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Biodiversity Development Assessment Report



Lot 406 // DP 1061103, Sunshine Bay, NSW

Proposed Modification Application (MP05-0029), Sunshine Bay Sub-Division

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Glossary and abbreviations

Acronym	Description
APZ	Assess Protection Zone
BAAS	Biodiversity Accredited Assessor Scheme
BAM	Biodiversity Assessment Method
BCT	Biodiversity Conservation Trust
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BC Reg	NSW <i>Biodiversity Conservation Regulation 2017</i>
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
DA	Development Application
DECCW	Department of Environment, Climate Change and Water (now OEH)
DMA	Development Modification Application
DotEE	Department of the Environment and Energy
DoI	Department of Industry
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia
ELEP	Eurobodalla Local Environment Plan
EP&A Act	State: <i>Environmental Protection and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
ha	hectare(s)
IBRA	Interim Bio-regionalisation of Australia
KFH	Key Fish Habitat
km	kilometre
LGA	Local Government Area
LLS	Local Land Services
masl	Metres above sea level
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SAII	Serious and Irreversible Impacts



Acronym	Description
SR	Southern Rivers map unit
Subject land	Lot 406 // DP1061103, Freycinet Drive, Sunshine Bay NSW
TEC	Threatened Ecological Community
VIS	Vegetation Information System
*	Denotes exotic species
†	Denotes both native and exotic

1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been undertaken to accompany a proposed Modification Application (MP05-0029) to be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), and relates to the subdivision of Lot 406 // DP 1061103, Freycinet Drive, Sunshine Bay, NSW 2536 (the project).

In preparing documentation for the proposed Modification Application, urPlan Consulting sought advice from the Land Management and Biodiversity Conservation (LMBC) service centre of the NSW Office of Environment and Heritage (OEH). Given the recent changes to environmental legislation, the OEH advised urPlan Consulting of the following:

- *The Biodiversity Conservation Act (BC Act) requires that the original development as proposed to be modified is to be used to determine whether the biodiversity offset scheme applies (as per Section 7.17(2)(b) of the Act and Clause 30 of the Biodiversity Conservation (Savings and Transitional) Regulations 2017). This means that the cumulative footprint, (and other impacts on threatened species, ecological communities and their habitats of the original development), all prior approved modifications and the proposed modification are to be considered when applying the biodiversity offset scheme threshold and the test of significance. This applies whether the approved impacts have already occurred or not. Information to be addressed included:*
 - *Outline available information concerning the original impact (from the original development and all prior approved modifications);*
 - *Identify original offset requirements (from the original development and all prior approved modifications);*
 - *Identify those requirements that have been discharged;*
 - *Provide an assessment, in accordance with the Biodiversity Assessment Method (BAM) of any new biodiversity impacts that result from the modification; and*
 - *Identify offset requirements and any new measures to avoid and minimise impacts in accordance with the BAM.*
- *Where the biodiversity offset scheme does not apply to the development as proposed to be modified, a biodiversity development assessment report is not required. The application for modification must be supported by evidence that the biodiversity offset scheme does not apply, including a test of significance.*

This BDAR has been prepared by Lucas McKinnon, an Accredited Assessor (BAAS17012) with support from Elizabeth Norris (Senior Botanist/Ecologist) under the NSW *Biodiversity Conservation Regulation 2017* (BC Reg), and is consistent with the Biodiversity Assessment Method (BAM; OEH 2017a). The Development Case number for this BDAR is 00012611/BAAS17012/19/00012612.

Sources of information for this report included:

- NSW Planning Portal (NSW Dept. of Planning and Environment 2019)
- BioNet Atlas of NSW Wildlife including BioNet Vegetation Classification (NSW Office of Environment and Heritage 2019)
- NSW Hydro line spatial data (Department of Industry 2019)
- PMA Consulting (2005)
- NGH Environmental (2007)
- Biodiversity Assessment Report for Sunshine Bay Sub-Division, Lot 402 // DP1061103, Sunshine Bay, NSW (Ecoplanning 2018)

1.1 Location and site identification

The subject land for this BDAR covers a total area of approximately 17.11 ha located within Lot 406 // DP 1061103, Freycinet Drive, Sunshine Bay, NSW 2536 (**Figure 1.1**). The subject land is situated in the Eurobodalla Shire Local Government Area (LGA). The proposed Development Modification Application (DMA) site includes the removal of approximately 0.31 ha of vegetation within a small drainage reserve within the subject land (**Figure 1.1**) and is here-in referred to as the DMA site.

The subject land is irregular in shape and generally slopes north west towards Short Beach Creek riparian corridors (**Figure 1.1**). The subject land currently supports land containing woodland vegetation within two drainage reserves and cleared land for the development of a 138 lot subdivision and public reserve.

The subject land is bound by George Bass Drive to the west, Freycinet Drive to the north, residential development to the north-east, White Stone Park Reserve to the east adjoining Hume Road, and residential development to the south (**Figure 1.1**).

1.2 Proposed Development

The proposed DMA includes the transfer of land (the subject site) originally set aside as a vegetated drainage reserve to be managed by Council, back to the developer as mutually agreed by Council, the DPE and the developer. Discussions were initiated with Council in December 2017 on the basis of the following:

- Some trees were removed as a result of clearing being carried out adjacent to the DMA site for road construction and APZ establishment.
- The construction of Brooke Way, upslope of the DMA site, has altered the natural gully flow. Overland flow is intercepted from the watershed and drains into the road stormwater network.
- That the landform is further diminished in length leaving the natural intermittently flowing gully with a lead length from Brook Way to the engineered detention/infiltration pond of less than 80 m.
- The DMA site will leave a legacy of high maintenance costs for Council into the future and due to the high embankments and topography it was argued that it will be an eyesore and waste urban land.

- Council's Dedication of Land Policy on unstructured public open space - public ownership is usually a last resort choice, unless the land has community and environmental benefits including (but not limited to) significant environmental features, cultural landscapes, significant views, and assists in adaptation to inundation from flooding. Eurobodalla Shire Council encourages landowners and developers to find the best and most innovative use and ownership of these lands having regard to the particular circumstances of each case.

The current approved sub-division layout is provided in **Figure 1.2** and the proposed DMA is provided in **Figure 1.2** and **Figure 1.3**.

The subject land is zoned R2 Low Density Residential under the Eurobodalla Local Environmental Plan (ELEP 2012).



Figure 1.1: Subject land and location

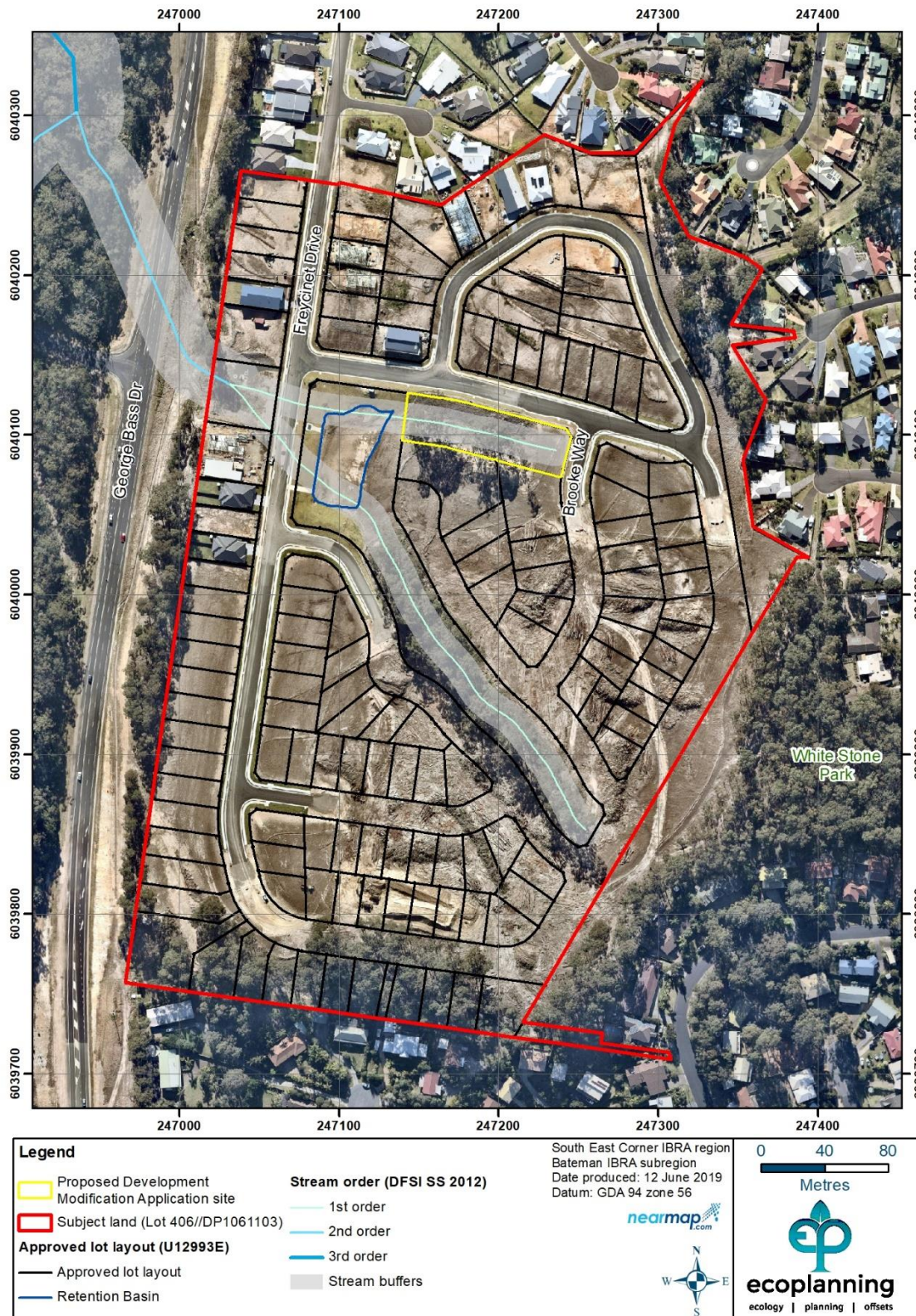


Figure 1.2: Approved subdivision layout, with proposed Development Modification Application area



Figure 1.3: Proposed Development Modification Application site sub-division layout

2 Landscape context

2.1 Identify landscape features

In accordance with the BAM, a number of features are assessed within the subject land and a 1,500 m buffer around the subject land. These landscape features are used to identify biodiversity values that are important for the subject land and inform the habitat suitability of the subject land for threatened species. Other features, such as rivers, streams, estuaries and wetlands, habitat connectivity, karst areas or areas of outstanding biodiversity value are considered, where appropriate.

2.1.1 IBRA bioregions and IBRA subregions

The Interim Biogeographic Regionalisation of Australia (IBRA, DotEE 2012) represents a landscape-based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna species present. The subject land is wholly located within the 'South East Corner' bioregion and the 'Bateman' subregion (IBRA version 7).

2.1.2 NSW Landscape regions (Mitchell Landscapes)

The subject land occurs wholly within one NSW Mitchell Landscape, being the '*Clyde Valley Foothills*' (Mitchell Landscapes V3).

2.1.3 Rivers, streams and wetlands

Rivers, streams and wetlands located within the 1,500 m buffer of the subject land, including the associated riparian buffers calculated in accordance with Appendix 3 of the BAM, are shown in **Figure 2.1**.

Rivers and streams

Two drainage lines occur within the subject land. The northern drainage line flows in a westerly direction and is located within land subject to the proposed DMA. The southern drainage line flows in a north westerly direction within the subject land. Both drainage lines converge into a constructed retention basin located on the eastern side of Freycinet Drive, developed as part of the Sunshine Bay Subdivision works. Water flow exiting the retention basin is via piping under Freycinet Drive, then through a drainage easement eventually linking to Short Beach Creek located west of George Bass Drive. Short Beach Creek flows north to north-east, eventually discharging into the ocean at Caseys Beach (**Figure 2.1**).

Review of state-wide topographic mapping and stream ordering following the Strahler system shows the two drainage lines as 1st order streams, becoming a 2nd order stream where these two converge above the constructed retention basin, prior to joining with Short Beach Creek to the west of the site (**Figure 2.1**) (Department of Industry [DoI] 2019). The riparian buffers associated with drainage lines are shown in **Figure 2.1**. Under the Eurobodalla LEP, both these watercourses are identified as Category 2 watercourses which require a 20 m buffer zone from the top of bank.

