Revised Revegetation Management Plan

Shire of Esperance 2024-25 Strategic Purpose Permit
Site B - River Road Gravel Pits

Report compiled by Shire of Esperance Environmental Team:

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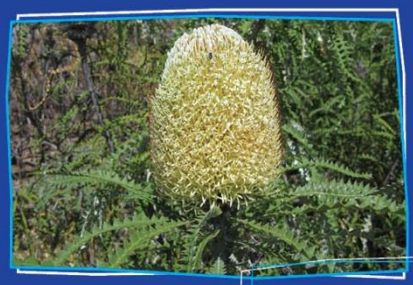

Updated May 2025

1 RECOMMENDATIONS

As Shire Environmental Coordinator signs off on project work packs the following recommendation will be included within the internal SOE approval process for the road project:

a) All vehicles and construction equipment to be cleaned prior to start of the project to mitigate spread of weeds and introduction of Phytophthora dieback;

b) Conduction of works during the drier months of summer and autumn to minimise risk of dieback spread;

c) Complete rehabilitation of gravel pit areas post-extraction;

d) Ensure Stage 1 (north side of road) rehabilitation meets completion criterion prior to starting on Stage 2 gravel extraction (south side of road);

e) Implementation of an approved weed management plan.

Revegetation Plan

Site B - River Road Gravel Pits is an important ecological linkage for fauna movement, and as such a staged approach to clearing and rehabilitating gravel pits will be applied. Stage 1 involves the 3 pits on the north side of River Road, Stage 2 involves the 3 pits on the south side of River Road.

The proposed 'River Road Gravel Pits' site will be rehabilitated by standard Shire of Esperance protocols; including the floristic and vegetative assessment of a reference site, stockpiling of topsoil material prior to gravel extraction, reshaping of the exhausted gravel pit to natural contours, spreading of stockpiled topsoil across the site, and preparatory site ripping.

1.1.1 Rehabilitation Methodology

A dozer will be used to clear native vegetation, stockpile topsoil, and remove overburden (consisting of approximately 300 mm of overlying soil substrate). The topsoil contains large reservoirs of valuable native seed, subterranean fauna and live clonal tissue; therefore, it will be stockpiled separate from the overburden to be used in rehabilitation. Multispectral drone imagery will be conducted prior to clearing so that the original vegetation cover and density can be used as a reference site.

After the exhaustion and cessation of extractive activity in the proposed Stage 1 gravel pits, rehabilitation works will commence in the following autumn or winter (April – June) prior to the onset of the main winter rain. Rehabilitation works will involve spreading stockpiled overburden and subsequently topsoil across the cleared area, and ripping of the site to a depth of 200 – 350 mm. The stored seed in the soil bank will be relied on to facilitate the revegetation component of rehabilitation, with direct seeding or tubestock planting only occurring as a contingency measure. Weed control will occur con-currently. (Refer to Section 7.2 of Garnaut, Walkerden & Waters (2024) Vegetation, Flora, Fauna and Environmental Considerations Report Shire of Esperance 2024-25 Strategic Purpose Permit Site B – River Road Gravel Pits)

Only after such time as deemed by the Environmental Specialist at the Shire of Esperance that the Stage 1 pits meet the Rehabilitation Completion Criteria outlined in Section 1.1.2. will clearing commence on Stage 2.

1.1.2 Rehabilitation Completion Criteria

The floristic and vegetation baseline data from the September 2023 reconnaissance survey will be used as the reference for rehabilitation success and completion criteria. Annual site inspections will be conducted to assess vegetation foliar cover, density, species richness and vegetative health. A drone may be flown over the site every alternate year to ascertain multispectral imagery to determine spatial distribution of vegetative health, cover, and density across the site. Refer to Table 1 below for a description of completion criteria and targets for the proposed 'River Road gravel pit' site.

Table 1: Completion criteria following the SMART (specific, measurable, achievable, relevant, time-bound) principles for the rehabilitation of the West Point Road gravel pit.

