

Appendix 2: Examples of suitable survey pro-formas

DIURNAL HERPETOFAUNA CENSUS SURVEY PROFORMA

Survey Details

Date of survey

Name of surveyor

Contact number

Number of surveyors

Total effort expressed in
person-hours

Total effort expressed in
number of rocks/logs
rolled

Location Details

Location (including basic
habitat) description

Map number

Map name

Type of survey, e.g.
transect or quadrat

AMG Zone

Active or passive search

Size of survey area (ha)

Survey area

Eastings (6 digits)

Northings (7 digits)

Eastings (6 digits)

Northings (7 digit)

Start time (24hr)

End time (24 hr)

Appendix 2: Examples of suitable survey pro-formas

Weather Details

At start of survey, record:

Cloud cover*

Wind direction and speed*

Rain*

Temperature (°C)

Moon*

At end of survey, record:

Temperature (°C)

Comments

Appendix 2: Examples of suitable survey pro-formas

[illegible]

Appendix 2: Examples of suitable survey pro-formas

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	_____	Contact number	_____
Number of surveyors	_____	Date of survey	_____
Total effort expressed in person hours	_____	Number of hectares covered or transect or point dimensions	_____

Location Details

Location description	_____		
Map number	_____	Map name	_____
Full AMG reference(s) for survey site or transect	_____		
	AMG Zone	_____	
Start details	_____	Finish details	_____
Easting (6 digits)	_____	Easting (6 digits)	_____
Northing (7 digits)	_____	Northing (7 digits)	_____
Start time (24hr)	_____	End time (24 hr)	_____

Weather Details

At start of survey, record:	Cloud cover*	_____
Wind direction and speed*	Rain*	_____
Temperature (°C)	Moon*	_____
At end of survey record:	_____	
Temperature (°C)	_____	

Appendix 2: Examples of suitable survey pro-formas

Comments

Species name	Ob. type*	MH type*	Grid reference (full AMG)	Accuracy

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

[illegible]

Appendix 2: Examples of suitable survey pro-formas

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL HOLLOW-BEARING TREE CENSUS SURVEY PROFORMA

Survey Details

Date of survey

Name of surveyor

Contact number

Number of surveyors

Total effort expressed in
person-hours

Location Details

Location (including basic
habitat) description

Map number

Map name

Type of survey, e.g.
transect or quadrat

AMG Zone

Size of survey area (ha)

Survey area

Eastings (6 digits)

Northings (7 digits)

Eastings (6 digits)

Northings (7 digit)

Start time (24hr)

End time (24 hr)

Appendix 2: Examples of suitable survey pro-formas

[illegible]

Appendix 2: Examples of suitable survey pro-formas

* See Appendix 3: Standard reporting codes

VERTEBRATE FAUNA SURVEY OPPORTUNISTIC RECORDS

AGM Zone _____

[illegible]

* See over ** Include initials of observer and any other information that will help relocation of site.

Cloud cover. Record cloud cover in eights of sky.

Moon. Record using the following codes. 0=None, 1=1/4 moon, 2=1/2 moon, 3=3/4 moon, 4=full moon.

Wind direction and speed. Record wind direction to nearest cardinal point. Record wind speed using the following codes. 0=calm 1= Light, leaves rustle 2= Moderate, branches move 3=Strong, tops of trees move

Rain. Record using the following codes. 0=none, 1=drizzle - light, 2=drizzle - heavy 3=heavy rain

Sizes of hollows. Record using the following codes. S=Small (1-5cm diameter), M=Medium (5-15cm diameter), L=Large (greater than 15cm diameter).

Types of hollows. Record using the following codes. T=Trunk hollow, B=Branch hollow

Observation type

Use the following codes:

O	Observed (sighted)	R	Road kill	F	Tracks, scratching
W	Heard call	D	Dog kill	Z	In raptor/owl pellet
X	In scat	C	Cat kill	M	Miscellaneous
P	Scat	V	Fox kill	E	Nest or roost
T	Trapped or netted	K	Dead	B	Burnt
H	Hair or feathers	S	Shot	Y	Bones or teeth
A	Stranded/beached	I	Fossil/subfossil	N	Not located

MH (microhabitat) type

Use the following codes:

AC	Flying above canopy	IB	In burrow	OB	On (beach) sand
BR	In/on bridge	IC	In cave	OL	On log
BU	In building	IG	In grass	OR	On rock
CK	Crevice in rock	IH	In tree hollow	OW	Over water
CL	Crevice in log	IL	In litter	RD	On road
DA	Farm/fire dam	IR	In reeds	TK	On trunk
DT	In dead tree (stag)	IS	In soil	UB	Under bark
EW	Edge of water	IT	In (live) tree	UC	Upper canopy
FC	In/on post or stump	IW	In water	UG	Undergrowth
FL	Flying within canopy	LC	Lower canopy	UL	Under log
GR	On ground	LS	Low shrub	UR	Under rock
HS	High shrub	MC	Mid canopy	UT	Under iron
				WH	Waterhole

Appendix B

Compliance with the DGR's

Section within DGR's	DGR Requirement	Revised SIS (2015)	Addendum SIS (2017)
	MATTERS WHICH HAVE BEEN LIMITED OR MODIFIED		
	The SIS need not address Section 110(2)(g) and 110(3)(d) of the TSC Act. The matters raised in these sections of the TSC Act have been clarified by these DGRs.		
	The following matters from Section 110 of the TSC Act need only be addressed where relevant:		
	All reference to threat abatement plans. There are no threat abatement plans relevant to the key threatening processes associated with the <i>proposal</i> .	No <i>Threat Abatement Plans</i> are relevant	
	All reference to recovery plans. There are approved and draft recovery plans relevant to the <i>subject species</i> listed in Tables 1 and 2 and the <i>subject ecological community</i> listed in Section 3.2 of these DGRs. However, if other entities should be deemed as <i>subject species, populations or ecological communities</i> by analysis in accordance with these DGRs, then any relevant recovery plans pertaining to these entities will need to be addressed in the SIS.	Chapters 9 and 10	Section 4.5 and Appendix D
	All reference to key threatening processes. Only the following key threatening processes are relevant to this proposal: <ul style="list-style-type: none"> • Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands • Bushrock removal • Clearing of native vegetation; • Invasion of native plant communities by exotic perennial grasses • Removal of dead wood and dead trees; • Loss of hollow-bearing trees; • Infection of native plants by <i>Phytophthora cinnamomi</i> 	Chapters 9 and 10	Section 4.5 and Appendix E
	For each <i>subject species, population or ecological community</i> likely to be affected by any of these key threatening processes, the SIS shall address whether the action will increase this threat, and shall describe proposed measures to ameliorate such threats.	Chapters 9 and 10	Section 5.1
	Please note that recovery plans may be approved, critical habitat may be declared and key threatening processes may be listed between the issue of these DGRs and the determination of the <i>proposal</i> . If this occurs, these additional matters will need to be addressed in the SIS and considered by the consent, determining or concurrence authority.	Acknowledged	

	MATTERS TO BE ADDRESSED		
	The TSC Act provides that the SIS must meet all the matters specified in Sections 109 and 110 of the Act with the exception of those matters limited above. Some of the requirements outlined in Sections 109 and 110 (excluding the matters limited above) have been repeated below (<i>italics</i>) along with the specific Director-General's Requirements for your <i>proposal</i> .	Acknowledged	
	Previous surveys and assessments may be used to assist in addressing these requirements. All references used throughout the SIS must be cited and detailed in a reference list.	Chapter 3; Appendices E and G; Bibliography	Chapter 3, Reference list
1	FORM OF THE SPECIES IMPACT STATEMENT		
	<i>A species impact statement must be in writing [Section 109 (1)]</i>		
	<i>A species impact statement must be signed by the principal author of the statement and by:</i> a) <i>the applicant for the licence, or</i> b) <i>if the species impact statement is prepared for the purposes of the Environmental Planning and Assessment Act 1979, the applicant for development consent or the proponent of the activity proposed to be carried out (as the case requires) [Section 109(2)].</i>	See Declaration at front of SIS	Certification
	The SIS must include the following declaration signed by the applicant or proponent: "I...[insert name], of...[address], being the applicant for the [choose one of the following development consent for/proponent of] the action proposed...[insert DA number, Lot & DP numbers, street, suburb and LGA names] have read and understood this species impact statement. I understand the implications of the recommendations made in the statement and accept that they may be imposed as conditions of consent or concurrence for the action proposed."	Declaration at front of SIS	Declaration at front of Report
2	CONTEXTUAL INFORMATION		
2.1	Description of proposal, subject site and study area		
	<i>A species impact statement must include a full description of the action proposed, including its nature, extent, location, timing and layout [Section 110 (1)]</i>	Chapter 2.3; Appendices C1 and C2 and D1 and D2	
	A full description of the action proposed includes a description of all associated actions. These actions may occur on or off the <i>subject site</i> . In describing the action proposed, the proportion of the <i>subject site</i> and the <i>study area</i> that will be affected is to be provided, including details of the location of any auxiliary infrastructure and all component parts of the <i>proposal</i> including, but not restricted to, c) roadworks and temporary access and egress routes, d) cycleways, walkways, drainage and settling ponds, stockpile areas, diversion banks, vehicle parking areas and temporary buildings, e) changes in surface water flows f) location of any powerlines, water and sewerage infrastructure.	Chapter 2.3; Appendices C1 and C2 and D1 and D2	Chapter 1
	The type of action proposed shall be detailed, including the timetable for the construction of the <i>proposal</i> . If a staged construction approach is adopted then the timetable shall clearly indicate this.	Chapter 2.3	
	If subsequent development of adjacent land is proposed by the proponent in the future, including any additional road construction then this shall be identified to the extent that it is known at the time of preparing	Chapter 2.3	

	the SIS. If existing structures such as the pipelines and transmission line are to be relocated, this should also be described and assessed.		
	The vegetation within the study that is to be retained is to be fully documented, and shown on the relevant plans and maps. The proposed management regimes for such areas are also to be documented.	Chapter 5; Figures 11A and 11B; Chapter 12	Chapter 4, Section 4.1 and 4.3; Chapter 5, Section 5.2 and 5.3; Figure 5.1 and 5.2
2.2	Provision of relevant plans and maps		
	A detailed plan of the study area shall be provided at a preferred scale of 1:4,000 or finer. This plan shall show the proposal, the location and type of vegetation communities present within the <i>study area</i> , the full extent of vegetation clearing anticipated, and the scale of the plan.	Appendices C1 and C2	Chapter 1, Section 1.4; Appendix C
	This plan shall also show the location of any key habitat resources for threatened species, such as Glossy Black-cockatoo feed trees, trees used as nesting sites by large forest owls and Gang-gang cockatoo, Yellow-bellied Glider feed trees, micro bat roosting or nest trees, and trees bearing hollows.	Figures 2, 11A, 11B, 15 and 17	
	Colour aerial photography of the locality (or reproduction of such photography) shall be provided. This aerial photograph shall clearly show the <i>subject site</i> and the scale of the photograph.	Figures 1, 2, 6, 11C and 14A	Chapter 1, Figure 1.1
	A topographic map of the subject site and immediate surrounds at a scale of 1:25000 shall be provided. This map shall detail the location of the proposal and location of works on site.	Figures 9, 10, 11B and 11C	Chapter 1, Figure 1.1
	A map of the locality, showing landscape features including rivers, swamps, wetlands, any locally significant areas for threatened species such as parks and reserves, and areas of high human activity such as townships, regional centres and major roads will also be provided. The location, size and dimensions of the study area shall be provided. This map shall represent the area within at least a radius of 5 km from the subject site.	Figures 1, 2, 6, 7A, 7B, 7C and 18, Chapter 2.2; Figure 5A; Appendix C2 Figures 1, 5A and 5B	Chapter 1
2.3	Land tenure information		
	The land tenure across the <i>study area</i> is to be described and any limitations to sampling across the <i>study area</i> resulting from this tenure (e.g. denied access to private land) shall be noted.	Chapter 2	
3	INITIAL ASSESSMENT		
	<i>A general description of the threatened species or populations known or likely to be present in the area that is the subject of the action and in any area that is likely to be affected by the action [Section 110 (2)(a)].</i>	Chapters 5 to 9	Chapter 2
3.1	Identifying subject species and populations		
	For the purposes of this SIS, the species listed in Table 1 are to be addressed as <i>subject species</i> :	Chapters 7 to 9	Chapter 2, Section 2.2

Table 1. List of <i>subject species</i>				
	SPECIES	SCIENTIFIC NAME	STATUS in NSW*	
	Fauna			
	Southern Brown Bandicoot	<i>Isoodon obesulus</i>	E	
	Long-nosed Potoroo	<i>Potorous tridactylus</i>	V	
	White-footed Dunnart	<i>Sminthopsis leucopus</i>	V	
	Eastern Pygmy Possum	<i>Cercartetus nanus</i>	V	
	Squirrel Glider	<i>Petaurus norfolcensis</i>	V	
	Yellow-bellied Glider	<i>Petaurus australis</i>	V	
	Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	
	Large-footed Myotis	<i>Myotis adversus</i>	V	
	Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V	
	Eastern Bent-wing Bat	<i>Miniopterus schreibersii oceanensis</i>	V	
	Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V	
	Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	
	Yellow-bellied Sheathetail-bat	<i>Saccolaimus flaviventris</i>	V	
	Golden-tipped Bat	<i>Kerivoula papuensis</i>	V	
	Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	
	Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V	
	Green and Golden Bell Frog	<i>Litoria aurea</i>	E	
	Beach Stone-curlew	<i>Esacus magnirostris</i>	V	
	Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	V	
	Pied Oystercatcher	<i>Haematopus longirostris</i>	E	
	Hooded Plover	<i>Thinornis rubricollis</i>	CE	
	Greater Sand-plover	<i>Charadrius leschenaultii</i>	V	
	Lesser Sand-plover	<i>Charadrius mongolus</i>	V	
	Sanderling	<i>Calidris alba</i>	V	
	Curlew Sandpiper	<i>Calidris ferruginea</i>	E	
	Great Knot	<i>Calidris tenuirostris</i>	V	
	Broad-billed Sandpiper	<i>Limicola falcinellus</i>	V	
	Black-tailed Godwit	<i>Limosa limosa</i>	V	
	Terek Sandpiper	<i>Xenus cinereus</i>	V	
	Little Tern	<i>Sternula albifrons</i>	E	
	Little Shearwater	<i>Puffinus assimilis</i>	V	
	Painted Snipe	<i>Rostratula australia</i>	E	
	Square-tailed Kite	<i>Lophoictinia isura</i>	V	
	Little Eagle	<i>Hieraaetus morphnoides</i>	V	
	Spotted Harrier	<i>Circus assimilis</i>	V	
	Osprey	<i>Pandion cristatus</i>	V	
	Powerful Owl	<i>Ninox strenua</i>	V	
	Barking Owl	<i>Ninox connivens</i>	V	
	Sooty Owl	<i>Tyto tenebricosa</i>	V	
	Masked Owl	<i>Tyto novaehollandiae</i>	V	

	also need to be included for assessment in this SIS on the basis of desktop and habitat analyses and the outcomes of fieldwork.		
	In determining whether the entities listed in Table 1, as well as other entities, should also be addressed as <i>subject species, populations and ecological communities</i> , consideration shall be given to the habitat types present within the <i>study area</i> , recent records of threatened species, populations or ecological communities in the <i>locality</i> and the known distributions of threatened species, populations and ecological communities. This analysis and its conclusion are to be documented in the SIS.	Chapters 3 and 5 to 9; Appendices J, K, P, R, T and V; Figures 16A, 16B and 17	Appendix D
	Databases such as the Atlas of NSW Wildlife, the Atlas of Living Australia (http://www.ala.org.au/), and the Australian Government's "Protected Matters Search Tool" (http://www.environment.gov.au/epbc/pmst/index.html) should be consulted to assist in compiling the list of possible entities to be analysed. It should be noted that if the OEH Atlas is the only database that is referred to, due to data exchange agreements, the data provided by OEH will only include that for which OEH is a custodian. In many cases, this may only be a small subset of the data available. Other databases must also be consulted to create a comprehensive list of entities for consideration as <i>subject species, populations or ecological communities</i> .	Chapter 3; Appendices J and K; research by Council's TSO	Chapter 2, Section 2.2; Figures 2.1, 2.2 and 2.3
3.2	Identifying habitats		
	In describing the <i>study area</i> , consideration shall be given to the previous land uses and the effect of these land uses on the <i>study area</i> . Relevant historical events may include fire, clearing, logging, slashing, recreational use and agricultural activities.	Chapter 4; Appendix L	
	A description of habitats including such components as the frequency of tree hollows, the presence of wetlands, the density of understorey vegetation, the composition of the ground cover, the soil type and the presence of heath and permanent or ephemeral swamps shall be given. The condition of these habitats within the <i>study area</i> shall be discussed, including the prevalence of introduced species. A description of the habitat requirements of threatened species, populations or ecological communities likely to occur in the <i>study area</i> shall be provided.	Chapters 4, 5 and 6; Appendices O and Q Chapters 4 to 9; Appendices Q and S	Appendix D
	Any areas which may provide habitat connectivity between the <i>study area</i> and adjacent areas of likely habitat for <i>subject species, populations or ecological communities</i> shall be identified and described.	Chapter 4; Figure 1	
	In defining the <i>study area</i> , consideration shall be given to possible <i>indirect impacts</i> of the proposed action on species/habitats in and surrounding the <i>subject site</i> . These could include impacts arising from altered fire and hydrology regimes, soil erosion or pollution, fencing, habitat fragmentation and disruption of wildlife movement corridors, edge effects, altered light and noise regimes, disturbance of roosting areas or other impacts due to increased use of the area by humans, and the impacts of increased levels of domestic and feral predators.	Chapters 2 and 10	Chapter 4, Section 4.2
4	SURVEY		
4.1	Requirement to survey		
	A flora and fauna survey is to be conducted in the <i>study area</i> . Targeted surveys shall be conducted for all <i>subject species, populations and ecological communities</i> determined in accordance with Section 3. Previous surveys and assessments may be used to assist in addressing this requirement. However, the efficacy of such previous surveys and assessments in meeting this requirement must be described in full. These previous surveys do not negate the need for the additional targeted survey work set out in Appendix 1 of these DGRs.	Chapter 3; Appendices E, F, G, H and I	Chapter 3, Section 3.1
	Particular attention shall be paid to the timing and climatic conditions for conducting fauna surveys, as many	Chapter 3;	Chapter 3, Section

	of the <i>subject species</i> will only be present or detectable for a few months each year or during certain climatic conditions. Additional advice on these matters should be sought from the OEH contact officer.	Appendices E, F, G, H and I	3.1
	Identification of all species is essential. Identification to genus only is not acceptable. Species of taxonomic uncertainty shall be confirmed by a recognised authority such as the Australian Museum or National Herbarium at the Royal Botanic Gardens, Sydney.	Chapter 3	Chapter 3, Section 3.1
4.2	Documentation of survey effort and technique		
	Survey technique(s) shall be described and a reference given, where available, outlining the survey technique employed.	Chapter 3; Appendices E, F, G, H and I	Chapter 3, Section 3.2
	Survey site(s) shall be identified on a map with a clear legend. The size, orientation and dimensions of quadrat or length of transect shall be clearly noted for each type of survey technique undertaken. Full AMG grid references for the survey site(s) shall be provided.	Chapter 3; Appendices E, F, G, H and I	Chapter 3, Section 3.2; Figures 3.1 and 3.2
	OEH survey proformas are to be used by field staff when applying a range of standard fauna survey techniques. Copies of standard proformas are included in Appendix 2 to these DGRs. Digital copies of these proformas can be requested from the nominated OEH contact officer. These proformas shall be used by field staff when undertaking fauna surveys and completed data sheets are to be included as an appendix to the SIS.	Appendix I	Appendix G
	The time invested in each survey technique shall be summarised in the SIS, based on completed proformas, e.g. number of person hours / transect, duration of call playback, number of nights that traps are set.	Chapter 3; Appendices E, F, G, H and I	Chapter 3, Section 3.2
	It is not sufficient to aggregate all time spent on all survey techniques. Effort must be expressed separately for each survey technique that is applied.	Chapter 3; Appendices E, F, G, H and I	Chapter 3, Section 3.2
	Personnel details including name of surveyor(s), contact phone number, qualifications and experience must be included. The person who identified records (e.g. Anabat, hair tubes, scat analysis) shall also be identified in this manner.	Chapters 3 and 12; Appendix Z	Chapter 3, Section 3.2
	Environmental conditions during the survey shall be noted from the commencement of each survey technique until its completion. These conditions must be documented in the SIS.	Chapter 3; Appendices E, F, G, H and I	Chapter 3, Section 3.2
	An assessment of the efficacy of each survey regime in detecting each species under the intensity utilised by the study is to be provided. The effect of the season and weather at the time of the field survey shall be considered with respect to the adequacy of survey results. An assessment will also be made of the adequacy of the survey and background information used to assess the likely area of use (home range) for each <i>subject species, population or ecological community</i> , and the areas providing habitat connectivity.	Chapter 3	Chapter 3, Section 3.2 and 3.3
	A full list of all flora and fauna species (threatened and non-threatened) recorded during the course of surveys shall be included in the SIS as this information provides an indication of the habitat diversity and quality of the site. OEH also requires that all flora and fauna records be placed on the Atlas of NSW Wildlife using the ATLAS spreadsheets found at the following link: http://www.environment.nsw.gov.au/resources/atlas/AtlasDatasheet.xls	Chapter 5 and 6; Appendices N, P and R	Chapter 3, Appendix F
4.3	Specific survey requirements		
	Appendix 1 details the specific survey requirements for the <i>subject species, populations or ecological communities</i> identified in Table 1 of these DGRs. These survey requirements can determine the presence	Chapter 3; Appendices E, F, G,	Chapter 3, Section 3.2