Vegetation within these two drainage lines is identified as being an extension of the surrounding vegetation comprising an open shrubby forest and woodland, rather than providing suitable habitat for riparian vegetation.

Wetlands

The BAM defines a 'wetland' as an area "...of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle.". No important wetlands, as defined under the BAM, are present within the 1,500 m buffer of the subject land. The nearest important wetland, to the subject land is the coastal wetland associated with McLeods Creek, approximately 6 km to the north of the subject land.

The nearest wetland to the subject land is a linear coastal estuarine wetland associated with an un-named north-flowing creek located approximately 850 m north-east of the subject land adjacent to Hume Road. As part of the current development works, a retention basin has been constructed where the two first order drainage lines converge providing a small artificial wetland adjacent to and east of Freycinet Drive (**Figure 1.2**)

The two drainage lines are not mapped as providing Key Fish Habitat (KFH) (Dept Primary Industries [DPI] 2019), and field inspection confirmed that these drainage lines would not sustain viable long-term populations of fish due to their ephemeral nature and lack of riparian habitat. The downstream reaches of Short Beach Creek are mapped as providing KFH.

2.1.4 Habitat connectivity

The Eurobodalla LEP (2012) provides a Terrestrial Biodiversity Map indicating endangered ecological communities (EECs), extant native vegetation and biocorridors. The subject land is not identified as having EECs present or as being part of a recognised biocorridor or habitat corridor under the ELEC Terrestrial Biodiversity Map.

Some connectivity may occur between smaller isolated patches of bushland to the east of the subject land, as well as to the more extensive bushland occurring west of the subject land, west of George Bass Drive (**Figure 2.1**).

2.1.5 Other landscape features

No other landscape features including areas of geological significance (including karst, caves, crevices and cliffs) or soil hazard features have been identified within the subject land and 1,500 m buffer around this land.

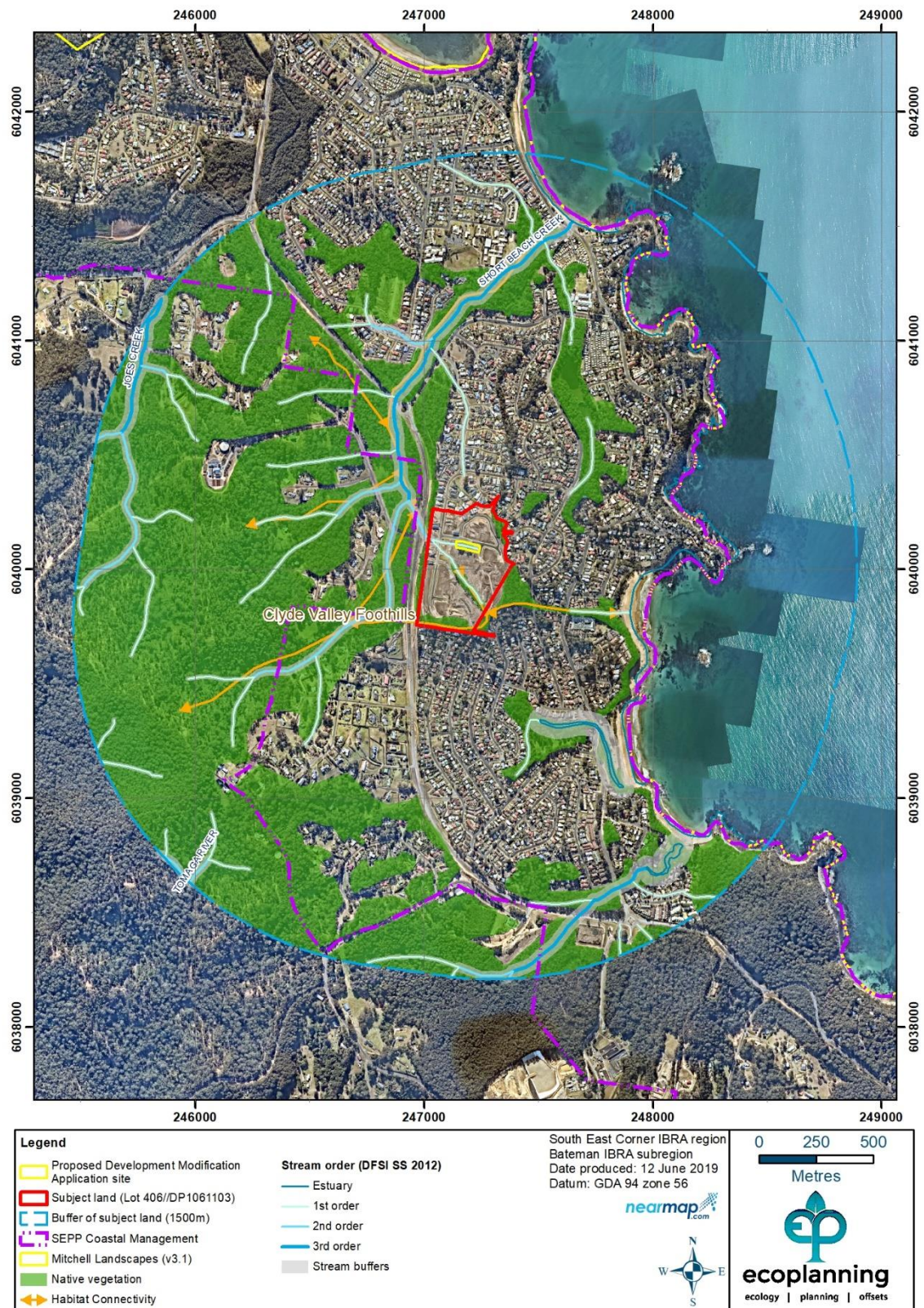


Figure 2.1: Location map – rivers, streams and wetlands

2.2 Determining site context

2.2.1 Assessing native vegetation cover

In accordance with Section 4.3.2 of the BAM, native vegetation cover must be estimated within a 1,500 m buffer around the subject land to determine the landscape context. The extent of native vegetation on the subject land and immediate surrounds was mapped using the vegetation mapping for the South East (Tozer et al. 2006), South East Local Land Services (ELA 2014) with revisions made based upon recent aerial photograph interpretation and site inspection (**Figure 2.1**).

Within the 994.67 ha area that includes the subject land and a 1,500 m buffer, 419.19 ha was mapped as supporting native vegetation. This equates to a cover of native vegetation across 42.14% of the subject land and 1,500 m buffer, which is within the >30-70% class in accordance with the BAM.

2.2.2 Assessing patch size

Patch size as defined by the BAM as *"an area of native vegetation that:*

- a) occurs on the development site or biodiversity stewardship site, and*
- b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).*

Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site."

In assessing patch size, stands of native vegetation within 100 m (where in a moderate to good condition) but which are separated by hard barriers including permanent artificial structures, wide roads or other barriers have been treated as separate patches. These highly modified breaks in vegetation connectivity would significantly alter ecological function of these areas of native vegetation such that these areas warrant recognition as separate patches.

Patch size was calculated for the vegetation on the subject land using the field validated map and Nearmap (2019). Patch size is required to be assessed as one of four classes per vegetation zone mapped, being <5 ha, 5-24 ha, 25-100 ha or >100 ha.

All vegetation within the subject land was identified as being separated by less than 100 m from other areas of similar native vegetation. Based upon mapping of native vegetation beyond the subject land (Tozer et al. 2006), the total area of this patch of native vegetation was calculated as being greater than 100 ha and within the >100 ha class.

3 Native vegetation

3.1 Existing information on native vegetation

A review of previous reports undertaken for the Sunshine Bay subdivision identified the following vegetation community occurring across the subject land: Forest Ecosystem 21: Northern Foothills Moist Shrub Forest - *C. maculata* - *E. pilularis* as described in Terrestrial Ecosystems of the Eurobodalla LGA (NPWS 2000) (PMA Consulting 2005, and NGH Environmental 2007).

A review of vegetation mapping (Tozer et al. 2006) identified one native vegetation community as occurring within the subject land, 'Batemans Bay Cycad Forest' (p90), which was mapped across the full extent of the subject land and adjoining areas (**Figure 3.1**). The 'Batemans Bay Cycad Forest' vegetation community, as described by Tozer et al. (2006) does not correspond to any Threatened Ecological Communities (TECs) listed under the BC Act or the EPBC Act.

More recent vegetation mapping (LLS 2014) identified one native vegetation community as occurring within the subject land, namely: 'Spotted Gum – White Stringybark – Burrawang shrubby open forest on hinterland foothills, northern South East Corner Bioregion' (SR643), which was mapped across the full extent of the subject land and adjoining areas (**Figure 3.2**). The 'Spotted Gum – White Stringybark – Burrawang shrubby open forest' vegetation community, as described by ELA (2014) conforms with the 'Batemans Bay Cycad Forest' of Tozer et al. (2006) and does not correspond to any Threatened Ecological Communities (TECs) listed under the BC Act or the EPBC Act.

A Biodiversity Assessment Report was prepared for the DMA site by Ecoplanning (2018). As part of this report, native vegetation was mapped across the subject land with a lesser cover of native vegetation identified compared to the regional vegetation mapping of Tozer et al. (2006) and ELA (2014). A review of the floristic plot-based data collected from the DMA site and other areas of native vegetation inspected on site indicated that the vegetation occurring on the subject land represented a Spotted Gum – Blackbutt open forest which supports the findings of NPWS (2000), PMA Consulting (2005) and NGH Environmental (2007, 2008), and is equivalent to the Southern Lowland Wet Forest (p104) described by Tozer et al. (2006).

3.2 Vegetation extent

The subject land covers an area of 17.11 ha. Prior to the sub-division development approval, the subject land was predominantly vegetated with a north-south road easement located adjacent to the western boundary (**Figure 3.1**). The original vegetation extent covered an area of approximately 15.41 ha with the road easement comprising approximately 1.70 ha.

Currently, extant vegetation within the subject land is located along two drainage reserves and a small area at the north-eastern boundary of the subject land comprising an original total area of 1.37 ha (**Figure 3.3**). The DMA site was originally 0.31 ha, with the vegetation now covering an area of 0.17 ha (**Figure 3.3**). For the purposes of this BDAR, the original area of vegetation within the DMA site is retained for the BAM calculator.

Remaining vegetation on the subject land is dominated by a canopy of *Corymbia maculata* (Spotted Gum) and *Eucalyptus pilularis* (Blackbutt) with the occasional *Eucalyptus paniculata* (Grey Ironbark) present. Areas which do not support native vegetation include those areas identified as being 'cleared' associated with prior approved vegetation clearing for the subdivision and the development of roads across the subject land.

In accordance with Section 5.1 of the BAM, areas that are not native vegetation do not require further assessment, except where they represent habitat for threatened species. No further assessment of the vegetation within 'cleared' areas has been undertaken.

