



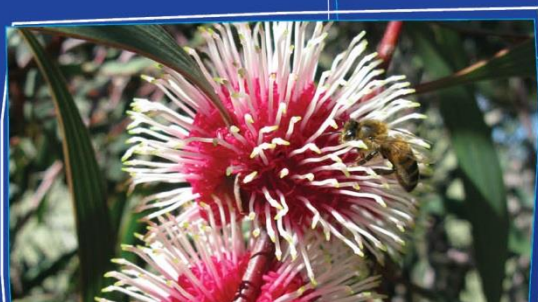
Offset Proposal

Reserve 26257 – Corner Merivale and Cape Le Grand Roads
Shire of Esperance Purpose Permit CPS 10154/1



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2 Summary

Reserve 26257 is a 105.03 ha reserve possessing a high level of floristic and ecological diversity, possessing a range of vegetation types across its low-lying sandplain, elevated granitic outcrops, and clay-rich lateritic ephemeral wetlands. Reserve 26257 is predominantly in excellent or pristine condition, and the dominant vegetation type is Kwongkan shrublands, an Endangered TEC under the EPBC Act and a Priority 3 PEC under the BC Act. It also possesses unique granite summit ecological communities. The Reserve provides excellent fauna habitat including suitable habitat for the EPBC Act-listed Carnaby's cockatoo (EN), and State-listed Quenda / southwestern brown bandicoot (P4).

Previously, a reconnaissance (previously Level 1) flora and vegetation survey was conducted in March 2017 by Julie Waters to initially ascertain the suitability of R 26257 for an environmental offset proposal required by DWER in the application to clear native vegetation under CPS 7188/1. The March 2017 Flora and Vegetation survey was conducted 18 months after the Merivale bushfires burnt intensely through the majority of the reserve's vegetation in November 2015. This resulted in much of the vegetation being in a regenerating state, with post fire disturbance opportunists altering the vegetation structure and composition from that of the climax ecological community. Additionally, the survey was conducted outside the peak flowering period of most flora within the Esperance Sandplains IBRA region, therefore potentially resulting in cryptic, annual or orchid species being overlooked during survey. However, many plants were able to be positively identified.

A second reconnaissance flora and vegetation survey, and basic fauna survey, was conducted on the 1st of September 2023 by Julie Waters (Environmental Coordinator) and Kahree Garnaut (Environmental Officer). This survey was undertaken during spring, the peak flowering period for most flora within the Esperance Sandplains IBRA Bioregion, and the vast majority of species were flowering and/or otherwise readily identifiable. Evidence of Carnaby's cockatoo foraging was identified within the Reserve in the form of chewed *Pinus pinaster* cones. As the site's vegetation is primarily comprised of coastal Proteaceae-rich shrublands and granite outcrop associations, the seasonal migrations of this species to eucalypt woodland breeding areas over winter and spring may result in any remnant foraging evidence being old or degraded in nature.

Kwongkan TEC/PEC was positively identified through the observation of key diagnostic species within Vegetation Type A. Almost all of the reserve was in Pristine condition, apart from a few areas effected by previous extractive activities, and utilities (roads and powerlines) or edge effects in the form of weed invasion from neighbouring agricultural paddocks.

3 Site Description

Reserve name:	Un-named Reserve	Reserve number	26257
Named Features:	None	NRM Region:	South Coast
Location number:	Lot: 1758 on Plan: 172751	Shire:	Esperance
Vesting:	Management Order Shire of Esperance	Nearest towns:	Condingup, Esperance
Current Purpose:	Conservation	Nearest roads:	Merivale Road, Cape Le Grand Road
Zoning:	Recreation and Parklands	Map reference:	427447.47 m E 6257895.15 m N
Area of Reserve:	105.03 ha	IBRA Sub Region:	Esperance Plains – Recherche (ESP)