	of <i>subject species, populations or ecological communities</i> known or likely to be in the <i>study area</i> and/or can provide contextual information on habitats to allow appropriate assessment of impacts at a broader scale. The flora and fauna survey of the <i>study area</i> must include the use of these survey methods.	H and I	
	It is recommended that the consultant(s) engaged to prepare the SIS contact OEH to discuss deriving an appropriate survey regime for some of these requirements, and to confirm the survey regimes proposed for any additional <i>subject species, populations and ecological communities</i> derived by analysis as part of this SIS.	Sufficient information is available in the general literature and DGRs; discussions with OEH during Culburra West project	
5	ASSESSMENT OF LIKELY IMPACTS ON THREATENED SPECIES, POPULATIONS AND ECOLOGICAL COMMUNITIES		
	For all <i>subject species, populations and ecological communities</i> , the SIS shall describe the following:		
	a) the location, nature and extent of habitat removal or modification which will result from the action proposed;	Chapter 10; Figures 3A, 3B, 11C, 14A and 18	Chapter 4; Appendix C, D and E
	b) the likely and potential direct and indirect impacts of the removal of habitat. Particular attention shall be given to the loss of: <ul style="list-style-type: none"> i. Habitat for Swamp Oak floodplain forest of the NSW North Coast Sydney basin and South East Corner Bio Region, Swamp Sclerophyll Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions and River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions ii. the number and proportion of hollow-bearing trees, Yellow-bellied Glider feed trees and other trees known to be utilised for breeding, roosting or denning by threatened fauna such as micro-chiropteran bats, gliders, threatened parrots and large forest owls iii. Similarly, attention is to be given to the likelihood of and extent of loss of food resources (e.g. <i>Allocasuarina littoralis</i>, nectar-rich tree and shrub species) and the impact this may have on the <i>subject species, populations or ecological communities</i>. iv. Changes occurring to aquatic biota and other habitat resources as a result of altered hydrology and increased nutrient loads occurring within Lake Wollumboola and associated watercourses. 	Chapters 10 and 12; Figures 15 and 17	Chapter 4; Appendix C, D and E
	c) any indirect impacts of the proposal including: <ul style="list-style-type: none"> i. the fragmentation or isolation of <i>local populations</i> and/or <i>local occurrences</i>, and the increased distance required for the movement of individuals/genetic material between habitat patches, ii. edge effects from creating gaps in contiguous woody vegetation, including incursion of weeds, dieback from <i>Phytophthora cinnamomi</i> and the potential impacts of aggressive overabundant species such as the Noisy Miner <i>Manorina melanocephala</i> that are favoured by clearing and simplification of habitat structure. iii. Ingress of pest animal species and possible consequential increase in predation pressure, loss of habitat condition or displacement of habitat arising from habitat clearance and fragmentation. 	Chapters 10 and 12	Chapter 4; Appendix D and E

	<ul style="list-style-type: none"> iv. change in vegetation floristics and structure resulting from edge effects, v. altered hydrology regimes to the Lake Wollumboola catchment (including increased runoff and raising or lowering of the water table, increased nutrient loads), vi. altered hydrology regimes to the Endangered Ecological Communities known to occur both onsite and adjacent to the development and the predicted impacts to these communities. vii. soil erosion and pollution, viii. disturbance to feeding or nesting/breeding of species, ix. trampling or other impacts due to increased use of the area by humans, particularly on Endangered Ecological communities x. increased mortality rates due to road deaths, xi. habitat fragmentation and disruption of wildlife movement corridors and pollination mechanisms, xii. change in fire behaviour as a result of clearing of native vegetation xiii. altered light and noise regimes, xiv. the likely contribution of the action proposed to the threatening processes already acting on populations of those <i>subject species or populations</i> and occurrences of <i>subject ecological communities</i> in the <i>locality</i>. 		
	All of the above contextual information (which can be incorporated into Sections 5.1 - 5.5 below) will assist with the assessment of cumulative impacts on the <i>subject species, populations and ecological communities</i> .	Chapter 10	
5.1	Assessment of species likely to be affected		
	<i>An assessment of which threatened species or populations known or likely to be present in the area are likely to be affected by the action [Section 110(2)(b)].</i>	Chapter 7,8 and 9	Chapter 4, Section 4.4; Appendix D
	This requirement allows refinement of the list of <i>subject species or populations</i> (given the outcome of survey and analysis of likely impacts) in order to identify which threatened species or populations may be affected, and the nature of the impact.	Chapter 7,8 and 9	Chapter 4, Section 4.4; Appendix D
	The remaining requirements in this section (5.2 – 5.5) need only be addressed for those threatened species or populations that are likely to be affected by the proposal.	Chapter 7,8 and 9	Chapter 4, Section 4.4
5.2	Discussion of local and regional abundance		
	<i>An estimate for the local and regional abundance of those species or populations [Section 110 (2)(d)]</i>		Chapter 4, Section 4.5
5.2.1	<p><u>Discussion of other known local populations</u></p> <p>A discussion of other known <i>local populations</i> in the <i>locality</i> shall be provided. The long-term security of other habitats shall be examined as part of this discussion. The relative significance of the <i>subject site</i> for the <i>subject species, populations and ecological communities</i> in the <i>locality</i> shall be discussed.</p> <p>It is essential that the SIS includes some surveys conducted beyond the <i>study area</i> to clarify the conservation significance of the <i>subject site</i> to the <i>subject species and populations</i>.</p> <p>The need for off-site surveys to provide context to the anticipated impacts of the <i>proposal</i> may also be required for other threatened species recorded during the surveys of the <i>study area</i>.</p>	<p>Chapters 9 and 10; Appendix X</p> <p>Chapter 3; Appendices E, F, G and H; Figure 5B</p>	Chapter 4, Section 4.5

5.2.2	<u>Discussion of habitat utilisation</u> An estimate of the number of individuals of each <i>subject species</i> utilising the <i>study area</i> shall be provided as well as a description of how these individuals use the <i>study area</i> (e.g. residents, transients, adults, juveniles, nesting, foraging). A discussion of the significance of these individuals to the viability of the <i>subject species</i> in the <i>locality</i> shall be provided.	Detailed data does not exist; but consideration of habitat use and the distribution of relevant (“ <i>affected</i> ”) threatened species is provided in Chapters 8 and 9; Appendices T and V	Chapter 4, Section 4.5
5.2.3	<u>Description of vegetation</u> The vegetation present within the <i>study area</i> and the surface area covered by each vegetation community shall be mapped and described. Reference to the vegetation classification system used (e.g. Specht, Benson, Keith) and to the ecological communities determined as endangered by the NSW Scientific Committee shall be provided. Classification must have regard to both structural and floristic elements.	Chapters 5 and 8; Figures 11A, 11B and 14B; Appendices N and O and V	Chapter 4, Section 4.5
5.2.4	<u>Discussion of corridors</u> Particular attention shall be given to identifying movement corridors for <i>subject species</i> within the <i>study area</i> . The impact of the proposal on these corridors and the resulting impact on the resident <i>subject species</i> shall be discussed.	Chapter 10	Chapter 4, Section 4.5
5.3	Assessment of Habitat		
	<i>A full description of the type, location, size and condition of the habitat (including critical habitat) of those species, populations and ecological communities and details of the distribution and condition of similar habitats in the region [Section 110 (2)(f) and Section 110 (3)(c)]</i>	Chapters 4, 5, 6 and 9; Figures 1, 2, 6, 7A, 7B, 11A, 11B, and 15; Appendix T	Chapter 4, Section 4.5
5.3.1	<u>Description of habitat values</u> Specific habitat features in the <i>study area</i> shall be described and quantified (e.g. frequency and location of stags, hollow bearing trees, culverts, rock shelters, rock outcrops, crevices, caves, drainage lines, soaks, area of ecological communities etc.), as well as the density of understorey vegetation and groundcover. The condition of the habitats and different vegetation communities or types within the <i>study area</i> shall be discussed, including the prevalence of introduced species, species of weeds present and an estimate of the total weed cover as a percentage of each vegetation community, whether trampling or grazing is apparent, effects of erosion, prevalence of rubbish dumping, history of resource extraction or logging and proximity to roads. Details of the <i>study area</i> ’s fire history (e.g. frequency, time since last fire, intensity) and the source of fire history (e.g. observation, local records), shall be provided.	Chapters 4, 5, 6 and 9; Figures 9, 11A, 11B, 15 and 17; Appendices N, O and Q Chapters 4 and 5; Appendices L, M1 and O	Chapter 4, Section 4.5
5.3.2	<u>Distribution and condition of regional habitats</u>	Chapters 4, 8 and 9;	Chapter 4, Section

	For the habitats of <i>subject species and populations</i> found in the study area, the SIS shall discuss the distribution and condition of similar habitats in the region. For the <i>subject ecological communities</i> found in the study area, the SIS shall discuss the distribution and condition of these ecological communities in the region. Regional information may be obtained from existing datasets and from other sources.	Figures 7A and 7B	4.5
5.4	Discussion of conservation status		
	<i>For each species or population likely to be affected, and for each ecological community present, details of its local, regional and State-wide conservation status,...[and]... its habitat requirements ... [Section 110(2)(c) and Section 110(3)(b)]</i>	Chapters 8, 9 and 10	Chapter 4, Section 4.5
	Assessment shall include reference to the threatening processes that are generally accepted by the scientific community as affecting the <i>subject species, population or ecological community</i> and which are likely to be caused or exacerbated by the <i>proposal</i> .	Chapters 9 and 10; Appendix X	Chapter 4, Section 4.5
	Assessment shall also include reference to any approved or draft recovery plans which may be relevant to the <i>proposal</i> . Up-to- date lists and copies of approved and draft recovery plans are available on the OEHS website www.environment.nsw.gov.au by following the links to threatened species.	Chapters 9 and 10; Appendix X	Chapter 4, Section 4.5
5.5	Description of feasible alternatives		
	<i>A description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed, having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development [Section 110(2)(h) and Section 110(3)(e)].</i>	Chapter 11	Chapter 4, Section 4.6
	In this instance, any other relevant planning proposals for the site shall be provided to support this description.	Chapter 11	Chapter 4, Section 4.6
6	IMPACT AMELIORATION		
6.1	Description of ameliorative measures		
	<i>A full description and justification of the measures proposed to mitigate any adverse effect of the action on the species, populations and ecological communities including a compilation (in a single section of the statement) of those measures [Section 110 (2)(i) and Section 110 (3)(f)].</i>	Chapter 12	Chapter 5
6.1.1	<p><u>Long term management strategies</u></p> <p>Consideration shall be given to the information contained in approved and draft recovery plans or threat abatement plans for existing taxa, known or likely to occur in the <i>study area</i>, and whether any recommendation is applicable to the <i>proposal</i>.</p> <p>The development of long-term management strategies shall be considered to protect areas within the study area which are of particular importance for the <i>subject species, populations or ecological communities</i> likely to be affected by the <i>proposal</i>. This may include proposals to restore or improve habitat on site where possible. If mitigation is to include rehabilitation of the site, then the rehabilitation strategy shall be detailed.</p> <p>Any measures proposed to mitigate the effect of the proposal on <i>local populations</i> of threatened species and populations and/or <i>local occurrences</i> of ecological communities shall be described. The potential</p>	Chapter 12	Chapter 5

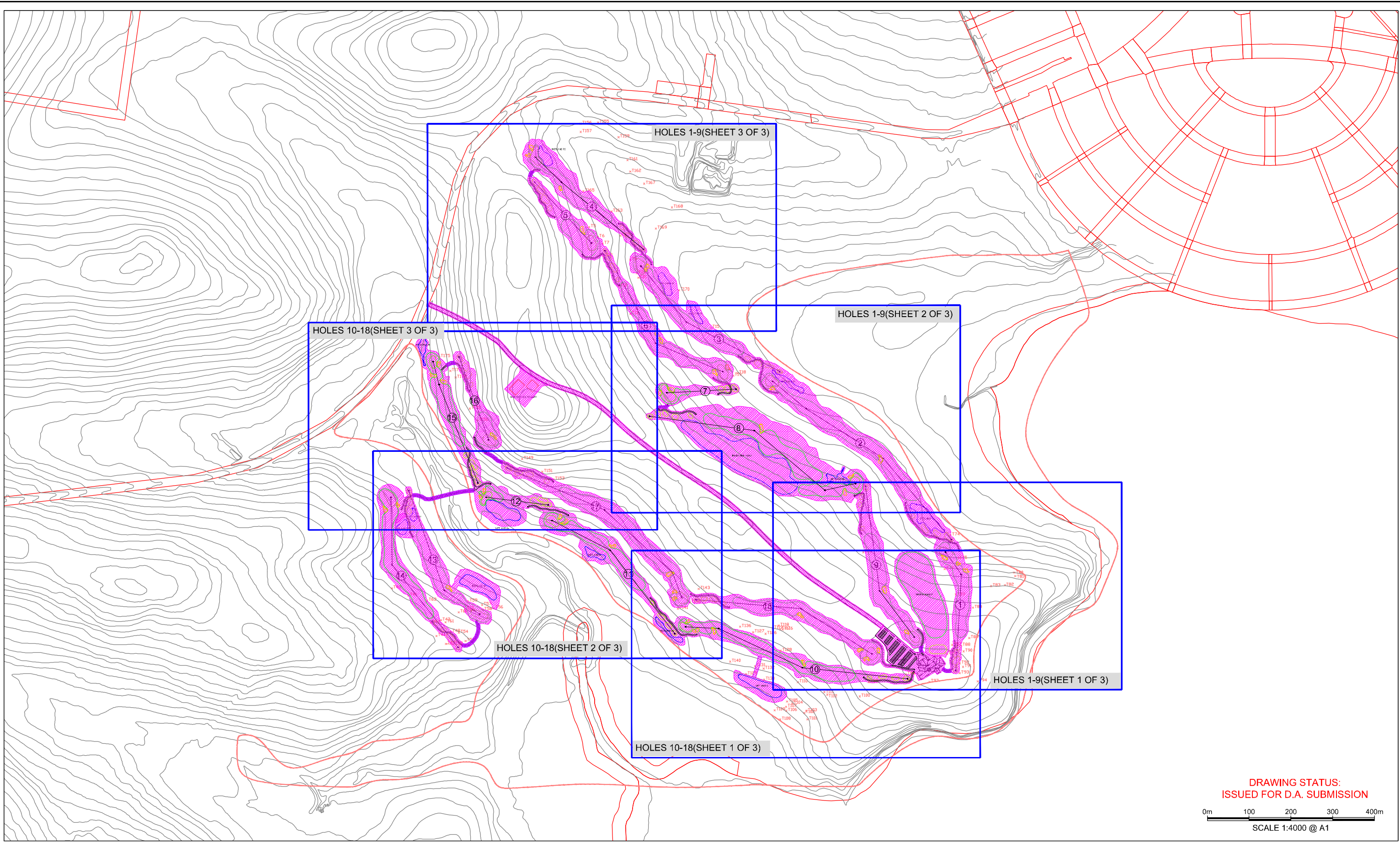
	effectiveness of any such amelioration in maintaining a viable <i>local population</i> and/or <i>local occurrence</i> in the short, medium and long term shall be discussed (e.g. fauna underpasses, vegetation management).		
6.1.2	<p><u>Compensatory strategies</u></p> <p>If significant modification of the <i>proposal</i> to minimise impacts on <i>subject species, populations or ecological communities</i> is not possible, then offset strategies shall be considered. These may include other off-site or local area proposals that contribute to long term conservation of the <i>subject species, populations or ecological communities</i>. These areas should be assessed in accordance with the Principles for the use of biodiversity offsets in NSW, which can be found on the following link on the OEH website http://www.environment.nsw.gov.au/biocertification/offsets.htm.</p> <p>The areas proposed to be used for compensatory strategies must be described in full including a detailed description of their biodiversity. A complete description of how the area will be managed for conservation in perpetuity must also be provided.</p> <p>Where such proposals involve other lands, or where involvement of community groups is envisaged in such proposals, landholders, land managers and/or community groups are to be consulted and <i>proposals</i> shall contain evidence of support from these stakeholders and relevant land managers.</p> <p>Compensatory benefits likely to result from such measures proposed for alternative sites are to be discussed and evaluated along with a discussion of the mechanisms through which they might best occur.</p>	Chapter 12; Appendix Y	Chapter 5, Section 5.3
6.1.3	<p><u>Ongoing monitoring</u></p> <p>Any proposed pre-construction monitoring plans or on-going monitoring of the effectiveness of the mitigation measures shall be outlined in detail, including the objectives of the monitoring program, method of monitoring, reporting framework, duration and frequency. Generally, ameliorative strategies that have not been proved effective should be undertaken under experimental design conditions and appropriately monitored.</p>	Chapter 12; Appendix D1 and D2	Chapter 5, Section 5.1 and 5.2
6.1.4	<p><u>Translocation</u></p> <p>OEH does not consider that translocation of threatened species, populations and ecological communities is an appropriate ameliorative strategy for the purposes of considering impacts of a particular development/activity. It strongly supports the view that development proposals which may impact on significant local populations of <i>subject species and populations</i> or significant local occurrences of <i>subject ecological communities</i> as determined by the SIS should aim to:</p> <ul style="list-style-type: none"> i. minimise the impacts by considering all possible alternatives to the <i>proposal</i>, such that a significant impact is not likely; and ii. manage the remaining habitat (if any) to ensure that the <i>local population</i> and/or <i>local occurrence</i> continues to exist in the long term. 	Chapter 12; No translocation is proposed – See Chapter 12.8	

	The translocation of <i>subject species, populations and ecological communities</i> is only supported by OEH in specific conservation programs (e.g. recovery planning).		
7	ASSESSMENT OF SIGNIFICANCE OF LIKELY EFFECT OF PROPOSED ACTION		
	An assessment of significance (s5A EP&A Act) is to be provided for each <i>subject species, population or ecological community</i> identified in the SIS, incorporating relevant information from sections 5.1 to 7 of the SIS. On the basis of these assessments, a conclusion is to be provided concerning whether, based on more detailed assessment through the SIS process and consideration of alternatives and/or ameliorative measures proposed in the SIS, the proposal is still considered likely to have a significant effect on threatened species, populations or ecological communities or their habitats.	Chapter 10.8; Appendix X	Appendix E
8	ADDITIONAL INFORMATION		
8.1	Qualifications and experience		
	<i>A species impact statement must include details of the qualifications and experience in threatened species conservation of the person preparing the statement and of any other person who has conducted research or investigations relied on in preparing the statement [Section 110(4)]</i>	Chapter 12; Appendix Z	
8.2	Other approvals required for the development or activity		
	<i>A list of any approvals that must be obtained under any other Act or law before the action may be lawfully carried out, including details of the conditions of any existing approvals that are relevant to the species or population or ecological community [Sections 110(2)(j) and 110(3)(g)]</i>	Chapter 13	
	In providing a list of other approvals the following shall be included: <ul style="list-style-type: none"> Where consent is required under Part 4 of the <i>Environmental Planning and Assessment Act 1979</i>, the name of the consent authority and the timing of the development application shall be included; or Where approval is required under Part 5 of the <i>Environmental Planning and Assessment Act 1979</i>, the name of the determining authority, the basis for the approval and when the approval is proposed to be obtained shall be included. Where consent or approval is required under any other Act, the name of the consent or determining authority and the timing of the development application, basis for the approval and when the approval is proposed to be obtained shall be included 	Chapter 13	
8.3	Licensing matters relating to flora and fauna surveys		
	Persons conducting flora and fauna surveys must have appropriate licences or approvals under relevant legislation. The relevant legislation and associated licences and approvals that may be required are listed below:	Chapter 13; Appendix Z	Chapter 3, Section 3.2
	<i>National Parks and Wildlife Act 1974:</i> <ul style="list-style-type: none"> General Licence (Section 120) to harm or obtain protected fauna (this may include threatened fauna). Licence to pick protected native plants (Section 131). Scientific Licence (Section 132C) to authorise the carrying out of actions for scientific, educational or conservation purposes. 	Chapter 13; Appendix Z	

	<p><i>Threatened Species Conservation Act 1995:</i></p> <ul style="list-style-type: none"> • Licence to harm threatened animal species, and/or pick threatened plants and/or damage the habitat of a threatened species (Section 91). 	Chapter 13; Appendix Z	
	<p><i>Animal Research Act 1985:</i></p> <ul style="list-style-type: none"> • Animal Research Authority to undertake fauna surveys. 	Chapter 13; Appendix Z	
8.4	Reports of State-wide conservation status		
	Section 110(5) of the <i>Threatened Species Conservation Act 1995</i> has the effect of requiring OEH to provide available information regarding the State-wide conservation status of the subject species, populations or ecological communities, in order to satisfy ss.110(2)&(3) of the Act.	Acknowledged	
	The State-wide conservation status of all threatened species, communities and populations is detailed on the OEH threatened species website (www.threatenedspecies.environment.nsw.gov.au). Reference to these profiles can be taken to have satisfied the requirements of ss.110(2)&(3) in relation to the State-wide conservation status of the listed species, populations and ecological communities.	Acknowledged	

Appendix C

Overview and Plan of the Culburra Golf Course

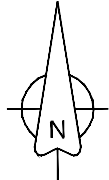


DRAWING STATUS:
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SCALE 1:4000 @ A1

REV	DESCRIPTION	DATE	DRG BY	CHKD BY
DR	DRAFT ISSUE FOR REVIEW	1/05/13	J.WILCHER	M.WYLIE
A	DA ISSUE	29/05/13	J.WILCHER	M.WYLIE
B	INCLUSION OF CART PATHS	3/06/13	J.WILCHER	M.WYLIE
C	DESIGN ADJUSTMENTS TO HOLES ADJACENT TO 7A ZONING BOUNDARY	20/06/13	J.WILCHER	M.WYLIE
D	DESIGN ADJUSTMENTS TO HOLES	17/09/13	J.WILCHER	M.WYLIE
E	DESIGN ADJUSTMENTS	11/10/13	J.WILCHER	M.WYLIE
F	ADJUSTED VEGETATIONS BOYS	26/02/14	J.WILCHER	M.WYLIE

REV	DESCRIPTION	DATE	DRG BY	CHKD BY
G	WETLAND BOUNDARIES ADJ.	1/05/15	A.MUNRO	J.WILCHER
H	OVERALL CLEARING ADJUSTED	13/11/17	PRAWAL	J.WILCHER



LEGEND

CLEARED AREAS

T108 HOLLOW BEARING TREES

EDGE OF CLEARING

CLEARED AREAS FOR CART PATHS

7(a) ZONE BOUNDARY

NOTES

1. EXTENT OF CLEARING SHALL BE SUBJECT TO FURTHER GROUND TRUTH DURING CONSTRUCTION. AREAS NOTED ON THE PLANS ARE TO BE CONSIDERED AS AN ACCURATE GUIDE ONLY. WHERE POSSIBLE ALL NOTABLE TREES WITHIN THE CLEARING EXTENTS WILL BE CONSIDERED FOR RETENTION.