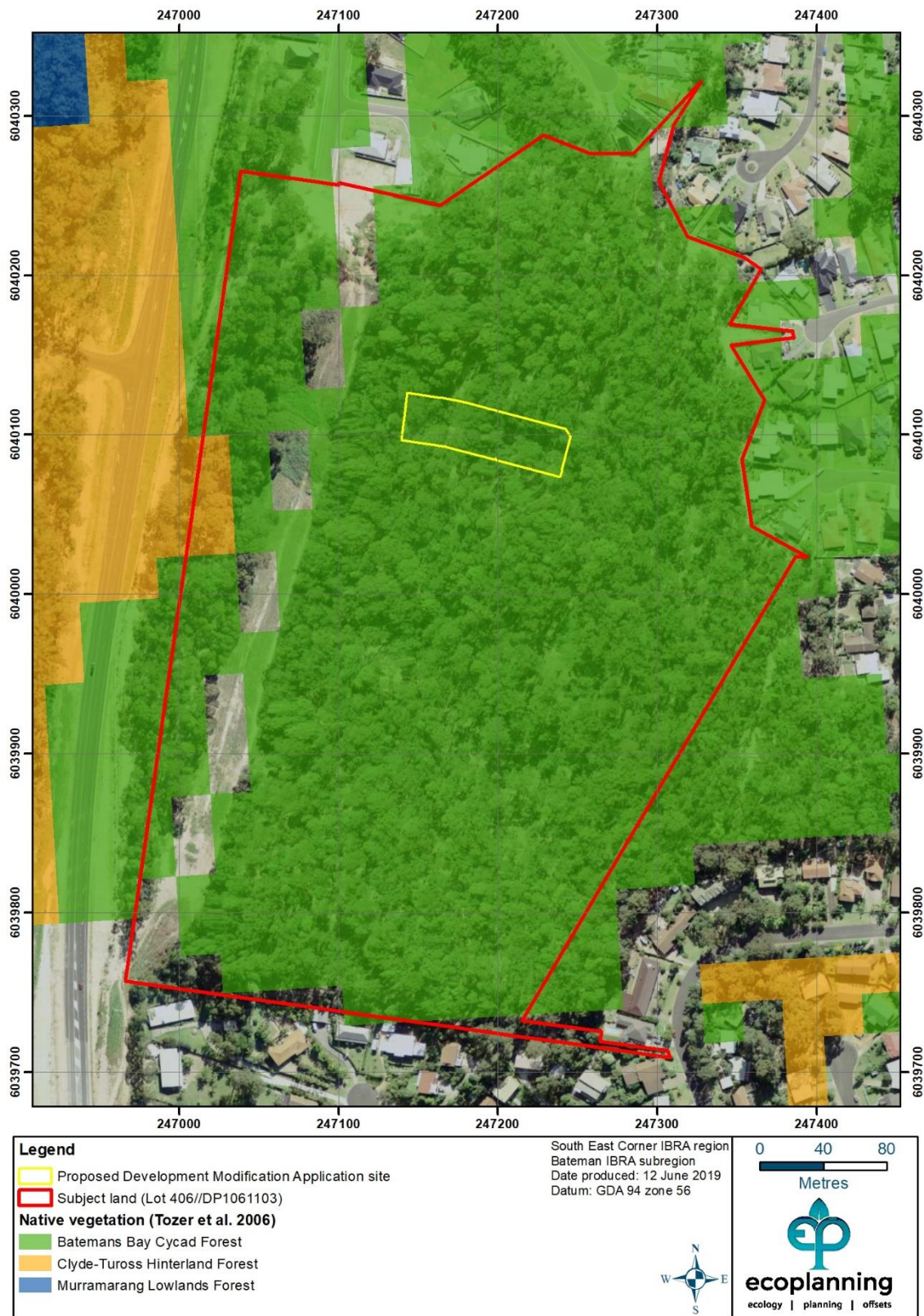


Figure 3.1: Regional Mapping of vegetation communities (Tozer et al. 2006)

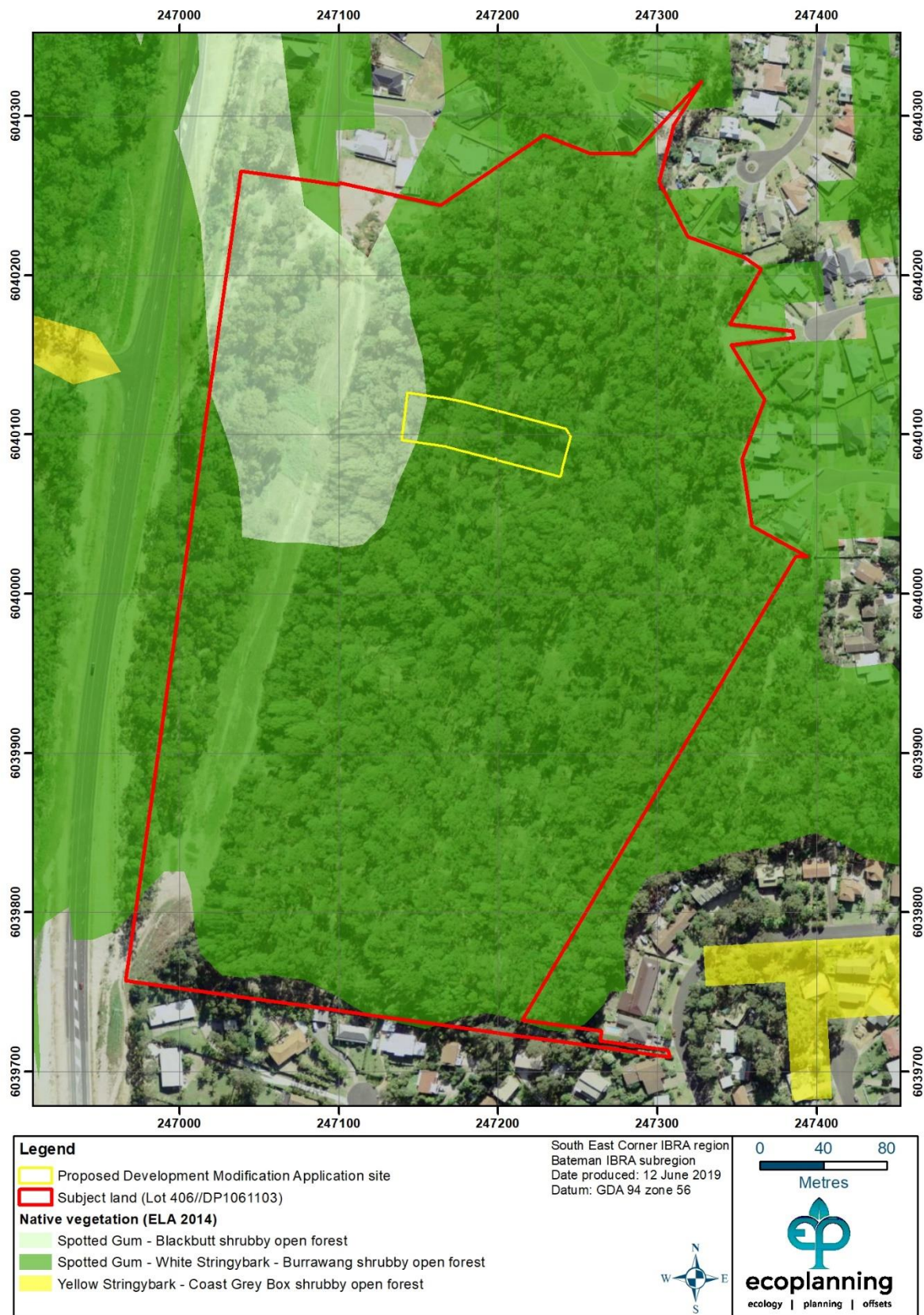


Figure 3.2: Regional vegetation mapping of vegetation communities (ELA 2014)



Figure 3.3: Extant vegetation on the subject land

3.3 Plant Community Types

3.3.1 Survey methodology

Identification and mapping of vegetation community and Plant Community Types (PCTs) was based upon validation of the preliminary mapping of PCTs within the subject land by Ecoplanning (2018). Vegetation polygons mapped by Ecoplanning (2018) were traversed whilst observing the vegetation structure and dominant species within each structural layer. The entire distribution of each vegetation polygon mapped by Ecoplanning (2018) was traversed to sample any spatial variation within each polygon, validate boundaries between PCTs and to record and variation in the broad condition state of vegetation polygons to identify and map vegetation zones.

Based upon traverses of the vegetation polygons and revisions to mapped boundaries, vegetation communities within the subject land were identified. The floristics were then sampled within a plot-based floristic vegetation survey within the DMA site consistent with Section 5.2.1.9 of the BAM. The location of the floristic plot is shown in **Figure 3.4**. The plot location also represented the location of the vegetation integrity plot in accordance with Section 5.3 of the BAM. A copy of the raw plot data recorded during the site survey is provided in **Appendix A**.

The identification of PCTs for the vegetation community was in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification (OEH 2019). Determination of the most appropriate PCT for the vegetation community within the subject land used the BioNet Vegetation Classification database to filter PCT types within the South East Corner Bioregion, which included the canopy species that had the greatest percent foliage cover and abundance as recorded within the floristic plot. The data for the PCT including vegetation formation, descriptive attributes and distribution information were then reviewed to determine the most appropriate PCT for the vegetation polygons within the subject land. Observations of vegetation structure and composition made during traverses of the subject lands as well as previous surveys over the subject land (PMA Consulting 2005, NGH Environmental 2007 Ecoplanning 2018) also informed the determination of the most appropriate PCT for the vegetation community within the DMA site. It is noted that identification of vegetation communities and PCTs was complicated by the fact that field observations were of mostly cleared and fragmented stands of vegetation. Consequently, the identification of vegetation communities was based upon observations of the communities in a highly modified state. Given the highly modified nature of the vegetation within the subject land and DMA site, no quantitative assessment of vegetation communities was undertaken.

3.3.2 Plant Community Types

One PCT was identified across the subject land with the distribution of this community confined along the two drainage lines and along the southern boundary of the subject land (**Figure 3.5**). The PCT identified within the subject land was:

- PCT 1206 Spotted Gum – Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin and Northern South East Corner Bioregion



Figure 3.4: Survey effort and location of BAM plot



Figure 3.5: Validated vegetation and location of BAM plot

A summary of the equivalent PCTs, vegetation communities and TECs are summarised in **Table 3.1**.

Table 3.1: Corresponding vegetation communities, PCTs and TECs

NPWS (2000), PMA Consulting (2005), NGH Environmental (2007)	Vegetation community (Tozer et al., 2010)	South East Local Land Services Biometric (ELA 2014)	Ecoplanning (2018)	Plant Community Types (PCTs)	Threatened Ecological Communities (TECs)	
					BC Act	EPBC Act
-	Batemans Bay Cycad Forest (p90)	Spotted Gum – White Stringybark – Burrawang shrubby open forest on hinterland foothills, northern South East Corner Bioregion (SR643)	-	PCT 1220 Spotted Gum – White Stringybark – Burrawang shrubby open forest on hinterland foothills, norther South East Corner Bioregion	Not listed	Not listed
Northern Foothills Moist Shrub Forest - <i>C. maculata</i> - <i>E. pilularis</i>	-	-	Southern Lowland Wet Forest (p104)	PCT 1206 Spotted Gum – Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin and Northern South East Corner Bioregion	Not listed	Not listed

A summary of the PCT within the subject land and DMA including areas of vegetation zones, the percent cleared for the PCT is included in **Table 3.2**. A description of the PCT within the subject land is outlined below.

Table 3.2: Details of the PCT within the subject land

Plant Community Types (PCTs)	Vegetation Formation & class	Vegetation zones	Area (ha) Subject land	Area (ha) DMA site	PCT percent cleared	Threatened Ecological Communities (TECs)
PCT 1206 Spotted Gum – Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin and Northern South East Corner Bioregion	Southern Lowland Wet Sclerophyll Forests	Intact	1.37	0.31	15%	No
Cleared land		cleared	14.04	N/A	N/A	N/A
Road easement	-	-	1.70	-	-	-
Total			17.11			

PCT 1206 Spotted Gum – Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin and Northern South East Corner Bioregion

Extant vegetation across areas of the drainage lines within the subject land and in proximity to the subject land boundary was identified as PCT 1206 Spotted Gum – Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin and Northern South East Corner Bioregion and the equivalent ‘Southern Lowland Wet Forest’ (map unit p104) as described by Tozer (2006) (**Figure 3.1**). This PCT consisted of a shrubby woodland dominated by a canopy of *Corymbia maculata* (Spotted Gum) and *Eucalyptus pilularis* (Blackbutt) with the occasional *Eucalyptus paniculata* (Grey Ironbark) present (**Figure 3.6**).

The shrub layer of these drainage reserves commonly included *Elaeocarpus reticulatus* (Blueberry Ash), *Acacia longifolia* subsp. *longifolia* (Sydney Golden Wattle), *Acacia irrorata* subsp. *irrorata* (Green Wattle), *Breynia oblongifolia* (Coffee Bush), *Acacia longissima* (Long-leaf Wattle), *Leucopogon juniperinus* and the occasional *Macrozamia communis* (Burrawang). Exotic shrub species were not recorded.

Commonly observed native understorey species included *Lepidosperma urophorum*, *Pteridium esculentum* (Common Bracken), *Calochlaena dubia* (Rainbow Fern), *Dianella revoluta* (Blue Flax-lily), *Lomandra longifolia* (Spiny-headed Mat-rush), *Entolasia stricta* (Wiry Panic) and *Microlaena stipoides* (Weeping Grass) (**Figure 3.7**).