Criterion	Baseline Floristic data	Completion Target	Completion Criteria
1	131 native vascular plant taxa present prior to clearing across three vegetation types	Restoration of a majority (70%) of floristic species richness after five years	92 native vascular plant taxa present
2	A total of 5.12ha of vegetation was classified as Carnaby's black-cockatoo foraging habitat prior to clearing, with 43 forage species present	Returns of 80% foraging species after five years	35 proteaceous, myrtaceous and / or Casuarinaceous species present providing foraging habitat within the area mapped as Carnaby's black-cockatoo foraging habitat
3	Vegetation cover as presented in pre-clearing drone aerials	Return of > 60% of vegetation cover by five years	Drone aerial presenting adequate and increasing vegetative cover > 60%.
4	Weed cover < 5 %	Minimal weed cover across rehabilitated site after five years	Weed cover < 5% within the rehabilitation area
5	Vegetation predominantly in 'Excellent' condition	Restoration of vegetation condition to near pre-clearing state after five years	Assessment of vegetation condition to be 'Very Good' or better

1.1.3 Monitoring

Monitoring of the rehabilitated areas will enable determination of successful achievement of completion criteria, and early detection of issues that may necessitate the enactment of contingency measures. It will also determine at what point Stage 2 can be commenced. Monitoring will involve annual on-site inspections by qualified environmental specialists (minimum tertiary-level qualification in Environmental Science or equivalent qualification). On-site inspections will involve visual assessment of completed rehabilitation processes (eg: ripping, spreading of topsoil), vegetative health and foliar cover, survey of establishing species present in the revegetation area, signs of fauna return, and determination of any issues potentially impeding rehabilitation success. Monitoring will coincide with the Annual Compliance inspection period for the financial year. Drone aerials will commence five years after the implementation of rehabilitation activities. Monitoring of the site will continue until achievement of successful rehabilitation.

1.1.4 Contingency Plan

Where the rehabilitation is deemed unsuccessful by comparison to the completion criteria (Section 5), contingency measures will be undertaken, until the completion criteria are met sufficiently. This is an

adaptive process and dependent on what completion criteria have failed. A few standard techniques are outlined below:

a) If the composition of species does not meet criteria, then specific species will be infill planted and/or seeded during the next revegetation season from April to June; and / or

b) If listed environmental weeds exist in the site then herbicide and or manual control will be applied to affected areas; and / or

c) If the substrate is determined to be unsuitable (i.e. compacted, too aerated), then amelioration practices such as ripping or re-spreading of material.

Keystone and dominant species will be selected as a contingency measure if respreading topsoil and stockpiled vegetation has unsuccessful germination and does not meet the completion criteria. The incidental species list from the spring 2023 flora survey (Appendix 1) will be the basis for determining species selection for seed and tubestock seedlings, based on availability. Seed can also be collected from the surrounding road reserve.

