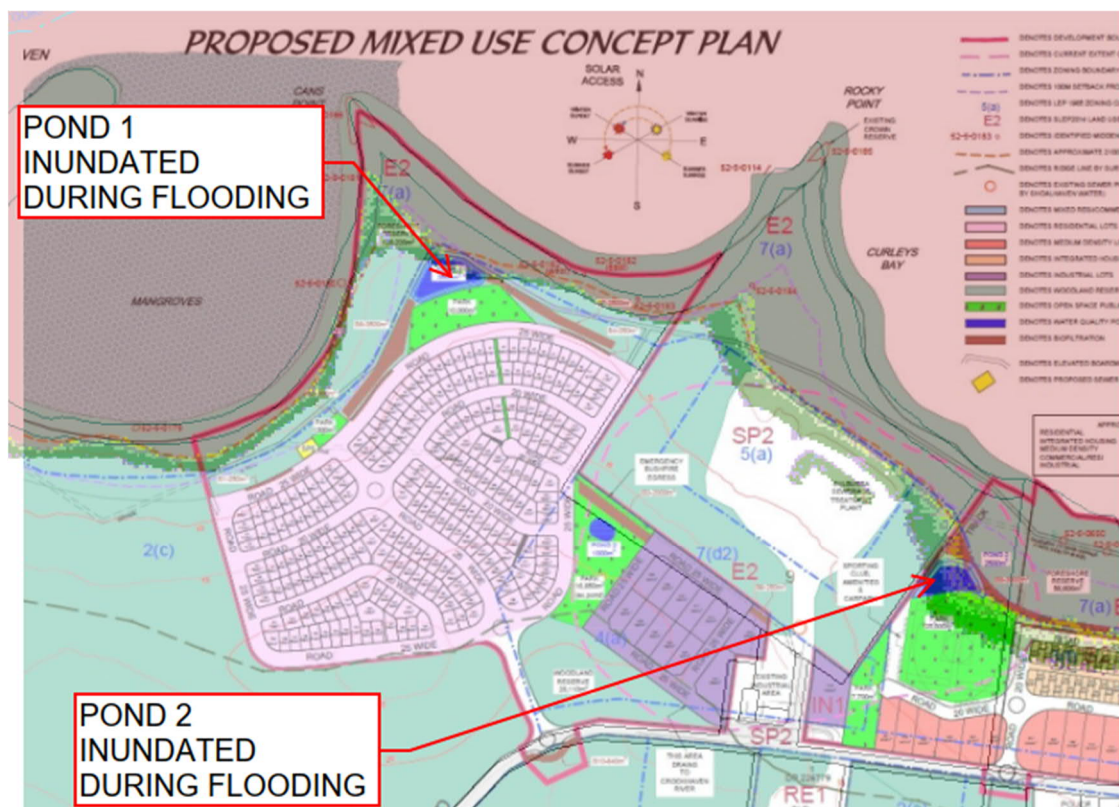


Figure 1 Shoalhaven Flood Mapping Superimposed onto the Development Showing Areas of Inundation

Details from our previous submission are provided below, these are still to be addressed by the developer. 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,



Elizabeth Freeman (MPhil Civil and Environmental Engineering, BE (1st class honours), MIEAUST)