Within the DMA site the vegetation was found to be in a modified and disturbed condition as a result of the spreading of mulch across the soil surface, the installation of bunds and deposited timber along the drainage line and assorted household rubbish (**Figure 3.8** and **Figure 3.9**). Canopy species were dominated *Corymbia maculata* (Spotted Gum) and *Eucalyptus pilularis* (Blackbutt) with one *Eucalyptus paniculata* (Grey Ironbark) and one *Eucalyptus globoidea* (White Stringybark). The shrub layer was generally sparse with some areas of the ground layer, particularly at the edges of the DMA site, covered by a dense layer of chipped vegetation. Few exotic ground layer species were recorded but included *Lysimachia arvensis* (Scarlet

Pimpernel), *Gamochaeta* sp. and *Hypochaeris radicata* (Catsear) all occurring in low abundance. The drainage line contained several earth and timber bunds most likely installed to slow water flow. Sediment build-up has occurred upslope of these bunds, and rubbish and litter were also present. The upslope end of the drainage line had been truncated by the development of road access as part of the approved subdivision planning. A sediment fence had been installed along the southern edge of the DMA site adjacent to earth moving and clearing works.

One vegetation zone was identified for PCT 1206, namely:

- Intact – areas with all structural layers present and native dominated (**Figure 3.6**, **Figure 3.7** and **Figure 3.9**).

Identification of the corresponding PCT was based review of the BioNet Vegetation Classification and specifically PCTs which occur within the 'Bateman' IBRA subregion and included *Corymbia maculata* and *Eucalyptus pilularis* as a dominant species. Based upon this search two PCTs were reviewed with PCT 1206 identified as the most appropriate PCT based upon the floristic description and the landscape position identified as coastal lowlands and hills between Milton and Narooma. Additionally, the reference for PCT 1206, namely: 'Southern Lowland Wet Forest' (Tozer et al. 2006) was considered a good description of the vegetation community within the DMA site and subject land.

Spotted Gum – Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin and Northern South East Corner Bioregion (PCT 1206) does not form part of an EEC, and is thus not identified as a potential Serious and Irreversible Impact (SAII) entity within Appendix 3 of the Guidance to assist a decision-maker to determine a serious and irreversible impact (OEI 2017b).

Exotic vegetation

Exotic species were of low occurrence and dominated by the forbs *Hypochaeris radicata* (Catsear), *Gamochaeta* sp., *Pelargonium capitatum*, *Lysimachia arvensis* (Scarlet Pimpernel) and the grass *Cenchrus clandestinus* (Kikuyu).

3.4 Current and future integrity scores

As outlined above, the PCT identified within the DMA site was classified into a vegetation zone in accordance with Section 5.3 of the BAM. The vegetation zone is based on the condition description above with the area of the vegetation zone shown in **Table 3.2**.

The vegetation zone identified within the DMA site was surveyed and quantitative measures of the composition, structure and function attributes recorded in accordance with Section 5.3.4 of the BAM. The location of the plot-based vegetation integrity survey is shown in **Figure 3.4** and **Figure 3.5**. The number of plots surveyed for the vegetation zone are equal to the required number of plots as outlined in Table 4 of the BAM and shown in **Table 3.3**. For the plot/transect, the vegetation composition, structure and function was assessed in accordance with the BAM and using the BAM Calculator a vegetation integrity score was calculated for the vegetation zone. Vegetation integrity plot data is provided in **Table 3.3**. Additional flora species opportunistically recorded to assist in PCT Identification are provided in **Appendix D**.



Figure 3.6: PCT 1206 – Spotted Gum – Blackbutt open forest



Figure 3.7: PCT 1206 – Spotted Gum – Blackbutt shrubby open forest with fern dominated understorey



Figure 3.8: PCT 1206 – Spotted Gum – Blackbutt shrubby open forest with disturbed understory



Figure 3.9: PCT 1206 – Spotted Gum – Blackbutt shrubby open forest – upstream end

The vegetation integrity score for the vegetation zone is presented in **Table 3.3**.

The vegetation integrity score for the vegetation zone mapped in the DMA was 63/100 (**Table 3.3**), which represents a combination of scores for vegetation composition, structure and function. The project will completely remove native vegetation within the DMA site and the default future vegetation integrity score of 0 for vegetation within the subject land was retained.

Table 3.3: Vegetation integrity scores for vegetation zones

Vegetation zone	Subject land	DMA area impacted (ha)	Plots required	Plots surveyed	Veg integrity score
PCT 1206 – Intact	1.47	0.31	1	1	63
Cleared land - approved	15.41	-	-	-	-
Road easements/infrastructure	1.70	-	-	-	-
Total	17.11	0.31	1	1	-

4 Assessing habitat suitability for threatened species

The chapter outlines the process for determining the habitat suitability for threatened species within the DMA site in accordance with Section 6 of the BAM.

Under the BAM, threatened species are separated into two classes, 'ecosystem' and 'species' credit species. Those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which a targeted survey has a low probability of detection, are identified as 'ecosystem' credit species. Targeted surveys are not required for ecosystem species and potential impacts to these species are assessed in conjunction with impacts to PCTs.

Threatened species where the likelihood of occurrence of a species or elements of suitable habitat for the species cannot be confidently predicted by vegetation surrogates and landscape features and can be reliably detected by survey are identified as 'species' credit species. A targeted survey or an expert report is required to confirm the presence or absence of these species on the DMA site.

For some threatened species, they are identified as both ecosystem and species credit species, with different aspects of the habitat and life cycle representing different credit types. Commonly, threatened fauna species may have foraging habitat as an ecosystem credit, while their breeding habitat represents a species credit.

The following sections outline the process for determining the habitat suitability for threatened species within the DMA site, survey effort for threatened species and the results of targeted surveys for candidate threatened species.

4.1 Identify threatened species for assessment

Threatened species that require assessment are initially identified based upon the following criteria:

- the distribution of the species includes the IBRA subregion in which the DMA site occurs (Bateman IBRA subregion).
- any geographic constraints of the distribution of the species within the IBRA subregion and DMA site.
- the species is associated with any of the PCTs identified within DMA site
- the native vegetation cover within an assessment area including a 1,500 m buffer around the DMA site is equal to or greater than the minimum required for the species.
- the patch size that each vegetation zone is part of is equal to or greater than the minimum required for that species.
- the species is identified as an ecosystem or species credit species in the Threatened Biodiversity Data Collection.

The process for identifying threatened species which meet the above criteria is completed through the BAM Calculator. The PCT identified within the study area, the patch size and native vegetation cover, as outlined in **Section 3**, were entered into the BAM Calculator and a preliminary list of threatened species were identified.

4.1.1 Ecosystem credit species

The ecosystem credit species predicted on the DMA site are provided in **Appendix B**. All ecosystem credit species were maintained in the assessment. As outlined above, targeted surveys are not required for these ecosystem species and impacts to these species are assessed in conjunction with impacts to PCTs.

4.1.2 Species credit species

As outlined above, species credit species are predicted in the BAM Calculator following assessment of geographic and habitat features in the credit calculator, such as site location (IBRA subregion), PCTs and condition, patch size and the area of surrounding vegetation within the 1,500 m buffer of the study area. Some species require further assessment of habitat constraints and/or geographic limitations before being confirmed as candidate species for assessment. **Table 4.1** outlines the constraints and limitations for these species provided in the BAM calculator, and whether the species is confirmed as a candidate species. On the basis of habitat constraints and geographic constraints the following species are not candidate species for the DMA site and no further assessment of these entities is required:

- *Burhinus grallarius* (Bush Stone Curlew)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Isoodon obesulus obesulus* (Southern Brown Bandicoot)
- *Petauroides volans endangered population* (Greater Glider)
- *Phascogale tapoatafa* (Brush-tailed Phascogale)

Table 4.1: Assessment of habitat constraints and geographic limitations

Scientific Name / Common Name	Habitat constraints / Geographic limitations	Maintained as candidate species
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	1. Occurs across a range of vegetation types including Spotted Gum – Blackbutt shrubby open forest. 2. DAM site close to southern known limit of the species.	Yes
<i>Burhinus grallarius</i> Bush Stone-curlew	1. Fallen/standing dead timber including logs	No suitable habitat as little woody debris on the DMA site to provide harbour.

Scientific Name / Common Name	Habitat constraints / Geographic limitations	Maintained as candidate species
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	1. Cliffs 2. Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels 3. North of Batemans Bay	No suitable habitat (cliffs) are present on the DMA site. No rocky areas containing caves, overhangs, outcrops escarpments, or crevices, or old mines or tunnels are not present within 2 km of the DMA site.
<i>Isodon obesulus obesulus</i> Southern Brown Bandicoot (eastern)	1. Requires dense ground cover in a variety of habitats	No suitable habitat as dense ground cover is absent.
<i>Myotis macropus</i> Southern Myotis	1. Hollow bearing trees 2. Within 200 m of riparian zone/other 3. Bridges, caves or artificial structures within 200 m of riparian Zone 4. Within 1 km of waterbody	Yes
<i>Petauroides volans</i> – endangered population Greater Glider population in the Eurobodalla LGA	1. Hollow bearing trees 2. Restricted to Moruya River to the north, the Pacific Ocean to the east, Coila Lake to the south and the Princes Highway to the west	No, the DMA site is not located within the area of the endangered population
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	1. Hollow bearing trees	No, one hollow bearing tree will be removed amongst a cleared landscape providing no other preferred micro habitat for this species

4.2 Identify candidate species credit species for further assessment

In accordance with Section 6.4.1.17 of the BAM, a predicted candidate species can be considered unlikely to occur within the DMA site (or specific vegetation zones) where habitat is substantially degraded such that the species is unlikely to use the area, or where an expert report identifies that the species is unlikely to be present within the DMA site (or a vegetation zone within the DMA site). The BAM operational manual (OEH 2018a) also identifies that the assessor may opt to undertake an onsite assessment to determine the presence of habitat constraints or microhabitats for the threatened species predicted to occur on the DMA site. The absence of microhabitats for the threatened species may be used to further refine the list of candidate species on the DMA site and potentially reduce the need for a survey. The BAM

operational manual recommends undertaking this step where species have identified habitat constraints, habitat is significantly degraded and where vegetation is missing key structural elements. If an assessor considers that the microhabitat/s required by a species credit species are degraded such that they are unlikely to be able to support the target species, the species can be removed from the candidate list and does not require further assessment on the DMA site (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the DMA site (or specific vegetation zones) must be documented.

As discussed in **Section 3**, much of the vegetation within the DMA site was found to be in a modified and disturbed condition as a result of the spreading of mulch across the soil surface, the installation of bunds and deposited timber along the drainage line and assorted household rubbish, and has been previously fragmented from other retained vegetation. These disturbances have impacted the habitat suitability for some candidate threatened species, while for some candidate species the microhabitats required are not present within the DMA site. **Table 4.2** outlines those threatened species which have been removed from the candidate species list based upon degraded habitat within the DMA site or the absence of micro-habitats, including justification. This also includes those species removed following assessment of habitat and geographic constraints as outlined in **Table 4.1**.

Table 4.2: Species removed from the candidate species list

Scientific Name / Common Name	Justification
FAUNA	
<i>Anthochaera phrygia</i> Regent Honeyeater (Breeding)	No suitable breeding habitat within the DMA site. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. Under the BAM, breeding habitat and important habitat areas for this species have been mapped on the NSW Government Biodiversity Values Map and Offset Tool. The DMA site is not identified as breeding or important habitat for this species.
<i>Burhinus grallarius</i> Bush Stone-curlew	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.
<i>Callocephalon fimbriatum</i> Gang Gang Cockatoo (Breeding)	No suitable breeding micro-habitats within the DMA site. In the spring and summer breeding season, the species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.

Scientific Name / Common Name	Justification
<i>Calyptorhynchus lathamii</i> Glossy Black-Cockatoo (Breeding)	No suitable breeding habitat available on the DMA site as this species is dependent on large hollow-bearing eucalypts for nest sites.
<i>Cercartetus nanus</i> Eastern Pygmy Possum	Unsuitable and degraded habitat within the DMA site. This species is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred.
<i>Heleioporus australiacus</i> Giant Burrowing Frog	No suitable habitat is found on the DMA site. This species is found in heath, woodland and dry sclerophyll forest When non-breeding, nests in leaf litter Home ranges are approximately 0.04 ha Breeding habitat includes soaks and pools within first or second order streams. The DMA site lacks soaks and pools
<i>Isodon obesulus obesulus</i> Southern Brown Bandicoot (eastern)	No suitable habitat on the DMA site as requires dense ground cover.
<i>Lathamus discolor</i> Swift Parrot (Breeding)	No suitable breeding habitat within DMA site. This species breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. Under the BAM, breeding habitat and important habitat areas for this species have been mapped on the NSW Government Biodiversity Values Map and Offset Tool. The DMA site is not identified as breeding or important habitat for this species.
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat (Breeding)	No suitable breeding habitat within the DMA site. The species forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes.
<i>Ninox connivens</i> Barking Owl (Breeding)	No suitable breeding habitat within the DMA site. This species nests in a large open hollow, often vertical or sloping, in the trunk or sometimes a spout of a Eucalypt or Melaleuca. Breeding hollows are 2-35 m above the ground with a diameter of 20-46 cm and depth of 20-300 cm. No suitable hollow bearing trees were recorded within the DMA site.