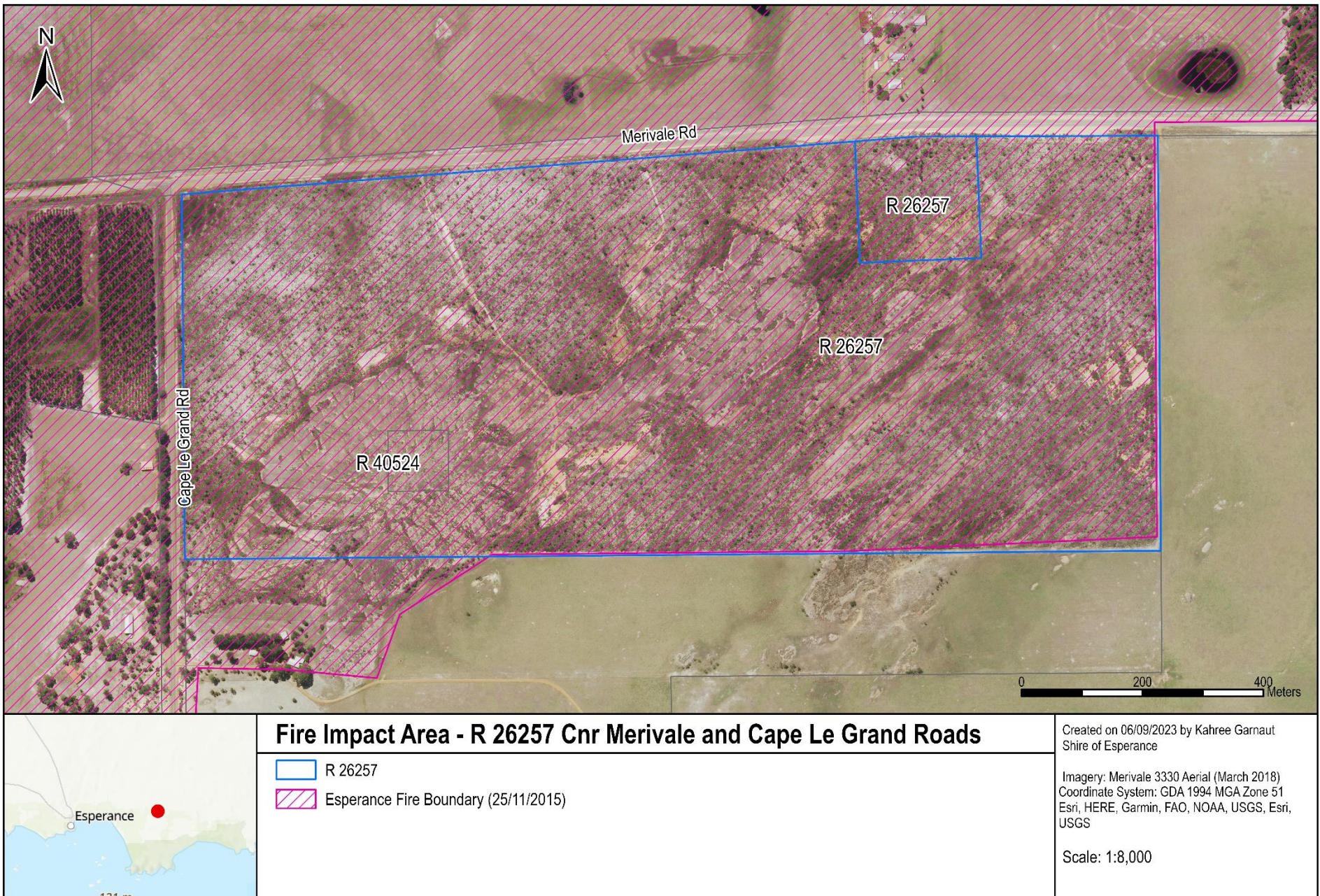


Figure 1: Map of Reserve 26257, with 2018 aerials.

4 Asset Values

4.1 Landform

Gently to moderately inclining slope towards elevated granitic outcrop; Well-draining sandplain in lowlands; Seasonally-wet, generally freshwater wetland in clay-rich lateritic soils near granite outcropping.

4.2 Climate

The Merivale district experiences a Mediterranean climate characterised by cool, wet winters and warm, dry summers. The area receives an annual rainfall of approximately 500 mm (BOM 2023).

4.3 Soils and Geology

Deep uniform sands on low rises, and gravelly mottled duplex soils with > 30 cm or 30 – 80 cm of sand overlying gravel (Schoknecht *et al.* 2004). Exposed Proterozoic granite bedrock outcrops in the southern portion of the reserve.

4.4 Catchments and Hydrology

The Reserve is located within the Esperance Coast Basin within the South West Division, and within the Cape LeGrand National Park Subcatchment. Additionally, it is located within the Esperance Sandplain Hydrological Zone (HZ25_ES), which is described as “Level to gently undulating plain dissected by a number of short rivers flowing south. Formed on Eocene marine sediments overlying Proterozoic granitic and metamorphic rocks. Soils are grey fine sandy duplex soils and fine sands.”

4.5 Threatened and Priority Flora

The 2023 desktop search revealed 50 Threatened and Priority flora to occur within 20 km of the site. One Priority species, the P3 *Persoonia scabra*, has been previously recorded within R 26257. The P1 *Eucalyptus balanopelex* (which has been removed from the Priority species list since its reclassification as a hybrid) has been recorded within 200 m of the reserve, alongside the P3 *Leucopogon interruptus*. No threatened or priority flora were located during the September 2023 survey.

4.6 Threatened Ecological Communities

The desktop survey indicated the reserve may contain the EPBC-listed ‘*Proteaceae-dominated Kwongkan shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)*’ TEC / PEC, which is listed Federally as ‘Endangered’ and under State legislation as ‘Priority 3’. This TEC was present during the September 2023 survey. No other TECs or PECs were present.

4.7 Threatened and Priority Fauna

The EPBC-Act listed EN Carnaby’s cockatoo (*Zanda latirostris*) has been recorded within R 26257. Evidence of Carnaby’s cockatoo foraging was observed within the site during the September 2023 survey. Within 5 km of the site, the Critically Endangered Western Ground Parrot (*Pezoporus flaviventris*), Endangered Australasian Bittern (*Botaurus poiciloptilus*) and the Migratory Wood Sandpiper (*Tringa glareola*) have been recorded.

Two known Carnaby's cockatoo roost sites occur 6.9 km and 19.0 km from the reserve. No breeding records occur within the Shire of Esperance.

4.8 Native Fauna

Fauna observed to inhabit the Reserve during the September survey included the spotted-thigh frog (*Litoria cyclorhyncha*), black-shouldered kite (*Elanus axillaris*), New Holland honeyeater (*Phylidonyris novaehollandiae*), yellow-throated miner (*Manorina flavigula*), and western grey kangaroo (*Macropus fuliginosus*).

Evidence of the EN Carnaby's cockatoo (*Zanda latirostris*) foraging was observed, in the form of chewed pine cones in the northern portion of the reserve. Macropod tracks and scats were observed throughout the reserve; however, the inexperience of surveyors with differentiating macropod tracks and scats infers the possibility of the tracks belonging to the P4 western brush wallaby and / or the tammar wallaby, both having suitable habitat within the site.

4.9 Beard Vegetation System

The entire site has been mapped at a broad scale by Beard (1973) as the Esperance 6048 Vegetation System Association, which is described as "Shrublands; banksia scrub-heath on sandplain (Eucalyptus mixed open mallee shrubland / Banksia open shrubland / Acacia mixed heath)." At the sub-Association level, the vegetation has been mapped as "*Eucalyptus incrassata*, *Nuytsia floribunda* and *Eucalyptus globata* Tree Mallee, over *Banksia speciosa*, *Banksia media*, and *Lambertia inermis* Shrublands, over *Acacia gonophylla*, *Adenanthos dobsonii*, and *Agonis spathulata* Low Shrubs." According to the statewide vegetation statistics (CAR, 2018), the Esperance 6048 System Association has 12.54% remaining within the Shire of Esperance, 14.16% remaining within the Recherche Esperance Sandplains IBRA subregion, and 0.16% of the pre-European extent protected for conservation. As less than 30% of the pre-European extent remains, this Vegetation System Association is considered to be extensively cleared within the Shire of Esperance, the Recherche subregion of the Esperance Sandplains IBRA Bioregion, and is under-represented in the CAR system (land protected for conservation).