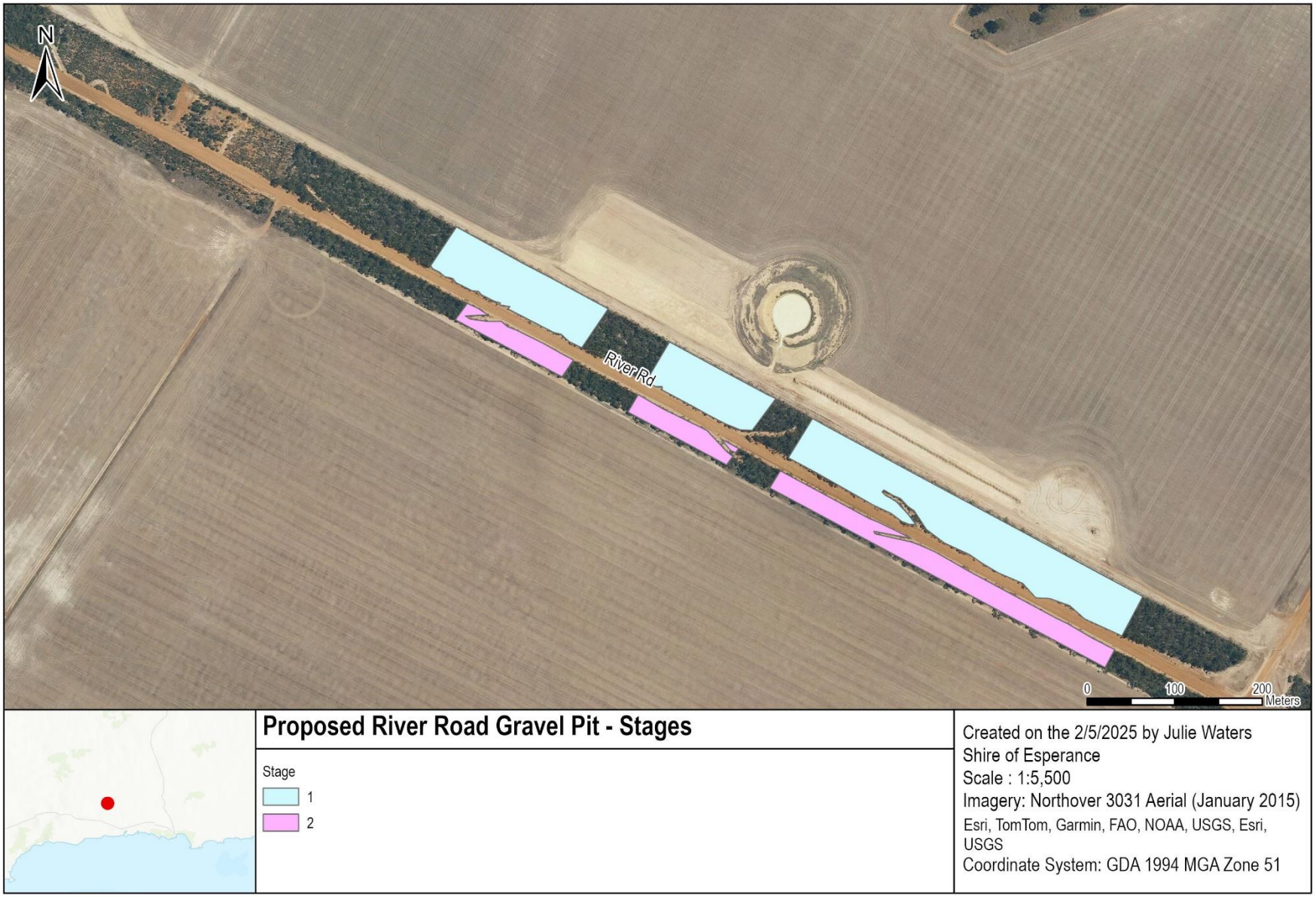

Figure 1: Stages of the Proposed River Road Gravel Pits within the Cascade district.