Scientific Name / Common Name	Justification
<i>Ninox strenua</i> Powerful Owl (Breeding)	No suitable breeding habitat is present on the DMA site as dense vegetation is lacking and large tree hollows (at least 0.5 m deep) in large old eucalypts (DBH 80-240 cm) are not present. No suitable hollow bearing trees were recorded within the DMA site.
<i>Petaurus norfolcensis</i> Squirrel Glider	No suitable habitat within the DMA site. Inhabits mature or old growth Blackbutt-Bloodwood forest with heath understorey, preferring mixed species stands with a shrub or Acacia midstorey. This species also requires abundant tree hollows for refuge and nest sites which are absent on the DMA site.
<i>Phascolarctos cinereus</i> Koala (Breeding)	Habitat within the DMA site is unsuitable and degraded for Koala breeding habitat. The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. The DMA site has been fragmented and isolated from any nearby records by previous vegetation clearing and urban development.
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (Breeding)	No breeding habitat identified on the DMA site. Camps are conspicuous, they have odour, are noisy and are highly visible in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, urban gardens and cultivated gardens. Camps are found generally within 20 km of a regular food source.
<i>Tyto novaehollandiae</i> Masked Owl (Breeding)	No suitable breeding habitat is available on the DMA site. This species roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

Based upon the assessment of available habitat for predicted candidate species within the DMA site, five species were confirmed as candidate species for the DMA site (**Table 4.1**).

Table 4.3: Candidate species and respective biodiversity risk and biodiversity risk weighting

Species	Biodiversity risk	Biodiversity risk weighting
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	Moderate	1.5
<i>Rhodamnia rubescens</i> Scrub Turpentine	Moderate	1.5



Species	Biodiversity risk	Biodiversity risk weighting
<i>Hieraaetus morphnoides</i> Little Eagle (Breeding)	Moderate	1.5
<i>Lophoictinia isura</i> Square-tailed Kite (Breeding)	High	2
<i>Myotis macropus</i> Southern Myotis	Very high	3

4.3 Determine the presence or absence of candidate threatened species

Those candidate species credit species for which the habitat suitability of the DMA site cannot be ruled out based upon habitat or geographic constraints or habitat degradation, require targeted surveys to determine their presence or absence from the DMA site. Targeted surveys for species credit species must be undertaken in accordance within Section 6.5 of the BAM, including undertaking surveys during the nominated survey period specified for each candidate species and in accordance with OEH threatened species survey guidelines. The following sections outline the surveys undertaken, and survey requirements, for the candidate species identified for the DMA site.

4.3.1 Targeted surveys – flora

Targeted surveys for candidate threatened flora species were conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016a). Targeted surveys for threatened flora were undertaken on 11 September 2018 by Elizabeth Norris (Senior Botanist/ Ecologist) and Justin Merdith (Ecologist) for the candidate species *Rhodamnia rubescens* (Scrub Turpentine). This species is associated with a number of vegetation communities including Spotted Gum – Blackbutt shrubby open forest identified on the DMA site. No individuals of this species were identified on the DMA site or other areas. Targeted surveys involved identification of areas of potential habitat for threatened flora species within the DMA site, with survey effort provided in **Figure 3.4**.

The nominated survey period for candidate threatened flora species is shown in

Table 4.4, and the timing of the flora survey is in accordance with the survey requirements for the candidate species.

Table 4.4: Nominated survey periods for candidate threatened species

Candidate species	Survey period (BAM Calculator)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid									Y			
<i>Rhodamnia rubescens</i> Scrub Turpentine									Y			
<i>Hieraaetus morphnoides</i> Little Eagle (Breeding)									Y			
<i>Lophoictinia isura</i> Square-tailed Kite (Breeding)									Y			
<i>Myotis macropus</i> Southern Myotis									Y			

Highlighted cells are the BAM nominated survey period; 'Y' – Field survey completed

Three other threatened flora species have been recorded within 5 km of the DMA site subject land (OEH 2019) (**Appendix C**) and have the potential to occur on the subject land, namely:

- *Correa baeuerlenii* (Chef's Cap Correa)
- *Persicaria elatior* (Tall Knotweed)
- *Pomaderris bodalla* (Bodalla Pomaderris)

No threatened flora species were recorded on the DMA site or subject land. A full list of flora species recorded during field survey is included in **Appendix D**.

4.3.2 Targeted surveys – fauna

Targeted surveys for threatened fauna were undertaken on 11 September 2018 by Elizabeth Norris (Senior Botanist/ Ecologist) and Justin Merdith (Ecologist).

Of the three candidate species identified for further assessment, one species has been maintained as species credit species as suitable habitat and geographic constraints are present (**Table 4.1**); Southern Myotis (*Myotis macropus*). Further, as field survey was undertaken outside the recommended survey months for the above two species (

Table 4.4), targeted surveys were unable to be conducted in accordance with the OEH Guidelines and the BAM calculator. As such, this species was retained in the Habitat Survey assessment under the 'yes – presumed present' category.

Following field survey, breeding habitat was not identified for *Hieraaetus morphnoides* (Little Eagle) and *Lophoictinia isura* (Square-tailed Kite). As such, these two species were not retained as candidate species for the DMA site.

Other fauna surveys undertaken were designed to create an inventory of the fauna species using the DMA site with a focus on BAM candidate species and other threatened species recorded occurring within 5 km of the DMA site (OEH 2019) (**Appendix C**).

In terms of connectivity for threatened fauna movement, the nearest patch of vegetation is approximately 63 m distant from the DMA site, occurring within the retained vegetation along the main drainage line within the subject land (**Figure 3.5**). The DMA site may provide foraging habitat for threatened arboreal species such as the Yellow-bellied Glider. Although the distance between the DMA site and the retained vegetation along the main drainage line is within gliding ranges of the Yellow bellied glider (Kavanagh pers. comm.), the location of the vegetation along the drainage lines of the DMA site and the retained vegetation make for difficult direct gliding angles to access to the DMA site for potential foraging. Greater connectivity for ground-dwelling and arboreal fauna movement is provided west to east through the retained vegetation located along this drainage line and the retained vegetation located to the south and east of the DMA site (**Figure 3.5**).

Although outside the preferred survey timing for microbat species, field survey included the use of one acoustic detector (anabat) deployed over three survey nights to record and inform of any microbats foraging within and on the margins of the DMA site and adjacent areas. (**Figure 3.4**). Weather (temperature and rainfall) conditions for the three nights of survey, as recorded from the Batemans Bay Meteorological Station (station 069134; BOM 2018), which is located approximately 5 km north of the DMA site, are summarised in **Table 4.5**.

Table 4.5: Weather conditions during the survey period, as recorded Batemans Bay Meteorological Station

Date	Temperatures °C		Rain (mm)	Max Wind	
	Min	Max		Direction	Speed at 9.00 am (km/hr)
11/9/2018	12.1	24.4	0	Calm	-
12/9/2018	11.9	N/A	0	NNW	28
13/9/2018	N/A	N/A	0	N/A	N/A

Over the three survey nights, calls of microchiropteran bats were infrequent, however, four species were recorded positively including the vulnerable Eastcoast Freetail Bat (*Mormopterus norfolkensis*), and a further four species were considered possible including the vulnerable Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) (**Table 4.6**).

The low level of microchiropteran bat activity within the DMA site and subject site is most likely due to the now cleared vegetation across the entire site, with better quality habitat available within the surrounding areas including the bushland to the west of the DMA site. Nonetheless, based upon the surveys undertaken and the modified habitat available, the subject site is not identified as crucial habitat for Eastcoat Freetail Bat, Eastern Bentwing Bat and other microchiropteran species.

Table 4.6: Microchiropteran bats recorded within and adjacent to the subject site

Species	Common name	Definite	Possible
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	x	x
<i>Mormopterus (Micronomus) norfolkensis</i>	Eastcoat Freetail Bat	x	x
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing Bat		x
<i>Nyctophilus</i> sp.	Long-eared Bat	x	
<i>Ozimops ridei</i>	Eastern Freetail Bat	x	x
<i>Scotorepens orion</i>	Eastern broad-nosed Bat		x
<i>Vespadelus darlingtoni</i>	Large Forest Bat		x

Other fauna surveys were composed of the following survey methodologies:

- Habitat searches
- Hollow bearing trees and nest searches
- Listening surveys
- Active searches including searches for indirect evidence of fauna species (whitewash, pellets, scats, tracks, scratches)

No other threatened fauna species were recorded on the DMA site during the field survey.

A full list of fauna species recorded within the DMA site is included in **Appendix D**.

5 Avoiding and minimising impacts on biodiversity values

5.1 Avoiding and minimising impacts on native vegetation and habitat

In accordance with Section 8.1.1.6 of the BAM, actions taken to avoid and minimise impacts through locating the proposal must be documented and justified in the BDAR.

The potential impacts are located within previously cleared areas which currently support a cleared development site for sub-division development. A total of 1.06 ha of native vegetation is present within the subject land to be retained as riparian and other reserves. The removal of 0.31 ha of habitat within the subject land is quantified in the vegetation integrity scores calculated for vegetation zones within the subject land.

The impacts associated with the proposed DMA include the complete clearing of native vegetation and habitat within the DMA site. Due to the location of the vegetation patch proposed to be removed (within a modified 1st order drainage line), the impacts to other retained native vegetation on the subject land will be avoided as the retained patches are disconnected from the DMA site, are located upslope of the DMA site, or are distant enough that impacts can be avoided (**Figure 3.5**).

5.2 Avoiding and minimising prescribed biodiversity impacts during project planning

Prescribed biodiversity impacts are defined under clause 6.1 of the BC Reg and include impacts on biodiversity values in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat. Prescribed biodiversity impacts are outlined within **Table 5.1** including their relevance to the DMA site and the proposal. Other than the clearing of native vegetation, prescribed impacts to biodiversity associated with the proposed DMA have not been identified (**Table 5.1**).

Assessment of impacts to the 'Spotted Gum – Blackbutt shrubby open forest' as part of the proposed DMA have been assessed as part of the assessment of vegetation clearing in **Section 5.1** and the biodiversity credit calculations in **Section 7**. Assessment of prescribed biodiversity impacts are discussed in **Section 6.2** and measures to mitigate these impacts are discussed in **Section 6.3**.

Table 5.1: Prescribed biodiversity impacts.

Prescribed biodiversity impacts	Presence within the DMA site
(a) the impacts of development on the following habitat of threatened species or ecological communities: (i) karst, caves, crevices, cliffs and other geological features of significance, (ii) rocks, (iii) human made structures, (iv) non-native vegetation,	No areas of karst, caves, crevices, cliffs and other geological features of significance, rocks, human made structures or areas of non-native vegetation which support threatened species or ecological communities are present within the DMA site.

Prescribed biodiversity impacts	Presence within the DMA site
b) the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,	The DMA site has not been identified as providing connectivity between areas of habitat for threatened species, such as the Yellow-bellied Glider, that facilitates the movement of that threatened species across its range. The proposed works would involve the removal of 0.31 ha of native vegetation (see Section 1.1 and Section 3.2) along a 1st order drainage line. The impacts to this drainage line and habitat connectivity would be not greater than the numerous roads and existing suburban development surrounding the DMA site. The nearest patch of vegetation that may provide connectivity for fauna movement is approximately 63 m distant, occurring within the retained vegetation along the main drainage line within the subject land. Although this distance is well within the gliding range of species such as the Yellow-bellied Glider (gliding distances for Yellow-bellied Gliders can range on average from 19-45 m [Goldingay 2014] to 143 m in tall forest [Kavanagh 1982 and pers. comm.]), the retained vegetation closest to the DMA site is located across and downslope of the DMA site making for difficult direct gliding angles to access to the DMA site for species such as the Yellow-bellied Glider. Greater connectivity is provided west to east through the retained vegetation along the drainage line and retained vegetation to the south and east of the DMA site.
(c) the impacts of development on movement of threatened species that maintains their lifecycle,	The DMA site has not been identified as providing movement of threatened species that maintains their lifecycle.
(d) the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development),	The DMA site has not been identified as impacting water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.
(e) the impacts of wind turbine strike on protected animals,	Not applicable.