4.10 Aboriginal and Cultural Heritage

88 Aboriginal heritage sites have been recorded within 20 km of R 26257. The closest is Lunette 1 (Place ID 2190), located 0.65 km from R 26257. Woodup Swamp is located

4.11 Phytophthora Dieback

In 2004, soil sample analysis confirmed that *Phytophthora cinnamomi* dieback was present within the Reserve, which was depicted by the site being mapped as High Confidence Dieback Infested in 2005 (DIDMS, 2023). Only a very small area in the north east section of the Reserve showed any evidence of dieback during the September 2023 survey, as evident by a few dead banksias and one Xanthorrhoea. The vast majority of Vegetation type A which had a high number of Proteaceae species did not show any evidence Phytophthora dieback, however neither surveyor is a qualified dieback interpreter.



Figure 2. Dead *Banksia speciosa* which may be indicative of *Phytophthora cinnamomi* infestation in north-east corner of R 26257. Photo taken by Julie Waters on the 1st of September 2023.

4.12 Human Activities and Disturbances

The most prominent anthropocentric disturbance within the site is the historical gravel and sand pits along the eastern and northern edges of the Reserve. There was no evidence of recent recreational activity. Although firebreaks under powerlines on northboundary were recently slashed they did not appear to be driven on. Evidence of old litter, such as bottles and cans, and some garden weeds were present in small isolated patches. A historical revegetation site in the northern area of the Reserve under a *Pinus pinaster* canopy presented flora such as *Eucalyptus preissiana* and *Eucalyptus tetraptera*, which are native to Western Australia but not to the immediate area and were likely planted.

4.13 Fire History

The site was almost entirely all burnt in November 2015 during the Merivale bushfires, approximately 8 years previous to the September 2023 survey. Despite the high intensity of the bushfire, the vegetation has since recovered to enable definitive identifications of flora in this highly biodiverse area. Some small long-unburnt pockets remain within the site mainly around old extraction sites where the disturbance slowed the fire.

4.14 Surrounding Landscape

Reserve 26257 is surrounded primarily by grazing / agricultural land on the east and south and blue gum plantations to the west. The northern edge of the reserve borders Merivale Road, whilst the western edge borders Le Grand Road. The southern and eastern edges border on agricultural land. Reserve 26257 is

located approximately 28 km west of Condingup, and 30 km east of the Esperance townsite. The broader landscape has been largely cleared for agriculture – particularly in the north – and this has resulted in the remnant vegetation becoming profusely fragmented and small in size. The Cape Le Grand National Park is situated approximately 9.3 km to the south. Reserve 26257 is connected to the national park via remnant native vegetation to the west of Cape Le Grand Road.

5 Vegetation

5.1 Vegetation Types

In 2017, three distinct vegetation types were mapped within Reserve 26257, which were subsequently refined further in September 2023. Refer to Table 1 below for the corresponding vegetation type descriptions.

Table 1. Vegetation Types present in Reserve 26257 identified in both 2017 and 2023 surveys.

Vegetation Type	Name (2017)	Name (2023)	Mapped Area in 2023 (ha)
A	Heath with scattered <i>Nuytsia floribunda</i>	Kwongkan Shrublands with scattered <i>Nuytsia floribunda</i>	
B	Good - degraded old sand and gravel pits.	<i>Melaleuca cuticularis</i> Wetland on Rehabilitated Gravel Pits	
C	<i>Borya</i> and <i>Kunzea baxteri</i> / <i>Hakea clavata</i> near granite areas	Mixed granitic heath with <i>Kunzea baxteri</i> and <i>Borya</i> spp.	

These vegetation types are described below.

Vegetation Type A: Kwongkan Shrublands with scattered *Nuytsia floribunda*

Vegetation Type A extended across the majority of the site that presented sandy, nutrient-deficient soil. It is exceptionally biodiverse in vegetation structure, floristic species richness, and ecological composition. The areas of this vegetation type fringing the Reserve boundaries appeared to be mildly infested with agricultural weeds, characteristic of edge effects in vegetation remnants in an extensively cleared agricultural landscape. Additionally, the presence of *Pinus pinaster* trees in two distinct areas along the north-western portion of the site, likely naturalised from surrounding pine plantations, degrade this vegetation type. Vegetation Type A bore striking similarities to the EN/P3 TEC/PEC, 'Kwongkan Shrublands of the South-East Floristic Province (Kwongkan)', which was determined through flora and vegetative survey analysis to be present. Fauna characteristic of Kwongkan shrublands was also present, including foraging evidence from the EN Carnaby's Cockatoo (refer to Table Z, Appendix CC).

Area: 59.75 ha.

Condition: Pristine to Degraded.

Vegetation Type B: *Melaleuca cuticularis* Wetland on Rehabilitated Gravel Pits

Vegetation Type B was present in disturbed clay-gravel soils overlying historical gravel pits. Seasonally-inundated ephemeral wetlands were present in clay-based depressions within this vegetation type, with

associated wetland sedges and *Meleleuca cuticularis*. The vegetation present did not bear similarity to any TECs or PECs identified on the desktop search, however, it does provide suitable habitat for Threatened and Priority fauna, namely the P4 quenda (*Isoodon obesulus fusciventer*), and a fresh water drinking source for the EN Carnaby's Cockatoo (*Zanda latirostris*).

Area: 6.91 ha

Condition: Good to Degraded.

Vegetation Type C: Mixed granitic heath with *Kunzea baxteri* and *Borya* spp.

Vegetation Type C was located on clay-rich soils adjacent to and within granitic outcrops present within the Reserve. They possessed a high species richness and a diversity of vegetation structure, ranging from low *Borya* spp. heath and herbfields to complex *Kunzea baxteri* shrublands occasionally featuring eucalypt mallee overstorey. The rock formations, vegetative debris, and damplands present within the vegetation type creates a myriad of faunal habitats, particularly for insects, reptiles, and nectivorous birds.

Area: 11.45 ha

Condition: Pristine

5.1 Vegetation Condition:

Vegetation condition within Reserve 26257 could be classed as predominantly 'Pristine' condition. 'Degraded' areas could be observed in the first few metres of vegetation fringing the site boundaries, largely due to agricultural weed invasion and edge effects. Additionally, the historical gravel pit areas depicted in Vegetation Type B remained in a predominantly 'Degraded' condition. The remainder of the vegetation within the site was classed as existing in a 'Good' to 'Excellent' condition. Several areas of Vegetation Type A along the northern fringe were degraded from 'Pristine' due to the presence of *Pinus pinaster* (likely self-seeded from adjacent plantations) and the presence of non-endemic Western Australian species in historical revegetation sites.

Table 2. Vegetation types and their respective conditions within R 26257.