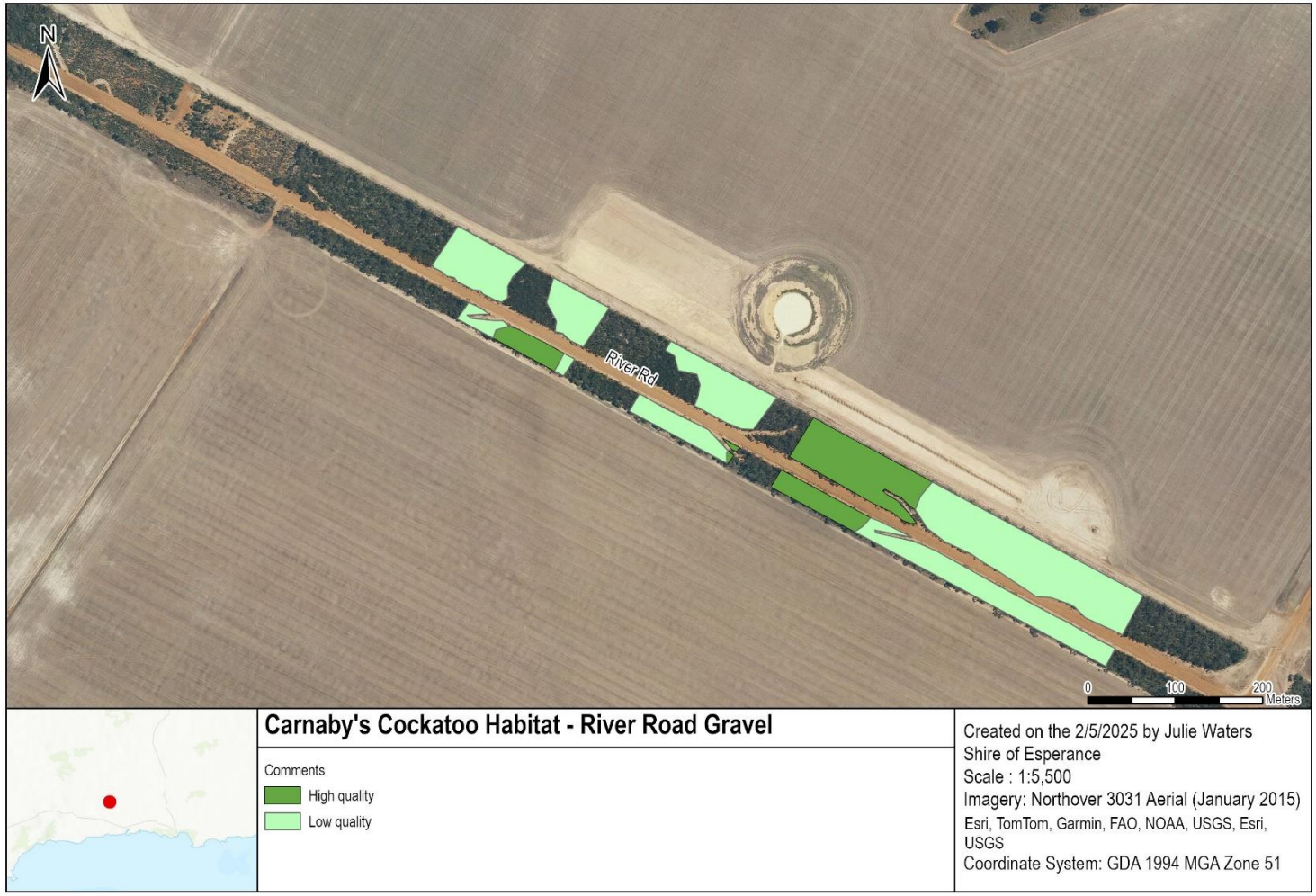

Figure 2: Carnaby's Cockatoo Habitat within Proposed River Road Gravel Pits

Appendix 1 Incidental species list from the spring 2023 flora survey

(Source: Garnaut, Walkerden & Waters (2024) Vegetation, Flora, Fauna and Environmental Considerations Report of Proposed River Road Gravel Pits, Cascade, Shire of Esperance).

Family	Genus	Species	Common Name	Invasive	WA Conservation Status	Herbarium Reference
Aizoaceae	*Carpobrotus*	*modesta*	Inland Pigface			
Amaranthaceae	*Ptilotus*	*polystachyus*	Prince of Wales Feather			
Apiaceae	*Platysace*	*effusa*				
Asparagaceae	*Laxmannia*	*grandiflora*	Paper-lily			
	Lomandra	*micrantha* subsp. *teretifolia*				
		mucronata				
	Thysanotus	*patersonii*	Paterson's Fringe Lily			
Asteraceae	*Arctotheca*	*calendula*	Cape Weed	X		
	Argentipallium	*niveum*				
	Erigeron	*bonariensis*		X		
	Sonchus	*oleraceus*		X		
	Ursinia	*anthemoides*	Solar Fire			
	Vellereophyton	*dealbatum*		X		
	Vittadinia	*gracilis*				
Brassicaceae	*Brassica*	*tournefortii*	Mediterranean Turnip	X		
	Lepidium	*africanum*	Rubble Peppercress	X		
Caryophyllaceae	*Polycarpon*	*tetraphyllum*	Four-leaf Allseed	X		
Chenopodiaceae	*Atriplex*	*semibaccata*	Berry Saltbush			
	Chenopodium	*desertorum*				
	Enchylaena	*tomentosa*	Barrier Saltbush			

Family	Genus	Species	Common Name	Invasive	WA Conservation Status	Herbarium Reference
Crassulaceae	*Crassula*	*exserta*				
Cupressaceae	*Callitris*	*roei*	Roe's Cypress Pine			
Cyperaceae	*Gahnia*	*ancistrophylla*	Hook-leaved Sedge			
	Lepidobolus	*chaetocephalus*				
	Lepidosperma	*carphoides*	Black Rapier Sedge			
		sanguinolentum				
		sp.				KSW06923 Acc10519
		sp.				KSW07023 Acc10519
	Leptospermopsis	*erubescens*				
		maxwellii				
	Netrostylis	sp.				KSW04423 Acc 10471
	Schoenus	*racemosus*				
Dilleniaceae	*Hibbertia*	*exasperata*				
		gracilipes				
		pungens				
Droseraceae	*Drosera*	*sp. Branched Styles*				
Ericaceae	*Acrotriche*	*platycarpa*			P1	KSW01123 Acc 10411, KSW01323 Acc 10411
	Lissanthe	*rubicunda*				
	Lysinema	*ciliatum*				
	Styphelia	*lissanthoides*				
		sp. Newdegate				
Euphorbiaceae	*Beyeria*	*sulcata*				
	Stachystemon	*brachyphyllus*				

