



Offset Proposal

Reserve 31099 'Old Smokey'

Shire of Esperance Strategic Purpose Permit
CPS 10158

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1 Summary

Reserve 31099 Old Smokey Reserve is a 35.6-ha reserve currently purposed for gravel extraction. Reserve 31099 is ecologically diverse, hosting a mosaic of species-rich shrublands, Swamp Yate (*Eucalyptus occidentalis*) woodlands, and Saltwater Paperbark (*Melaleuca cuticularis*) wetlands. The majority of the reserve is in a pristine or excellent condition, with remaining areas varying from a very good to degraded condition. Reserve 31099 is surrounded by agricultural land utilised for livestock grazing, and remnant vegetation vested for gravel pits.

This report proposes Reserve 31099 as a potential conservation offset for Kwongkan TEC being cleared under CPS 10158/1. Vegetation Type A: *Banksia speciosa* and *Nuytsia floribunda* Low Open Woodland over Mixed Myrtaceous and Proteaceous Open Heath with Restiads is rich in diagnostic kwongkan species and exists in a predominantly Very Good to Pristine condition, and therefore presents as a suitable offset site for Kwongkan TEC, this vegetation was considered to be of a 'high' condition category.

A preliminary flora and vegetation survey was conducted by Shire of Esperance Environmental Officers, Katherine Walkerden and Kahree Garnaut on the 18th of January 2024. An in-depth flora survey could not be undertaken due to the significant limitations in species detectability and difficulties in taxonomic identification presented by the mid-summer survey timing outside the peak flowering period for the Esperance Plains IBRA Bioregion.

2 Area Description

Reserve Name:	Unnamed	Reserve No.	31099
Named Features:	None	NRM Region:	South Coast
Location No.	Lot: 460 on Plan: 175372	LGA	Shire of Esperance
Vesting:	Shire of Esperance	Nearest Towns:	Esperance
Current Purpose:	Gravel	Nearest Roads:	Old Smokey Road, Fisheries Road
Zoning:	Government services	Map Reference:	409625 m E 6267807 m N
Area of Reserve:	35.6 ha	IBRA Sub Region:	Recherche



Figure 1. Map of Reserve 31099 with 2018 aerials.

3 Asset Values

Landform	<ul style="list-style-type: none"> Level plain, <1% slope Gently undulating plain, 1-3% slope
Soils	<ul style="list-style-type: none"> Gravelly, yellow mottled sandy duplex soils over gravel layer at 30-80cm Deep uniform sand, Podzol > 80 cm (Corinup), Uc2.22
Geology/Regolith	<ul style="list-style-type: none"> Tertiary marine sediments of the Pallinup formation Quaternary aeolian sand overlying Tertiary sediments of the Pallinup formation
Threatened Ecological Communities	EPBC listed "Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia (Kwongkan)" TEC
Threatened and Priority fauna	Carnaby's Black Cockatoo - <i>Zanda latirostris</i> – Endangered Western brush wallaby - <i>Notamacropus irma</i> – Priority 4 Quenda - <i>Isoodon obesulus fusciventer</i> - Priority 4
Native Fauna	30 species of native fauna were positively identified within the reserve.

Beard Vegetation Associations	<ul style="list-style-type: none"> ESPERANCE_4048 - Shrublands; scrub-heath in the Esperance Plains including Mt Ragged scrub-heath
Catchment	Bandy Creek Catchment
European evidence	<p>This site has been previously used for the purpose of gravel extraction, with all gravel extraction having occurred prior to 2022. These have been rehabilitated through ripping and spreading of topsoil, historic gravel pits are in an excellent condition.</p> <p><i>Pinus pinaster</i> has been planted within a 1.9ha area, this area was potentially a very old gravel pit.</p>
Aboriginal evidence	Closest listed heritage site was 2.5km away.
Recreational evidence	No evidence of recreational activity was found.
Fire	No recent fire history.

4 Regional Context

Reserve 31099 is located approximately 14 km north-east of the Esperance Townsite along Old Smokey Road. The regional landscape is highly fragmented due to agricultural clearing. The Reserve is situated between Reserve 28225, Old Smokey Road Reserve and farmland. The reserve provides significant ecological connectivity within a highly cleared landscape.

The area is listed as containing Beard vegetation association Esperance 4048. The Esperance 4048 has been moderately cleared with 60% of its pre-European extent remaining, the vegetation association is also well represented with 47% of its pre-European extent represented within conservation estate.

Table 1. Vegetation association by percentage of pre-European extent remaining.

Vegetation association	Esperance 4048
Description	Shrublands; scrub-heath in the Esperance Plains including Mt Ragged scrub-heath
Pre-European extent remaining	59.71
Pre-European extent remaining within the Shire of Esperance	57.61
Pre-European extent remaining within Recherche IBRA Sub-region	49.85
Pre- European extent in land protected for conservation	47.62