Vegetation Type	Vegetation Condition		Approximate Area (ha)	
	Class	Proportion of Vegetation Type (%)	Vegetation Condition	Total
A: Kwongan Shrublands with <i>Nuytsia floribunda</i>	Pristine	89.56	53.54	59.78
	Excellent	0.20	0.12	
	Very Good	1.84	1.10	
	Good	1.00	0.60	
	Degraded	7.41	4.43	
B: <i>Melaleuca cuticularis</i> Wetland on Gravel	Good	21.85	1.51	6.91
	Degraded	78.15	5.40	
C: Mixed Granitic Heath with <i>Kunzea baxteri</i> and <i>Borya</i> spp.	Pristine	100	11.45	11.45

The vegetation communities in the reserve and their constituent vegetation conditions were mapped using a combination of aerial imagery interpretation and field ground-truthing. Note that due to the extensive size of the reserve, vegetation type extent and vegetation condition boundaries are approximations.

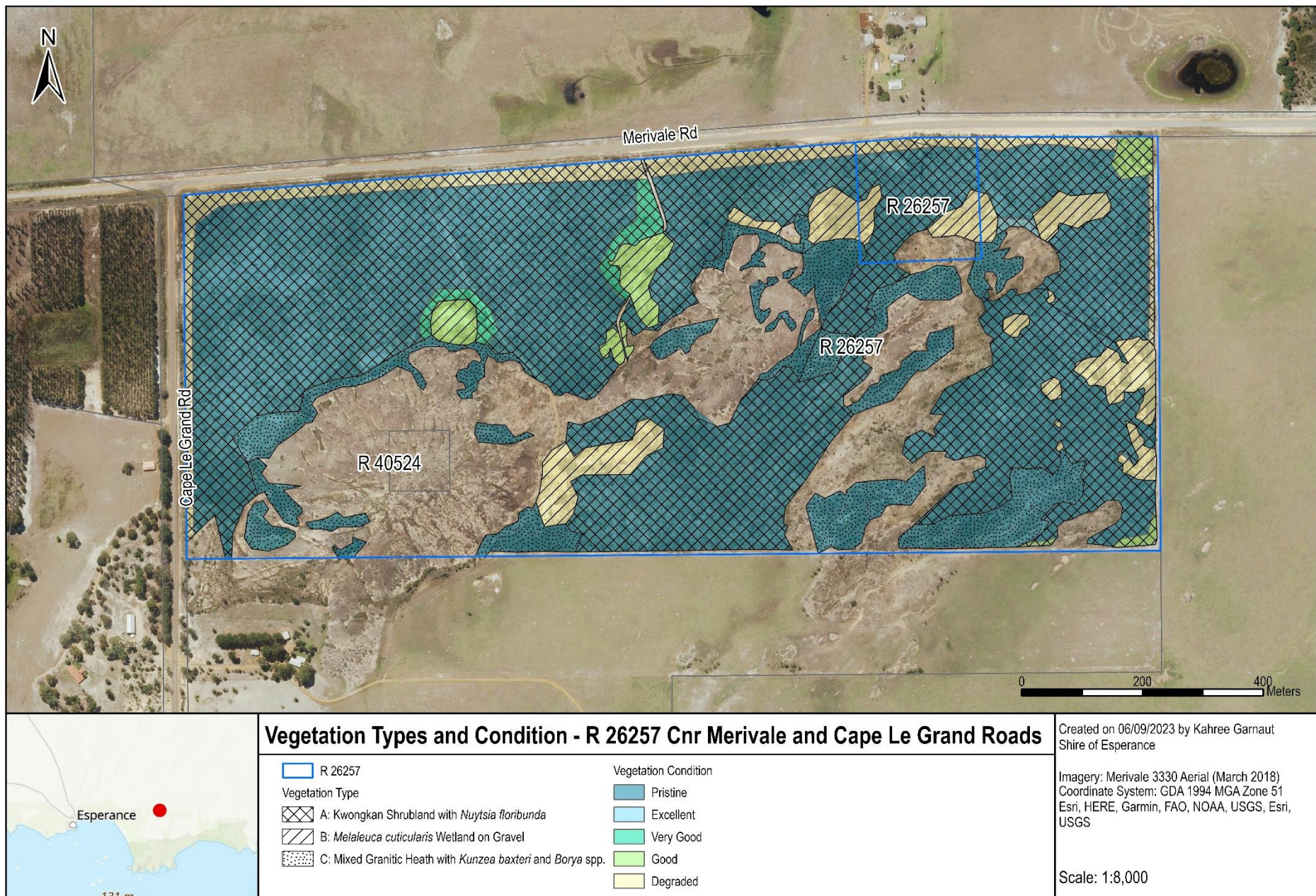


Figure 3. Vegetation types and condition present within the Reserve 26257.



Figure 4. Vegetation Type A – Kwongkan Shrublands with *Nutysia floribunda*. Photos taken by Julie Waters on 1st September 2023.



Figure 5. Vegetation Type B (*Melaleuca cuticularis* Wetland on Gravel) Photos taken on the 1st September 2023 by Kahree Garnaut.



Figure 6. Vegetation Type C – Mixed granitic heath with *Kunzea baxteri* and *Borya* spp. near granite areas. Photo taken by Julie Waters on 1st September 2023.

5.2 Threatened Ecological Communities

The “Proteaceae dominated kwongkan shrublands of the southeast coastal floristic province of Western Australia” TEC was found to be present within Reserve 26257, represented in this report by Vegetation Type A. An approximate total of 55.32 ha of Kwongkan TEC was identified to be present in an adequate condition (i.e. ‘Pristine’ to ‘Good’) within Reserve 26257.

Table 3: Kwongkan TEC analysis for Vegetation Type A

Kwongkan TEC Diagnostic features and condition thresholds	Vegetation Type A
Criterion 1: Occurs within the Southeast Coastal Floristic Province (<i>sensu</i> Hopper and Gioia, 2004; relating to south west Australian phytogeographic boundaries. Includes the islands of the Recherche Archipelago).	Yes – within Recherche subregion of Esperance Sandplains IBRA Bioregion.
Criterion 2: 2a) Characterised by Proteaceae species having 30% or greater cover of Proteaceae species across all layers where these shrubs occur (crowns measured as if they are opaque), OR	Yes 2a - > 30% 2b - Yes, more than two diagnostic Proteaceae species for the Esperance

2b) Two or more diagnostic Proteaceae species are present that are likely to form a significant vegetative component when regenerated (see list of diagnostic species in Table 1). The use of diagnostic species is for situations in which the cover of Proteaceae species is reduced due to recent disturbance (e.g. fire).	region were positively identified within Vegetation Type A.
Kwongkan TEC PEC (Yes / No)	Yes

Table 4: Condition thresholds for Kwongkan TEC.