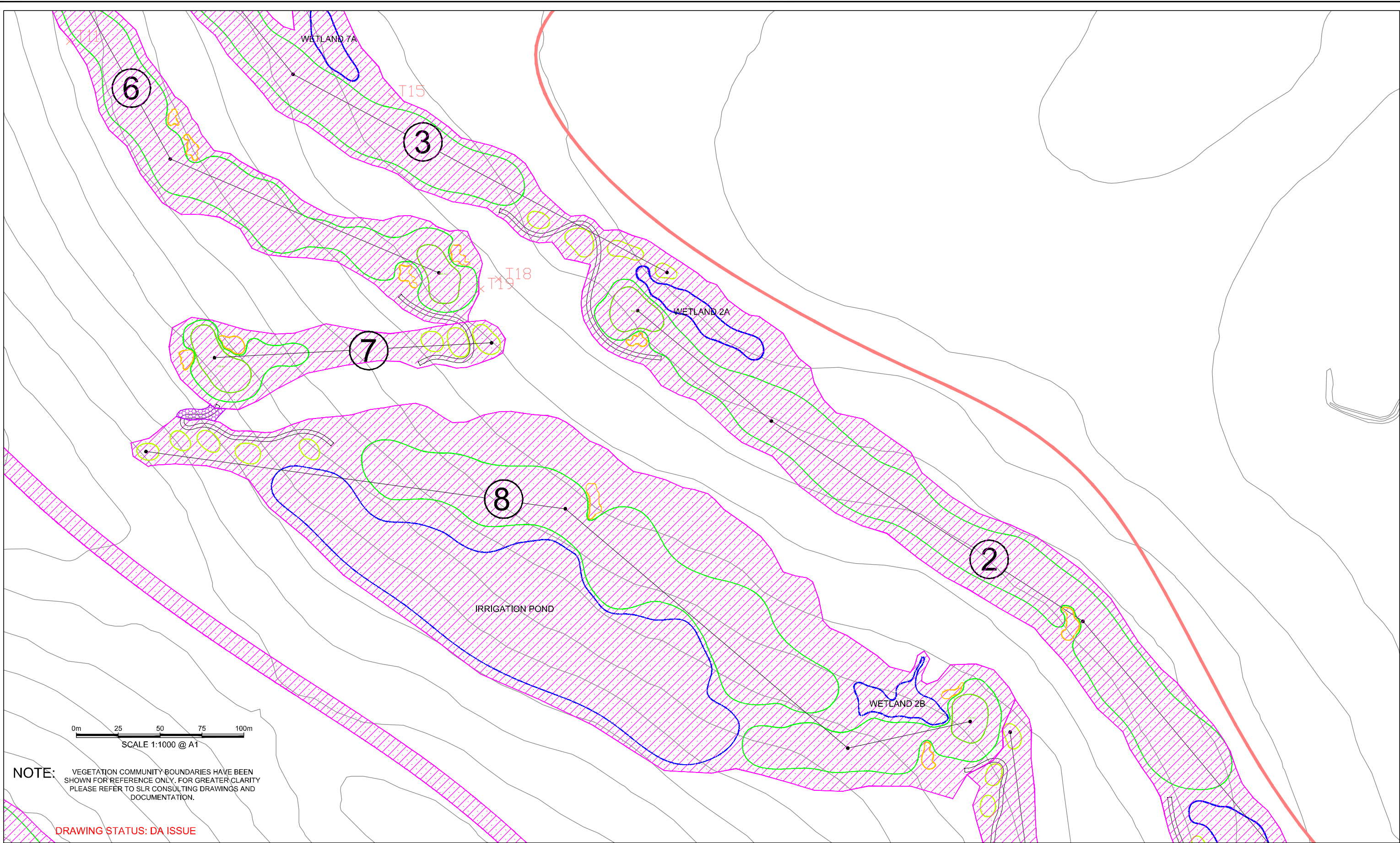
2. CART PATHS LINKING HOLES HAVE BEEN SHOWN. THESE PATHS WILL BE LOCATED ACCURATELY ON SITE DURING CONSTRUCTION TO AVOID ANY NOTABLE VEGETATION ALONG ITS ALIGNMENT.

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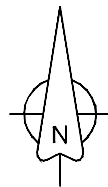
GOLF COURSE DESIGN - PROJECT MANAGEMENT - LAND PLANNING

TITLE	PROJECT	
CLEARING PLAN (INDEX SHEET)	NEW 18-HOLE GOLF COURSE AT CULBURRA	
CLIENT	DRAWING NO.	DRAWING REV
	1202-02-00	H
	SCALE	START DATE
THE HALLORAN TRUST	1:4000 (@ A1)	5th DEC 2017



REV	DESCRIPTION	DATE	DRG BY	CHKD BY
DR	DRAFT ISSUE FOR REVIEW	1/05/13	J.WILCHER	M.WYLIE
A	DA ISSUE	29/05/13	J.WILCHER	M.WYLIE
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H	OVERALL CLEARING ADJUSTED	13/11/17	PRAWAL	J.WILCHER



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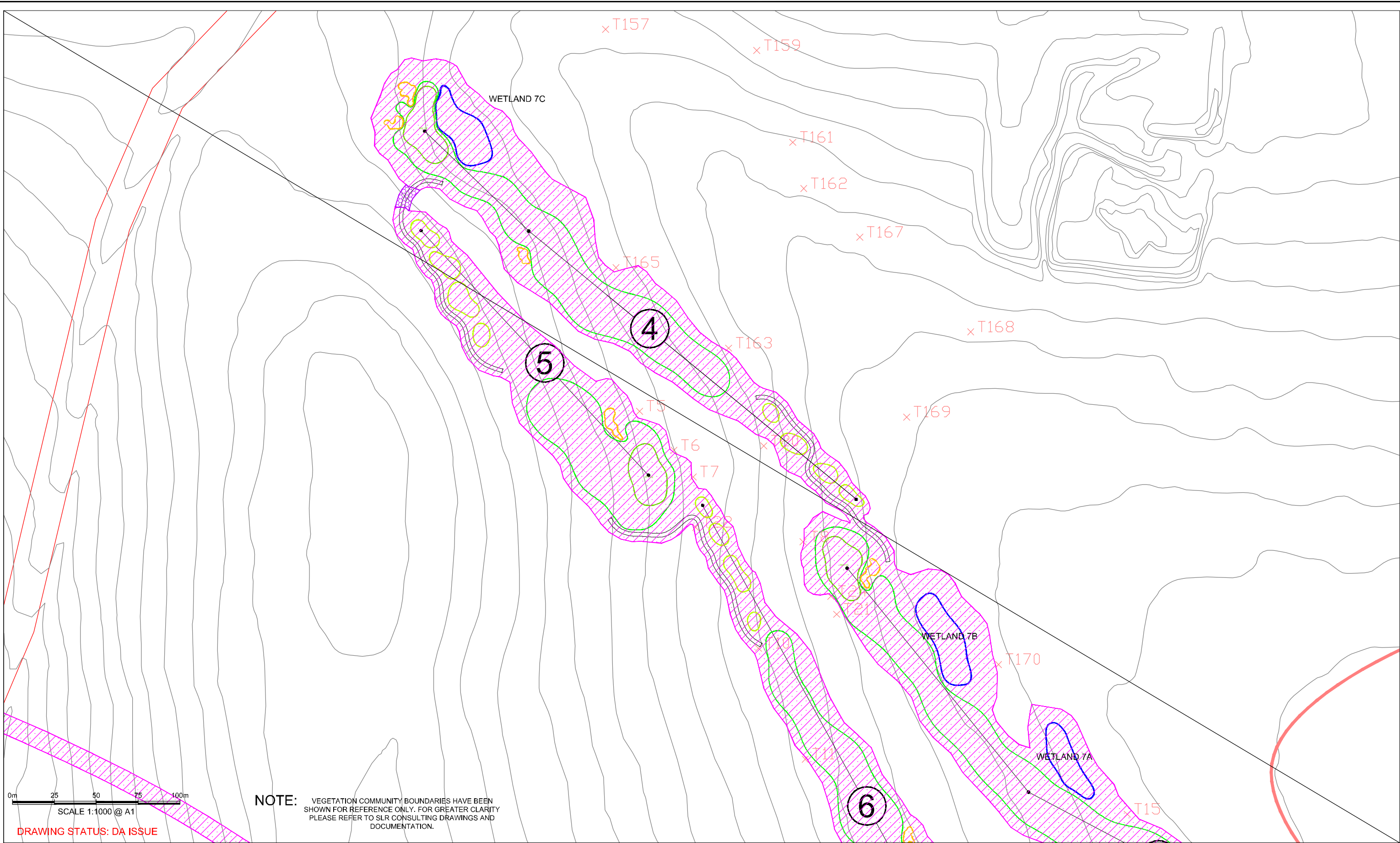
GOLF COURSE DESIGN • PROJECT MANAGEMENT • LAND PLANNING

TITLE
VEGETATION CLEARING PLAN:
HOLES 1-9 (Sheet 2 of 3)

CLIENT
THE HALLORAN TRUST

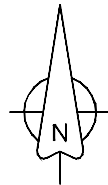
PROJECT
NEW 18-HOLE GOLF COURSE AT CULBURRA






DRAWING No.	DRAWING REV
1202-02-02	H
SCALE	START DATE
1:1000 (@ A1)	13th NOV 2017



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REV	DESCRIPTION	DATE	DRG BY	CHKD BY
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H	OVERALL CLEARING ADJUSTED	13/11/17	PRAWAL	J.WILCHER



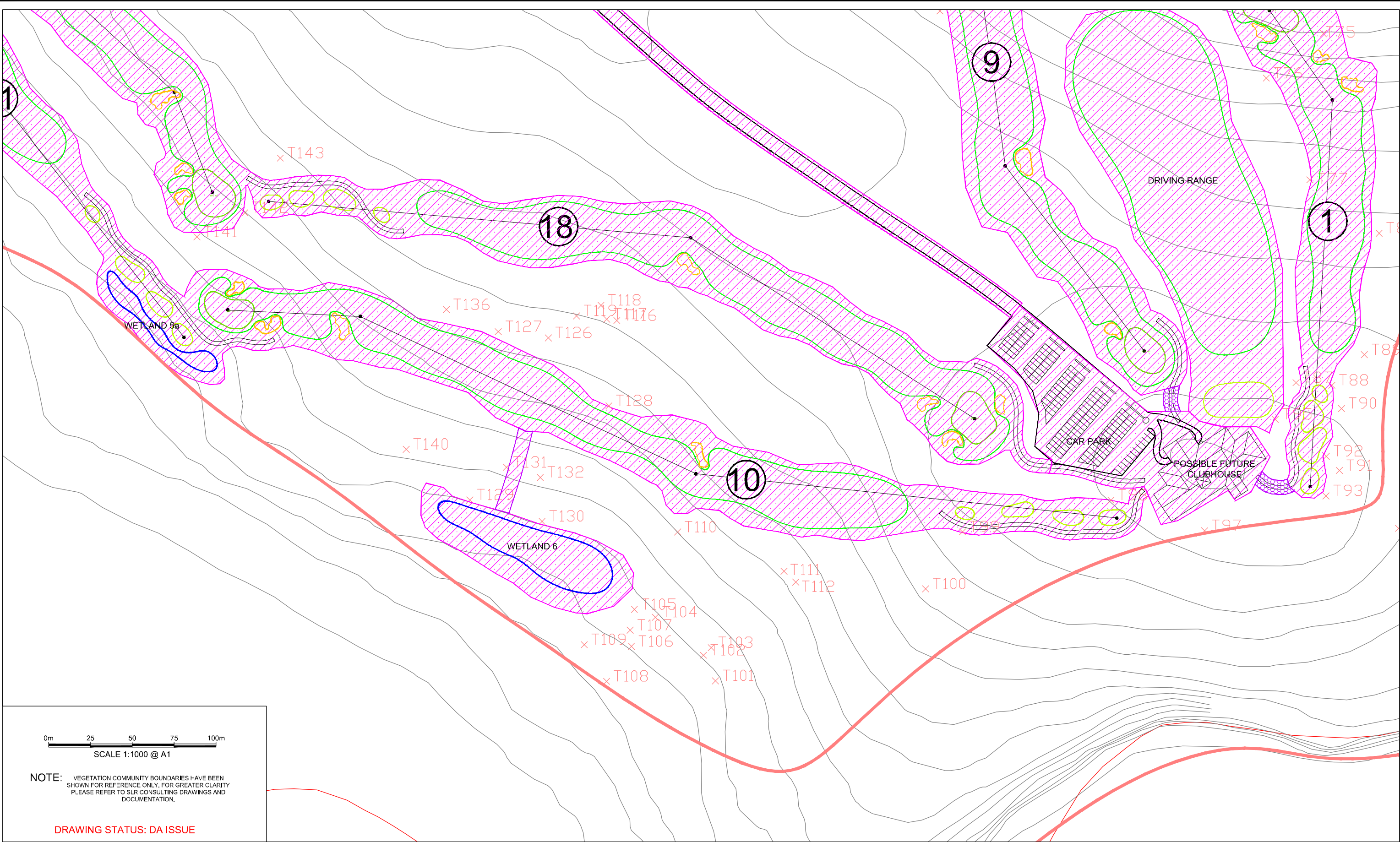
LEGEND	
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	CLEARED AREAS FOR CART PATHS
	HOLLOW BEARING TREES
	EDGE OF CLEARING
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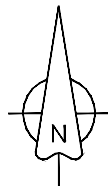
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TITLE VEGETATION CLEARING PLAN: HOLES 1-9 (Sheet 3 of 3)		PROJECT NEW 18-HOLE GOLF COURSE AT CULBURRA	
CLIENT THE HALLORAN TRUST		DRAWING No. 1202-02-03	DRAWING REV H
		SCALE 1:1000 (@ A1)	START DATE 13th NOV 2017



REV	DESCRIPTION	DATE	DRG BY	CHKD BY
DR	DRAFT ISSUE FOR REVIEW	1/05/13	J.WILCHER	M.WYLIE
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REV	DESCRIPTION	DATE	DRG BY	CHKD BY
G	WETLAND BOUNDARIES ADJ.	23/06/15	A.MUNRO	J.WILCHER
H	HOLE 10 CLEARING ADJ.	09/07/15	A.MUNRO	J.WILCHER
I	OVERALL CLEARING ADJUSTED	13/11/17	PRAWAL	J.WILCHER



LEGEND

- CLEARED AREAS
- CLEARED AREAS FOR CART PATHS
- T108 HOLLOW BEARING TREES
- EDGE OF CLEARING
- 7(a) ZONE BOUNDARY

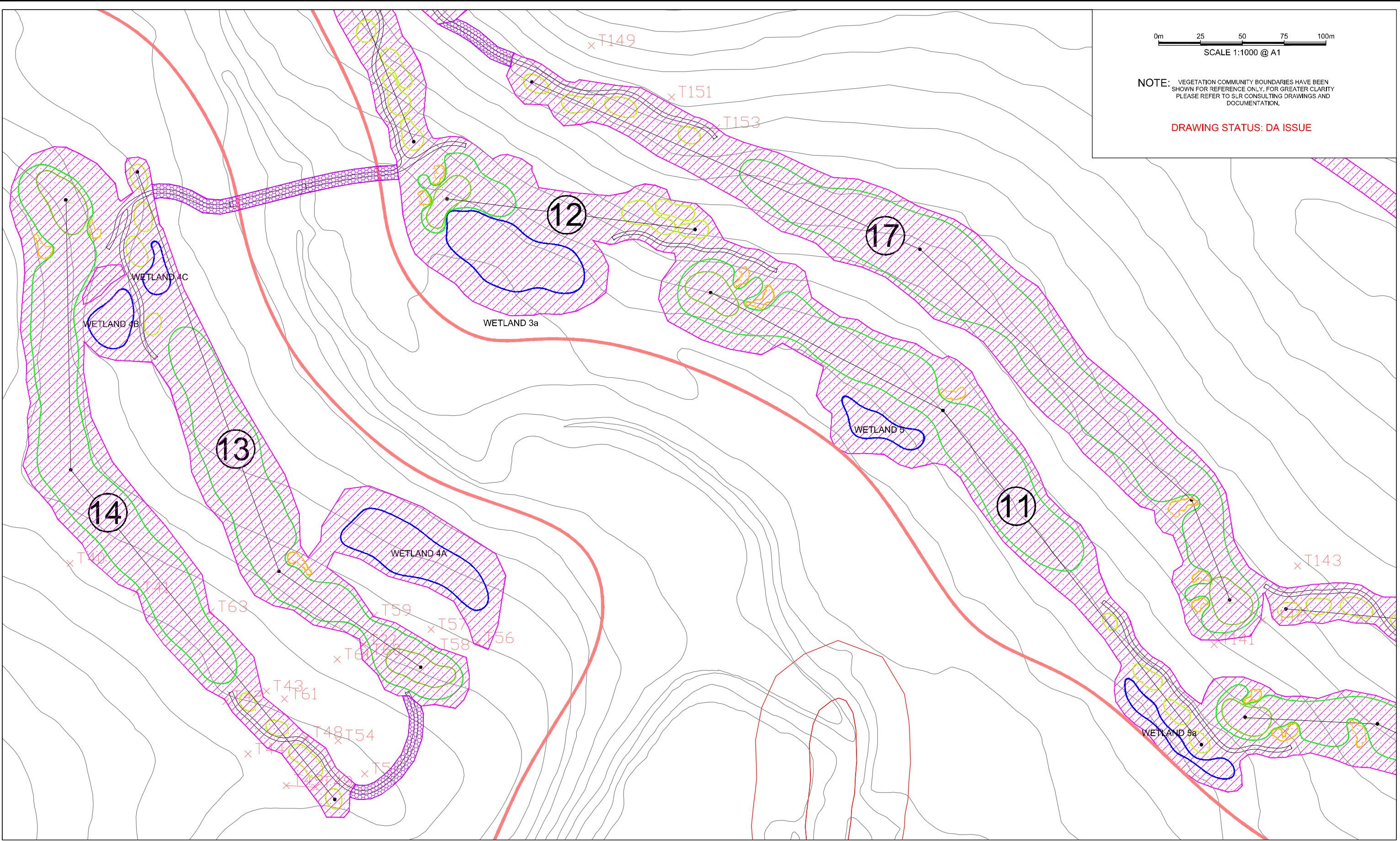
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VEGETATION CLEARING PLAN: HOLES 10 - 18 (Sheet 1 of 3)		NEW 18-HOLE GOLF COURSE AT CULBURRA	
CLIENT THE HALLORAN TRUST	DRAWING NO.	DRAWING REV	
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	SCALE	START DATE	
	1:1000 (@ A1)	13th NOV 2017	



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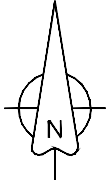
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REV	DESCRIPTION	DATE	DWG BY	CHKD BY
G	WETLAND BOUNDARIES ADJ.	23/06/15	A.MUNRO	J.WILCHER
H	OVERALL CLEARING ADJUSTED	13/11/17	PRAWAL	J.WILCHER