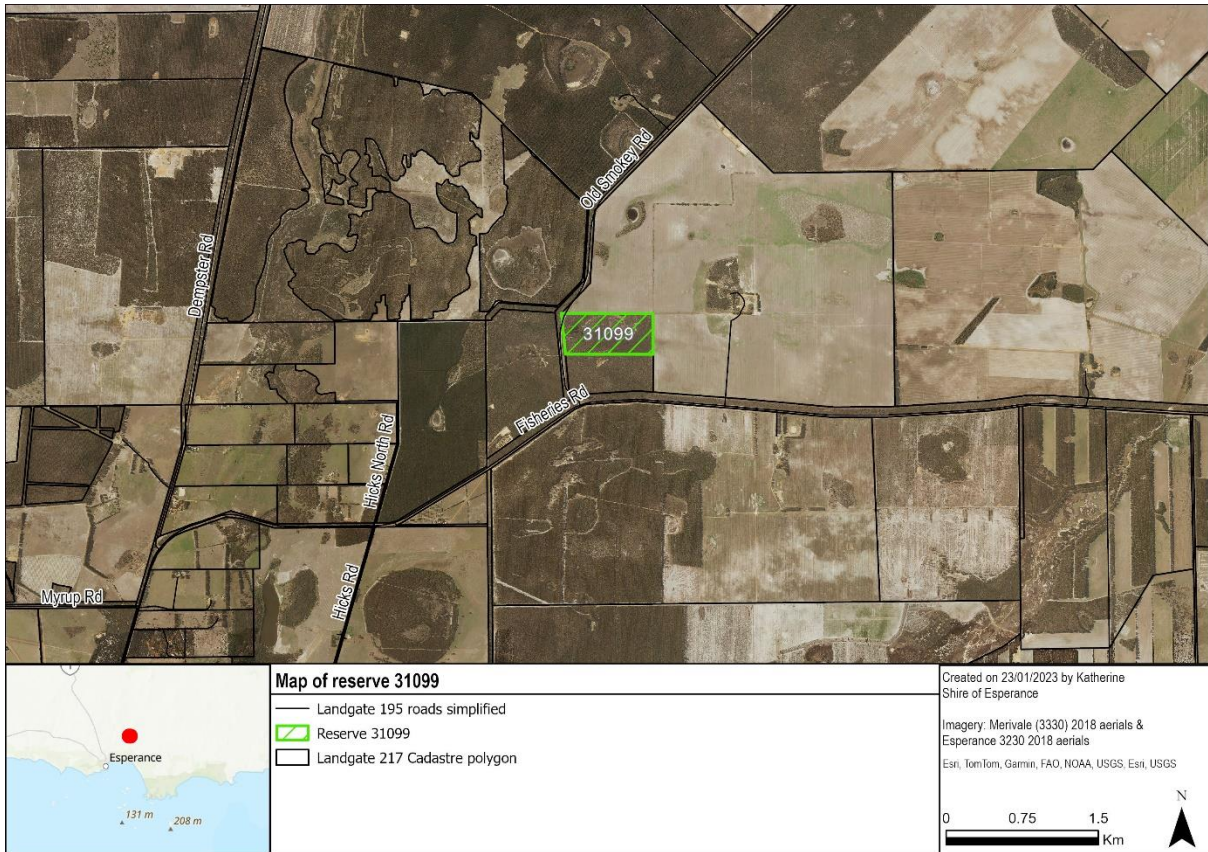


Figure 2. Map showing regional context of Reserve 31099.

5 Historic Gravel Extraction Activities

Significant historical gravel extraction has occurred within the reserve all gravel extraction activities had occurred prior to 2002, with most of the gravel pits also being rehabilitated prior to 2002. There was also an area with historic pine plantings that may have been cleared for gravel extraction purposes. There was a total of 8.5ha of rehabilitated gravel pits present within Reserve 31099.

Most of the gravel pit rehabilitation was of good quality, though portions of the gravel pit had waterlogging issues, some of these waterlogged areas had been colonised by native wetland species, though some of these waterlogged areas lacked any trees or shrubs being dominated almost exclusively by *Leptocarpus crebriculmis*.

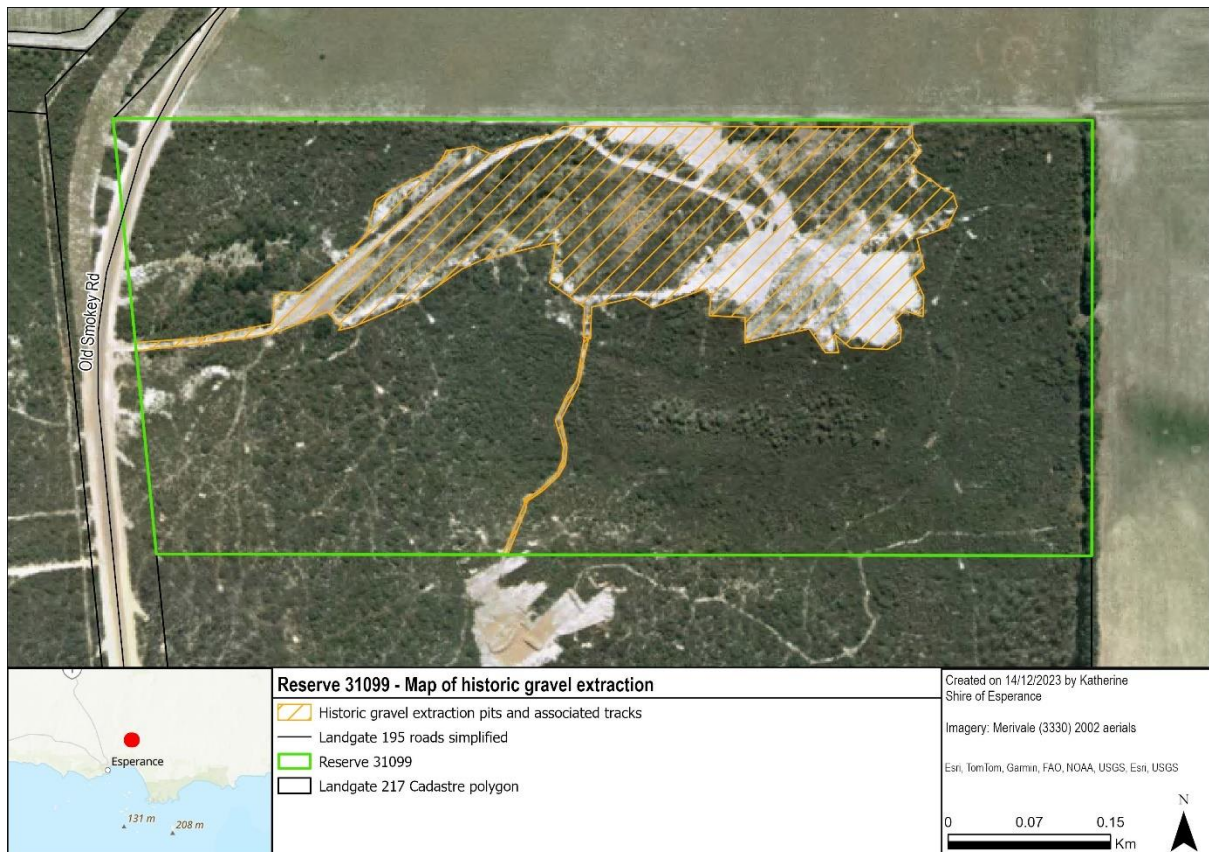


Figure 3. Map of historic gravel pits and associated tracks.

6 Vegetation Communities

In 2024, the vegetation communities of the reserve were mapped using a combination of aerial photography interpretation and ground truthing via walking meandering traverses through the reserve.

Reserve 31099 consists of seven vegetation communities:

- A. *Banksia speciosa* and *Nuytsia floribunda* Low Open Woodland over Mixed Myrtaceous and Proteaceous Open Heath with Restiads.
 - 22.847 ha
- B. Mixed Myrtaceous and Proteaceous Dominated Open Heath with Restiads.
 - Occurring in rehabilitated gravel pits

- 6.414 ha
- C. *Eucalyptus occidentalis* Low Woodland with *Melaleuca cuticularis* and *Melaleuca brevifolia*-dominated Open Shrubland and *Leptocarpus crebriculmis* Sedgeland.
 - Occurring in rehabilitated gravel pits where soil profile has been significantly lowered
 - 1.370 ha
- D. *Melaleuca cuticularis* Low Woodland with *Taxandria callistachys* dominated Tall Open Scrub with a Restiad Sedgeland.
 - 1.527 ha in a pristine condition
 - 0.215 ha in a good condition
 - Wetland vegetation
- E. *Pinus pinaster* monoculture with scattered remnant native vegetation.
 - 1.877 ha
 - Carnaby's cockatoo foraging was evident
- G. *Leptocarpus crebriculmis* dominated sedgeland.
 - a. Occurring in rehabilitated gravel pits where soil profile has been significantly lowered
 - b. 0.359 ha