Prescribed biodiversity impacts	Presence within the DMA site
f) the impacts of vehicle strike on threatened species of animals or on animals that are part of a threatened ecological community.	Not applicable.

6 Assessing and offsetting impacts

6.1 Assessment of impacts

6.1.1 Assessment of impacts to native vegetation and habitat, TECs, and threatened species habitats

Impacts to native vegetation are anticipated through the direct clearing of the approximately 0.31 ha of native vegetation. The direct clearing and subsequent development of the DMA site would represent a permanent impact, or loss, of this native vegetation and habitat. As outlined in **Section 3.5** of this BDAR, and in accordance with Section 9.1.2.5 of the BAM, the future vegetation integrity score for all vegetation within the DMA site has been assigned 0. The single hollow bearing tree within the DMA site would be cleared as part of the proposal. It is recommended that the hollow bearing tree be salvaged as part of the project and utilised to create a standing hollow-bearing snag or used to increase fallen woody debris with other retained woodland areas within the sub-division site. The installation of three similar-sized nest boxes within the retained vegetation on the subject land is recommended as a measure to offset the loss of the single hollow-bearing tree within the DMA site. Further, the development of a Vegetation Management Plan (VMP) is recommended to enhance biodiversity values and connectivity of the retained vegetation within the subject land.

6.1.2 Assessing indirect impacts on native vegetation and habitat

It is difficult to quantify indirect impacts associated with the proposal, but these may include impacts such as noise and/or dust associated with the construction phase of the project and downstream impacts during the operational phase of the project.

Given the location of the DMA site adjacent to existing road infrastructure and cleared land for development, it is considered unlikely that the proposal would have inadvertent impacts which would reduce viability of any adjacent native vegetation or habitat due to edge effects, noise, dust or light spill, or disturbance to breeding habitats. The proposal is considered unlikely to cause any increase in trampling of flora, rubbish dumping, firewood or bush rock collection or introduce any pests, weeds or pathogens to adjacent areas of native vegetation and habitat. The management of retained vegetation as part of ongoing obligations by the developer would further reduce the likelihood of any of these indirect impacts occurring to areas of native vegetation and habitat outside the DMA site.

Changes to the drainage and hydrology of the DMA site have the potential to impact on downstream habitats through erosion, sedimentation or bank scour. However, these impacts have been considered previously, as part of the approved development works through the construction of the retention basin downstream of the DMA site (**Figure 3.3** and **Figure 6.1**).

Further details regarding mitigation measures which would aim to avoid any indirect impacts are included in **Section 6.3**.



Figure 6.1: Retention basin located downstream of the DMA site

6.2 Assessing prescribed impacts

As outlined within **Section 5.2**, prescribed biodiversity impacts are impacts in addition to vegetation clearing. No threatened ecological communities will be impacted by the proposed DMA as none have been identified on site. The removal of 0.31 ha 'Spotted Gum – Blackbutt shrubby open forest', has already been assessed as part of impacts associated with the clearing of this vegetation. This impact has been quantified through calculation of a Vegetation Integrity Score for the DMA site (63/100) and as all vegetation is to be removed a future Vegetation Integrity Score of 0 has been assigned. Credit calculations to offset this impact area included in **Section 7**. Consequently, the impacts are not in addition to vegetation clearing. Nonetheless, an assessment of the impacts in accordance with Section 9.2.1.7 of the BAM is provided in **Section 6.3** of this BDAR.

6.3 Mitigating and managing impacts on biodiversity values

As described in **Section 5.1** of this BDAR, the development footprint will impact native vegetation, habitat and biodiversity values of the DMA site. Measures should be implemented to reduce direct and indirect impacts, where possible, such as appropriate pre-clearance protocols, the preparation of a Construction Environmental Management Plan (CEMP). Details are provided below.

6.3.1 Pre-clearance protocols

Two threatened fauna species, *Myotis macropus* (Southern Myotis) and *Mormopterus norfolkensis* (Eastcoat Freetail Bat), and number of non-threatened fauna species, such as birds and amphibians, have been recorded within the subject land and/or DMA site.

Appropriate pre-clearance protocols are to be put in place at the time of vegetation clearing and to mitigate and avoid potential harm or injury to native fauna. These protocols should include, as a minimum, soft-felling techniques and clearing supervision where habitat trees (including the hollow-bearing tree) are to be removed.

Soft-felling techniques as part vegetation clearing encourage fauna to relocate outside of the disturbance footprint prior to habitat clearing or alternatively provide an opportunity to move fauna during vegetation clearing works. Soft-felling techniques should be adaptive depending on site-specific conditions but typically would include:

- marking the habitat tree to be cleared;
- removal of ground-layer and mid-storey vegetation (under-scrubbing) around the habitat tree;
- tapping/nudging of habitat trees by heavy machinery 24 hrs prior to the proposed removal of the habitat trees;
- 'Slow drop' of habitat trees, involving the gentle lowering of habitat trees with hollows intact;
- inspection of lowered habitat trees and capture and release of any fauna species present. Injured fauna are to be taken to WIRES or a veterinary clinic.

Pre-clearance surveys aim to identify if fauna species (in particular threatened species) are occupying habitat trees prior to removal which allows fauna to relocate themselves or with assistance from a supervising ecologist.

6.3.2 Construction Environmental Management Plan (CEMP)

To avoid potential indirect offsite impacts to both aquatic and riparian ecosystems during the construction phase of the proposed development, an appropriate erosion and sedimentation control plan should be in place following best practice protocols such as Landcom (2004). It is recommended that this is included in a site-specific CEMP prior to any construction works commencing.

6.4 Adaptive management for uncertain impacts

Impacts associated with the proposal are largely certain and associated with the direct impacts as a result of vegetation clearing as documented within **Section 6.5**. Uncertain impacts associated with the proposal would be limited to potential impacts to downstream environments, although these impacts have been considered previously through the development of the retention basin downstream of the DMA site (**Figure 3.3**). During the construction phase of the project, the works would be undertaken in accordance with any

licence issued under by the NSW Environment Protection Authority or the controls under the NSW *Protection of the Environment Operations Act 1997*.

Excluding the need for a CEMP, no additional adaptive management measures are proposed.

6.5 Thresholds for the assessment and offsetting of impacts of development

6.5.1 Serious and irreversible impacts

Section 6.7 of the BC Reg defines SAIL as impacts likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- (a) it will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline, or*
- (b) it will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or*
- (c) it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or*
- (d) the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.*

The Guidance to assist a decision-maker to determine a SAIL (OEH 2017b) and the BioNet database identify potential SAIL entities.

No species or ecological communities within the DMA site are identified as potential SAIL entities in either the guidance (OEH 2017b) or the BioNet Database.

6.5.2 Impacts which require an offset

Section 10.3.1 of the BAM outlines that the following vegetation zones require offsets:

- Vegetation zones that have a vegetation integrity score ≥ 15 where the PCT is representative of an endangered or critically endangered ecological community.
- A vegetation zone that has a vegetation integrity score of ≥ 17 where the PCT is associated with threatened species habitat or is a vulnerable ecological community.
- A vegetation zone that has a vegetation integrity score ≥ 20 .

The native vegetation within the DMA site has not been identified as an EEC, however, it has a vegetation integrity score of equal to or greater than 20/100 and thus requires to be offset (**Table 6.1**).

Table 6.1: Vegetation integrity score for PCT 1206

Veg. Zone	Plant community type	Condition class	Management zone	Area impacted (ha)	Veg integrity score – before development
1	PCT 1206 Spotted Gum – Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin and Northern South East Corner Bioregion	'Intact'	Clearing	0.31	63
Total				0.31	

6.6 Impacts which do not require offsets

There are no other impacts that require offsetting.

7 Credit calculations

7.1 Credit calculations and classes

A biodiversity offset requirement for residual impacts of a proposed development, must be calculated in accordance with Section 11.2 and Section 11.3 of the BAM. The following section outlines the credit requirements for the Project in order to achieve the 'no net loss standard' as established by the BAM.

The Credit Summary Report, the Biodiversity Credit Report and the Credit Payment Report generated from the BAM Calculator are included as **Appendix E** of this report.

7.1.1 Ecosystem credits

The ecosystem credits required to offset the residual impacts of the project are provided in **Table 7.1**. A total of seven credits are required to offset the development.

Table 7.1: Ecosystem credit offset requirements

Vegetation zone	Vegetation integrity loss	Area	Credit requirement
PCT 1206 – Intact	63	0.31	7

The following offset rules apply:

For PCT 1206:

- Any PCT in the 'Southern Lowland Wet Sclerophyll forests vegetation class (including PCT's 777,1079,1206,1212, 1214, 1220, 1283) AND < 50% cleared group (including Tier 7 or higher).
- Containing hollow bearing trees.
- In the following IBRA subregions: Bateman, Bungonia, Ettrema, Jervis and South East Coastal Ranges or any subregion within 100 km of the outer edge of the DMA site.

7.1.2 Species credits

A total of seven *Cryptostylis hunteriana* (Leafless Tongue Orchid) species credits and ten Southern Myotis (*Myotis macropus*) species credits are required to offset the project. The credit requirement can only be satisfied through purchasing Southern Myotis species credits, but the credits can be from a site anywhere within NSW.

7.2 Securing biodiversity credits

The measures proposed to address the offset obligation outlined above will be determined as the project approvals progress, noting that the credit requirements will need to be met prior to commencement of the project. All credit requirements are to be met using like-for-like biodiversity credits under Section 6.3 of the BC Reg. or payment of an amount into the

Biodiversity Conservation Fund to satisfy the requirement to retire biodiversity credits as defined under Section 6.6 of the BC Reg.

7.2.1 Credit costs

The total cost of credits, should the Biodiversity Conservation Trust (BCT) be used to offset the impacts, are currently (as at 30 October 2019) calculated to be **\$43,730.27** (ex. GST). Details are provided in **Table 7.2**.

Table 7.2: Credit requirements and estimated credit costs, as calculated on: 30/05/2019

Ecosystem credits				
Plant Community Type	Baseline price per credit	Price per credit*	No. of ecosystem credits	Final credits price (ex GST)
PCT 1206 Spotted Gum – Blackbutt – shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	\$6,886.21	\$4,775.87	7	\$33,431.09
Species credits				
Species	Baseline price per credit	Price per credit	No. of species credits	Final credits price* (ex GST)
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	-	\$150.00	7	\$1,399.90
<i>Myotis macropus</i> Southern Myotis	-	\$725.00	10	\$8,899.28
Total (ex GST)				\$43,730.27

*includes weighting and administration fees

Baseline credit price and price per credit per BAM calculator

8 Conclusions and summary of the BDAR

This BDAR has been prepared in accordance with the BAM to assess the impacts to biodiversity values, including threatened species communities and their habitats, associated with the proposed development modification application within the DMA site.

This BDAR has identified the landscape context of the DMA site and a 1,500 m buffer around the DMA site, in accordance with the BAM. The native vegetation within the subject land and the DMA site has been assessed including identification of the PCT present across the subject land, and vegetation condition has been mapped (vegetation zones) and vegetation integrity scores have been assigned for the vegetation zone. No TECs have been identified on the subject land or DMA site. The calculated vegetation integrity scores are above the threshold for a non-threatened ecological community (i.e. >20/100) and the offset rules apply.

In accordance with Appendix 2 of the BAM, impacts to threatened flora and fauna species, including their habitats, have been considered and assessed. One flora species, the Leafless Tongue Orchid, and one fauna species, the Southern Myotis, were retained as candidate species as habitat constraints for this species are present within the DMA site. One additional threatened microbat species, the Eastern Freetail Bat, was recorded utilising the site following analysis of acoustic recordings (anabat). Impacts resulting in the potential loss of connectivity across the subject land as a result of vegetation removal within the DMA site, with particular reference to the Yellow-bellied Glider, was considered in the assessment. Adjacent areas of retained native vegetation within the subject land provide for better east-west connectivity.