LEGEND

 CLEARED AREAS

 CLEARED AREAS FOR CART PATHS

 **xT108** HOLLOW BEARING TREES

 EDGE OF CLEARING

 7(a) ZONE BOUNDARY

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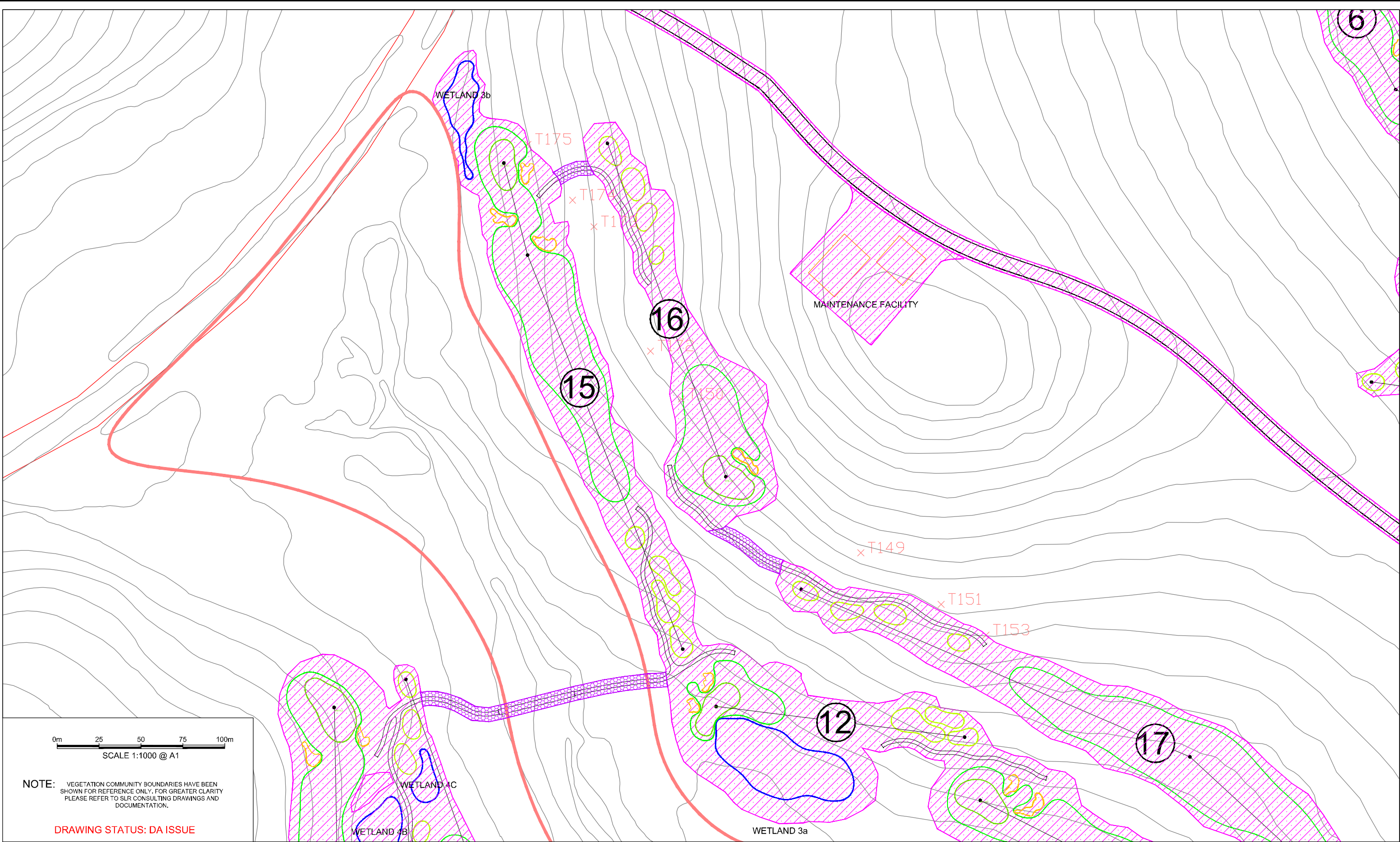
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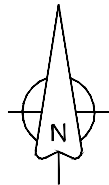
GOLF COURSE DESIGN • PROJECT MANAGEMENT • LAND PLANNING

TITLE VEGETATION CLEARING PLAN: HOLES 10 - 18 (Sheet 2 of 3)	PROJECT NEW 18-HOLE GOLF COURSE AT CULBURRA			
	CLIENT THE HALLORAN TRUST		DRAWING NO. 1202-02-05	DRAWING REV H
			SCALE 1:1000 (@ A1)	START DATE 11th NOV 2017



REV	DESCRIPTION	DATE	DRG BY	CHKD BY
DR	DRAFT ISSUE FOR REVIEW	1/05/13	J.WILCHER	M.WYLIE
A	DA ISSUE	29/05/13	J.WILCHER	M.WYLIE
B	INCLUSION OF CART PATHS	3/06/13	J.WILCHER	M.WYLIE
C	DESIGN ADJUSTMENTS TO HOLES ADJACENT TO 7A ZONING BOUNDARY	20/06/13	J.WILCHER	M.WYLIE
D	DESIGN ADJUSTMENTS TO HOLES	17/09/13	J.WILCHER	M.WYLIE
E	DESIGN ADJUSTMENTS	11/10/13	J.WILCHER	M.WYLIE
F	ADJUSTED VEGETATIONS BOYS	26/02/14	J.WILCHER	M.WYLIE

REV	DESCRIPTION	DATE	DRG BY	CHKD BY
G	WETLAND BOUNDARIES ADJ.	23/06/15	A.MUNRO	J.WILCHER
H	OVERALL CLEARING ADJUSTED	13/11/17	PRAWAL	J.WILCHER



LEGEND	
CLEARED AREAS	CLEARED AREAS FOR CART PATHS
xT108 HOLLOW BEARING TREES	
EDGE OF CLEARING	7(a) ZONE BOUNDARY

NOTES
1. EXTENT OF CLEARING SHALL BE SUBJECT TO FURTHER GROUND TRUTH DURING CONSTRUCTION. AREAS NOTED ON THE PLANS ARE TO BE CONSIDERED AS AN ACCURATE GUIDE ONLY. WHERE POSSIBLE ALL NOTABLE TREES WITHIN THE CLEARING EXTENTS WILL BE CONSIDERED FOR RETENTION.
2. CART PATHS LINKING HOLES HAVE BEEN SHOWN. THESE PATHS WILL BE LOCATED ACCURATELY ON SITE DURING CONSTRUCTION TO AVOID ANY NOTABLE VEGETATION ALONG ITS ALIGNMENT.

PREPARED BY
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GOLF COURSE DESIGN - PROJECT MANAGEMENT - LAND PLANNING

TITLE VEGETATION CLEARING PLAN: HOLES 10 - 18 (Sheet 3 of 3)		PROJECT NEW 18-HOLE GOLF COURSE AT CULBURRA	
CLIENT THE HALLORAN TRUST		DRAWING NO. 1202-02-06	DRAWING REV H
		SCALE 1:1000 (@ A1)	START DATE 13th NOV 17

Appendix D

Likelihood of Occurrence

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Myobatrachidae	<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	0	Revised SIS	Occurs in heath, woodland and open dry sclerophyll forest on a variety of soil types. Breeding habitat for this species usually contains soaks or pools within first of second order streams.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Hylidae	<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	98	DGRs, Revised SIS, Atlas 2017	The species is found in a wide range of water bodies except fast moving streams. It commonly inhabits disturbed sites such as abandoned quarries and mines, though generally breeds in habitats that include still, shallow, unpolluted water bodies, that are unshaded, contain aquatic plants are free of Mosquito fish and other predators, with a range of diurnal shelter sites (emergent aquatic vegetation).	Potential to occur. Several individuals previously recorded within the locality however only very marginal habitat present within the subject site. This species was recorded within the subject site during surveys in 1996 and 2001 however has not been recorded during targeted surveys since 2001.	Yes	No
Myobatrachidae	<i>Mixophyes balbus</i>	Stuttering Frog	E	V	0	Revised SIS	Typically found in association with permanent streams through temperate and sub-tropical rainforest, and wet sclerophyll forest. It is rarely found in dry, open, tableland, riparian vegetation, and moist gullies in dry forest.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Ardeidae	<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	0	Revised SIS	Occurs in freshwater wetlands, and more rarely, estuarine wetlands. It favours wetlands with tall, dense vegetation, and forages in shallow water up to a depth of 0.3m. It nests in deep vegetative cover over shallow pools.	Unlikely to occur. One previous record within the locality however no suitable habitat present within the subject site.	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	E	E	0	DGRs, Revised SIS	Inhabits fringes of shallow inland wetlands, swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Strigidae	<i>Ninox connivens</i>	Barking Owl	V	-	0	DGRs, Revised SIS	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Dense vegetation is used occasionally for roosting. Nests in hollows of large, old eucalypts. Hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations it becomes more reliant on birds, invertebrates and terrestrial mammals. Requires very large permanent territories in most habitats due to sparse prey densities.	Unlikely to occur. Although there is some marginal suitable habitat this species has never been recorded within the locality.	No	No
Scolopacidae	<i>Limosa lapponica</i>	Bar-tailed Godwit	-	V, M	9701	Atlas 2017	It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Burhinidae	<i>Esacus magnirostris</i>	Beach Stone-curlew	CE	-	11	DGRs, Revised SIS, Atlas 2017	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.			
Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	1	Revised Atlas 2017	SIS, Inhabits terrestrial and estuarine wetlands, generally in areas containing permanent water and dense vegetation. The species can occur in flooded grassland, woodland, rainforest, and mangroves. It feeds on frogs, reptiles, fish, and invertebrates such as snails, dragonflies, shrimp and crayfish. It roosts during the day on the ground amongst dense reeds or within trees. It nests in branches overhanging water.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Meliphagidae	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-	0	Revised SIS	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>) and Forest Red Gum (<i>E. tereticornis</i>). In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site. The subject site is also outside of their know/predicted distribution.	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Scolopacidae	<i>Limosa limosa</i>	Black-tailed Godwit	V	M	1	DGRs, Revised SIS, Atlas 2017	Found in coastal habitats such as mudflats, estuaries, bays and intertidal sandflats.	Unlikely to occur. Previously recorded within the locality and may be recorded around the foreshore of Lake Wollumboola however, no suitable habitat available within the subject site.	No	No
Anatidae	<i>Oxyura australis</i>	Blue-billed Duck	V	-	7	Revised SIS	Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. This species is completely aquatic.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Scolopacidae	<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	M	2	DGRs, Revised SIS, Atlas 2017	Occurs in sheltered parts of the coast including mudflats, harbours and lagoons.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	0	Revised SIS	Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Laridae	<i>Hydroprogne caspia</i>	Caspian Tern	-	M	97	Atlas 2017	Prefers sheltered coastal embayments but is known to occur in near-coastal or inland terrestrial wetlands. Builds nests in open areas or areas with low vegetation.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Ardeidae	<i>Ardea ibis</i>	Cattle Egret	-	M	12	Atlas 2017	Found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures	Unlikely to Occur. No suitable habitat available within the subject site.	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							and croplands, especially where drainage is poor. Will also forage at garbage dumps, and is often seen with cattle and other stock.			
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	-	M	188	Atlas 2017	Occurs in a wide variety of inland wetlands and sheltered coastal areas. Species does not breed in Australia.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Laridae	<i>Sterna hirundo</i>	Common Tern	-	M	42	Atlas 2017	Marine, pelagic and coastal habitats.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE, M	8	DGRs, Revised SIS, Atlas 2017	The Curlew Sandpiper is found in coastal areas with intertidal mudflats, including estuaries, inlets and lagoons, and ponds in salt works. The species have also occasionally been recorded inland around lakes, dams and waterholes with mud or sand present. Main requirements for feeding habitats are the presence of mudflats or shallow water up to 60mm. The Curlew Sandpiper may also forage in saltmarsh environments and flooded paddocks.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	0	Revised SIS	Occurs in grassy eucalypt woodland, open forest and riparian areas.	Unlikely to occur. No records from the locality and only marginal	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
								suitable habitat available within the subject site.		
Artamidae	<i>Artamus cyanopterus</i>	Dusky Woodswallow	V	-	1	Atlas 2017	Species inhabits dry, open eucalypt forests and woodlands with an open or sparse understory of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Has also been recorded in shrublands, heathlands, moist forest or rainforest, and farmland along the edges of forest or woodland.	Unlikely to Occur. Some habitat available however only one individual has previously been recorded within the locality.	No	No
Dasyornithidae	<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	1	Atlas 2017	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	Unlikely to Occur. Very marginal suitable habitat available and only one individual ever recorded in the locality.	No	No
Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE	1640	Atlas 2017	Prefers sheltered coasts, especially estuaries, bays, harbours, inlets and lagoons. Also known to occur in sewage farms, wetlands and mangroves. Species roosts on sandy spits and in low Saltmarsh or mangroves.	Unlikely to occur. Previously recorded within the locality and may be recorded around the foreshore of Lake Wollumboola however, no suitable habitat available within the subject site.	No	No
Psittacidae	<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V	-	5	Revised Atlas 2017	SIS, Species is a ground-dwelling parrot of coastal and sub-coastal heaths. It inhabits south-eastern Australia,	Unlikely to occur. No suitable habitat is	No	No

Table D.1 **Likelihood of occurrence for threatened fauna**

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							from southern Queensland through available within the NSW to western Victoria. It subject site. occupies high rainfall heathlands and sedgelands, generally below one metre in height, and very dense with up to 90% foliage cover. It has a home range typically of up to 10 ha, and feeds on seeds. Its nests are hidden under overhanging tall grasses, sedges, or low, heathy shrubs.			
Accipitridae	<i>Pandion cristatus</i>	Eastern Osprey	V	M	5	DGRs, Revised SIS, Atlas 2017	Found in littoral and coastal habitats and terrestrial wetlands. They generally are found in coastal areas though will travel inland along major water courses. They visit a wide range of wetland habitats including inshore waters, reefs, bays, coastal cliffs, estuaries, mangrove swamps, broad rivers, reservoirs, large lakes, and water holes. They feed on fish over clear, open water, and nest in trees or dead trees, generally within one kilometre of the ocean.	Unlikely to occur. Previously recorded within the locality and may be recorded around the foreshore of Lake Wollumboola however, no suitable habitat available within the subject site.	No	No
Petroicidae	<i>Petroica phoenicea</i>	Flame Robin	V	-	0	DGRs, Revised SIS	Breeds in upland tall, moist, eucalypt forests and woodlands, often on ridges and slopes. Ground layer of breeding habitat is dominated by native grasses. It occasionally occurs in herbfields, heathlands, shrublands, and sedgelands at high altitudes. In winter the species migrates to drier, more open habitats in the lowlands. The species forages from low perches, pouncing on	Unlikely to occur. One previous record within the locality however the subject site lacks suitable habitat for this species.	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							small invertebrates on the ground or off logs, and other coarse woody material.			
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	-	M	1	Atlas 2017	Species has been recorded throughout NSW, but mostly east of the Great Divide. The species is almost exclusively aerial in Australia and breeds overseas. It forages from a metre above the ground, up to hundreds of metres in altitude, and mostly occur over inland plains, though sometimes over foothills, and coastal areas.	Unlikely to Occur. No suitable habitat available within the subject site.	No	No
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	30	DGRs, Revised SIS, Atlas 2017	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes and in drier more open eucalypt forests and woodlands, and often found in urban areas. In NSW, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes.	Likely to occur. Species has previously been recorded within the study area. Suitable foraging and breeding habitat present.	Yes	Yes
Cacatuidae	<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	164	DGRs, Revised SIS, Atlas 2017	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) or Drooping She-oak (<i>A. verticillata</i>) occur.	Likely to occur. Species has previously been recorded within the study area. Suitable foraging and breeding habitat present.	Yes	Yes
Scolopacidae	<i>Calidris tenuirostris</i>	Great Knot	V	CE, M	0	DGRs, Revised SIS	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including	Unlikely to Occur. May be recorded around the foreshore of Lake	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							inlets, bays, harbours, estuaries and lagoons.	Wollumboola however no suitable habitat available within the subject site.		
Charadriidae	<i>Charadrius leschenaultii</i>	Greater Sand-plover	V	V, M	2	DGRs, Revised SIS, Atlas 2017	Found in coastal areas.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Charadriidae	<i>Pluvialis squatarola</i>	Grey Plover	-	M	33	Atlas 2017	Species occurs in coastal areas, preferring sheltered embayments, estuaries, lagoons with mudflats and sandflats, and occasionally on rocky coasts with reef-flats, or on reefs within muddy lagoons. Species also occurs around terrestrial wetlands near coastal lakes and swamps, or salt-lakes.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Scolopacidae	<i>Tringa brevipes</i>	Grey-tailed Tattler	-	M	34	Atlas 2017	Found on sheltered coasts with reefs and rock platforms or with intertidal mudflats.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site..	No	No
Laridae	<i>Gelochelidon nilotica</i>	Gull-billed Tern	-	M	5	Atlas 2017	Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands. They are only rarely found over the ocean.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Charadriidae	<i>Thinornis rubricollis</i>	Hooded Plover	E	V, M	2	DGRs, Revised SIS, Atlas 2017	The species inhabits coastal areas, on or near high energy sandy beaches. They are generally found	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							close to the shore but may visit coastal lakes.	suitable habitat available within the subject site.		
Petroicidae	<i>Melanodryas cucullata</i>	<i>cucullata</i> Hooded Robin (south-eastern form)	V	-	0	DGRs, Revised SIS	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Scolopacidae	<i>Gallinago hardwickii</i>	Latham's Snipe	-	M	18	Atlas 2017	Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Charadriidae	<i>Charadrius mongolus</i>	Lesser Sand-plover	V	E, M	168	DGRs, Revised SIS, Atlas 2017	Occurs in coastal areas.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Scolopacidae	<i>Numenius minutus</i>	Little Curlew	-	M	1	Atlas 2017	Species is a non-breeding visitor to NSW and has scattered records east of the Great Dividing Range. Species forages in dry grassland and sedgeland and rests around pools, river beds and water-filled tidal channels, and shallow water at the edges of billabongs.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	1	DGRs, Revised SIS, Atlas 2017	The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland, or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch.	Unlikely to occur. Marginal suitable habitat is present on the subject site. Only one record within the locality however not previously recorded within the subject site.	No	No
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	6	DGRs, Revised SIS, Atlas 2017	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	Potential to occur. There is suitable habitat present within the subject site. Although targeted surveys did not detect this species it has been recorded within the locality and might use the subject site for foraging.	Yes	Yes
Procellariidae	<i>Puffinus assimilis</i>	Little Shearwater	V	-	0	DGRs, Revised SIS, Atlas 2017	Breeding sites at Lord Howe Island include Roach Island, Muttonbird Island, Blackburn Island and on the main Island at Muttonbird Point and Transit Hill.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Laridae	<i>Sternula albifrons</i>	Little Tern	E	M	458	DGRs, Revised SIS, Atlas 2017	Occurs in sheltered coastal environments.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	-	M	3	Atlas 2017	Occurs in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. Roosting occurs on tidal mudflats, near Saltmarsh, and around inland swamps.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V	-	6	DGRs, Revised SIS, Atlas 2017	Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats.	Potential to occur. There is suitable habitat present within the subject site. Although targeted surveys did not detect this species it has been recorded within the locality and might use the subject site for foraging.	Yes	Yes
Procellariidae	<i>Macronectes halli</i>	Northern Giant-Petrel	V	V, M	1	Atlas 2017	Pelagic species with a circumpolar pelagic distribution, usually between 40-64°S in open oceans. Their range extends into subtropical waters (to 28°S) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Pachycephalidae	<i>Pachycephala olivacea</i>	Olive Whistler	V	-	0	DGRs, Revised SIS	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No