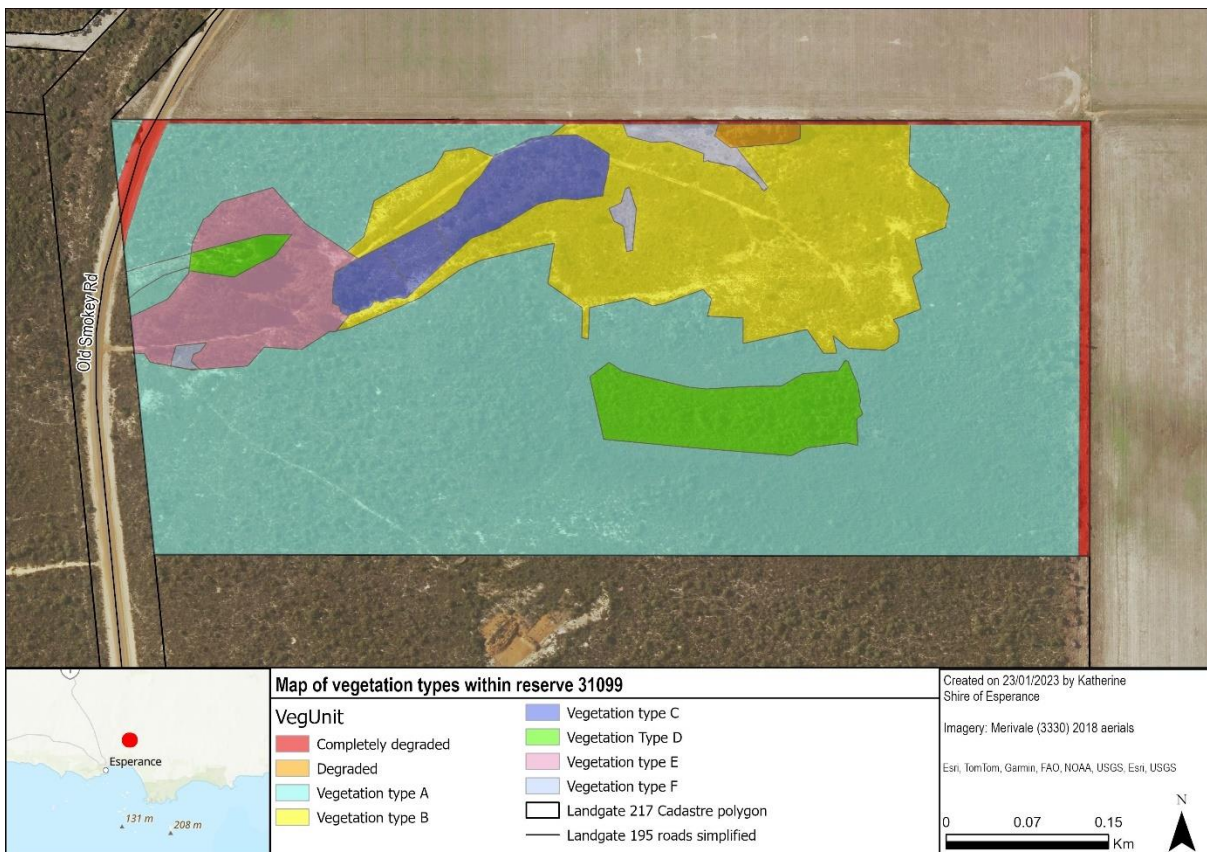


Figure 4. Map of vegetation types present within the Reserve 31099.

7 Vegetation Condition

Approximately 38% of Reserve 31801 existed in a Pristine condition (13.813 ha), with approximately 42% of the reserve was in an Excellent condition. The remainder of the reserve varied in condition between Very good and Completely Degraded.

There had been significant historical gravel extraction within the reserve and significant weed invasion within portions of the historic gravel pits. Weed invasion had also occurred along the tracks and along the firebreaks. *Pinus pinaster*, *Gaudium laevigatum* and *Eragrostis curvula* being the most significant weeds present within the reserve.

The soil profile had been significantly lowered within sections of the gravel pit, in these areas the shrubland plants present prior to clearing have been unable to establish with different wetland plant communities having established within these areas.

There was a large historically disturbed area (potentially a gravel pit) where *Pinus pinaster* had been planted, this vegetation had some native vegetation present in the understorey.

Table 2. Quantifying vegetation by vegetation type and condition.

Vegetation Type	Pristine	Excellent	Very Good	Good	Degraded	Completely degraded	Total
A	12.286	9.897	0.641	-	-	-	22.847
B	-	4.337	2.077	-	-	-	6.414
C	-	0.795	0.575	-	-	-	1.370
D	1.527	-	-	0.215	-	-	1.742
E	-	-	-	-	1.877	-	1.877
F	-	-	0.072	0.239	0.048	-	0.359
-	-	-	-	-	0.144	0.876	1.020
Total	13.813	15.050	2.860	0.959	2.069	0.876	35.627



Figure 5. Vegetation condition within Reserve 31099.

8 Phytophthora dieback

Dieback Information Delivery and Management System (DIDMS; GAIA Resources, SCNRM & State NRM 2022) data shows positive *Phytophthora cinnamomi* sample results in the immediate area, with positive results in the neighbouring Reserve 28225 and along Fisheries Road near the intersection with Old Smokey Road.

Vegetation type B where gravel extraction had previously occurred had a lower proportion of proteaceous vegetation present, potentially as a result of dieback introduction and spread during gravel extraction and rehabilitation activities.



Figure 6. Map of positive *Phytophthora* samples surrounding Reserve 31099 (top right rectangle), with *Phytophthora cinnamomi* points in red.

9 Threatened Ecological Communities

The desktop search showed the EPBC Act-listed 'Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia (Kwongkan)' TEC to be mapped approximately 0.37 km from the reserve. The field survey confirmed that Kwongkan TEC was present within Reserve 31099 within Vegetation Type A.

The EPBC listed TEC was observed within the Reserve 31099. Vegetation type A provided suitable Kwongkan TEC offsets.

Within the overstorey of vegetation type A, roughly 60% of the overstorey plants were proteaceous (*Banksia speciosa*). Proteaceous cover within the shrub layer was roughly 35%, with *Adenanthos cuneatus* being the most prolific proteaceous shrub within the vegetation type. A total of 11 Kwongkan indicator species (Appendix 1) were observed within the reserve.

Vegetation type A is considered to be in a high condition category due to the large patch size with low or absent weed cover and lacking dieback presence.