Condition Category	Minimum patch size	Weeds	Dieback
High	1 ha	≤ 30% perennial weed cover	No known dieback infestation
Moderate	0.05 ha (e.g. 10 m x 50 m, or 5 m x 100 m in roadside vegetation)	≤ 70% perennial weed cover	May be present or absent

6 Threatened and Priority Fauna

6.1 Carnaby's Cockatoo

Evidence of Carnaby's cockatoo (*Zanda latirostris*) foraging was observed within the reserve in the form of chewed *Pinus pinaster* cones (refer to Figure 7). This species, listed as 'Endangered' under the EPBC Act, is known to roost within 7 km of the site, and possesses an abundance of cockatoo plant food species, particularly within the areas of Kwongkan vegetation.



Figure 7: Evidence of Carnaby's cockatoo (*Zanda latirostris*) foraging activity within Reserve 26257.



Figure 8: Carnaby's cockatoo (*Zanda latirostris*) foraging habitat present within Reserve 26257. A) Kwongkan shrubland possessing an abundance of Proteaceous and Myrtaceous foraging species; B) *Pinus pinaster* providing a novel foraging resource of pine cones, both within the reserve and within old plantations throughout an extensively-cleared agricultural landscape.

Carnaby's cockatoo is endemic to southwestern Western Australia, where the species' range extends north to Kalbarri, inland to Merredin, and east to Cape Arid. Within the Esperance region, Carnaby's cockatoos rely heavily on Proteaceous vegetation and associated Myrtaceous species for foraging, as well as exotic plantation pines, canola crops and ornamental trees. They require an abundance of

foraging species, a reliable fresh water source within reasonable proximity (There are no records of Carnaby cockatoo breeding within the Shire of Esperance, with the closest record occurring further west in the Ravensthorpe – Hopetoun area. Therefore, it is likely that the Esperance population migrates west towards the Fitzgerald Biosphere to breed in the eucalypt woodlands during the winter-spring breeding season, with a resident population of non-breeding individuals apparently remaining in the Esperance area year-round. The effects of fire on Carnaby's cockatoo include the temporary loss of key forage species, potential loss of large roosting and nesting hollow trees, and risk of habitat alteration through fire-induced weed invasion. Intense bushfires are recognised to significantly diminish the availability of Proteaceous foraging materials for Carnaby's cockatoos, with the vegetation's ability to provide for the cockatoos returning as the vegetation reaches sexual maturity (Densmore and Clingan, 2019).

Approximately 90% of Reserve 26257 burnt in the November 2015 Merivale bushfires, with some small pockets of unburnt vegetation remaining, including that on the granite outcrops. However, in the eight years since the fire, the vegetation in the burnt areas has fully regenerated, with fruiting and flowering Carnaby's cockatoo forage species evident during the September 2023 survey. Vegetation Type A 'Kwongkan Shrubland' contains approximately 55.36 ha of suitable vegetation possessing adequate foraging and perching habitat (such as *Lambertia inermis*, *Banksia obovata*, including mature, cone-bearing *Pinus pinaster* trees).

6.2 Critical Habitat

Critical habitat for Threatened and Priority fauna and flora was present within all three vegetation types within the Reserve. This includes:

- EN Carnaby's cockatoo – Kwongkan shrubland (foraging) and ephemeral Melaleuca wetlands (drinking and foraging);
- P4 quenda / southern brown bandicoot – ephemeral wetland habitat with dense understorey and surrounding Kwongkan shrublands.

7 Threats

Table 5. Summary of threats to Nature Conservation Values

Altered hydrology	Climate change may decrease inundation periods of ephemeral freshwater wetlands present within Vegetation Type B; this may impact breeding activities of frogs, insects, and other fauna, and alter recruitment and / or survival of mesic flora.
Introduced plants	Weeds are in small localised patches and easily controlled at this point in time. Locations have been saved in Shire of Esperance Weeds Spatial database. Freesias (<i>Freesia alba</i> x <i>leichtlinii</i>), Agapathus spp. present as an isolated patch within Vegetation Type A; likely a result of historical garden waste dumping in the previous gravel pit. Agricultural and forestry weeds such as Guildford Grass (<i>Romulea rosea</i>), Victorian Tea Tree (<i>Gaudium laevigatum</i>), Pinaster Pine (<i>Pinus pinaster</i>), and Rose Geranium (<i>Pelargonium capitatum</i>).
Introduced animals	Feral predators and herbivores such as foxes, cats and rabbits are likely present within the reserve; however, no feral animal control is currently occurring within the reserve, with Calici virus may have been released by DPIRD or neighbours to manage rabbit populations.
Disease	Majority of vegetation susceptible to Phytophthora dieback. Mapped as High Confidence Dieback Infested in 2005. Some possible evidence of dieback evident in northern east portion of reserve within Kwongkan.
Detrimental regimes (fire)	Approximately 90% of the reserve burned in November 2015 in the Merivale bushfire (Granite areas were largely unburnt).
Timber cutting / clearing	No evidence of timber extraction within the reserve. <i>Pinus pinaster</i> trees in northern site may present a firewood resource.
Extractive activities	There are numerous gravel pits that have only been partially rehabilitated at the site, occupying a total of approximately 6.91 ha (Vegetation Type B).
Rubbish	Glass bottles and minor debris present scarcely across northern portion of site, particularly focused within Vegetation Type B.
Grazing	Kangaroos and other native herbivores present, potentially feral herbivore grazing (rabbits).
Beekeeping	None present.
Utilities	Powerlines on north boundary of reserve
Recreation	Little to no evidence of recreational activities; likely that tourists bypass reserve en route to Cape Le Grand National Park. Old gravel pits that may have once been illegal camped in are no longer accessible by vehicle.

8 Offset suitability

Reserve 26257 is a medium-sized highly ecologically and botanically diverse reserve. The reserve contains suitable offsets as for Beard Vegetation Association 6048, Kwongkan TEC and Carnaby's cockatoo foraging habitat.