As the proposal will completely remove vegetation from the DMA site, measures to avoid and minimise impacts to biodiversity have been outlined in consideration of habitat features on the DMA site and subject land. Additional measures to minimise impacts to biodiversity which are to be incorporated into the project include soft-felling techniques during vegetation removal, the salvage and reuse of the hollow bearing tree to be incorporated into future landscape planning, the provision and installation of three habitat nest boxes to compensate for the removal of the single tree with a small hollow and the development of a VMP to enhance biodiversity values and connectivity of retained vegetation within the subject land. A CEMP should be prepared to manage any direct and indirect impacts during the vegetation clearing and subsequent development works.

The biodiversity offset requirement for residual impacts of the proposed development have been calculated and presented in accordance with Section 11.2 and Section 11.3 of the BAM. The Credit Summary Report, the Biodiversity Credit Report and the Credit Payment Report generated from the BAM Calculator are included in this report. A total of 7 ecosystem credits and 10 species credits are required.

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Appendix A Vegetation integrity plot data

Plot No.	Bearing	Composition						Structure					
		Tree	Shrub	Grass	Forb	Fern	Other	Tree	Shrub	Grass	Forb	Fern	Other
1	80	4	14	12	8	2	10	35.2	5.5	6.2	1.0	2.0	4.1
Plot	Function												
	Large trees	Hollow trees	Litter cover	Fallen logs	Tree stem 5-10	Tree stem 10-20	Tree stem 20-30	Tree stem 30-50	Tree stem 50-80	Tree regen	High threat exotic		
1	1	0	56.6	13.0	1	1	1	1	1	1	1		

Family	Species	Plot 1	Growth Form/HTE
Asteraceae	<i>Coronidium elatum</i>	x	Forb (FG)
	<i>Gamochaeta</i> sp. (? <i>calviceps</i>)	x	Exotic
	<i>Hypochaeris radicata</i>	x	Exotic
	<i>Ozothamnus diosmifolius</i>	x	Shrub (SG)
	<i>Sigesbeckia orientalis</i> subsp. <i>orientalis</i>	x	Forb (FG)
Bignoniaceae	<i>Pandorea pandorana</i> subsp. <i>pandorana</i>	x	Other (OG)
Blechnaceae	<i>Blechnum cartilagineum</i>	x	Fern (EG)
Cyperaceae	<i>Lepidosperma urophorum</i>	x	Grass & grasslike (GG)
Dennstaedtiaceae	<i>Pteridium esculentum</i>	x	Fern (EG)
Dicksoniaceae	<i>Calochlaena dubia</i>	x	Fern (FG)
Dilleniaceae	<i>Hibbertia aspera</i> subsp. <i>aspera</i>	x	Shrub (SG)
Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>	x	Shrub (SG)
Ericaceae	<i>Leucopogon juniperinus</i>	x	Shrub (SG)
Euphorbiaceae	<i>Breynia oblongifolia</i>	x	Shrub (SG)
	<i>Poranthera microphylla</i>	x	Forb (FG)
Fabaceae - Faboideae	<i>Glycine clandestina</i>	x	Other (OG)
	<i>Hardenbergia violacea</i>	x	Other (OG)
	<i>Kennedia rubicunda</i>	x	Other (OG)
Fabaceae - Mimosoideae	<i>Acacia irrorata</i>	x	Shrub (SG)
	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	x	Shrub (SG)
	<i>Acacia longissima</i>	x	Shrub (SG)
	<i>Acacia terminalis</i> subsp. 'Glabrous Form'	x	Shrub (SG)
Geraniaceae	<i>Pelargonium capitatum</i>	x	Exotic
Goodeniaceae	<i>Goodenia ovata</i>	x	Shrub (SG)
Haloragaceae	<i>Gonocarpus teucroides</i>	x	Forb (FG)
Lamiaceae	<i>Clerodendrum tomentosum</i>	x	Tree (TG)

Family	Species	Plot 1	Growth Form/HTE
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	x	Grass & grasslike (GG)
	<i>Lomandra glauca</i>	x	Grass & grasslike (GG)
	<i>Lomandra longifolia</i>	x	Grass & grasslike (GG)
	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	x	Grass & grasslike (GG)
Luzuriagaceae	<i>Eustrephus latifolius</i>	x	Other (OG)
	<i>Corymbia maculata</i>	x	Tree (TG)
Myrtaceae	<i>Eucalyptus paniculata</i>	x	Tree (TG)
	<i>Eucalyptus globoidea</i>	x	Tree (TG)
	<i>Leptospermum polygalifolium</i> subsp. <i>polygalifolium</i>	x	Shrub (SG)
Orchidaceae	<i>Cryptostylis erecta</i>	x	Forb (FG)
Oxalidaceae	<i>Oxalis perennans</i>	x	Forb (FG)
Phormiaceae	<i>Dianella revoluta</i>	x	Forb (FG)
Pittosporaceae	<i>Billardiera scandens</i>	x	Other (OG)
Poaceae	<i>Cenchrus clandestinus</i>	x	High Threat Exotic
	<i>Dichelachne micrantha</i>	x	Grass & grasslike (GG)
	<i>Digitaria</i> sp.	x	Grass & grasslike (GG)
	<i>Entolasia stricta</i>	x	Grass & grasslike (GG)
	<i>Imperata cylindrica</i>	x	Grass & grasslike (GG)
	<i>Microlaena stipoides</i>	x	Grass & grasslike (GG)
	<i>Panicum simile</i>	x	Grass & grasslike (GG)
	<i>Rytidosperma pallidum</i>	x	Grass & grasslike (GG)
Primulaceae	<i>Lysimachia arvensis</i>	x	Exotic
Ranunculaceae	<i>Clematis glycinoides</i> var. <i>glycinoides</i>	x	Other (OG)
Rubiaceae	<i>Opercularia hispida</i>	x	Forb (FG)
Santalaceae	<i>Exocarpos cupressiformis</i>	x	Shrub (SG)
Solanaceae	<i>Solanum prinophyllum</i>	x	Forb (FG)
Smilacaceae	<i>Smilax glyciphylla</i>	x	Other (OG)
Zamiaceae	<i>Macrozamia communis</i>	x	Other (OG)

Raw plot data

BAM Plot – Field Survey Form						Site Sheet no: 1 of 3	
Date: 11/09/18		Survey Name: Sunshine Bay		Plot Identifier: SB-01		Recorders: EN + JM	
Zone: 56	Datum: GDA	IBRA region: SEH	Photo #	St: 272	End: 273	Zone ID	
Easting: S:24748	Northing: S:6040105	Plot Dimensions: (e.g. 20 x 20 m 20 x 50)		Orientation of midline from the 0 m point:		60°	
Likely Vegetation Class: Southern Lowland Wet sclerophyll forests						Confidence: H M L	
Plant Community Type: 1206 Spotted Gum-Blackbutt shrubby open forest on the coastal foothills						EEC: N	
						Confidence: H M L	

Record easting and northing from the plot marker. If applicable, orient picket so that perforated nb points along direction of midline. Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values	BAM Attribute (20 x 50 m plot)		Stem Classes and Hollows		Record living eucalypt* (Euc*) and living native non-eucalypt (Non Euc) stems separately Data needed is presence only (tick) unless a 'large tree' for that veg class. * includes all species of Eucalyptus, Corymbia, Angophora, Lophosiemon and Syncarpia † For hollows count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.	
			dbh	Euc*	Non Euc	Hollows†		
Count of Native Richness	Trees	4	80+ cm	1 Ironbark			0	
	Shrubs	14	50-79 cm	11 Spotted Gum				
	Grasses etc.	11	30-49 cm	✓		Hollows 20cm+		
	Forbs	8	20-29 cm	✓			0	
	Ferns	2	10-19 cm	✓				
	Other	10	5-9 cm	✓				
Sum of Cover of native vascular plants by growth form group	Trees	35.2	< 5 cm	✓		This size class records tree regeneration		
	Shrubs	5.5	Length of logs (m) (≥10 cm diameter, >50 cm in length)		55+3+3+15		13.1m m	total
	Grasses etc.	8.1						
	Forbs	1						
	Ferns	2						
Other	4.1							
High Threat Weed cover %		0.1						

Each size class is noted as present by the living tree stems only. Depending on the Vegetation Class, DBH values and counts may be needed for a size class. For a multi-stemmed tree, only the largest living stem is included in the count/estimate if it is required by the large tree category for that vegetation class.
Hollows at least 20cm across are recorded for the purposes of habitat of some threatened species.

This table may be completed with whatever data is available today. It is not required while in the field.

veg: 25/5/2/12/15 ~ 7.8%

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	45	35	30	82	85	30	60	58	10	10	-	-	-	-	-	-	-	-	-	-
Average of the 5 subplots	56.6																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type	Landform Element	Landform Pattern	Microrelief
Lithology	Soil Surface Texture	Soil Colour	Soil Depth
Slope	Aspect	Site Drainage	Distance to nearest water and type

Plot Disturbance	Severity code	Age code
Clearing (inc. logging)	2	0
Cultivation (inc. pasture)	-	-
Soil erosion	3	R
Firewood / CWD removal	1	R
Grazing (identify native stock)	-	-
Fire damage	1	0
Storm damage	0	0
Weediness	1	R
Other		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe
Age: R=recent (<3yrs), NR=not recent (3-10yrs), 0=old (>10yrs)

Form version designed 15 September 2017 - Modified 20 October 2017 (by MF@ELA) Printed 18 June 2018

Free Text Section for brief site description

- litter + rubbish
- anthropogenic woody debris for creekline banding
- erosion along creek i sediment accumulation
+ + much deposition on northern + eastern bank
(possible) gully in hill upslope
- undergrowth mostly under natural regen of native shrubs - few weeds
- retention basin to west i water ponding



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400 m ² plot: Sheet <u>2</u> of <u>5</u>		Survey Name	Plot Identifier	Recorders			
Date	11 Oct 18	Sunshine Bay	SB-01				
GF Code	Full species name mandatory, or a unique means of identifying separate taxa within a survey. Data from here will be used to assign growth form counts and covers.	N, E or HTE	% Cover	Abund	stratum	voucher	
T	<i>Corymbia maculata</i>		20	9	U		
T	Ironbark = <i>E. paniculata</i>		15	2	U		
T	Stringybark - <i>E. globosa</i> * regen only *		<1	2	L		
S	<i>Exocarpos cypripedium</i> #11		.5	2	M		
F							
S	<i>Acacia longifolia</i> #11		1	5	M		
G	<i>Entolasia stricta</i> ++		1	50	L		
T	<i>Acacia</i> sp. <i>meurii</i> ? = <i>A. irrorata</i> subsp. <i>irrorata</i> (C)		.5	2	M		
L	<i>Hardenbergia violacea</i> #11		.5	7	L		
S	<i>Goodenia ovalis</i>		.3	15	L		
E	<i>Pteridium esculentum</i>		1	20	L		
F	<i>Solanum pinophyllum</i> #11 (C)		<1	2	L		
F	<i>Rorippa microphylla</i> #11		<1	2	L		
S	<i>Ozothamnus diosmifolius</i> #11		.5	2	M		
L	<i>Billardiera scandens</i> #11		<1	2	L		
E	<i>Blechnum arthroglossum</i> #10		1	10	L		
L	<i>Pandorea pandorana</i> #11		.5	7	L		
F	<i>Dianella revoluta</i>		.3	20	L		
L	<i>Clematis glycinoides</i>		<1	1	L		
S	<i>Brassia oblongifolia</i> #11 (poor)		.1	2	M		
D	<i>Pennisetum clandestinum</i> = <i>Cenchrus clandestinus</i>		<1	2	L		
G	<i>Lomandra longifolia</i>		.5	5	L		
G	<i>Lomandra multiflora</i>		.3	5	L		
T	<i>Elaeagnus reticulata</i> #11		.5	2	M		
L	<i>Styene clandestina</i> #11		<1	2	L		
G	<i>Lomandra filifolia</i> #11		<1	1	L		
E	<i>Juncus pallidus</i> #11		<1	1	L		
G	<i>Microseris stipoides</i> #11 #11		.3	15	L		
G	<i>Impeata cylindrica</i> ++		.5	50	L		
S	<i>Hibbertia aspera</i> #11 H. <i>aspera</i> subsp. <i>aspera</i> (C)		.3	4	L		
L	<i>Eustrephus latifolia</i> #11		<1	1	L		
S	<i>Kunzea ambigua</i> #11 (C)		<1	2	M		
S	<i>Acacia linearis</i> = <i>A. longissima</i>		.1	2	M		
F	<i>Gastrodia</i> sp. *	E	<1	1	L		
F	<i>Oxalis perennans</i>		<1	3	L		
G	<i>Panicum simile</i>		<1	2	L		
L	<i>Kennea nigrifolia</i> #11		<1	2	L		
F	<i>Gonocarpus tetradactylus</i>		<1	5	L		
F	<i>Anagallis arvensis</i> *	E	<1	2	L		
S	(unknown fab = <i>yang chendendrum tomentosum</i>)		<1	1	L		

GF Code: see Growth Form definitions in BAM Appendix 1. Identify top 3 dominants in the veg zone. N: native, E: exotic, HTE: high threat exotic.
Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ..., 100% (foliage cover). Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ..., 100, 200, ..., 1000, ...