Table 3. Quantifying the 'Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia' by condition in hectares

TEC/PEC	Pristine	Excellent	Very Good	Total
Kwongkan TEC Vegetation Types A	12.286	9.897	0.641	22.847

Vegetation Type B had variable levels of proteaceous cover with portions of the reserve likely passing the 30% proteaceous threshold, for the TEC, other areas had a significantly lower proportion of proteaceous species. Additional surveys will be required to accurately map the areas within vegetation type B which could be considered as being the TEC. At this stage, Vegetation Type B is not required as a Kwongkan TEC offset for CPS 10158, but with additional surveys it may be used in the future to offset other clearing.

10 Carnaby’s Black Cockatoo Habitat

Vegetation Type A provided suitable native foraging habitat for the Carnaby’s Black Cockatoo, with evidence of foraging on *Banksia speciosa* and *Banksia obovata* fruit and flowers present within Reserve 31099. This included a total of 22.847 ha. The Carnaby’s black cockatoo foraging quality scoring tool was undertaken for vegetation type A with a resulting score of 8, with 2 points subtracted due to a lack of breeding habitat in the Esperance region (Appendix 5).

Vegetation Type E provided suitable exotic foraging and roosting habitat for the Carnaby’s Cockatoo, this included a total area of 1.9 ha. There was evidence of Carnaby’s cockatoo foraging on *Pinus pinaster* cones within Vegetation Type E.

10.1 Carnaby’s Cockatoo Foraging Habitat Assessment

Vegetation Type A & E contain various levels of suitable foraging habitat for Carnaby’s Cockatoo.

Vegetation Type A contained a range of *Banksia*, *Hakea*, *Isopogon*, *Allocasuarina* species which are known to be foraged on by Carnaby’s Cockatoos.

Vegetation Type E almost exclusively included *Pinus pinaster* a preferred foraging recourse for Carnaby’s cockatoos.

10.1.1 Proximity to foraging habitat

Large patches of remnant native vegetation representing native foraging habitat surround the reserve with Reserve 28225 immediately adjacent to the east of Reserve 31099. Numerous large *Pinus pinaster* plantations immediately surround the reserve on private property.

10.1.2 Proximity to roosting habitat

Pinus pinaster plantations and windbreaks occur sporadically across the landscape, acting as both foraging and potential night roosting habitat. Several pine plantations were located within 1km of the reserve with the closest being located 80m away from the reserve. In addition, the reserve was 1.9km away from the ‘ESPMYRR002’ known roosting site.

10.1.3 Proximity to water resources

Vegetation type C, D & F are all winter wet areas and will provide water recourse during spring. There were several dams nearby with the closest being 1.5km away.

11 Threats (to nature conservation values)

<p>Introduced plants</p>	<p>Various weeds were present. <i>Pinus pinaster</i>, <i>Gaudium laevigatum</i> and <i>Eragrostis curvula</i> being the most significant weeds present within the reserve. <i>Gaudium laevigatum</i> was the most serious threat to vegetation</p>
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	<p>within the reserve. The species was outlined in the Esperance Environmental Weed Strategy 2009. A single <i>Yucca</i> sp. plant was present</p> <p>Weed invasion had occurred along the tracks, firebreaks and within the historical gravel pits.</p>
Introduced animals	Evidence of various domestic animals were found within the reserve with skeletons of a domestic dog, sheep and horse found. Evidence of rabbits and foxes were also found.
Disease	No obvious signs of disease were present. Vegetation type A & B both contained vegetation vulnerable to dieback infection. Vegetation type B had a much lower proportion of proteaceous vegetation potentially indicating dieback presence within the gravel pit.
Extractive activities	The historic gravel pits have been rehabilitated mostly to an excellent condition.
Rubbish	A tyre pile was present along the old historic track (Figure 15). Animal carcasses were likely dumped in the reserve given the presence of sheep, dog and horse skeletons. An historically dumped car was present within the reserve, this can be removed once <i>Gaudium laevigatum</i> control has been completed.
Grazing	None present.
Beekeeping	None present.
Utilities	None present.
Recreation	No signs of recreation were present.
Erosion	No signs of erosion were present.

12 Remediation actions

The reserve contained several areas requiring various remediation actions to be undertaken, the biggest issue within the reserve was the presence of *Gaudium laevigatum* in varying densities throughout the reserve. At the current extent, the *Gaudium laevigatum* infestation is manageable with high densities only present within vegetation type E, *Gaudium laevigatum* was present in a much lower densities within the gravel pits and can still be cost-effectively eradicated from the gravel pit.

There were several low-lying areas within the historic gravel pits that had experienced seasonal inundation within these areas only waterlogging tolerant species have survived, this included Vegetation type C, D & G. In vegetation types C & D different overstorey wetland species had naturally colonised, in vegetation type F no overstorey or midstorey species had successfully colonised and the vegetation type was almost exclusively dominated by *Leptocarpus crebriculmis*. Planting of vegetation type F with wetland species is recommended to restore these areas to an excellent condition.

12.1 Revegetation

There was a total of 0.58 ha of inundated gravel pits that lacked shrub or tree cover, due to the inundation present within these areas. It is unlikely that they will be able to be returned to their pre-gravel extraction state due to this altered soil profiles and hydrology. The Shire of Esperance intends to plant a range of locally endemic wetland species throughout these areas. The pristine patch of vegetation type D, the naturally occurring wetland within the reserve will be used as a basis for species selection.



Figure 7. Map of proposed revegetation areas within Reserve 31099.

12.2 Weed control

12.2.1 Victorian Tea Tree – *Godium laevigatum*

There was a large 3.7ha area of *Godium laevigatum* infestation that required control, with this species being the most significant threat to the vegetation within the reserve.

Removal of this species will be conducted with a integrated weed management plan including mulching, chain sawing and stump spraying of large plants and spraying of juvenile plants. Follow up control will need to occur for at least 4 years after initial control works.