The reserve vesting of the site was changed in 2017 to "Environmental Conservation". The majority of the site including Beard Vegetation Association 6048, Kwongkan TEC and Carnaby's cockatoo foraging habitat remains in the Shire of Esperance's banked Environmental Offsets sites.

Reserve 26257 contains vegetation of the same vegetation types and in better condition than that being cleared as part of CPS 10154/1.

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Appendix 1: Incidental Species List

Family	Genus	Species	Common Name	Invasive
Anarthriaceae	Anarthria	scabra		
Anarthriaceae	Lyginia	imberbis		
Apiaceae	Platysace	compressa		
Asparagaceae	Billardiera	fusiformis	Australian Bluebell	
Asparagaceae	Lomandra	hastilis		
Asteraceae	Ursina	anthemoides		x
Cassuarinaceae	Allocasuarina	thyoides		
Casuarinaceae	Allocasuarina	humilis	Dwarf Sheoak	
Cupressaceae	Callitris	roei	Roe's Cypress Pine	
Cyperaceae	Caustis	dioca		
Cyperaceae	Chaetospora	curvifolia		
Cyperaceae	Mesomelaena	stygia	Stygian's Mesomelaena	
Cyperaceae	Mesomelaena	tetragona	Semaphore Sedge	
Cyperaceae	Schoenus	caespititius		
Cyperaceae	Tricostularia	aphylla		
Dilleniaceae	Hibbertia	gracilipes		
Dilleniaceae	Hibbertia	acerosa		
Droseraceae	Drosera	sp. Branched styles		
Droseraceae	Drosera	glanduligera	Pimpernel Sundew	
Ericaceae	Leucopogon	carinatus		
Ericaceae	Leucopogon	sp. Coujinup		
Ericaceae	Lysinema	ciliatum		
Fabaceae	Chorizema	aciculare	Needle-leaved Chorizema	
Fabaceae	Chorizema	obtusifolium		
Fabaceae	Daviesia	dilatata		
Fabaceae	Gompholobium	baxteri		
Fabaceae	Gompholobium	knightianum		
Fabaceae	Gompholobium	marginatum		
Fabaceae	Hovea	pungens		
Fabaceae	Isotropis	cuneifolia	Granny Bonnets	
Fabaceae	Jacksonia	spinosa		
Fabaceae	Pultenaea	strobilifera		
Fabaceae	Acacia	subcaerulea		
Fabaceae	Acacia	conniana		
Fabaceae	Acacia	crassiuscula		

Family	Genus	Species	Common Name	Invasive
Fabaceae	Acacia	nigricans		
Geraniaceae	Pelargonium	capitatum	Rose Geranium	X
Goodeniaceae	Goodenia	incana		
Goodeniaceae	Leschenaultia	formosa	Red Leschenaultia	
Haemodoraceae	Conostylis	bealiana		
Haloragaceae	Gonocarpus	scordioides		
Hemerocallidaceae	Chamaescilla	corymbosa	Blue Squill	
Hemerocallidaceae	Stypantra	glauca	Blind Grass	
Iridaceae	Freesia	alba x leichtlinii	Freesia	X
Iridaceae	Patersonia	juncea	Rush-leaved Patersonia	
Iridaceae	Romulea	rosea	Guildford grass	X
Lentibulariaceae	Utricularia	menziesii	Redcoats	
Loranthaceae	Nuytsia	floribunda	WA Christmas Tree	
Malvaceae	Thomasia	angustifolia		
Myrtaceae	Apectospermum	spinescens	Spiny Tea Tree	
Myrtaceae	Beaufortia	empetrifolia		
Myrtaceae	Calothamnus	gracilis		
Myrtaceae	Calothamnus	quadridus	One-sided Bottlebrush	
Myrtaceae	Calytrix	lechenaultii		
Myrtaceae	Darwinia	vestita		
Myrtaceae	Eucalyptus	doratoxylon		
Myrtaceae	Eucalyptus	pleurocarpa	Tallerack	
Myrtaceae	Eucalyptus	preissiana	Bell-fruited Mallee	Likely planted
Myrtaceae	Eucalyptus	tetraptera	Four-winged Mallee	No, likely planted
Myrtaceae	Eucalyptus	uncinata		
Myrtaceae	Gaudium	laevigatum	Victorian tea tree	X
Myrtaceae	Kunzea	baxteri	Baxter's Kunzea	
Myrtaceae	Melaleuca	calycina		
Myrtaceae	Melaleuca	cuticularis	Saltwater Paperbark	
Myrtaceae	Melaleuca	scabra		
Myrtaceae	Melaleuca	striata		
Myrtaceae	Melaleuca	thymoides		
Myrtaceae	Melaleuca	tubulata var. macrophylla		
Myrtaceae	Taxandria	callistachys		
Myrtaceae	Taxandria	spathulata		
Myrtaceae	Verticordia	minutifolia		

Family	Genus	Species	Common Name	Invasive
Orchidaceae	Caladenia	decora	Esperance King Spider Orchid	
Orchidaceae	Caladenia	longicauda		
Orchidaceae	Caladenia	longicauda subsp. crass x decora	Esperance White Spider Orchid hybrid with King Spider Orchid	
Orchidaceae	Caladenia	sp.		
Orchidaceae	Diuris	littoralis	Green Range Donkey Orchid	
Orchidaceae	Diuris	pulchella	Beautiful Donkey Orchid	
Orchidaceae	Leporella	fimbriata	Hare Orchid	
Orchidaceae	Pyrorchis	nigricans	Red Beaks	
Orchidaceae	Thelymitra	antennifera	Lemon-scented Sun Orchid	
Orchidaceae	Elythranthera	brunonis	Purple Enamel Orchid	
Orchidaceae	Thelymitra	antennifera	Lemon-scented Sun Orchid	
Pinaceae	Pinus	pinaster		X
Poaceae	Neurachne	alopecuroidea	Foxtail Mulga Grass	
Polygonaceae	Muehlenbeckia	adpressa	Climbing Lignum	
Proteaceae	Adenanthos	cuneatus	Coastal jugflower	
Proteaceae	Banksia	armata	Prickly Dryandra	
Proteaceae	Banksia	nivea	Honeypot Dryandra	
Proteaceae	Banksia	nutans	Nodding Banksia	
Proteaceae	Banksia	obovata	Wedge-leaved Dryandra	
Proteaceae	Banksia	repens	Creeping Banksia	
Proteaceae	Conospermum	distichum		
Proteaceae	Hakea	corymbosa	Cauliflower Hakea	
Proteaceae	Hakea	ferruginea		
Proteaceae	Hakea	obliqua	Needles and Corks	
Proteaceae	Hakea	trifurcata	Two-leaf Hakea	
Proteaceae	Isopogon	formosus	Rose Coneflower	
Proteaceae	Lambertia	inermis	Chittick	
Proteaceae	Synaphea	media		
Proteaceae	Synaphea	oligantha		
Restionaceae	Chordifex	laxus		
Restionaceae	Hypolaena	fastigiata		