Print more copies of this sheet to allow for higher species counts at a plot. All species at a plot need to be recorded.

Cut stamps x2

Form version released 15 September 2017. Modified 20 October 2017 (by MF@FIA) Printed 18 June 2018

Appendix B Ecosystem credit species predicted within the DMA site

Species / common name	NSW listing status* (BC Act)	National listing status* (EPBC Act)
<i>Anthochaera phrygia</i> Regent Honeyeater (Foraging)	CE	CE
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo (Foraging)	V	-
<i>Calyptrorhynchus lathamii</i> Glossy Black-Cockatoo (Foraging)	V	-
<i>Daphoenositta chrysoptera</i> Varied Sittella	V	-
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V	E
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	V	-
<i>Glossopsitta pusilla</i> Little Lorikeet	V	-
<i>Hieraaetus morphnoides</i> Little Eagle (Foraging)	V	-
<i>Kerivoula papuensis</i> Golden-tipped Bat	V	-
<i>Lathamus discolor</i> Swift Parrot (Foraging)	E	CE
<i>Lophoictinia isura</i> Square-tailed Kite (Foraging)	V	-
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat (Foraging)	V	-
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	V	-
<i>Ninox connivens</i> Barking Owl (Foraging)	V	-
<i>Ninox strenua</i> Powerful Owl (Foraging)	V	-
<i>Pachycephala olivacea</i> Olive Whistler	V	-
<i>Petaurus australis</i> Yellow-bellied Glider	V	-
<i>Phascolarctos cinereus</i> Koala (Foraging)	V	V
<i>Potorous tridactylus</i> Long-nosed Potoroo	V	V

Species / common name	NSW listing status* (BC Act)	National listing status* (EPBC Act)
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (Foraging)	V	V
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V	-
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	V	-
<i>Tyto novaehollandiae</i> Masked Owl (Foraging)	V	-

CE – Critically Endangered; E – Endangered; V – Vulnerable

Appendix C Species likelihood of Occurrence

The potential for each threatened species, population and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field surveys and review of available habitat within the study area, the potential for species to utilise the site and be affected directly or indirectly by the proposal were considered as either:

- “Recent record” = species has been recorded in the study area within the past 5 years
- “High” = species has previously been recorded in the study area (>5 years ago) or in proximity (for mobile species), and/or habitat is present that is likely to utilised by a local population
- “Moderate” = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- “Low” = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- “Not present” – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

Scientific Name Common Name	Legal Status	Number of records within 5 km radius	Closest record	Most recent record	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
KINGDOM: Animalia; CLASS: Aves						
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	BC Act: V	12	1.5 km	6/10/2006	Moderate	Low
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	BC Act: V	13	1.4 km	1/11/2017	Low	Low
<i>Calyptorhynchus lathami</i> Glossy Black Cockatoo	BC Act: V	61	1.8 km	1/05/2018	Low	Low
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	BC Act: V	2	0.89	2/03/2016	Low	Low
<i>Daphoenositta chrysoptera</i> Varied Sittella	BC Act: V	14	1.5 km	30/05/2012	Low	Low
<i>Glossopsitta pusilla</i> Little Lorikeet	BC Act: E1	39	0.99 km	23/05/2017	Low	Low
<i>Hieraaetus leucogaster</i> White-bellied Sea-Eagle	BC Act: V EPBC: C	14	0.87 km	13/10/2013	Low	Low
<i>Hieraaetus morphnoides</i> Little Eagle	BC Act: V	1	9.69 km	25/07/2016	Low	Low
<i>Hirundapus caudacutus</i> White-throated Needletail	EPBC: M	4	1.6 km	9/01/2001	Low	Low
<i>Lathamus discolor</i> Swift Parrot	BC Act: E EPBC: CE	32	1.8 km	12/01/2009	Low	Low
<i>Lophoictinia isura</i> Square-tailed Kite	BC Act: V	9	0.71 km	13/07/2017	Moderate	Low
<i>Ninox strenua</i> Powerful Owl	BC Act: V	12	1.2 km	16/05/2017	Moderate	Moderate

Scientific Name Common Name	Legal Status	Number of records within 5 km radius	Closest record	Most recent record	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
<i>Tyto novaehollandiae</i> Masked Owl	BC Act: V	5	1.4 km	26/10/2016	Moderate	Moderate
<i>Tyto tenebricosa</i> Sooty Owl	BC Act: V	4	1.5 km	26/10/2016	Moderate	Low
KINGDOM: Animalia; CLASS: Mammalia						
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	BC Act: V EPBC: E	1	4.5 km	3/09/2014	Low	Low
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	BC Act: V	3	0.89 km	2/03/2016	Moderate	Moderate
<i>Isodon obesulus obesulus</i> Southern Brown Bandicoot	BC Act: E EPBC: E	1	2.9 km	3/01/1998	Low	Low
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat	BC Act: V	6	1.8 km	12/01/2009	Moderate	Moderate
<i>Mormopterus (Micronomus) norfolkensis</i> Eastern Freetail-bat	BC Act: V	6	0.89 km	2/03/2016	Moderate	Present
<i>Myotis macropus</i> Southern Myotis	BC Act: V	17	1.9 km	12/01/2009	Low	Low
<i>Petauroides volans</i> Greater Glider Greater Glider population in the Eurobodalla LGA	BC Act: EP EPBC Act: V	28	0.46 km	16/02/2018	Low	Low
<i>Petaurus australis</i> Yellow-bellied Glider	BC Act: V	201	0.74 km	17/01/2018	Low	Low
<i>Petaurus norfolcensis</i> Squirrel Glider	BC Act: V	2	0.89 km	2/03/2016	Low	Low

Scientific Name Common Name	Legal Status	Number of records within 5 km radius	Closest record	Most recent record	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	BC Act: V	1	2.9 km	1/5/1997	Not present	Not present
<i>Phascolarctos cinereus</i> Koala	BC Act: V EPBC: V	1	4.2 km	30/06/2016	Low	Low
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	BC Act: V EPBC Act: V	100545	0.89 km	3/01/2017	Moderate	Low
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	BC Act: V	3	1.7 km	12/01/2009	Moderate	Moderate
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	BC Act: V	3	0.89 km	2/03/2016	Moderate	Moderate
KINGDOM: Plantae						
<i>Correa baeuerlenii</i> Chef's Cap Correa	BC Act: V EPBC Act: V	1	3.01 km	30/12/1999	Moderate	Low
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	BC Act: V EPBC Act: V	3	1.8 km	20/11/2008	Not present	Not present
<i>Persicaria elatior</i> Tall Knotweed	BC Act: V	14	0.9 km	17/04/2016	Not present	Not present
<i>Pomaderris bodalla</i> Bodalla Pomaderris	EPBC Act: E	1	4.5 km	1/03/2005	Not present	Not present

Appendix D Other flora and fauna species recorded across the subject land and DMA site

Flora

Family	Scientific name	Common name	Native/ Exotic
Blechnaceae	<i>Doodia aspera</i>	Prickly Rasp Fern	Native
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-oak	Native
Cyperaceae	<i>Lepidosperma neesii</i>		Native
Dicksoniaceae	<i>Calochlaena dubia</i>	Rainbow Fern	Native
Dilleniaceae	<i>Hibbertia dentata</i>	Trailing Guinea Flower	Native
	<i>Hibbertia diffusa</i>	Wedge Guinea Flower	Native
Ericaceae	<i>Leucopogon juniperinus</i>	Prickly Beard-heath	Native
Iridaceae	<i>Patersonia glabrata</i>	Leafy Purple-flag	Native
Myrtaceae	<i>Eucalyptus pilularis</i>	Blackbutt	Native
Phormiaceae	<i>Dianella caerulea</i> var. <i>caerulea</i>	Blue Flax-lily	Native
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum	Native
Proteaceae	<i>Persoonia linearis</i>	Narrow-leaved Geebung	Native

Fauna

Class	Family	Scientific name	Common name	Native/ Exotic
Aves	Psittaculidae	<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet	Native
Amphibia	Myobatrachidae	<i>Crinia signifera</i>	Eastern Common Froglet	Native
Mammalia	Miniopteridae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing Bat♦	Native
	Molossidae	<i>Mormopterus (Micronomus) norfolkensis</i>	Eastcoast Freetail Bat	Native
		<i>Ozimops ridei</i>	Eastern Freetail Bat	Native
	Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	Native
		<i>Nyctophilus</i> sp.	Long-eared Bat	Native
		<i>Scotorepens orion</i>	Eastern Broad-nosed Bat♦	Native
		<i>Vespadelus darlingtoni</i>	Large Forest Bat♦	Native

♦ Results of anabat data analysis not definitive for these species, however presence considered potential.

Appendix E Credit Summary Report and Credit Payment Report



BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012611/BAAS17022/19/00012612	Sunshine Bay	30/10/2019
Assessor Name	Report Created	BAM Data version *
Lucas McKinnon	31/10/2019	16
Assessor Number	BAM Case Status	Date Finalised
BAAS17012	Open	To be finalised
Assessment Revision	Assessment Type	
0	Part 4 Developments (General)	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAIL	Ecosystem credits
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion								
1	1206_Intact	63.0	0.3	0.25	High Sensitivity to Potential Gain	1.50		7
							Subtotal	7
							Total	7

Assessment Id
00012611/BAAS17022/19/00012612

Proposal Name
Sunshine Bay

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BAM Credit Summary Report

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAIL	Species credits
Cryptostylis hunteriana / Leafless Tongue Orchid (Flora)						
1206_Intact		63.0	0.31	0.25	1.5 False	7
						Subtotal
						7
Myotis macropus / Southern Myotis (Fauna)						
1206_Intact		63.0	0.31	0.25	2 False	10
						Subtotal
						10

Assessment Id
00012611/BAAS17022/19/00012612

Proposal Name
Sunshine Bay

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Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00012611/BAAS17022/19/00012612	61	0	31/10/2019
Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Lucas McKinnon	BAAS17012	Sunshine Bay	Open
	Assessment Type	Date Finalised	
	Part 4 Developments (General)	To be finalised	

PCT list

Include	PCT common name	Credits
Yes	1206 - Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	7

Species list

Include	Species	Credits
Yes	<i>Cryptostylis hunteriana</i> (Leafless Tongue Orchid)	7
Yes	<i>Myotis macropus</i> (Southern Myotis)	10

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Assessment Id	Proposal Name	Page 1 of 3
00012611/BAAS17022/19/00012612	Sunshine Bay	



Biodiversity payment summary report

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Bateman	1206 - Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion Note: This PCT has trades recorded	\$6,886.21	0.71782200	1.94130560	19.99%	\$20.00	1.0000	\$4,775.87	7	\$33,431.09
Subtotal (excl. GST)										\$33,431.09
GST										\$3,343.11
Total ecosystem credits (incl. GST)										\$36,774.20

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10187	<i>Cryptostylis hunteriana</i> (Leafless Tongue Orchid)	Vulnerable	\$150.00	19.9900%	\$20.00	7	\$1,399.90
10549	<i>Myotis macropus</i> (Southern Myotis)	Vulnerable	\$725.00	19.9900%	\$20.00	10	\$8,899.28
Subtotal (excl. GST)							\$10,299.18

Assessment Id	Proposal Name	Page 2 of 3
00012611/BAAS17022/19/00012612	Sunshine Bay	





Biodiversity payment summary report

	GST	\$1,029.92
Total species credits (incl. GST)		\$11,329.10
Grand total		\$48,103.30