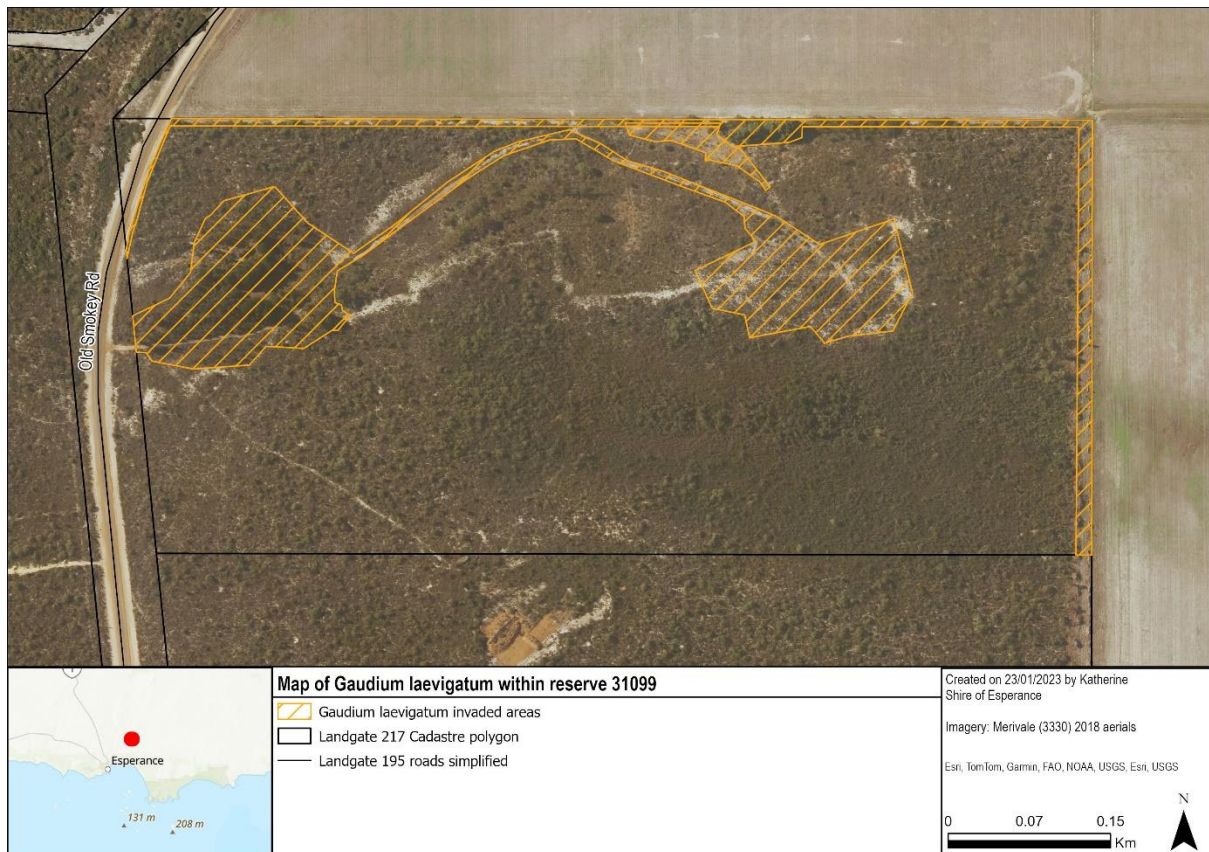


Figure 8. Map of *Godium laevigatum* within Reserve 31099.

12.2.2 Maritime Pine - *Pinus pinaster*

Pinus pinaster was prolific within a 1.9ha area of the reserve, due to *Pinus pinaster* providing important feeding and roosting habitat to Carnaby's Cockatoo the 1.9 ha *Pinus pinaster* woodland cannot be removed without EPBC approval.

There were scattered *Pinus pinaster* seedlings within the gravel pits and near the firebreaks, particularly along the Eastern firebreak. These will be removed while conducting *Godium laevigatum* control within the reserve.

A single *Yucca* sp. was present within the reserve along the northern firebreak, this will be removed via herbicide stem injection.

12.3 Rubbish removal

A large patch of tyres was present within the reserve along the track into the reserve (Figure 15), the track into currently too overgrown with *Godium laevigatum* to access. Tyres will be removed once *Godium laevigatum* control is complete. A historically dumped car body was also present within the reserve this will also be removed once *Godium laevigatum* control is complete.

13 Disease Hygiene Management

There are a large number of plant pathogens that can be spread by moving infected soil and plant material. Specifically, of focus is Phytophthora Dieback, such as *Phytophthora cinnamomi*. The project falls within the rainfall zone in which Phytophthora dieback may occur. Hygiene measures to minimise the risk of diseases are a standard part of Shire of Esperance's practices when clearing vegetation, including:

- a) All machinery, plant and equipment shall be free of soil and vegetative matter prior to entering and leaving the site.
- b) The movement of soil shall be avoided in wet conditions.

There is an assumption that no dieback is currently present at the site (based on DIDMS information and healthy looking Proteaceous species observed at the site during initial survey). The Shire of Esperance will use best practice clean down to ensure dieback is not introduced into the site due to our operations, however given that the site is on a public road, and accessible by the public, the SOE cannot guarantee that dieback will not be introduced into the site by a member of the public.

14 Monitoring

Monitoring of the rehabilitated area following remediation works will determine if completion criteria have been achieved and if contingency measures are required. The methodology for monitoring will involve onsite visual assessments to determine whether revegetation has been implemented as planned and that completion criteria have been met, as outlined in Table 3. Monitoring will occur annually after the fourth year by the Shire of Esperance's Environmental Officers, who have a tertiary level education in Environmental Science or similar qualifications. This will continue for up to six years post rehabilitation event or until rehabilitation has been deemed successful.

Table 4. Completion criteria following the SMART (specific, measurable, achievable, relevant, timebound) principles for the rehabilitation of Reserve 31801.

Criterion	Baseline Floristic data	Completion Target	Completion Criteria
1.	Vegetation type E contained large numbers of mature <i>Godium laevigatum</i> plants.	<i>Godium laevigatum</i> has been reduced to a level that is manageable with follow up control.	<i>Godium laevigatum</i> eradicated from over 90% of reserve
2.	Rehabilitated gravel pits have low densities of <i>Godium laevigatum</i> present.	<i>Godium laevigatum</i> eradicated from rehabilitated gravel pits.	No plants found during inspection.
3.	There are currently no <i>Godium laevigatum</i> or <i>Pinus pinaster</i> plants within areas currently mapped as pristine.	<i>Godium laevigatum</i> and <i>Pinus pinaster</i> do not spread in areas currently mapped as pristine.	No plants found during inspection of pristine areas within reserve.

4.	Vegetation type F currently lacks trees and shrubs.	Trees and shrubs planted for revegetation successfully establish	An estimated 70%+ seedling successfully establishes in low lying areas.
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15 Offset Suitability

CPS10158/1 requires a small quantity of additional offsets for the 'Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia' TEC. The remainder of the site will be banked for use as an offset for future projects.

Reserve 31099 was also being utilised by Carnaby's Black Cockatoo with the reserve providing significant areas of exotic and native foraging habitat for the Carnaby's Black Cockatoo, these areas will provide a valuable banked offset for Carnaby's Black Cockatoo foraging habitat.

Reserve 31099 was also being used by Western brush wallaby (*Notamacarpus Irma*) with a diagnostic pointed scat and tracks from this species being found within the rehabilitated gravel pits, the reserve provided significant suitable habitat for this species.

Reserve 31801 contained a range of different vegetation communities and supported a high diversity of flora. Vegetation condition within the reserve was mostly in a pristine or excellent condition with some vegetation varying between very good and degraded.