Family	Genus	Species	Common Name	Invasive
Restionaceae	Leptocarpus	crebriculmis		
Rhamnaceae	Cryptandra	myriantha		
Rhamnaceae	Cryptandra	pungens		
Rhamnaceae	Spyridium	globulosum	Basket Bush	
Rubiaceae	Opercularia	vaginata	Dog Weed	
Solanaceae	Anthocercis	viscosa ssp. caudata		
Stylidiaceae	Stylidium	corymbosum		
Xanthorrhoeaceae	Xanthorrhoea	platyphylla		

Appendix 2: Desktop Flora Search Results

Table 4. Threatened or priority flora identified by the desktop study to be present within a 20 km radius of the offset site, using Threatened and Priority Flora Reporting, WA Herbarium and Esperance District Threatened Flora datasets

Taxon	Conservation Status		WA herb	DBCA	SOE	Distance (km)
	BC Act	EPBC Act				
<i>Persoonia scabra</i>	P3		X		X	0.0
<i>Eucalyptus balanopelex</i> (taxon removed from census. Considered now to be a hybrid with <i>E. kesselli</i> subsp. <i>eugnosta</i> x <i>E. semiglobosa</i>)	P1				X	0.2
<i>Leucopogon interruptus</i>	P3		X	X	X	0.2
<i>Stylidium glandulosum</i>	P3		X			3.1
<i>Utricularia oppositiflora</i>	P3		X			3.1
<i>Eucalyptus ligulata</i> subsp. <i>ligulata</i>	P4		X		X	3.1
<i>Lasiopetalum maxwellii</i>	P2		X		X	5.4
<i>Astartea eobalta</i>	P2		X		X	5.4
<i>Leucopogon apiculatus</i>	P3		X		X	5.7
<i>Rumicstrum chamaecladum</i>	P2		X		X	6.0
<i>Ricinocarpos pilifer</i>	P2				X	6.4
<i>Acacia incanica</i>	P2		X	X	X	6.4
<i>Utricularia helix</i>	P2		X		X	7.0
<i>Styphelia multiflora</i>	P2		X			7.0
<i>Myriophyllum petraeum</i>	P4		X	X		7.7
<i>Eucalyptus semiglobosa</i>	P3		X		X	8.5
<i>Verticordia verticordina</i>	P3		X		X	9.2
<i>Opercularia hirsuta</i>	P2				X	9.5

Taxon	Conservation Status		WA herb	DBCA	SOE	Distance (km)
	BC Act	EPBC Act				
<i>Thysanotus parviflorus</i>	P4		X		X	9.6
<i>Lepyrodia fortunata</i> ms	P2				X	9.7
<i>Comesperma lanceolatum</i>	P2		X	X	X	9.9
<i>Banksia prolata</i> subsp. <i>prolata</i>	P3		X			10.1
<i>Stylidium roseonanum</i>	P3		X			10.1
<i>Eucalyptus insularis</i> subsp. <i>continentalis</i>	DRF	EN	X	X	X	10.2
<i>Thysanotus volubilis</i>	P2		X		X	10.8
<i>Pleurophascum occidentale</i>	P4		X	X		10.9
<i>Boronia scabra</i> subsp. <i>attenuata</i>	P3		X		X	11.1
<i>Gonocarpus pycnostachyus</i>	P3		X	X	X	11.1
<i>Microtis quadrata</i>	P4		X			11.4
<i>Daviesia pauciflora</i>	P3		X		X	12.0
<i>Utricularia westonii</i>	P2		X		X	12.0
<i>Dampiera decurrens</i>	P2		X	X	X	12.1
<i>Myoporum velutinum</i>	DRF	EN	X		X	14.5
<i>Styphelia rotundifolia</i>	P3		X	X	X	14.7
<i>Lobelia archeri</i>	P1		X		X	15.4
<i>Poa billardi</i> <i>ereii</i>	P3		X			15.5
<i>Aldrovanda vesiculosa</i>	P2		X			16.2
<i>Patersonia inaequalis</i>	P2		X		X	16.4
<i>Calectasia jubilae</i>	P2		X		X	16.7
<i>Leucopogon corymbiformis</i>	P2		X			16.7
<i>Trachymene anisocarpa</i> var. <i>trichocarpa</i>	P3		X		X	16.7
<i>Acacia nitidula</i>	P2				X	16.8
<i>Lambertia echinata</i> subsp. <i>echinata</i>	DRF	CR	X	X	X	16.9
<i>Gonocarpus simplex</i>	P4		X	X	X	18.1
<i>Lepyrodia fortunata</i>	P2		X		X	18.8
<i>Banksia prolata</i> subsp. <i>calcicola</i>	P4		X			19.2
<i>Atriplex muelleri</i>	P1		X		X	19.2
<i>Goodenia quadrilocularis</i>	P2		X	X	X	19.4
<i>Scaevola paludosa</i>	P2		X			19.4
<i>Eucalyptus aquilina</i>	P4		X		X	19.5