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Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							shrubs and on the ground, feeding on berries and insects.			
Pssitacidae	<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CE	CE	0	DGRs, Revised SIS	Recent records of this species in NSW are rare, but it has been recorded at Comerong Island, Shoalhaven Estuary, in June 1986. It is found in salt marshes, coastal dunes, pastures, shrub lands, estuaries, islands, beaches and moorlands within 10 km of the coast. Species utilises holes in eucalypts for nesting.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	-	M	2	Atlas 2017	The Oriental Plover is found generally inland; in open grasslands in arid and semi-arid zones; and less often in estuarine or littoral environments. This species prefers flat inland plains, sparsely vegetated short grass with hard bare ground including claypans, playing fields, lawns and cattle camps. The Oriental Plover may move to lightly-wooded grasslands with the onset of the wet season.	Unlikely to occur. No suitable habitat is available within the subject site.	No	No
Charadriidae	<i>Pluvialis fulva</i>	Pacific Golden Plover	-	M	2,374	Atlas 2017	Occurs in coastal habitats and occasionally around inland wetlands. Inland areas usually consist of wetlands with muddy margins and short emergent vegetation.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Haematopodidae	<i>Haematopus longirostris</i>	Pied Oystercatcher	E	-	80	DGRs, Revised SIS, Atlas 2017	Prefers intertidal flats of inlets and bays, open beaches and sandbanks. Nests primarily on coastal or estuarine beaches.	Unlikely to occur. No suitable habitat is available within the subject site.	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Petroicidae	<i>Petroica rodinogaster</i>	Pink Robin	V	-	0	DGRs, Revised SIS	Inhabits rainforest and tall, open, eucalypt forest, particularly in densely vegetated gullies. It catches prey by pouncing from perches to the ground, feeding on insects and spiders.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V	-	52	DGRs, Revised SIS, Atlas 2017	In NSW the Powerful Owl lives in forests and woodlands occurring in the coastal, escarpment, tablelands and western slopes environments. Specific habitat requirements include eucalypt forests and woodlands on productive sites on gentle terrain; a mosaic of moist and dry types, with mesic gullies and permanent streams; presence of leafy sub canopy trees or tall shrubs for roosting; presence of large old trees to provide nest hollows. Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials.	Potential to occur. Previous records within the locality. Suitable foraging and breeding habitat available.	Yes	Yes
Procellariidae	<i>Pterodroma solandri</i>	Providence Petrel	v	-	2	Revised Atlas 2017	SIS, Nest on the tops of Mount Gower and Mount Lidgbird and to a less extent, on the lower slopes of the mountains.	Unlikely to occur. No suitable habitat is available within the subject site.	No	No
Scolopacidae	<i>Calidris canutus</i>	Red Knot	-	E, M	630	Atlas 2017	Found on the coast in sandy estuaries with tidal mudflats.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Scolopacidae	<i>Calidris ruficollis</i>	Red-necked Stint	-	M	4,748	Atlas 2017	Species occurs in coastal areas including sheltered inlets, bays,	Unlikely to Occur. May be recorded around the	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							lagoons, mudflats, shallow wetlands, swamps and other waterbodies. Species roosts in primarily near waterbodies listed above, but also recorded at inland claypans.	foreshore of Lake Wollumboola however no suitable habitat available within the subject site.		
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	0	DGRs, Revised SIS	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes.	Potential to occur. There is suitable habitat present within the subject site despite no previous records within the locality. Targeted bird surveys have been conducted within the study area and this species has not been recorded.	Yes	No
Scolopacidae	<i>Calidris alba</i>	Sanderling	V	-	4	DGRs, Revised SIS, Atlas 2017	Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V	-	1	DGRs, Revised SIS, Atlas 2017	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Nests are often found in a dead branch in	Potential to occur. Previously recorded within the locality and suitable habitat is available within the subject site. Targeted bird surveys have been conducted within the study area and this species has not been recorded.	Yes	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							a live tree, or in a dead tree or shrub.			
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	M	1,206	Atlas 2017	Species prefers muddy edges of shallow fresh or brackish wetlands with inundated or low vegetation. Known to occur lagoons, swamps, lakes, dams, and other waterbodies. Roosts at the edges of wetlands.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Procellariidae	<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	-	M	1	Atlas 2017	Species is pelagic with breeding sites at Lord Howe Island include Roach Island, Muttonbird Island, Blackburn Island and on the main Island at Muttonbird Point and Transit Hill.	Unlikely to occur. No suitable habitat is available within the subject site.	No	No
Tytonidae	<i>Tyto tenebricosa</i>	Sooty Owl	V	-	0	DGRs, Revised SIS	Occurs in coastal rainforest, including dry, subtropical, and temperate rainforests, and moist eucalypt forests. Utilises tall trees in heavily vegetated areas for day time resting. It hunts during the night for small ground or tree dwelling mammals such as the Common Ringtail Possum or Sugar Glider. The species requires very large tree hollows for nesting.	Unlikely to occur. No recent records from the locality and no suitable habitat present within the subject site.	No	No
Haematopodidae	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	-	39	DGRs, Revised SIS, Atlas 2017	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	Unlikely to occur. No suitable habitat is available within the subject site.	No	No
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	0	Revised SIS	Occurs in communities dominated by Eucalyptus, with a grassy understorey, most commonly occurring on rocky ridges and gullies.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V	-	0	DGRs, Revised SIS	Occurs throughout mainland Australia except in densely forested or wooded habitats of the coast, escarpment, and ranges. It inhabits open grassy woodland, shrubland, and grassland. It nests in trees and preys on terrestrial mammals, birds, and reptiles, and will occasionally consume carrion.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	2	DGRs, Revised SIS, Atlas 2017	Found in a variety of timbered habitats including dry woodlands and open forests. It is a specialist hunter preying on passerine birds, especially honeyeaters and targets predominately nestlings and insects occurring in the tree canopy. It nests in tree forks or on large horizontal tree limbs located mostly along or near watercourses.	Likely to occur. Species has previously been recorded within the study area. Suitable foraging and breeding habitat present.	Yes	Yes
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	CE	28	DGRs, Revised SIS, Atlas 2017	In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as <i>Eucalyptus robusta</i> , <i>Corymbia maculata</i> , <i>C. gummifera</i> , <i>E. sideroxylon</i> , and <i>E. albens</i> . Breeds in Tasmania in spring and summer.	Potential to occur. There is suitable habitat present within the subject site. Although targeted surveys didn't detect this species it has been recorded within the locality and might use the subject site for foraging.	Yes	Yes
Scolopacidae	<i>Xenus cinereus</i>	Terek Sandpiper	V	M	0	DGRs, Revised SIS	Found on the coast in mangrove swamps, tidal mudflats and the seashore.	Unlikely to occur. No records from the locality and no suitable habitat	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
								present within the subject site.		
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V	-	0	DGRs, Revised SIS	Found at the edges of eucalypt woodland adjacent to clearings, timbered ridges and creeks in farmland. Associated with coastal scrubland, open forest and timbered grassland. Nests in hollow-bearing trees, logs or posts.	Potential to occur. No records from the locality however suitable habitat present within the subject site. Targeted bird surveys have been conducted within the study area and this species has not been recorded.	Yes	No
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	6	DGRs, Revised SIS, Atlas 2017	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Inhabits most of mainland Australia except the treeless deserts and open grasslands.	Potential to occur. There is suitable habitat present within the subject site. Although targeted surveys didn't detect this species it has been recorded within the locality and might use the subject site for foraging.	Yes	Yes
Diomedidae	<i>Diomedea exulans</i>	Wandering Albatross	E	E	1	Revised Atlas 2017	SIS, Wandering albatross spend the majority of their time in flight, soaring over the southern oceans. They breed on a number of islands just north of the Antarctic Circle including Macquarie Island (Australia).	Unlikely to occur. No suitable habitat available within the subject site.	No	No
Procellariidae	<i>Ardenna pacificus</i>	Wedge-tailed Shearwater	-	M	1	Atlas 2017	Species is pelagic with only one breeding area on the mainland.	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No
Scolopacidae	<i>Numenius phaeopus</i>	Whimbrel	-	M	249	Atlas 2017	Occurs primarily in intertidal mudflats or sheltered coasts, but	Unlikely to occur. No suitable habitat is	No	No

Table D.1 **Likelihood of occurrence for threatened fauna**

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							also occurs in sheltered coastal areas and saline or brackish lakes near the coast. Nesting usually occurs in mangroves and tall coastal trees.	available within the subject site.		
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	28	Atlas 2017	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water.	Unlikely to occur. No suitable habitat available within the subject site.	No	No
Meliphagidae	<i>Epthianura albifrons</i>	White-fronted Chat	V	-	114	DGRs, Revised SIS, Atlas 2017	This is a gregarious species generally found foraging on bare or grassy ground in wetland areas, alone or in pairs. They feed on insects, mainly flies and beetle caught on the ground or close to. It occupies foothills and slopes up to 1000 m ASL, though in coastal areas is predominately found in areas of salt marsh, and occasionally in low shrubs bordering wetland areas.	Potential to occur. No suitable habitat is available within the subject site however previous records indicate that the species may be found within the study area. Most likely to be encountered around Wollumboola Lake. This species is unlikely to be affected by the proposal.	Yes	No
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail	-	M	6	Atlas 2017	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Unlikely to occur. No suitable habitat available within the subject site. Although this species has been recorded within the study area it is a migratory species that is almost exclusively aerial.	No	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Laridae	<i>Chlidonias leucopterus</i>	White-winged Black Tern	-	M	79	Atlas 2017	Species occurs primarily in fresh, brackish or saline, and coastal or subcoastal wetlands. The species does not breed in Australian but roosts near the in branches and other debris near wetland edges.	Unlikely to Occur. May be recorded around the foreshore of Lake Wollumboola however no suitable habitat available within the subject site.	No	No
Dasyuridae	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	0	Revised SIS	Prefers dry sclerophyll open forest with a sparse groundcover of herbs, grasses, shrubs or leaf litter. Occasionally inhabits rainforest and heath. Nests and shelters in tree hollows.	Potential to occur. Suitable habitat is available within the subject site despite no previous records from the locality. Surveys were conducted to target this species across the study area however no individuals were recorded.	Yes	No
Vespertilionidae	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	10	DGRs, Revised SIS, Atlas 2017	Forages above the canopy and eats mostly moths. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Likely to occur. Previously recorded within the subject site. Suitable foraging and roosting habitat available.	Yes	Yes
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	5	DGRs, Revised SIS, Atlas 2017	Occurs along the south-east coast and ranges of Australia from Queensland to Tasmania. Prefers moist habitats with trees taller than 20 m. Species generally roosts in eucalypt hollows, but will also utilise loose bark on trees and buildings.	Likely to occur. Previously recorded within the subject site. Suitable foraging and roosting habitat available.	Yes	Yes
Molossidae	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	4	DGRs, Revised SIS, Atlas 2017	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts in tree hollows but will also roost under bark or in man-made structures.	Likely to occur. Previously recorded on the subject site in 2012 (SLR Consulting).	Yes	Yes

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
								Suitable habitat available.		
Burramyidae	<i>Cercartetus nanus</i>	Eastern Pygmy Possum	V	-	0	DGRs, Revised SIS	Species is found in a broad range of habitats from rainforest to wet and dry sclerophyll forests through to woodland and heath. Woodland and heath habitats are preferred. The species feeds on pollen and nectar from banksias, eucalypts, and bottlebrushes, though will eat soft fruits when flowers are unavailable, and will also eat insects throughout the year. They shelter in tree hollows, rotten stumps, holes in the ground, abandoned birds nests and Ringtail Possum dreys, and thickets of vegetation. Tree hollows are preferred for nesting but the species will also nest under tree bark and shredded bark in tree forks.	Potential to occur. Suitable habitat is available within the subject site despite no previous records from the locality. Surveys were conducted to target this species across the study area however no individuals were recorded.	Yes	No
Dasyuridae	<i>Dasyurus viverrinus</i>	Eastern Quoll	E	CE	0	Revised SIS	Highly flexible habitat selection, occurring in dry sclerophyll forest, scrub, heathland, pasture and even cultivated land.	Potential to occur. Only marginal habitat available. No previous records from the locality and no individuals were recorded during targeted surveys across the study area.	Yes	No
Vespertilionidae	<i>Kerivoula papuensis</i>	Golden-tipped Bat	V	-	0	DGRs, Revised SIS	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Roost mainly in rainforest gullies on small first- and	Unlikely to occur. No records from the locality and no suitable habitat present within the subject site.	No	No

Table D.1 **Likelihood of occurrence for threatened fauna**

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							second-order streams in usually abandoned hanging. Bats may also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes.			
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	4	DGRs, Revised SIS, Atlas 2017	Found mainly in the gullies and river systems that drain the Great Dividing Range. Usually roosts in tree hollows and buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects.	Likely to occur. Previously recorded within the subject site. Suitable foraging and roosting habitat available.	Yes	Yes
Pseudocheiridae	<i>Petauroides volans</i>	Greater Glider	-	V	9	Atlas 2017	Occurs in eucalypt forests and woodlands from north-eastern Queensland to the Central Highlands of Victoria. The species has a relatively small home range which consists of numerous tree hollows.	Potential to occur. Some marginally suitable habitat is available on the subject site. Despite a small number of records in the locality, there have been no previous records within the study area.	Yes	No
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	10,515	DGRs, Revised SIS, Atlas 2017	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Likely to occur. Species has previously been recorded within the subject site. Suitable foraging and breeding habitat present.	Yes	Yes

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala (combined population of Qld, NSW and the ACT)	V	V	1	Revised Atlas 2017	SIS, Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred feed species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Potential to occur. Some marginally suitable habitat is available and there has been one previous record within the locality. This species however has never been recorded within the study area.	Yes	No
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	0	DGRs, Revised SIS	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin. Found in well-timbered areas containing gullies.	Unlikely to occur. No suitable habitat available within the subject site. No previous records from the locality.	No	No
Vespertilionidae	<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	0	Revised SIS	Moist eucalypt forest, rainforest or dense coastal Banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Potential to occur. Some marginally suitable habitat is available and this species has been recorded on one occasion within the study area.	Yes	Yes
Potoroidae	<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo	V	V	0	DGRs, Revised SIS	Occurs in coastal heaths and dry and wet sclerophyll forests. Species prefers areas with a dense understorey with occasional open areas.	Unlikely to occur. No previous records within the locality and no individuals recorded during targeted surveys.	No	No
Peramelidae	<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	E	E	0	DGRs, Revised SIS	Within NSW, the species is rare and almost exclusively restricted to the coastal fringe of the state, from the southern side of the Hawkesbury River in the north to the Victorian border in the south. More specifically, the subspecies is considered to occur primarily in	Potential to occur. Only marginal habitat available. No previous records from the locality and no individuals were recorded during targeted surveys.	Yes	No

Table D.1 Likelihood of occurrence for threatened fauna

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							two areas: Ku-ring-gai Chase and Garigal National Parks; and in the far south-east corner of the state. Occurs within their distribution in a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland.			
Vespertilionidae	<i>Myotis macropus</i>	Southern Myotis	V	-	111	DGRs, Revised SIS, Atlas 2017	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Likely to occur. Previously recorded within the subject site. Only marginal roosting habitat available within the subject site.	Yes	Yes
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	0	DGRs, Revised SIS	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	Potential to occur. Only marginal habitat available. No previous records from the locality and no individuals were recorded during targeted surveys.	Yes	No
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	0	DGRs, Revised SIS	Occurs in mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Requires an abundant number of tree hollows.	Potential to occur. Suitable habitat available. No previous records from the locality and no individuals recorded within the study area during targeted surveys.	Yes	No
Dasyuridae	<i>Sminthopsis leucopus</i>	White-footed Dunnart	V	-	0	DGRs, Revised SIS	Species occurs in a range of different habitats across its distribution, including coastal dune	Potential to occur. Only marginal habitat available. No previous	Yes	No

Table D.1 **Likelihood of occurrence for threatened fauna**

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	No. Of Individuals Recorded (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
							vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest. Dens in bark nests in hollows under standing or fallen timber, burrows in the ground, piles of logging debris, in the 'skirts' of grass trees and rock crevices.	records from the locality and no individuals were recorded during targeted surveys.		
Petauridae	<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	37	DGRs, Revised SIS, Atlas 2017	Occurs in tall, mature eucalypt forest, mostly in areas with high rainfall and soil nutrients. Forest types include mixed coastal forests, dry escarpment forests, moist coastal gullies and creek flats, to tall montane forests. Feeds primarily on plant and insect exudates, including nectar, sap, honeydew, and manna, supplemented with insects to provide protein. The species dens in family groups, in hollows in large trees.	Likely to occur. Previously recorded on the subject site in 2012 by SLR consulting. Suitable habitat available.	Yes	Yes
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	0	DGRs, Revised SIS	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Likely to occur. No records available in the atlas database however previous records of this species have been documented within the subject site.	Yes	Yes

*Data obtained from the Atlas of NSW Wildlife (OEH, 2017a)

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

Table D.2 **Likelihood of occurrence for threatened flora**

Family	Scientific Name	Common Name	TSC Act	EPBC Act	No. of records (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Convolvulaceae	<i>Wilsonia backhousia</i>	Narrow-leafed Wilsonia	V	-	6	DGR's, Revised SIS, Atlas 2017	This is a species of the margins of salt marshes and lakes.	Unlikely to occur. No suitable habitat available within the subject site. Previous records are within close proximity to Wollumboola Lake.	No	No
Convolvulaceae	<i>Wilsonia rotundifolia</i>	Round-leafed Wilsonia	E	-	3	DGR's, Revised SIS, Atlas 2017	Grows in mud in coastal saltmarsh and inland saline or brackish lake beds.	Unlikely to occur. No suitable habitat available within the subject site. Previous records are within close proximity to Wollumboola Lake.	No	No
Dilleniaceae	<i>Hibbertia stricta subsp. furcatula</i>		E	-	0	Revised SIS	Habitat of the Southern Sydney population is broadly dry eucalypt forest and woodland. This population appears to occur mainly on upper slopes and above the Woronora River gorge escarpment, at or near the interface between the Lucas Heights soil landscape and Hawkesbury sandstone.	Unlikely to occur. The species has not been recorded in the locality the subject site lacks suitable.	No	No
Euphorbiaceae	<i>Chamaesyce psammogeton</i>	Sand Spurge	E		2	Atlas 2017	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (<i>Spinifex sericeus</i>) and Prickly Couch (<i>Zoysia macrantha</i>).	Unlikely to occur. No suitable habitat available within the subject site. Previous records are within close proximity to Wollumboola Lake.	No	No
Lamiaceae	<i>Prostanthera densa</i>	Villous Mint-bush	V	V	2	Atlas 2017	Villous Mintbush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Potential to occur. Previously recorded within the locality however not recorded during previous surveys of the subject site.	Yes	No
Myrtaceae	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	0	DGR's, Revised SIS, Atlas 2017	Species occurs naturally from Forster in the north to Jervis Bay in the south. It is found in rainforest on sandy soils or on sand dunes at low altitude in coastal areas. It is most commonly associated with littoral and gallery rainforest types. The species is extensively cultivated as an ornamental plant.	Unlikely to occur. The species has not been recorded in the locality and no suitable habitat is available.	No	No
Orchidaceae	<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E	E	0	DGR's, Revised SIS	Grows in dry sclerophyll forest and in moss gardens over sandstone and flowers February to March.	Unlikely to occur. The species has not been recorded in the locality and only marginal habitat is available.	No	
Orchidaceae	<i>Genoplesium vernale</i>	East Lynne Midge Orchid	V	V	0	Revised SIS	The East Lynne Midge Orchid grows in 'poorer' dry sclerophyll woodland and forest on the south coast of New South Wales between Mogo and Ulladulla. It is confined to areas with good drainage and shallow, low fertility soils.	Potential to occur. Some suitable habitat is available however this species has not been recorded during surveys of the subject site and has also never been recorded in the locality.	Yes	No

Table D.2 **Likelihood of occurrence for threatened flora**

Family	Scientific Name	Common Name	TSC Act	EPBC Act	No. of records (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
Orchidaceae	<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	V	E	0	DGR's, Revised SIS	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed.	Potential to occur. Suitable habitat available for what is currently known about the species however surveys have targeted this species within the subject site and it has not been recorded. Also not recorded in the locality.	Yes	No
Orchidaceae	<i>Pterostylis gibbosa</i>	Illawarra Greenhood	E	E	0	DGR's, Revised SIS	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum (<i>Eucalyptus tereticornis</i>), Woollybutt (<i>E. longifolia</i>) and White Feather Honey-myrtle (<i>Melaleuca decora</i>). Near Nowra, the species grows in an open forest of Spotted Gum (<i>Corymbia maculata</i>), Forest Red Gum and Grey Ironbark (<i>E. paniculata</i>). In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark (<i>E. crebra</i>), Forest Red Gum and Black Cypress Pine (<i>Callitris endlicheri</i>).	Potential to occur. Suitable habitat available however surveys have targeted this species within the subject site and it has not been recorded. Also not recorded in the locality.	Yes	No
Orchidaceae	<i>Prasophyllum affine</i>	Jervis Bay Leek Orchid	E	E	75	Revised SIS, Atlas 2017	Grows on poorly drained grey clay soils that support low heathland and sedgeland communities.	Potential to occur. The species has been recorded within the locality and some suitable habitat is available. No individuals were detected during targeted surveys	No	No
Orchidaceae	<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	1	DGR's, Revised SIS, Atlas 2017	Occur in a wide variety of habitats including heathlands, heathy woodlands, sedgelands, <i>Xanthorrhoea spp.</i> plains, dry sclerophyll forests (shrub/grass sub-formation and shrubby sub-formation), forested wetlands, freshwater wetlands, grasslands, grassy woodlands, rainforests and wet sclerophyll forests. Soils are generally considered to be moist and sandy, however, this species is also known to grow in dry or peaty soils. Is associated with the community Bloodwood / Scribbly Gum / Silver-top Ash Forest on the South Coast. Species is known to have occurrence associated with other <i>Cryptostylis</i> species. Flowering occurs generally from November to February.	Potential to occur. The species has been recorded within the locality and some suitable habitat is available. No individuals were detected during targeted surveys	Yes	No
Orchidaceae	<i>Calochilus pulchellus</i>	Pretty Beard Orchid	E	-	0	DGR's, Revised SIS	The species has a cryptic nature, with a single leaf present above ground for only a few months and a flowering stem that lasts for a few days or a week. At Vincentia the species grows in low Scribbly Gum dominated woodland with a low wet heath understorey. The soil is a sandy loam overlying sandstone. In Booderee National Park it grows in a tall heathy association. In Morton National Park on the Little Forest Plateau it occurs in low heath among scattered clumps of emergent eucalypts and Banksia in shallow coarse white sand over sandstone, in a near-escarpment area subject to strong orographic precipitation.	Unlikely to occur. The species has not been recorded in the locality the subject site lacks suitable.	No	No
Orchidaceae	<i>Caladenia tessellate</i>	Thick-lip Spider Orchid	E	V	0	DGR's, Revised SIS	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Potential to occur. Marginal habitat available however surveys have	Yes	No

Table D.2 Likelihood of occurrence for threatened flora

Family	Scientific Name	Common Name	TSC Act	EPBC Act	No. of records (Atlas Database)	Source	Habitat Requirements	Likelihood of Occurrence	Subject Species	Affected Species
								targeted this species within the subject site and it has not been recorded. Also not recorded in the locality.		
Orchidaceae	<i>Pterostylis ventricosa</i>		CE	-	0	DGR's, Revised SIS	Predominantly in more open areas of tall coastal eucalypt forest often dominated by one or more of the following tree species:- Turpentine, Spotted Gum, Grey Ironbark, Blackbutt, White Stringybark, Scribbly Gum and Sydney Peppermint. Often favours more open areas such as along powerline easements and on road verges where the tree overstorey has been removed or thinned. Grows in a range of groundcover types, including moderately dense low heath, open sedges and grasses, leaf litter, and mosses on outcropping rock.	Potential to occur. Marginal habitat available however surveys have targeted this species within the subject site and it has not been recorded. Also not recorded in the locality.	Yes	No
Poaceae	<i>Distichlis distichophylla</i>	Australian Saltgrass	E	-	2	Atlas 2017	A coloniser of damp saline soils; found at the edges of salt marshes and on low dunes. Flowers and sets seed in late spring and summer.	Unlikely to occur. The species has not been recorded in the locality and no suitable habitat is available.	No	No
Rubiaceae	<i>Galium australe</i>	Tangled Bedstraw	E	-	0	DGR's, Revised SIS	In NSW (and ACT Territory in Jervis Bay), Tangled Bedstraw has been recorded in Turpentine forest and coastal Acacia shrubland.	Unlikely to occur. The species has not been recorded in the locality and no suitable habitat is available.	No	No

*Data obtained from the Atlas of NSW Wildlife (OEH, 2017a)
TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

Appendix E

**Assessment of Significance of Likely Effect of
Proposed Action**

E.1 Introduction

Assessments of significance determine whether there is likely to be a significant impact on any threatened ecological community, flora or fauna in order to determine whether the preparation of a SIS is required. Once avoidance, mitigation and compensation measures are considered, these assessments can be repeated in order to assess if there are residual significant impacts. This has been done for all TECs and threatened species identified as affected species.