16 Photos



Figure 9. Vegetation type A described as "Scattered *Banksia speciosa* and *Nuytsia floribunda* over mixed myrtaceous and proteaceous dominated open heath with restiads". Photo taken on the 17/01/2024 by Katherine Walkerden.



Figure 10. Vegetation Type A described as “Scattered *Banksia speciosa* and *Nuytsia floribunda* over mixed myrtaceous and proteaceous dominated open heath with restiads”. Photo taken on the 17/01/2024 by Kahree Garnaut.



Figure 11. Vegetation Type B described as “Mixed myrtaceous and proteaceous dominated open heath with restiads”. Photo taken on the 17/01/2024 by Katherine Walkerden.



Figure 12. Vegetation Type C described as “*Eucalyptus occidentalis* low woodland with *Melaleuca cuticularis* and *Melaleuca brevifolia* open shrubland and *Leptocarpus crebriculmis* dominated sedgeland”. Photo taken on the 17/01/2024 by Katherine Walkerden.



Figure 13. Vegetation Type D described as “*Melaleuca cuticularis* low woodland with *Taxandria callistachys* dominated tall open scrub with a restiad sedgeland”. Photo taken on the 23/01/2023 by Katherine Walkerden.



Figure 13. Vegetation Type D described as “*Melaleuca cuticularis* low woodland with *Taxandria callistachys* dominated tall open scrub with a restiad sedgeland”. Photo taken on the 23/01/2023 by Katherine Walkerden.



Figure 13. Vegetation Type E described as “*Pinus pinaster* monoculture with scattered remnant native vegetation”. Photo taken on the 17/01/2023 by Katherine Walkerden.



Figure 14. Vegetation Type F described as "*Leptocarpus crebriculmis* dominated sedgeland". Photo taken on the 17/01/2023 by Katherine Walkerden.



Figure 15. Photo of dumped tyres present within Vegetation Type E . Photo taken on the 17/01/2023 by Katherine Walkerden. (GDA95, Zone 51, 409344 m E, 6267805 m N)



Figure 16. Photo of dog mandible found within Vegetation Type E. Photo taken by Kahree Garnaut on 17/01/2023.



Figure 17. Photo of sheep skull found within Vegetation Type E. Photo taken by Kahree Garnaut on 17/01/2023.



Figure 18. Photo showing evidence of Carnaby's foraging on *Banksia speciosa*. Photo taken by Kahree Garnaut on 17/01/2023.



Figure 19. Photo showing evidence of Carnaby's foraging on *Banksia speciosa*. Photo taken by Kahree Garnaut on 17/01/2023.



Figure 20. Photo showing evidence of Carnaby's foraging on *Pinus pinaster*. Photo taken by Kahree Garnaut on 17/01/2023.



Figure 21. Photo showing evidence of Carnaby's foraging on *Pinus pinaster*. Photo taken by Kahree Garnaut on 17/01/2023.

Appendix 1: Incidental Flora Species List

Family	Taxon	Invasive	Diagnostic Kwongkan Species
Anarthriaceae	<i>Anarthria laevis</i>		
Asparagaceae	<i>Thysanotus patersonii</i>		
Asparagaceae	<i>Yucca sp.</i>	X	
Asteraceae	<i>Erigeron bonariensis</i>	X	
Asteraceae	<i>Hypochaeris radicata</i>	X	
Casuarinaceae	<i>Allocasuarina humilis</i>		
Casuarinaceae	<i>Casuarina obesa</i>		
Cyperaceae	<i>Caustis dioica</i>		
Cyperaceae	<i>Gahnia trifida</i>		
Cyperaceae	<i>Lepidosperma sp.</i>		
Cyperaceae	<i>Lyginia imberbis</i>		
Cyperaceae	<i>Mesomelaena tetragona</i>		
Cyperaceae	<i>Tricostularia aphylla</i>		
Dilleniaceae	<i>Hibbertia andrewsiana</i>		
Dilleniaceae	<i>Hibbertia cuneiformis</i>		
Dilleniaceae	<i>Hibbertia gracilipes</i>		
Ericaceae	<i>Andersonia micrantha</i>		
Ericaceae	<i>Leucopogon carinatus</i>		
Ericaceae	<i>Lysinema sp.</i>		
Ericaceae	<i>Oligarrhena barbata</i>		
Ericaceae	<i>Styphelia cylindrica</i>		
Fabaceae	<i>Acacia cyclops</i>		
Fabaceae	<i>Acacia myrtifolia</i>		
Fabaceae	<i>Acacia saligna</i>		
Fabaceae	<i>Gompholobium baxteri</i>		
Fabaceae	<i>Viminaria juncea</i>		
Goodeniaceae	<i>Dampiera sp.</i>		
Haemodoraceae	<i>Conostylis seorsiflora subsp. seorsiflora</i>		
Haemodoraceae	<i>Haemodorum sp.</i>		
Iridaceae	<i>Patersonia sp.</i>		
Iridaceae	<i>Romulea rosea</i>	X	
Juncaceae	<i>Juncus microcephalus</i>	X	
Lamiaceae	<i>Microcorys barbata</i>		
Loranthaceae	<i>Nuytsia floribunda</i>		
Myrtaceae	<i>Beaufortia empetrifolia</i>		
Myrtaceae	<i>Conothamnus aureus</i>		
Myrtaceae	<i>Darwinia diosmoides</i>		
Myrtaceae	<i>Eucalyptus gomphocephala</i>		
Myrtaceae	<i>Eucalyptus occidentalis</i>		

Family	Taxon	Invasive	Diagnostic Kwongkan Species
Myrtaceae	<i>Gaudium laevigatum</i>	X	
Myrtaceae	<i>Kunzea baxteri</i>		
Myrtaceae	<i>Melaleuca brevifolia</i>		
Myrtaceae	<i>Melaleuca cuticularis</i>		
Myrtaceae	<i>Melaleuca pulchella</i>		
Myrtaceae	<i>Melaleuca scabra</i>		
Myrtaceae	<i>Melaleuca striata</i>		
Myrtaceae	<i>Melaleuca tuberculata</i>		
Myrtaceae	<i>Phymatocarpus maxwellii</i>		
Myrtaceae	<i>Taxandria callistachys</i>		
Myrtaceae	<i>Taxandria spathulata</i>		
Myrtaceae	<i>Verticordia plumosa</i>		
Pinaceae	<i>Pinus pinaster</i>	X	
Pittosporaceae	<i>Billardiera fusiformis</i>		
Poaceae	<i>Briza maxima</i>	X	
Poaceae	<i>Cynodon dactylon</i>	X	
Poaceae	<i>Eragrostis curvula</i>	X	
Proteaceae	<i>Adenanthos cuneatus</i>		X
Proteaceae	<i>Banksia armata</i>		X
Proteaceae	<i>Banksia nutans</i>		X
Proteaceae	<i>Banksia obovata</i>		X
Proteaceae	<i>Banksia speciosa</i>		X
Proteaceae	<i>Banksia pulchella</i>		X
Proteaceae	<i>Hakea cinerea</i>		X
Proteaceae	<i>Hakea trifurcata</i>		X
Proteaceae	<i>Isopogon polycephalus</i>		X
Proteaceae	<i>Isopogon trilobus</i>		X
Proteaceae	<i>Lambertia inermis</i>		X
Proteaceae	<i>Mesomelaena stygia</i>		
Proteaceae	<i>Synaphea sp.</i>		
Proteaceae	<i>Stirlingia anethifolia</i>		
Restionaceae	<i>Hypolaena sp.</i>		
Restionaceae	<i>Leptocarpus crebriculmis</i>		
Rhamnaceae	<i>Spyridium globulosum</i>		
Xanthorrhoeaceae	<i>Xanthorrhoea platyphylla</i>		