Appendix 3: Desktop Fauna Search Results

CLASS	Scientific name	Vernacular name	Conservation Status		Distance (km)
			BC Act	EPBC Act	
Bird	<i>Zanda latirostris</i>	Carnaby's cockatoo, Ngoolark	EN	EN	0.0
	<i>Tringa glareola</i>	Wood sandpiper	MI	MI	0.7
	<i>Pezoporus flaviventris</i>	Western ground parrot, Kyloring	CR	CR	3.7
	<i>Botaurus poiciloptilus</i>	Australasian bittern	EN	EN	3.9
	<i>Ixobrychus dubius</i>	Australian little bittern	P4		5.9
	<i>Plegadis falcinellus</i>	Glossy ibis	MI	MI	7.0
	<i>Tringa nebularia</i>	Common greenshank	MI	MI	10.9
	<i>Actitis hypoleucos</i>	Common Sandpiper	MI	MI	10.9
	<i>Hydroprogne caspia</i>	Caspian Tern	MI	MI	10.9
	<i>Thalasseus bergii</i>	Crested tern	MI	MI	10.9
	<i>Cereopsis novaehollandiae grisea</i>	Cape Barren Goose, Recherche Cape Barren goose	VU	VU	10.9
	<i>Calidris ferruginea</i>	Curlew sandpiper	CR	MI	12.6
	<i>Calidris ruficollis</i>	Red-necked stint	MI	MI	12.6
	<i>Charadrius bicinctus</i>	Double-banded Plover	MI	MI	13.0
	<i>Calidris acuminata</i>	Sharp-tailed sandpiper	MI	MI	13.0
	<i>Calidris alba</i>	Sanderling	MI	MI	13.0
	<i>Calidris melanotos</i>	Pectoral Sandpiper	MI	MI	13.0
	<i>Charadrius leschenaultii</i>	Greater sand plover, large sand plover	VU	MI	13.0
	<i>Charadrius mongolus</i>	Lesser Sand Plover	EN	MI	13.0
	<i>Limosa lapponica</i>	Bar-tailed godwit	MI	MI	13.0
	<i>Pluvialis fulva</i>	Pacific golden plover	MI	MI	13.0
	<i>Falco peregrinus</i>	Peregrine falcon	OS		13.0
	<i>Thinornis rubricollis</i>	Hooded plover, hooded dotterel	P4		13.0
	<i>Calidris tenuirostris</i>	Great knot	CR	MI	14.6
	<i>Tringa brevipes</i>	Grey-tailed tattler	MI and P4	MI	15.1
Mammal	<i>Isodon obesulus fusciventer</i>	Quenda, southwestern brown bandicoot	P4		15.3
Bird	<i>Ardenna carneipes</i>	Flesh-footed Shearwater	VU	MI	15.5
	<i>Ardenna tenuirostris</i>	Short-tailed shearwater	MI	MI	15.5

CLASS	Scientific name	Vernacular name	Conservation Status		Distance (km)
			BC Act	EPBC Act	
	<i>Stercorarius parasiticus</i>	Arctic jaeger, Arctic skua	MI	MI	15.5
	<i>Thalassarche chlororhynchos</i>	Atlantic yellow-nosed albatross	VU	MI	15.5
Reptile	<i>Caretta caretta</i>	Loggerhead turtle	EN	EN	16.7
Mammal	<i>Petrogale lateralis lateralis</i>	Black-flanked rock-wallaby, black-footed rock-wallaby, moororong	EN	EN	17.8
	<i>Neophoca cinerea</i>	Australian sea-lion	EN	EN	18.0
Invertebrate	<i>Atelomastix brennani</i>	Brennan's atelomastix millipede	VU		18.7
Reptile	<i>Eretmochelys imbricata</i>	Hawksbill turtle	VU	VU	19.2
Mammal	<i>Notamacropus eugenii derbianus</i>	Tammar wallaby	P4		19.2
Bird	<i>Thalassarche melanophris</i>	Black-browed albatross	EN	MI	19.3
Invertebrate	<i>Zephyrarchaea marki</i>	Cape Le Grand assassin spider	VU		19.8

Appendix 4: Kwongkan TEC Diagnostic Species List (extracted from Table 1, Conservation Advice)

District – Esperance (east)	Present in Vegetation Type A
<i>Adenanthos cuneatus</i>	Y
<i>Banksia alliacea</i>	
<i>Banksia armata</i>	Y
<i>Banksia cirsioides</i>	
<i>Banksia media</i>	
<i>Banksia nivea</i>	Y
<i>Banksia nutans</i>	Y
<i>Banksia obovata</i>	Y
<i>Banksia occidentalis</i>	
<i>Banksia petiolaris</i>	
<i>Banksia pilostylis</i>	
<i>Banksia plumosa</i>	
<i>Banksia prolata</i>	
<i>Banksia pulchella</i>	
<i>Banksia speciosa</i>	Y
<i>Banksia tenuis</i>	
<i>Grevillea concinna</i>	
<i>Hakea cinerea</i>	
<i>Hakea corymbosa</i>	Y
<i>Hakea drupacea</i>	
<i>Hakea nitida</i>	
<i>Hakea obliqua</i>	Y
<i>Hakea pandanycarpa</i>	
<i>Hakea trifurcata</i>	Y
<i>Isopogon formosus</i>	Y
<i>Isopogon heterophyllus</i>	
<i>Isopogon polycephalus</i>	
<i>Isopogon trilobus</i>	
<i>Lambertia inermis</i>	Y

Appendix 5: Carnaby's cockatoo Foraging Quality Assessment

Adapted from EPBC Act Referral Guidelines

Starting Score		Carnaby's Cockatoo	
10		<p>Start at a score of 10 if your site is native shrubland, Kwongan heathland or woodland, dominated by proteaceous plant species such as <i>Banksia</i> spp., <i>Hakea</i> spp. and <i>Grevillea</i> spp., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation.</p> <p>This tool only applies to sites equal to or larger than 1 hectare in size.</p>	
Attribute	Subtractions	Context adjustor (attributes reducing functionality of foraging habitat)	Site performance
Foraging potential	-2	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Evidence of foraging debris on site (chewed, discarded pine cones).
Connectivity	-2	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	Site is within close proximity (< 12 km) of surrounding suitable forage habitat, including a pine plantation and Cape Le Grand National Park.
Proximity to breeding	-2	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	No breeding habitat within 12 km; closest is ~ 180 km west in Ravensthorpe-Hopetoun area.
Proximity to roosting	-1	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Two known roosts within 20 km of the site; 6.9 km and 17 km away, respectively.
Impact from significant plant disease	-1	Subtract 1 if your site has disease present (e.g. <i>Phytophthora</i> spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	Dieback present in some areas; some <i>Proteaceous</i> plant deaths observed (e.g. <i>Banksia speciosa</i> in north-eastern corner).
Total score		7	
Appraisal		The vegetation within R 26257 (predominantly within Vegetation Type A has a foraging score value of 7, indicating that this vegetation is suitable foraging habitat.	