E.2 Threatened Ecological Communities

E.2.1 Bangalay Sand Forest

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

There will be no clearing of vegetation within this community. It is therefore unlikely that the proposed action will have an adverse effect on the extent or the composition of the ecological community, such that its local occurrence is likely to be placed at risk of extinction.

The proposed development is unlikely to substantially and adversely modify the composition of the community as it is located outside of the subject site and within a direct interface to the proposed development.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and Threatened Species Assessment Guidelines, August 2007

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

There will be no removal, fragmentation or isolation of habitat for this community. Any potential indirect impacts, which could result in modification of habitat, will be managed and monitored in perpetuity, with corrective actions to be undertaken, should such modification occur. It is anticipated that the ecological value of this community within the study area will be improved in the long-term, due to active management under a VMP. The vegetation mapping by OEH in 2013 (Shoalhaven_EECs_v2_E_3901) mapped 7,188 ha of this community within the Shoalhaven, Eurobodalla and Bega Valley LGAs (OEH, 2013). The 3.66 ha of this community within the study area constitutes 0.05% of this community within the locality. Therefore, even in the unlikely event of indirect impacts, this small patch is not important to the long-term survival of this community.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for Bangalay Sand Forest has been identified by OEH.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan has not been prepared for Bangalay Sand Forest and no threat abatement plans are relevant to this community within the study area.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The main threats to this community comprise land clearing, degradation and disturbance associated with heavy recreational use, frequent burning, rubbish dumping and weed invasion. The proposed action does not constitute or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process. Due to regular management and maintenance, these key threatening processes will be reduced and/or managed.

Conclusion

No area of Bangalay Sand Forest is proposed to be removed within the subject site. Given that no area of this community is proposed to be cleared and the implementation of the VMP within the retained vegetation, the proposed development is not considered to have a significant impact on Bangalay Sand Forest and therefore no species impact statement is required.

E.2.2 Coastal Saltmarsh

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

There will be no clearing of vegetation within this community. Additionally, management plans have been put into place to ensure that runoff from the proposed development does not have an adverse effect on this community. It is therefore unlikely that the proposed action will have an undesirable effect on the extent or the composition of the ecological community, such that its local occurrence is likely to be placed at risk of extinction.

The proposed development is unlikely to substantially and adversely modify the composition of the community as it is located outside of the subject site and within a direct interface to the proposed development.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and Threatened Species Assessment Guidelines, August 2007

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

There will be no removal, fragmentation or isolation of habitat for this community. Any potential indirect impacts which could result in modification of habitat will be managed and monitored in perpetuity, with corrective actions to be undertaken, should such modification occur. It is anticipated that the ecological value of this community within the study area will

be improved in the long-term, due to active management under a VMP. The vegetation mapping by OEH in 2013 (Shoalhaven_EECs_v2_E_3901) mapped 2,052 ha of this community within the Shoalhaven, Eurobodalla and Bega Valley LGAs (OEH, 2013). The 4.22 ha of this community within the study area constitutes 0.2% of this community within the locality. Therefore, even in the unlikely event of indirect impacts, this small patch is not important to the long-term survival of this community.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for Coastal Saltmarsh has been identified by OEH.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan has not been prepared for Coastal Saltmarsh and no threat abatement plans are relevant to this community within the study area.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The main threats to this community comprise infilling, modified tidal flow, weed invasion, damage by domestic and feral animals, human disturbance, altered fire regimes, encroachment by mangroves, discharge of stormwater, changes in salinity regimes, increase in nutrient levels and climate change. If these potential impacts are managed before, during and after construction and the proposed management plans are adhered to, it is unlikely that the proposed action constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process. Therefore, it is paramount that the proposed management plans include actions specific to this community in order to prevent these indirect impacts occurring.

Conclusion

No area of Coastal Saltmarsh is proposed to be removed within the subject site. Given that no area of this community is proposed to be cleared and the implementation of the VMP within the retained vegetation, the proposed development is not considered to have a significant impact on Coastal Saltmarsh and therefore no species impact statement is required.

E.2.3 Swamp Sclerophyll Forest

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The proposed action will result in the removal of 7.92 ha of this community. This is equal to approximately 20% of the current extent of this community within the study area. The retained extent of this community will be managed through the implementation of the VMP.

Within the subject site, a substantial change will occur to the composition of the community, as it will be entirely removed. There is potential for changes to species composition in the area of this community at the interface to the proposed development. These changes are expected to be localised and overall are not considered to cause a substantial change in species composition.

Given the small area of this community proposed to be cleared within the study area, in conjunction with the proposed mitigation of indirect impacts, the removal and potential modification of vegetation through direct and indirect impacts is not considered to place the local occurrence of the community at risk of extinction.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and Threatened Species Assessment Guidelines, August 2007

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The removal of 7.92 ha of this community will not further fragment or isolate this community, since the retained vegetation is contiguous with large areas of adjacent native vegetation. Any potential indirect impacts which could result in modification of habitat will be managed and monitored in perpetuity, with corrective actions to be undertaken, should such modification occur. It is anticipated that the ecological value of the retained areas of this community within the study area will be improved in the long-term, due to active management under a VMP. The vegetation mapping by OEH in 2013

(Shoalhaven_EECs_v2_E_3901) mapped 3,224 ha of this community within the Shoalhaven, Eurobodalla and Bega Valley LGAs (OEH, 2013). The 32 ha of this community within the study area constitutes 0.99% of this community within the locality. The 7.92 ha to be cleared constitutes 0.25% of this community in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for Swamp Sclerophyll Forest has been identified by OEH.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan has not been prepared for Swamp Sclerophyll Forest and no threat abatement plans are relevant to this community within the study area.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The main threats to this community comprise clearing, continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic livestock and feral animals including pigs, activation of 'acid sulfate soils', removal of dead wood and rubbish dumping. While the proposed action includes clearing of a small patch of this community, the on-site and off-site offsets are considered to improve the protection and long-term survival of this community in the locality. The offset liability calculations under NSW BioBanking scheme are based on the "maintain and improve" principle. Due to regular management and maintenance, the other key threatening processes will be reduced and/or managed.

Conclusion

The proposed development will involve the removal of a small area of Swamp Sclerophyll Forest, and may also involve the indirect impacts to the retained portions of the community. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a VMP will assist in the mitigation of indirect impacts to the community as well as increasing the biodiversity values of the retained extent of the community within the study area. As a result, the proposed development is not considered to have a significant impact on Swamp Sclerophyll Forest and therefore no species impact statement is required.

E.3 Swamp Oak Floodplain Forest

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The proposed action will result in removal of 2.24 ha of this community. This is equal to approximately 6% of the current extent of this community within the study area. The retained extent of this community will be managed through the implementation of the VMP.

Within the subject site, a substantial change will occur to the composition of the community, as it will be entirely removed. There is potential for changes to species composition in the area of this community at the interface to the proposed development. These changes are expected to be localised and overall are not considered to cause a substantial change in species composition.

Given the small area of this community proposed to be cleared within the study area, in conjunction with the proposed mitigation of indirect impacts, the removal and potential modification of vegetation through direct and indirect impacts is not considered to place the local occurrence of the community at risk of extinction.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and Threatened Species Assessment Guidelines, August 2007

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The removal of 2.24 ha of this community will not further fragment or isolate this community, since the retained vegetation is contiguous with large areas of adjacent native vegetation. Any potential indirect impacts which could result in modification of habitat will be managed and monitored in perpetuity, with corrective actions to be undertaken, should such modification occur. It is anticipated that the ecological value of the retained areas of this community within the study area will be improved in the long-term, due to active management under a VMP. The vegetation mapping by OEH in 2013 (Shoalhaven_EECs_v2_E_3901) mapped 6,125 ha of this community within the Shoalhaven, Eurobodalla and Bega Valley LGAs (OEH, 2013). The 40 ha of this community within the study area constitutes 0.65% of this community within the locality. The 2.24 ha to be cleared constitutes 0.04% of this community in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for Swamp Oak Floodplain Forest has been identified by OEH.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan has not been prepared for Swamp Oak Floodplain Forest and no threat abatement plans are relevant to this community within the study area.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The main threats to this community comprise clearing, alteration to hydrological flow regimes, invasion of exotic perennial grasses, anthropogenic climate change and high fire frequency. While the proposed action includes clearing of a small patch of this community, the on-site and off-site offsets are considered to improve the protection and long-term survival of this community in the locality. The offset liability calculations under NSW BioBanking scheme are based on the “maintain and improve” principle. Due to regular management and maintenance, the other key threatening processes will be reduced and/or managed.

Conclusion

The proposed development will involve the removal of a small area of Swamp Oak Floodplain Forest, and may also involve the indirect impacts to the retained portions of the community. The habitat to be cleared or modified represents a small portion of the available habitat within the study area and locality. Implementation of a VMP will assist in the mitigation of indirect impacts to the community as well as increasing the biodiversity values of the retained extent of the community within the study area. As a result, the proposed development is not considered to have a significant impact on Swamp Oak Floodplain Forest and therefore no species impact statement is required.

E.4 Threatened Fauna

E.4.1 Blossom-dependent Birds

The following Assessment of Significance has been prepared as a composite test for nectarivorous bird species listed under the TSC Act that are known to or are likely to occur within the Study Area. These include the following:

- Little Lorikeet
- Swift Parrot

- a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Neither the Little Lorikeet or Swift Parrot have been recorded within the study area however both species have been recorded in connected areas of habitat within the locality. The local populations of these species are considered to extend beyond the study area and have both been assessed as viable.

The proposed development will remove potential habitat for the Little Lorikeet and Swift Parrot. These species are highly mobile and are considered likely to utilise habitat resources throughout the locality and within adjacent National Parks and private land. These areas will continue to provide suitable breeding and foraging habitat for the Little Lorikeet and suitable foraging habitat for the Swift Parrot, as it migrates to Tasmania for breeding. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

- d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents potential foraging habitat for both the Little Lorikeet and Swift Parrot. This includes a 32.36 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for these species within the study area. Some fragmentation will occur between patches of vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, all of these species are highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for these species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for these species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

A National recovery Plan has been developed for the Swift Parrot. The plan considers the conservation requirements of the species across its range, identifies the actions to be taken to ensure its long-term viability in nature and the parties who will undertake these actions.

No recovery plan has been developed for the Little Lorikeet.

Additionally, no threat abatement plans are relevant for these species.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following Key Threatening Processes (KTPs) are relevant to these species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for the species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of nesting habitat for some species;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important ground foraging and nesting habitat;
- 'Competition from feral honey bees (*Apis mellifera*)' as they compete with native fauna for tree hollows and floral resources; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some potential habitat for the Little Lorikeet and Swift Parrot will be cleared and clearing is a KTP for both of these species. However, the majority of habitat will be retained within the study area and actively managed via a VMP. On the balance, the impacts of clearing will be counter balance by regeneration of habitats conserved in the study area.

Conclusion

The proposed development will result in the direct loss of potential foraging habitat for the Little Lorikeet and Swift Parrot, and potential breeding habitat for the Little Lorikeet. Given that the species are highly mobile and are likely to utilise numerous habitat resources within the locality, the species are considered to remain viable within the locality and their ranges. The removal and possible modification of potential habitat for the Little Lorikeet and Swift Parrot is not considered to result in a significant impact to either of these species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, some of which are relevant to these species.

E.4.2 Varied Sittella

- a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The Varied Sittella has not been recorded within the study area however has been recorded in connected areas of habitat within the locality. The local populations of this species are considered to extend beyond the study area and have been assessed as viable.

The proposed development will remove potential habitat for the Varied Sittella. This species is highly mobile and is considered likely to utilise habitat resources throughout the locality and within adjacent National Parks and private land. These areas will continue to provide

suitable breeding and foraging habitat for this species. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of this species such that a viable local population is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The area of habitat to be removed within the subject site represents potential foraging habitat for the Varied Sittella. This includes 32.36 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for this species within the study area. Some fragmentation will occur between patches of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, this species is highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for this species as extensive areas of suitable habitat occur

within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for this species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

A recovery plan has not been developed for this species and no threat abatement plans are relevant.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following KTPs are relevant to this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for the species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of nesting habitat for some species;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important ground foraging and nesting habitat;
- 'Invasion of native plant communities by exotic perennial grasses' as this results in the loss of key food plants and habitat and encourages flock-foraging species;
- Predation by the European Red Fox, *Vulpes vulpes* as they pose a major threat to the survival of native Australian fauna, with non-flying mammals and ground-nesting birds at greatest risk;
- 'Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa*' as wallowing and rooting causes direct disturbance to habitats and may increase erosion;
- 'Competition and grazing by the feral European rabbit, *Oryctolagus cuniculus*' as they compete with native fauna for resources, alter the structure and composition of vegetation, and degrade the land;
- 'Competition from feral honey bees (*Apis mellifera*)' as they compete with native fauna for tree hollows and floral resources; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some potential habitat for the Varied Sittella will be cleared and clearing is a KTP for this species. However, the majority of habitat will be retained within the study area and actively managed via a VMP. On the balance, the impacts of clearing will be counter balance by regeneration of habitats conserved in the study area.

Conclusion

The proposed development will result in the direct loss of potential habitat for the Varied Sittella. Given that this species is highly mobile and is likely to utilise numerous habitat resources within the locality, it is considered to remain viable within the locality and its ranges. The removal and possible modification of potential habitat for the Varied Sittella is not considered to result in a significant impact to the species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, some of which are relevant to the Varied Sittella.

E.4.3 Cockatoos

The following Assessment of Significance has been prepared as a composite test for Cockatoos listed under the TSC Act that are known to or are likely to occur within the study area. These include the following:

- Glossy Black-cockatoo; and
- Gang-gang Cockatoo.

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Glossy Black-cockatoo and Gang-gang Cockatoo have been recorded within the study area as well as in adjoining connected areas of habitat. The local populations of these species are considered to extend beyond the study area. The local populations of these species have been assessed as viable.

The proposed development will remove an area of known habitat for the Glossy Black-cockatoo and Gang-gang Cockatoo. Large hollow-bearing trees within the subject site may provide breeding habitat for the Glossy Black-cockatoo. These species are highly mobile and are considered likely to utilise habitat resources throughout the locality within National Parks and private land. These areas will continue to provide breeding habitat for the Glossy Black-cockatoo species. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents known foraging and potential breeding habitat for both the Gang-gang Cockatoo and Glossy Black Cockatoo. This includes 32.36 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for these species within the study area. Some fragmentation will occur between patches of treed vegetation and additionally the loss of some ecotonal habitat. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, both of these species are highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for these species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for these species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

A recovery plan has not been developed for these species and no threat abatement plans are relevant.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following KTPs are relevant to these species within the study area:

- “Clearing of native vegetation’ as this reduces the area of forage and nesting habitat available for the species;
- ‘Loss of hollow-bearing trees’ as this reduces the abundance of nesting habitat;
- ‘Removal of dead wood and dead trees’ as this reduces the abundance of important nesting habitat;
- ‘Competition from feral honey bees (*Apis mellifera*)’ as they compete with native fauna for tree hollows and floral resources; and
- ‘Anthropogenic climate change’ as this can reduce the geographic range of species and alter the structure and composition of communities.

The majority of habitat for this species is within the retained areas of vegetation within the study area. It is expected that conservation management actions via the VMP will reduce the KTPs on such habitats within the study area. Although some areas will be cleared, a key threatening process, sustainable areas will be retained and managed for conservation, offsetting the impacts of clearing.

Conclusion

The proposed development will result in the direct loss known habitat for the Glossy Black-cockatoo and Gang-gang Cockatoo. Given that the species are highly mobile and are likely to utilise numerous habitat resources within the locality, the species are considered to remain viable within the locality and their ranges.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, some of which are relevant to these species. The measures will assist in addressing the impacts to these species, including addressing the loss of woodland and forest habitat.

E.4.4 Forest Owls

The following Assessment of Significance has been prepared as a composite test for owls listed under the TSC Act that are known to or are likely to occur within the study area. These include the following:

- Masked Owl; and
- Powerful Owl.

- a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Neither the Masked Owl or Powerful Owl have been recorded within the subject site, however both species have been recorded in connected areas of habitat within the locality. The local populations of these species are considered to extend beyond the study area and have both been assessed as viable.

The proposed development will remove an area of potential habitat for the Masked Owl and Powerful Owl. Large hollow-bearing trees within the study area have been avoided during the design of the subject site and as such potential breeding habitat is unlikely to be effected by the proposed development. These species are highly mobile and are considered likely to utilise habitat resources throughout the locality and within adjacent National Parks. These areas will continue to provide breeding habitat for the Masked Owl and Powerful Owl. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

- d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents potential foraging and breeding habitat for these species. This includes 32.36 ha of forest and woodland vegetation..

The proposed development is not considered to significantly increase fragmentation of habitat for these species within the study area. Some fragmentation will occur between patches of treed vegetation and additionally the loss of some ecotonal habitat. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, both of these species are highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for these species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for these species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

The *Recovery Plan for Large Forest Owls* (DEC (NSW), 2006), which include the Powerful Owl and Masked Owl, contains a number of objectives with the overall aim to ensure that viable populations of the large forest owls continue in the wild in NSW in each region where they presently occur. Although potential habitat for this species will be removed within the subject site, the consideration of impacts to this species is consistent with the plan.

No threat abatement plans are relevant to these species.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following KTPs are relevant to these species within the Study Area:

- Clearing of native vegetation as this reduces the area of forage and nesting habitat available for this species;
- Loss of hollow-bearing trees as this reduces the abundance of nesting habitat;

- Removal of dead wood and dead trees as this reduces the abundance of important ground foraging and nesting habitat;
- Competition and grazing by the feral European rabbit, *Oryctolagus cuniculus* as they compete with native fauna for resources, alter the structure and composition of vegetation, and degrade the land;
- Competition from feral honey bees (*Apis mellifera*) as they compete with native fauna for tree hollows and floral resources; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some forest will be cleared and as a result hollow-bearing trees will be lost. This relates to two KTPs for these species. However, the majority of the habitats for these species will be retained within the study area and actively managed for conservation under a VMP.

Conclusion

The proposed development will result in the direct loss of potential habitat for the Masked Owl and Powerful Owl. Given that the species are highly mobile and are likely to utilise numerous habitat resources within the locality, the species are considered to remain viable within the locality and their ranges. The removal and possible modification of potential habitat for these species is not considered to result in a significant impact to either of these species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, some of which are relevant to these species.

E.4.5 Square-tailed Kite

- a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The Square-tailed Kite has been recorded within the study area as well as in connected areas of habitat within the locality. The local populations of this species are considered to extend beyond the study area and have been assessed as viable.

The Project will remove an area of known habitat for the Square-tailed Kite. Large remnant trees within the study area may provide breeding habitat for these species. A nesting site has been identified for the Square-tailed Kite adjacent to the subject site; however this will not be directly impacted by the proposed development. This species is highly mobile and considered likely to utilise habitat resources throughout the locality and within adjacent National Parks. These areas will continue to provide breeding habitat for the Spotted Square-tailed Kite. Accordingly, the Project is not considered to have an adverse effect on the life cycle of this species such that a viable local population is likely to be placed at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

- d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents known breeding and foraging habitat for the Square-tailed Kite. This includes 32.36 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for this species within the study area. Some fragmentation will occur between patches of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, this species is highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for this species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for this species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

A recovery plan has not been developed for this species and no threat abatement plans are relevant.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following KTPs are relevant to this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for this species;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important nesting habitat; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some potential habitat for the Square-tailed Kite will be cleared and clearing is a KTP for this species. However, the majority of habitat will be retained within the study area and actively managed via a VMP. On the balance, the impacts of clearing will be counter balance by regeneration of habitats conserved in the study area.