Appendix 2: Incidental Fauna Species List

Class	Family	Taxon	Common name	WA Cons status	Introduced
Arachnida	Araneidae	<i>Argiope protensa</i>	Tailed grass spider	DD	
Arachnida	Areneidae	<i>Argiope trifasciata</i>	Banded orb-weaving spider	LC	
Arachnida	Areneidae	<i>Austracantha minax</i>	Christmas spider	LC	
Arachnida	Areneidae	<i>Eriophora biapicata</i>	Garden spider		
Aves	Acanthizidae	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped thornbill	LC	
Aves	Acanthizidae	<i>Sericornis frontalis</i>	White-browed scrubwren	LC	
Aves	Acanthizidae	<i>Smicornis brevirostris</i>	Weebill	LC	
Aves	Accipitridae	<i>Elanus axillaris</i>	Black-shouldered kite	LC	
Aves	Artamidae	<i>Cracticus torquatus</i>	Grey butcherbird	LC	
Aves	Artamidae	<i>Gymnorhina tibicen</i>	Australian magpie	LC	
Aves	Cacatuidae	<i>Zanda latirostris</i>	Carnaby's Cockatoo	EN / EN	
Aves	Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced cuckoo-shrike	LC	
Aves	Columbidae	<i>Phaps chalcoptera</i>	Common bronzewing	LC	
Aves	Meliphagidae	<i>Anthorchaera carunculata</i>	Red wattlebird	LC	
Aves	Meliphagidae	<i>Anthorchaera lunulata</i>	Western wattlebird	LC	
Aves	Meliphagidae	<i>Lichmera indistincta</i>	Brown's honeyeater	LC	
Aves	Meliphagidae	<i>Phylidonyris novaehollandiae</i>	New Holland honeyeater	LC	
Aves	Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	LC	
Aves	Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey fantail	LC	
Aves	Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie-wagtail	LC	
Aves	Zosteropidae	<i>Zosterops lateralis gouldi</i>	Western silvereye	LC	
Insecta	Acrididae	<i>Macrotona australis</i>	Common Macrotona		
Insecta	Aeshnidae	<i>Hemianax papuensis</i>	Australian Emperor dragonfly	LC	
Insecta	Apidae	<i>Apis mellifera</i>	European honeybee*		X

Class	Family	Taxon	Common name	WA Cons status	Introduced
Insecta	Lycaenidae	<i>Zizinia labradus</i>	Common grass-blue butterfly		
Insecta	Pieridae	<i>Eurema smilax</i>	Small grass yellow butterfly	LC	
Insecta	Pieridae	<i>Pieris rapae</i>	Cabbage white butterfly*		X
Mammalia	Bovidae	<i>Ovis aries</i>	Domestic sheep*		X
Mammalia	Canidae	<i>Canis lupus familiaris</i>	Domestic dog		X
Mammalia	Canidae	<i>Vulpes vulpes</i>	European red fox*	Declared Pest	X
Mammalia	Equidae	<i>Equus caballus</i>	Domestic horse		X
Mammalia	Leporidae	<i>Oryctolagus cuniculus</i>	European rabbit	Declared Pest	X
Mammalia	Macropodidae	<i>Macropus fuliginosus</i>	Western grey kangaroo	LC	
Mammalia	Macropodidae	<i>Notamacropus irma</i>	Western brush wallaby	P4	
Mammalia	Muridae	<i>Rattus fuscipes</i>	Bush rat	LC	
Mammalia	Peramelidae	<i>Isodon obesulus fusciventer</i>	Quenda, southwestern brown bandicoot	P4	
Mammalia	Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked echidna	LC	

Appendix 3: Threatened and Priority flora species identified within 20 km

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

Taxon	Conservation Status	Distance from site (km)
<i>Baekkea</i> sp. Gibson (K.R. Newbey 11084)	P1	18.4080257
<i>Beyeria physaphylla</i>	P1	14.17979884
<i>Cyathostemon</i> sp. Esperance (A. Fairall 2431)	P1	19.16569334
<i>Dampiera sericantha</i>	P1	0.752806286
<i>Darwinia</i> sp. Gibson (R.D. Royce 3569)	P1	18.86847286
<i>Hibbertia carinata</i>	P1	18.61044305
<i>Lobelia archeri</i>	P1	12.77542291
<i>Stenanchera lacsalaria</i>	P2	18.96475578
<i>Comesperma lanceolatum</i>	P2	19.95153413
<i>Eucalyptus sweedmaniana</i>	P2	19.77035196
<i>Hibbertia turleyana</i>	P2	16.24421145
<i>Leucopogon corymbiformis</i>	P2	12.6466078
<i>Myriophyllum muelleri</i>	P2	19.71533251
<i>Paracaleana parvula</i>	P2	18.80437165
<i>Rumic astrum chamaecladum</i>	P2	19.52779286
<i>Stenanchera lacsalaria</i>	P2	18.94365983
<i>Tecticornia indefessa</i>	P2	9.783984619
<i>Goodenia exigua</i>	P2	19.99551778
<i>Austrobaekkea uncinella</i>	P3	9.753495466
<i>Brachyloma mogin</i>	P3	14.31986392
<i>Comesperma calcicola</i>	P3	8.649193442
<i>Dampiera triloba</i>	P3	19.38953648
<i>Daviesia pauciflora</i>	P3	1.098845072
<i>Eucalyptus foliosa</i>	P3	15.7616832
<i>Eucalyptus semiglobosa</i>	P3	2.462980411
<i>Hopkinsia adscendens</i>	P3	19.16569334
<i>Isopogon alcicornis</i>	P3	18.99282985
<i>Lepidium fasciculatum</i>	P3	19.16569334
<i>Leucopogon interruptus</i>	P3	12.69554148
<i>Pityrodia chrysocalyx</i>	P3	18.96903024
<i>Pterostylis faceta</i>	P3	19.3435411
<i>Banksia prolata</i> subsp. <i>calcicola</i>	P4	17.32531204
<i>Darwinia</i> sp. Mount Burdett	P4	19.79564889
<i>Eucalyptus aquilina</i>	P4	19.3178161
<i>Eucalyptus ligulata</i> subsp. <i>ligulata</i>	P4	19.3178161
<i>Eucalyptus missilis</i> x	P4	19.28671739

Taxon	Conservation Status	Distance from site (km)
<i>Eucalyptus preissiana</i> subsp. <i>lobata</i>	P4	14.87923443
<i>Eucalyptus</i> x <i>missilis</i>	P4	18.10916953
<i>Grevillea baxteri</i>	P4	11.84931741
<i>Anigozanthos bicolor</i> subsp. <i>minor</i>	T	9.653069231
<i>Eremophila glabra</i> subsp. <i>Scaddan</i>	T	19.80440079

Appendix 4: Threatened Fauna Species Identified Within 20 km

Assessment of Threatened and Priority fauna potentially occurring within 20 km of the site was conducted utilising the DBCA Threatened Fauna database (DBCA 2023).