Conclusion

The proposed development will result in the direct loss of potential habitat for the Square-tailed Kite. Given that this species is highly mobile and is likely to utilise numerous habitat resources within the locality, it is considered to remain viable within the locality and its ranges. The removal and possible modification of potential habitat for the Square-tailed Kite is not considered to result in a significant impact to the species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, which are relevant to the Square-tailed Kite.

E.4.6 Yellow-bellied Glider

Assessment of Significance

- a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The Yellow-bellied Glider has been recorded within the study area as well as in connected areas of habitat within the locality. The local populations of this species are considered to extend beyond the study area and have been assessed as viable.

The Yellow-bellied Glider will primarily be impacted by the proposed development through direct removal of habitat within the subject site. The habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality. Sufficient habitat will be retained within the study area and an extensive area of habitat is conserved within National Parks and private land in the locality. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of this species such that a viable local population is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

d) In relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents known habitat for the Yellow-bellied Glider. This includes 32.36.65 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for this species within the study area. Some fragmentation will occur between

patches of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat for this species. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, this species is highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for this species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat for this species has been identified by OEH.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,

A recovery plan has not been developed for this species and no threat abatement plans are relevant.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following KTPs are relevant to this species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for this species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of nesting habitat;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important nesting habitat; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some potential habitat for the Yellow-bellied Glider will be cleared and clearing is a KTP for this species. However, the majority of habitat will be retained within the study area and actively managed via a VMP. On the balance, the impacts of clearing will be counter balance by regeneration of habitats conserved in the study area.

Conclusion

The proposed development will result in the direct loss of potential habitat for the Yellow-bellied Glider. Given that this species is highly mobile and is likely to utilise numerous habitat resources within the study area and wider locality, the Yellow-bellied Glider is considered to remain viable within the locality and its ranges. The removal and possible modification of

potential habitat for the Yellow-bellied Glider is not considered to result in a significant impact to the species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, some of which are relevant to the Yellow-bellied Glider.

E.4.7 Grey-headed Flying-fox

Assessment of Significance

- a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The Grey-headed Flying-fox has been recorded within the study area as well as in connected areas of habitat within the locality. There are no Grey-headed Flying-fox camps within the study area. The local populations of this species are considered to extend beyond the study area and have been assessed as viable. There are

The Grey-headed Flying-fox will primarily be impacted by the proposed development through direct removal of foraging habitat within the subject site. The habitat to be impacted within the subject site is not considered important for the long-term survival of the species within the locality. Sufficient habitat will be retained within the study area and an extensive area of habitat is conserved within National Parks and private land in the locality. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of this species such that a viable local population is likely to be placed at risk of extinction.

- b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

- c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*
- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

- d) In relation to the habitat of a threatened species, population or ecological community:*

- (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents known foraging habitat for the Grey-headed Flying-fox. This includes 32.36 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for this species within the study area. Some fragmentation will occur between patches of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat for this species. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, this species is highly mobile and capable of accessing fragmented habitats.

No Grey-headed Flying-fox camps are located on the subject site and the area of foraging habitat available is likely only utilised periodically as part of a much broader foraging range. The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for this species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for this species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

A recovery plan has not been developed for this species and no threat abatement plans are relevant.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following KTPs are relevant to the Grey-headed Flying-fox within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for this species;

- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some forest that would potentially be used for foraging by this species will be cleared and clearing is a FTP for this species. However, the majority of habitat for the Grey-headed Flying-fox will be retained within the study area. The implementation of a VMP will assist in increasing the biodiversity values of the retained habitat.

Conclusion

The proposed development will result in the direct loss of potential habitat for the Grey-headed Flying-fox. Given that this species is highly mobile and is likely to utilise numerous habitat resources within the study area and wider locality, the Grey-headed Flying-fox is considered to remain viable within the locality and its ranges. The removal and possible modification of foraging habitat for the Grey-headed Flying-fox is not considered to result in a significant impact to the species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, some of which are relevant to the Grey-headed Flying-fox.

E.4.8 Cave-dependent Bats

The following Assessment of Significance has been prepared as a composite test for a number of cave-roosting microbat species known or considered to have potential to occur within the study area based on the availability of suitable habitat. These include the following:

- Eastern Bentwing-bat; and
 - Little Bentwing-bat.
- a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The Eastern Bentwing-bat has previously been recorded within the study area as well as in connected areas of habitat within the locality. The Little Bentwing-bat has no published records within the locality however was recorded by SLR within the study area in 2012 (Gunninah, 2015). The local populations of these species are considered to extend beyond the study area and have been assessed as viable.

The proposed development will remove known foraging habitat for the Eastern Bentwing-bat and Little Bentwing-bat. These species are highly mobile and are considered likely to utilise habitat resources throughout the locality and within adjacent National Parks and private land. There is no suitable roosting habitat, such as sandstone caves and crevices within the subject site suitable for either of these two species. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

- d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents known foraging habitat for the Eastern Bentwing-bat and Little Bentwing-bat. This includes 32.36 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for these species within the study area. Some fragmentation will occur between patches of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat for these species. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, these species are highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for these species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for these species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

Recovery plans have not been developed for these species and no threat abatement plans are relevant.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following KTPs are relevant to these species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for this species;
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some forest, including forest with hollow-bearing trees will be cleared within the subject site which are both threats to the Little Bentwing-bat and Eastern Bentwing-bat. However, the majority of the habitats for these species will be retained within the study area. The implementation of a VMP will assist in increasing the biodiversity values of the retained habitat.

Conclusion

The proposed development will result in the direct loss of potential habitat for the Eastern Bentwing-bat and Little Bentwing-bat. Given that these species are highly mobile and likely to utilise numerous habitat resources within the study area and wider locality, the species are considered to remain viable within the locality and their ranges. The removal and possible modification of foraging habitat for these species is not considered to result in a significant impact to either species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, some of which are relevant to the Eastern Bentwing-bat and Little Bentwing-bat.

i. Hollow-dependent Bats

The following Assessment of Significance has been prepared as a composite test for a number of hollow-roosting microbat species that known or considered to have potential to occur within the study area. These include the following:

- Eastern False Pipistrelle

- Eastern Freetail Bat
- Greater Broad-nosed Bat
- Southern Myotis
- Yellow-bellied Sheathtail-bat

- a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The Eastern False Pipistrelle, Eastern Freetail Bat, Greater Broad-nosed Bat, Southern Myotis and Yellow-bellied Sheathtail-bat have previously been recorded within the study area as well as in connected areas of habitat within the locality. The local populations of these species are considered to extend beyond the study area and have been assessed as viable.

The proposed development will remove known foraging and potential roosting habitat for these species. These species are highly mobile and are considered likely to utilise habitat resources throughout the locality and within adjacent National Parks and private land. These areas will continue to provide breeding habitat for these species. Accordingly, the proposed development is not considered to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

- c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

- d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
- (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The area of habitat to be removed within the subject site represents known habitat for the Eastern False Pipistrelle, Eastern Freetail Bat, Greater Broad-nosed Bat, Southern Myotis and Yellow-bellied Sheath-tail-bat. This includes 32.36 ha of forest and woodland vegetation.

The proposed development is not considered to significantly increase fragmentation of habitat for these species within the study area however some fragmentation will occur between patches of treed vegetation. Although the proposed development will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat for these species. Habitat connectivity will be maintained within the study area and within neighbouring National Parks. Furthermore, these species are highly mobile and capable of accessing fragmented habitats.

The habitat to be removed or indirectly impacted by the proposed development is not considered locally important for these species as extensive areas of suitable habitat occur within other areas of the study area and the locality. Extensive areas of suitable habitat will remain and connect to adjacent conserved habitat.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

No critical habitat for these species has been identified by OEH.

- f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

Recovery plans have not been developed for these species and no threat abatement plans are relevant.

- g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The following KTPs are relevant to these species within the study area:

- 'Clearing of native vegetation' as this reduces the area of forage and nesting habitat available for this species;
- 'Loss of hollow-bearing trees' as this reduces the abundance of roosting habitat for some species;
- 'Removal of dead wood and dead trees' as this reduces the abundance of important roosting habitat;

- Competition from feral honey bees (*Apis mellifera*) as they compete with native fauna for tree hollows and floral resources; and
- 'Anthropogenic climate change' as this can reduce the geographic range of species and alter the structure and composition of communities.

Some forest, including forest with hollow-bearing trees will be cleared within the subject site which are both threats to the hollow-dependent bats listed above. However, the majority of the habitats for these species will be retained within the study area. The implementation of a VMP will assist in increasing the biodiversity values of the retained habitat.

Conclusion

The proposed development will result in the direct loss of potential habitat for the Eastern False Pipistrelle, Eastern Freetail Bat, Greater Broad-nosed Bat, Southern Myotis and Yellow-bellied Sheath-tail-bat. Given that these species are highly mobile and likely to utilise numerous habitat resources within the study area and wider locality, the species are considered to remain viable within the locality and their ranges. The removal and possible modification of foraging habitat for these species is not considered to result in a significant impact to either species in the locality.

A range of impact avoidance, mitigation and compensation measures have been developed for the proposed development, which are relevant to these species.

Appendix F

Fauna Species Recorded in 2017

Table F.1 Fauna species recorded during 2017 field surveys

Survey Type	Common Name	Scientific Name
IR Camera	Australian Magpie	<i>Cracticus tibicen</i>
	Bassian Thrush	<i>Zoothera lunulata</i>
	Bush Rat	<i>Rattus fuscipes</i>
	Common Brushtail Possum	<i>Trichosurus vulpecula</i>
	Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>
	Common Wombat	<i>Vombatus ursinus</i>
	Crimson Rosella	<i>Platycercus elegans</i>
	Eastern Grey Kangaroo	<i>Macropus giganteus</i>
	Eastern Water Dragon	<i>Intellagama lesueurii</i>
	Eastern Yellow Robin	<i>Eopsaltria australis</i>
	European Rabbit	<i>Oryctolagus cuniculus</i>
	European Red Fox	<i>Vulpes vulpes</i>
	Laughing Kookaburra	<i>Dacelo novaeguineae</i>
	Long-nosed Bandicoot	<i>Perameles nasuta</i>
	Pacific Black Duck	<i>Anas superciliosa</i>
	Red-browed Finch	<i>Neochmia temporalis</i>
	Short Beaked Echidna	<i>Tachyglossus aculeatus</i>
	Superb fairy Wren	<i>Malurus cyaneus</i>
	Swamp Wallaby	<i>Wallabia bicolor</i>
	Tawny Frogmouth	<i>Podargus strigoides</i>
	Variegated Fairy Wren	<i>Malurus lamberti</i>
	White-browed Scrubwren	<i>Sericornis frontalis</i>
	Wild Dog	<i>Canis lupus</i>
	Brown Antechinus	<i>Antechinus stuartii</i>
	White-throated Treecreeper	<i>Cormobates leucophaea</i>
	Willie Wagtail	<i>Rhipidura leucophrys</i>
	Sugar Glider	<i>Petaurus breviceps</i>
Pitfall Trap	Brown Antechinus	<i>Antechinus stuartii</i>
	Striped Marsh Frog	<i>Limnodynastes peronii</i>
Elliot Trap	Brown Antechinus	<i>Antechinus stuartii</i>
	Bush Rat	<i>Rattus fuscipes</i>
	Swamp Rat	<i>Rattus lutreolus</i>

Appendix G

Fauna Survey Proformas

16087 CULBURRA - TRAP LINE RESULTS DATASHEET

MP, JL

TRAP LINE Results

Date	Site ID	Trap Type	Position	Species	#	Notes
11/10/17	4	-	-	-	-	-
11/10/17	3	-	-	-	-	-
11/10/17	2	-	-	-	-	-
11/10/17	1	E	38	Brown Antechinus	1	Female, PES-1.5cm, Body 10cm, head-tail 17cm
11/10/17	5	-	-	-	-	-
12/10/17	4	E	20	Brown Antechinus	1	Female, PES 1.5, Body 9cm, head-tail 17cm
12/10/17	4	E	14	Brown Antechinus	1	-
12/10/17	3	PF	1	Striped Marsh Frog	1	-
12/10/17	2	E	2	Brown Antechinus	1	-
12/10/17	2	E	4	Bush Rat	1	-
12/10/17	2	E	5	Brown Antechinus	1	Pes 3.4, Body 10, tail 13
12/10/17	1	E	40	Brown Antechinus	1	-
12/10/17	5	E	10	Brown Antechinus	1	-
13/10/17	4	E	20	Brown Antechinus	1	Female
13/10/17	4	E	14	Brown Antechinus	1	Female
13/10/17	3	-	-	-	-	-
13/10/17	2	E	2	Brown Antechinus	1	Female
13/10/17	2	E	5	Brown Antechinus	1	Female
13/10/17	1	E	47	Brown Antechinus	1	Female
13/10/17	1	E	26	Bush Rat	1	Female
13/10/17	1	PF	2	Brown Antechinus	1	Male
13/10/17	5	E	9	Bush Rat	1	-

Trap Type: A = Hairtube, B = Elliott B, C = Cage, H = Harp
Position: #1-25 (for A, B and C only)

photos 11/4-05/1
11/4-05/2

-scapula

Trap Type: PF = Pitfall, E = Elliott B, NB = Nest Box

10/10/17

Site ID: #1 Veg. Comm.: 19-2 GPS Unit: 19

Camera/Photo IDs: 19-2 Deployment Date: 10/10/17



Trap Line						
Position #	Waypoint	Easting	Northing	Pitfall (PF), Elliot (E), Nest Box (NB)	ID	Collection Date
1	90	294024	6132096	PF	1	14/10
2	91	294023	6132100	PF	2	14/10
3	92	294016	6132140	PF	3	14/10
4	93	294016	6132142	PF	4	14/10
5	94	294007	6132083	F	47	14/10
6	95	294002	6132097	F	48	14/10
7	96	294011	6132106	F	38	14/10
8	97	294001	6132126	F	27	14/10
9	98	293995	6132139	F	26	14/10
10	124	294013	6132080	VB	19	8/11/17
11	125	294015	6132099	VB	18	" "
12	127	293987	6132107	VB	17	" "
13	128	293995	6132114	VB	20	" "
14						
15						
16						
17						
18						
19						
20						

IR CAMERA Location	
Site ID	#1
Unit	CF-16
Waypoint	123
Easting	294041
Northing	6132077
IR CAMERA Location	
Site ID	#1
Unit	1403042
Waypoint	126
Easting	293994
Northing	6132164

NOTES
IR cameras delayed on 10/10/17 picked up on 10/11/17



Site ID: #2 Veg. Comm.: 1326 GPS Unit: 19

Camera/Photo IDs: 16-18 Deployment Date: 10/10/17

Trap Line					
Position #	Waypoint	Easting	Northing	Pitfall (PF), Elliot (E), Nest Box (NB)	ID
1	81	294414	6131764	PF	3
2	82	294420	6131741	PF	7
3	83	294429	6131737	PF	5
4	84	294434	6131751	PF	4
5	85	294451	6131751	PF	2
6	86	294447	6131754	PF	1
7	87	294434	6131758	PF	2
8	88	294430	6131760	PF	3
9	89	294424	6131760	PF	4
10	119	294415	6131734	NB	16
11	120	294420	6131753	NB	14
12	121	294432	6131754	NB	15
13	122	294428	6131768	NB	13
14					
15					
16					
17					
18					
19					
20					

IR CAMERA Location	
Site ID	#2
Unit	Q01
Waypoint	117
Easting	294420
Northing	6131736
IR CAMERA Location	
Site ID	#2
Unit	CF-17
Waypoint	118
Easting	294420
Northing	6131695

NOTES
IR's deployed on 10/10/17
Pickup on 8/11/17

Original location Culburra (See photo 12)
within dense
mallee to suitable habitat



Site ID: #3

Veg. Comm.: 654

GPS Unit: 19

Camera/Photo IDs: 12-15

Deployment Date: 10/10/17

Trap Line					
Position #	Waypoint	Easting	Northing	Pitfall (PF), Elliot (E), Nest Box (NB)	ID
1	72	294 791	6131 680	PF	1
2	73	294 792	6131 680	PF	2
3	74	294 769	6131 674	PF	3
4	75	294 765	6131 670	PF	4
5	76	294 747	6131 655	E	23
6	77	294 754	6131 667	E	39
7	78	294 763	6131 675	E	32
8	79	294 781	6131 683	F	16
9	80	294 792	6131 688	E	29
10	113	294 797	6131 682	NB	9
11	114	294 778	6131 682	NB	10
12	115	294 763	6131 665	NB	11
13	116	294 701	6131 675	NB	12
14					
15					
16					
17					
18					
19					
20					

IR CAMERA Location	
Site ID	#3
Unit	Q02
Waypoint	111
Easting	294779
Northing	6131689
IR CAMERA Location	
Site ID	#3
Unit	1A
Waypoint	112
Easting	294743
Northing	6131680

NOTES
IRS deployed on 10/10/17
Rechecked on 8/11/17



Site ID: #4

Veg. Comm.: 1326

GPS Unit: 19

Camera/Photo IDs: 6-11

Deployment Date: 10/10/17

Trap Line					
Position #	Waypoint	Easting	Northing	Pitfall (PF), Elliot (E), Nest Box (NB)	ID
1	63	294 816	6131 018	PF	1
2	64	294 794	6131 001	PF	2
3	65	294 779	6130 993	PF	3
4	66	294 759	6130 979	PF	4
5	67	294 770	6130 958	E	14
6	68	294 780	6130 971	E	20
7	69	294 791	6130 972	E	42
8	70	294 805	6130 975	E	18
9	71	294 818	6130 981	E	44
10	107	294 797	6131 019	NB	5
11	108	294 820	6130 995	NB	6
12	109	294 809	6130 972	NB	7
13	110	294 770	6130 950	NB	8
14					
15					
16					
17					
18					
19					
20					

IR CAMERA Location	
Site ID	#4
Unit	1403048
Waypoint	104
Easting	293680
Northing	6131357
IR CAMERA Location	
Site ID	#4
Unit	Q04
Waypoint	106
Easting	294850
Northing	6130985

NOTES
IR's deployed on 10/10/17
Picked up on 9/11/17



Site ID: #5

Veg. Comm.: 654

GPS Unit: 19

Camera/Photo IDs: 1-4, 5

Deployment Date: 10/10/17

Trap Line						
Position #	Waypoint	Easting	Northing	Pitfall (PF), Elliot (E), Nest Box (NB)	ID	Collection Date
1	54	293666	6131410	PF	1 1	14/10/17
2	55	293668	6131403	PF	2	" "
3	56	293686	6131392	PF	3	" "
4	57	293688	6131389	PF	4	" "
5	58	293682	6131369	E	11	" "
6	59	293669	6131384	E	13	" "
7	60	293669	6131390	E	10	" "
8	61	293666	6131399	E	8	" "
9	62	293660	6131405	E	9	" "
10	99	293679	6131413	NB	1	8/11/2017
11	102 107	293690	6131399	NB	2	8/11/2017
12	103	293689	6131399	NB	4	8/11/17
13	104	293680	6131357	NB	3	8/11/17
14						
15						
16						
17						
18						
19						
20						

IR CAMERA Location	
Site ID	#5
Unit	LE-19
Waypoint	100
Easting	293673
Northing	6131412
IR CAMERA Location	
Site ID	#5
Unit	IR-11
Waypoint	101
Easting	293694
Northing	6131405

NOTES
IR deployed on 10/10/17
Picked up on 8/11/17

Appendix H

Biodiversity Assessment

H.1 Introduction

H.1.1 *BioBanking*

The BioBanking Assessment Methodology 2014 (BBAM) (OEH, 2014a) has been designed to address the loss of biodiversity in NSW by enabling landowners in NSW to establish BioBanking sites to secure conservation outcomes and offset impacts on biodiversity values, based on an improve or maintain outcome. The landowners create BioBanking credits by committing to improve and/or increase the habitat of threatened species and ecological communities. Developers can buy the credits to offset impacts from their development. They will need to source particular types of credits in accordance with the offset rules in the BBAM (OEH, 2014a).

- Ecosystem credits can only be used to offset biodiversity impacts on the same ecological community, or on another community of the same formation that has an equal or greater percentage of land cleared and the same predicted threatened species; and
- Species credits can only be used to offset biodiversity impacts on the same threatened species.

Ecological communities are used in the BBAM as a surrogate for general biodiversity values. They are referred to as Plant Community Types (PCTs) and should be the vegetation type assumed to have originally occurred at the site. The names used for PCTs in a BioBanking assessment are selected from the Office of Environment and Heritage (OEH) Vegetation Information Systems (VIS) database (OEH, 2017r). The names available differ to some extent from those used in other existing vegetation maps and also from names used for Commonwealth and State EECs. The selection of PCTs influences the outcome of the assessment because different PCTs produce different credit calculations, due to some plant communities supporting more threatened flora/fauna species than others. PCTs within a Major Catchment Area (MCA) are assigned a Biometric Vegetation Type (BVT) code that is used within the Online BioBanking Credit Calculator (BBCC) (OEH, 2014b).

PCTs for the study area were selected based on the best-fit PCTs from the VIS database using the floristic data collected during field surveys by ELA. The landscape position and soil type were also used in determining the best-fit PCT for the vegetation communities within the study area. Once the PCTs were selected, they were input into the BBCC along with the plot and transect data, in accordance with the BBAM, in order to calculate the credit requirement for the impacts within the subject site. The credits generated within the conservation area (i.e. offset area) were also calculated to inform on the suitability in meeting the credit requirement of the proposed impacts. The results of these calculations are presented in **Table E.5**.

H.1.2 *Legislative Changes*

The legislation and methods for biodiversity assessments have recently changed under the NSW Land Management and Biodiversity Conservation (LMBC) reform. This includes

legislative changes and a suite of new regulations, guidelines and tools. In November 2016 the NSW Parliament passed the following two Acts, which commenced on 25 August 2017:

- *The Biodiversity Conservation (BC) Act 2016*, which replaces the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and parts of the *National Parks and Wildlife Act 1974*; and
- *The Local Land Services Amendment (LLSA) Act 2016*, which replaces the *Native Vegetation Act 2003* and the *Native Vegetation Regulation 2005*.
- The Biodiversity Assessment Method (BAM) replaced the following biodiversity assessment methods:
 - BioBanking Assessment Methodology (BBAM);
 - Biodiversity Certification Assessment Methodology (BCAM); and
 - Framework for Biodiversity Assessment (FBA).
- The new BAM is largely based on the FBA. There are a large number of minor changes in the BAM regarding field assessment methodologies, thresholds, how consent is granted and how assessments are documented and approved or declined. Vegetation communities are assessed on a state-wide basis and have to be matched with a Plant Community Type (PCT). The floristic data required under the BAM comprises three floristic components, i.e. composition, structure and function, which have to be assessed by following a strict scientific methodology. While data from previous assessments is required to be included in reports, it cannot be used for the offset liability calculations unless it was collected under the BAM methodology.
- Projects which have significantly commenced under the previous legislation are listed as transitional projects and can be assessed under the previous legislation if the proponent chooses to do so.

For the purpose of this assessment, the BBAM methodology and calculator were used, since all the plot data was collected under the BBAM and does not comply with the BAM.

H.2 Assumptions and Limitations

The following limitations apply to this preliminary BioBanking assessment:

- The vegetation mapping, selection of BVTs/PCTS and floristic plot data is entirely based on the mapping by ELA. The data was checked for consistency and completeness, but not for accuracy, since Cumberland Ecology staff members have not visited the site for additional flora assessments.
- These calculations are preliminary and are not to be used for a BioBanking Statement/Agreement Application. The assessment was conducted to quantify the

offset liability of the proposed development and to assess the adequacy of the proposed onsite offset.

- Impacts to threatened species have not been assessed. Since the vegetation communities in the offset (i.e. conservation area) are of better quality than the vegetation within the impact footprint (i.e. subject site), it is assumed that the offset will provide the same, if not better quality of habitat for all flora and fauna species present on site.
- The boundary of the conservation area was designed by ELA, based on the environmentally conservative decisions to not include the following areas in the conservation area:
 - The thin strips of vegetation between the fairways due to edge effects and different management actions, which require prioritisation of human safety over ecological values; and
 - A 5m buffer around all cleared vegetation.
 - Cleared land within the conservation area (i.e. less than 02 ha) will require replanting of species matching the composition of adjacent vegetation communities. Since these areas are relatively small, it is assumed that the replanting will not incur a considerable cost and therefore it has been included in the conservation area. The VMP will discuss the species composition and density to be planted.

Although BioBanking methodology is systematic, there is also considerable scope for “professional judgement” to be applied; meaning different operators may arrive at differing credit calculations. Thus, a number of assumptions have been made throughout the assessment process and include the following:

- The percent native vegetation was calculated based on the vegetation mapping by OEH (Shoalhaven Biometric v2 VisID 3900). The vegetation mapping by ELA could not be used since it does not cover the entire 1,000 ha assessment circle.
- The BAM methodology specifies the number of floristic plots required for each vegetation zone, depending on its size. The plot data received from ELA did not include the required number of plots for some vegetation zones within the conservation area. The number of plots, however, for the impact footprint was sufficient. It is considered unnecessary to collect additional flora plots, since this BAM calculation is used to inform the offset strategy, rather than for an official biodiversity assessment. ELA conducted 31 BAM plots within the study area and it is unlikely that additional plot data will change the outcome of the calculations.
- There is no plot data for any of the cleared land, which contains ground cover species only. The credit calculation for cleared land within the conservation area to be rehabilitated was therefore based on an imaginary plot comprising no canopy species, no mid-storey species and low species diversity in the ground cover.

H.3 Locality Data

H.3.1 Landscape Values

Landscape values are an assessment of the spatial configuration of vegetation in the landscape, including regions, subregions, catchments, fragmentation, connectivity and patch size of remnant vegetation. The regions and sub-regions required by the BAM calculator are shown in **Table H.1** below.

Table H.1 Landscape Regions and Sub-regions

Region	Region Name
Catchment Management Area (CMA)	Southern Rivers
LGA	Shoalhaven City Council
IBRA Sub-Region	Jervis
Mitchell Landscape	Wandanadian Coastal Plains
Connectivity	Riparian Buffer of an Estuarine Area

The percent cover of native vegetation is calculated within a 1,000 ha and a 100 ha assessment circle, which are centred over the study area. For the impact area, the percent native vegetation is calculated in both assessment circles before and after the clearing. This provides a landscape value score for the study area, determining the impact of the proposed development within the locality. Since the conservation area includes a patch of cleared land of 0.11 ha, the percent native vegetation before and after the rehabilitation remains within the same intervals. **Table H.2** below shows the percent native vegetation cover for the study area before and after vegetation clearing/restoration.

Table H.2 Percent Native Vegetation within Assessment Circles

% Native Vegetation	Before Development (ha)	After Development (ha)
1,000 ha Assessment Circle	637	608
100 ha Assessment Circle	83	65

H.3.2 Geographic / Habitat Features

The following geographic and habitat features are assumed to be present within the study area under the BAM online calculator. The presence or absence of these habitat features has no implications on the number or type of credits. They are, however, used to provide a list of target species to be surveyed, which was used by Cumberland Ecology to design the additional surveys conducted for this report.

- Land within 40 m of heath, woodland or forest with sandy or friable soils;

- Swamps, swamp margins or creek edges;
- Rainforest or tall open wet forest with understorey and/or leaf litter and within 100 m of streams;
- Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels;
- Land within 40 m of gullies in eucalypt forests;
- Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation or emergent aquatic vegetation;
- Land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters;
- Land within 100 m of emergent aquatic or riparian vegetation;
- Land containing brackish or freshwater wetlands;
- Margins of salt marshes and lakes, both coastal and inland;
- Land within 40 m of high water mark on beaches, sandbars, margins of estuaries or lagoons;
- Intertidal mudflats or sandflats within inlets, bays, harbours, estuaries, lagoons or ocean beaches or sandy spits;
- Salt marsh, saline areas or margins of these areas;
- Land within 40 m of freshwater or saline wetlands (e.g. saltmarsh, mangroves, mudflats, swamps, billabongs, floodplains, watercourse pools, wet heathland and/or farm dams);
- Sheltered areas in mangroves, estuaries or sand surrounded by short grass or scattered shrubs;
- Intertidal mudflats or sandflats within inlets, bays, harbours, estuaries, lagoons, ocean beaches and/or sandy spits; and
- Land within 100 m of coastal or upland swamps, bogs or wetlands.

H.4 BioBanking Calculations of Subject Site

As discussed the vegetation mapping, condition attributes and floristic plot data were provided by ELA. The vegetation zones within the subject site, i.e. the areas to be cleared for the proposed development, are shown in **Table H.3** below.

Table H.3 BioBanking vegetation zones within subject site

BVT	PCT	Condition	TEC	Impact Area (ha)
SR516	694	Mod-Good	No	10.92
SR592	1079	Mod-Good	No	11.28
SR648	1231	Mod-Good	Swamp Sclerophyll Forest	7.35
SR649	1232	Mod-Good	Swamp Oak Floodplain Forest	2.06
SR651	1236	Mod-Good	Swamp Oak Floodplain Forest	0.17
SR669	1326	Mod-Good	Swamp Sclerophyll Forest	0.57

H.5 BioBanking Calculations of Conservation Area

The vegetation zones within the conservation area are shown in **Table H.4** below.

Table H.4 BioBanking vegetation zones within conservation area

BVT	PCT	Condition	TEC	Conservation Area (ha)
SR512	659	Mod-Good	Bangalay Sand Forest	3.66
SR516	694	Mod-Good	No	25.09
SR592	1079	Low	No	0.11
SR592	1079	Mod-Good	No	40.80
SR614	1126	Mod-Good	Coastal Saltmarsh	4.22
SR648	1231	Mod-Good	Swamp Sclerophyll Forest	20.89
SR649	1232	Mod-Good	Swamp Oak Floodplain Forest	16.58
SR650	1234	Mod-Good	Swamp Oak Floodplain Forest	5.05
SR651	1236	Mod-Good	Swamp Oak Floodplain Forest	14.04
SR669	1326	Mod-Good	Swamp Sclerophyll Forest	6.45

H.6 Results

There is a credit surplus for some vegetation communities and a credit shortfall for others, while overall, 68% of the credit liability is achieved. Assuming that the like-for-like principal is applied, where the surplus of credits cannot be used against another vegetation community, the following credits will need to be purchased:

- 594 ecosystem credits for SR516 (Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion), which can be offset by:

- SR516 (Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion) or
- SR652 (Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion).
- 183 ecosystem credits for SR592 (Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion), which can be offset by:
 - SR592 (Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion) or
 - SR642 (Spotted Gum - Grey Ironbark - Woollybutt grassy open forest on coastal flats, southern Sydney Basin Bioregion and South East Corner Bioregion).
- 346 ecosystem credits for SR648 (Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion), which can be offset by:
 - SR648 (Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion) or
 - SR546 (Forest Red Gum - Woollybutt - Pithy Sword-sedge swamp woodland in dune swales near Pambula, southern South East Corner Bioregion).

Some vegetation communities within the conservation areas do not exist within the subject site and are therefore not required as an offset. For some vegetation community the on-site offset generates a surplus of credits, due to the impact area being very small. A full list of credit requirements can be found in **Table H.5**. The credit profiles generated by the online calculator are included below.

In order to satisfy the offset liability, the proponent has the following options:

- Purchase additional credits of the required type and within the same or adjacent IBRA subregion on the market;
- Commit additional land to the conservation area; or
- Apply offset variations by financially contributing to research projects, the Biodiversity fund and/or conservation projects.

While there is a shortfall of overall credits, the following needs to be considered:

- The vegetation within the conservation area is generally in good condition, while the vegetation to be cleared is generally in lower condition. Due to the BAM being based on improvement of biodiversity values, conservation of vegetation in bad condition is rewarded higher than conservation of vegetation in good condition.

Since this assessment is not an official biodiversity application, leniency should be awarded for having vegetation with high environmental values within the study area, rather than being punished for it. Ironically, if the proposed development was to be placed within vegetation in good condition, rather than on the cleared and low quality land, the offset liability could potentially be achieved.

- If the proposed development is approved the vegetation within the conservation area will be managed and maintained, which will minimise the risk of degradation in the future. If the development is not approved, the future of the vegetation on site is unclear.
- The conservation area will comprise Coastal Saltmarsh TEC, which is an important ecosystem for aquatic, terrestrial and migratory species. The VMP for this proposed development will include management, maintenance and monitoring of this EEC. In ecological terms, conservation of Coastal Saltmarsh should be valued much higher than the loss of common vegetation communities. The like-for-like offset rules under the BAM, however, do not allow such trade-offs.

Overall, an additional 719 credits are required, or, if the BAM like-for-like rules are applied, an additional 1,123 credits.

Table H.5 below shows a summary of all vegetation zones within the study area and the biodiversity credits generated by the subject site and the offset area. The BioBanking assessment reports from the online BBAM assessment are included below.

Table H.5							Study Area			Impact Veg (Subject Site)				Conservation Veg			Biodiversity Credits	
BVT Description	BVT	PCT	Zone	Condition	Ancillary	EEC	Area (ha)	Area (ha)	% of Total	Area (ha)	Area (ha)	Credits	% of Total	Area (ha)	Area (ha)	Credits	Surplus	Shortfall
Cleared	N/A	N/A	0	N/A	N/A	No	7.87			3.32			9.30%	0.00	N/A	N/A		
Cleared (Water)	N/A	N/A	0	N/A	N/A	No	30.47	38.46	16.98%		3.32	N/A		30.47	N/A	N/A		
Cleared (SR592)	N/A	N/A	32	N/A	To be Revegetated into SR592	No	0.11							0.11	0.11	1	1	
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	SR512	659	8	Mod-Good	Coastal Sand Forest sometimes with patches of Lantana	Bangalay Sand Forest of the Sydney Basin and South	3.66	3.66	1.61%					3.66	3.66	36	36	
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	SR516	694	13	Mod-Good	Moister Tall Forest in sheltered locations	No	43.21	43.21	19.07%	10.92	10.92	849	30.56%	25.09	25.09	255		594
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	SR592	1079	9	Mod-Good	Young shrubby regrowth in grazing paddocks with scattered remnant trees	No	0.00	58.62	25.87%		11.33	664		0.00	40.80	481		183
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	SR592	1079	1	Mod-Good	Logged/advanced regrowth with scattered old-growth trees	No	58.62			11.33			31.71%	40.80				
Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	SR614	1126	21	Mod-Good	Saltmarsh in excellent condition	Coastal Saltmarsh	4.22	4.22	1.86%					4.22	4.22	43	43	
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	SR648	1231	2	Mod-Good	Swamp Forest occurring along broad drainage lines usually dominated by Woollybutt, but also Swamp Mahogany, with a sedge and swamp shrub understorey	Swamp Sclerophyll Forest	13.84	31.77	14.02%	2.06	7.35	564	5.76%	10.99	20.89	218		346
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	SR648	1231	14	Mod-Good	Swamp Forest dominated by Swamp Mahogany or Bangalay with very dense swamp understorey immediately behind estuaries	Swamp Sclerophyll Forest	5.21			1.29			3.60%	3.63				
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	SR648	1231	29	Mod-Good	Young Swamp Forest regrowth	Swamp Sclerophyll Forest	12.72			4.01			11.23%	6.27				
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	SR649	1232	5	Mod-Good	Regrowth Swamp Oak forest sometimes with patches of Lantana	Swamp Oak Floodplain Forest	4.02	19.36	8.55%	1.58	2.06	97	4.42%	1.91	16.58	192	95	
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	SR649	1232	6	Mod-Good	Older growth Swamp Oak forest sometimes with patches of Lantana	Swamp Oak Floodplain Forest	15.35			0.48			1.35%	14.67				
Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	SR650	1234	4	Mod-Good	Estuarine fringe forest typically in excellent condition however sometime with some Lantana	Swamp Oak Floodplain Forest	5.05	5.05	2.23%					5.05	5.05	52	52	
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	SR651	1236	7	Mod-Good	Excellent condition Estuarine Creek Flat Scrub	Swamp Oak Floodplain Forest	14.04	14.78	6.53%		0.17	8		14.04	14.04	154	146	
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	SR651	1236	24	Mod-Good	Young Swamp Paperbark regrowth over pasture	Swamp Oak Floodplain Forest	0.74			0.17			0.49%					
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	SR669	1326	3	Mod-Good	Grassy swamp forest with Melaleuca decora dominated subcanopy, open understorey and graminoid dominated groundcover	Swamp Sclerophyll Forest	7.43	7.43	3.28%	0.57	0.57	34	1.58%	6.45	6.45	65	31	
Native Vegetation							188.09		83.02%	32.40		2,216	90.70%	136.88	136.88	1,497	404	1,123
Water							30.47							30.47				
Cleared							7.99		3.53%	3.32			9.30%					
To be Replanted														0.11	0.11			
Total							226.55	226.55	100.00%	35.73	35.73		100.00%	167.36	136.88			

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 13/12/2017

Time: 1:15:04PM

Calculator version: v4.0

Development details

Proposal ID: 0057/2017/4219D

Proposal name: 16087 - Development (updated footprint)

Proposal address: NSW

Proponent name: Cumberland Ecology

Proponent address: 1 Mountain Street Epping NSW 2121

Proponent phone: 298681933

Assessor name: David Robertson

Assessor address: PO BOX 2474 Carlingford Court NSW 2118

Assessor phone: 02 9868 1933

Assessor accreditation: 0057

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark
- ☐ Change negligible loss
- ☐ Expert report...



Request for additional gain in site value



Predicted threatened species not on site



Change threatened species response to gain (Tg value)

Ecosystem credits summary

Plant Community type	Area (ha)	Credits required	Red flag
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	10.92	849.00	No
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	11.33	664.00	No
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	7.35	564.48	Yes
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	2.06	97.47	Yes
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	0.17	8.44	Yes
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	0.57	34.00	Yes
Total	32.40	2,217	

Credit profiles

1. Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion, (SR592)

Number of ecosystem credits created 664
IBRA sub-region Jervis

Offset options - vegetation types	Offset options - CMA sub-regions
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion, (SR592) Spotted Gum - Grey Ironbark - Woollybutt grassy open forest on coastal flats, southern Sydney Basin Bioregion and South East Corner Bioregion, (SR642)	Jervis and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion, (SR516)

Number of ecosystem credits created 849
IBRA sub-region Jervis

Offset options - vegetation types	Offset options - CMA sub-regions
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion, (SR516) Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion, (SR652)	Jervis and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion, (SR669)

Number of ecosystem credits created 34
IBRA sub-region Jervis

Offset options - vegetation types	Offset options - CMA sub-regions
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion, (SR669)	Jervis and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

4. Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion, (SR648)

Number of ecosystem credits created 564
IBRA sub-region Jervis

Offset options - vegetation types	Offset options - CMA sub-regions
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the	Jervis

Sydney Basin Bioregion and South East Corner Bioregion, (SR648) Forest Red Gum - Woollybutt - Pithy Sword-sedge swamp woodland in dune swales near Pambula, southern South East Corner Bioregion, (SR546)	and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
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5. Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion, (SR649)

Number of ecosystem credits created	97
IBRA sub-region	Jervis

Offset options - vegetation types	Offset options - CMA sub-regions
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion, (SR649) Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion, (SR650)	Jervis and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

6. Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion, (SR651)

Number of ecosystem credits created	8
IBRA sub-region	Jervis

Offset options - vegetation types	Offset options - CMA sub-regions
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion, (SR651) Floodplain wetlands of the coastal lowlands, southern South East Corner Bioregion, (SR542) Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion, (SR649) Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion, (SR650)	Jervis and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Species credits summary

BioBanking credit report



Office of
Environment
& Heritage

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 13/12/2017

Time: 3:25:29PM

Calculator version: v4.0

Biobank details

Proposal ID: 0057/2017/4667B

Proposal name: 16087 - Conservation (updated layout)

Proposal address: NSW

Proponent name: Cumberland Ecology

Proponent address: 1 Mountain Street Epping NSW

Proponent phone: (02) 9868 1933

Assessor name: David Robertson

Assessor address: PO BOX 2474 Carlingford Court NSW 2118

Assessor phone: 02 9868 1933

Assessor accreditation: 0057

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	3.66	36.00
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	25.09	255.00
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	40.91	482.00
Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	4.22	43.00
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	20.89	218.00
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	16.58	192.00
Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	5.05	52.00
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	14.04	154.00
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	6.45	65.00
Total	136.89	1,497

Credit profiles

1. Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion, (SR592)

Number of ecosystem credits created	481
IBRA sub-region	Jervis

2. Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion, (SR592)

Number of ecosystem credits created	1
IBRA sub-region	Jervis

3. Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion, (SR516)

Number of ecosystem credits created	255
IBRA sub-region	Jervis

4. Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion, (SR669)

Number of ecosystem credits created	65
IBRA sub-region	Jervis

5. Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion, (SR512)

Number of ecosystem credits created	36
IBRA sub-region	Jervis

6. Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion, (SR648)

Number of ecosystem credits created	218
IBRA sub-region	Jervis

7. Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion, (SR649)

Number of ecosystem credits created	192
IBRA sub-region	Jervis

8. Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion, (SR650)

Number of ecosystem credits created	52
IBRA sub-region	Jervis

9. Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion, (SR651)

Number of ecosystem credits created	154
IBRA sub-region	Jervis

10. Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion, (SR614)

Number of ecosystem credits created	43
IBRA sub-region	Jervis

Species credits summary

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	Control of feral pigs
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	Exclude commercial apiaries
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	Fox control
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	Exclude commercial apiaries
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	Exclude miscellaneous feral species
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin Bioregion	Fox control
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	Exclude commercial apiaries
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	Exclude miscellaneous feral species
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin Bioregion	Fox control
Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Control exotic pest fish species (within dams)
Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Control of feral pigs
Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species

Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Fox control
Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Maintain or re-introduce natural flow regimes
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	Control of feral pigs
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	Exclude commercial apiaries
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion	Fox control
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	Control of feral pigs
Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species
Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	Fox control
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	Control of feral pigs
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	Fox control
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	Exclude commercial apiaries
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species
Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control

Woollybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion	Fox control
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