Taxon	Common name	WA status	EPBC status	Distance (km)
<i>Acanthophis antarcticus</i>	Southern death adder	P3		19.90802
<i>Actitis hypoleucos</i>	Common sandpiper	MI	MI	9.643449
<i>Apus pacificus</i>	Fork-tailed swift	MI	MI	16.30946
<i>Arctocephalus forsteri</i>	New Zealand fur-seal	OS		19.91631
<i>Ardenna carneipes</i>	Flesh-footed shearwater	VU	MI	9.7096
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	MI	MI	9.702554
<i>Calidris alba</i>	Sanderling	MI	MI	9.7096
<i>Calidris canutus</i>	Red knot	EN	EN	17.43677
<i>Calidris ferruginea</i>	Curlew sandpiper	CR	MI	8.948987
<i>Calidris melanotos</i>	Pectoral sandpiper	MI	MI	11.61375
<i>Calidris ruficollis</i>	Red-necked stint	MI	MI	8.685143
<i>Calidris tenuirostris</i>	Great knot	CR	MI	17.54865
<i>Calyptorhynchus latirostris</i>	Carnaby's cockatoo	EN	EN	0.459649
<i>Cereopsis novaehollandiae grisea</i>	Recherche Cape Barren goose	VU	VU	5.632014
<i>Charadrius bicinctus</i>	Double-banded Plover	MI	MI	11.61375
<i>Charadrius leschenaultii</i>	Greater sand plover	VU	MI	11.61375
<i>Charadrius mongolus</i>	Lesser sand plover	EN	MI	11.61375
<i>Dermochelys coriacea</i>	Leatherback turtle	VU	EN	14.90222
<i>Elanus scriptus</i>	Letter-winged kite	P4		9.7096
<i>Eubalaena australis</i>	Southern right whale	VU	EN	17.09486
<i>Falco peregrinus</i>	Peregrine falcon	OS		3.655496
<i>Hydroprogne caspia</i>	Caspian tern	MI	MI	8.948987
<i>Isoodon fusciventer</i>	Quenda, southwestern brown bandicoot	P4		6.378213
<i>Leipoa ocellata</i>	Malleefowl	VU	VU	13.7181
<i>Limosa lapponica</i>	Bar-tailed godwit	MI	MI	8.948987
<i>Neophoca cinerea</i>	Australian sea-lion	EN	EN	16.52693
<i>Notamacropus irma</i>	Western brush wallaby	P4		18.80119
<i>Oxyura australis</i>	Blue-billed duck	P4		9.572887

Taxon	Common name	WA status	EPBC status	Distance (km)
<i>Pezoporus flaviventris</i>	Western ground parrot	CR	CR	18.79193
<i>Plegadis falcinellus</i>	Glossy ibis	MI	MI	11.89628
<i>Pluvialis fulva</i>	Pacific golden plover	MI	MI	11.61375
<i>Pluvialis squatarola</i>	Grey plover	MI	MI	9.702554
<i>Stercorarius antarcticus lonnbergi</i>	Brown skua	P4		18.5241
<i>Thalassarche chlororhynchos</i>	Atlantic yellow-nosed albatross	VU	MI	16.89092
<i>Thalasseus bergii</i>	Crested tern	MI	MI	5.632014
<i>Thinornis rubricollis</i>	Hooded plover, hooded dotterel	P4		9.34676
<i>Tringa brevipes</i>	Grey-tailed tattler	MI and P4	MI	17.43677
<i>Tringa glareola</i>	Wood sandpiper	MI	MI	12.37672
<i>Tringa nebularia</i>	Common greenshank	MI	MI	8.948987
<i>Tringa stagnatilis</i>	Marsh sandpiper	MI	MI	15.83264
<i>Westralunio carteri</i>	Carter's freshwater mussel	VU	VU	18.5241

Appendix 5: Carnaby's Cockatoo foraging habitat scoring template

Adapted from Tables A1 and A2 of Department of Agriculture, Water and the Environment (2022)

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. (including <i>Dryandra</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)	Subtractions	
Foraging potential	-2	Subtract 2 from your score if there is no evidence of feeding debris on your site.	0	Feeding debris from <i>Pinus pinaster</i> cones, <i>Banksia speciosa</i> and <i>Banksia obovata</i> pods were present.
Connectivity	-2	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 1km of your site.	0	There are large quantities of remnant native vegetation and <i>Pinus pinaster</i> plantations within 1km of the site.
Proximity to breeding	-2	Subtract 2 if you have evidence to conclude that your site is more than 12km from breeding habitat.	-2	Carnaby's cockatoo is not known to breed in the Esperance region.
Proximity to roosting	-1	Subtract 1 if you have evidence to conclude that your site is more than 20km from a known night roosting habitat.	0	There are numerous pine plantations within 20km of Reserve 31099, and the reserve is only 1.9km from a known roost site.
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 preferred food plants present.	0	There was no evidence of <i>Phytophthora cinnamomi</i> within vegetation type A.
Total score	Enter score		8	
Other considerations for assessment of foraging habitat	<ul style="list-style-type: none"> - The presence, extent and density (including foliage cover and flowering density) of all plant species that provide foraging, including non-native food sources used - The distribution and size of foraging habitat in proximity (e.g. up to 12 km) to the impact site. - Site degradation (such as cleared, disturbed or degraded areas). - The fire history of the impact site. - Landscape characteristics around the impact site, including details of roosting and breeding habitat in proximity (e.g. up to 20km for roosting and 12km for breeding); and - The location and details of watering points that could support the use of the foraging habitat. 			
Appraisal	<p>To support your habitat score, you should provide an overall appraisal of the habitat on the impact site and within 20km of the impact area to clearly explain and justify the score. It should include discussion on the foraging habitat's proximity to other resources (e.g. exact distance to proximate resources), frequency of use of proximate sites, the degree of evidence and description of vegetation type and condition.</p>			