Family	Genus	Species	Common Name	Invasive	WA Conservation Status	Herbarium Reference
Fabaceae	*Acacia*	*declinata*				
		fragilis				
		gonophylla				
		lasiocarpa var. *bracteolata*				
		mutabilis subsp. *angustifolia*				
		octonervia				
		tetanophylla				KSW06823, Acc 10518
	Chorizema	*aciculare*	Needle-leaved Chorizema			
	Daviesia	*lancifolia*				
		teretifolia				
	Gompholobium	*baxteri*				
	Hovea	*pungens*	Devil's Pins			
	Templetonia	*sulcata*				
	Pultenaea	*indira* subsp. *indira*				
Geraniaceae	*Erodium*	*botrys*	Long Storksbill	X		
Goodeniaceae	*Coopernookia*	*strophiolata*				
	Dampiera	*lavandulacea*				
	Lechenaultia	*formosa*	Red Leschenaultia			
Lauraceae	*Cassytha*	*melantha*	Large Dodder Laurel			
Loganiaceae	*Logania*	*micrantha*				
Malvaceae	*Alyogyne*	*hakeifolia*	Native Hibiscus			
	Lasiopetalum	*rosmarinifolium*				
Myrtaceae	*Austrobaeckea*	*latens*				

Family	Genus	Species	Common Name	Invasive	WA Conservation Status	Herbarium Reference
	Beaufortia	*micrantha*	Little Bottlebrush			
		schaueri	Pink Beaufortia			
	Calothamnus	*gibbosus*				
	Calytrix	*lechenaultii*				
	Cyathostemon	*ambiguus*				
		baeckeaceus subsp. *baeckeaceus*				
	Eucalyptus	*connexa*				
		ecostata	Silver Mallee			
		flocktoniae	Merrit			
		forrestiana	Forrest's Marlock			KSW01223, Acc 10411
		incrassata	Ridge-fruited Mallee			
		kessellii subsp. *eugnosta*	Jerdacuttup Mallee			
		phaenophylla	White Mallee			
		phenax	Green Dumosa Mallee			
		pleurocarpa	Tjaltjraak			
	Kunzea	*micromera*				
	Melaleuca	*acuminata*				
		carrii				
		glaberrima				
		hamata				
		lateriflora				
		rigidifolia				
Myrtaceae	*Melaleuca*	*sapientes*				

Family	Genus	Species	Common Name	Invasive	WA Conservation Status	Herbarium Reference
		scabra				
		subfalcata				
		tuberculata subsp. *macrophylla*				
	Micromyrtus	*elobata* subsp. *elobata*				
		imbricata				
	Rinzia	*communis*	Mallee Rinzia			
	Verticordia	*acerosa* subsp. *preissii*				
		inclusa				
Olacaceae	*Olax*	*benthamiana*				
Orchidaceae	*Cyanicula*	*aperta*	Western Tiny Blue Orchid			
	Prasophyllum	sp.	Leek Orchid			
	Pterostylis	*mutica*	Midget Greenhood			
		recurva	Jug Orchid			
		sargentii	Frog Greenhood			
		vittata	Banded Greenhood			
Pittosporaceae	*Billardiera*	*coriacea*				
		venusta				
	Marianthus	*bicolor*	Painted Marianthus			
Poaceae	*Austrostipa*	*hemipogon*				
		scabra	Speargrass			
	Eragrostis	*curvula*	African Lovegrass	X		
Poaceae	*Hordeum*	sp.	Barley Grass	X		

Family	Genus	Species	Common Name	Invasive	WA Conservation Status	Herbarium Reference
	Neurachne	*alopecuroidea*	Foxtail Mulga Grass			
	Schismus	*arabicus*	Arabian Grass	X		
Polygalaceae	*Comesperma*	*virgatum*	Milkwort			
Proteaceae	*Banksia*	*armata*	Prickly Dryandra			
		media	Southern Plains Banksia			
	Grevillea	*pectinata*	Comb-leaved Grevillea			
	Hakea	*corymbosa*	Cauliflower Hakea			
		ilicifolia				
		laurina	Pincushion Hakea			
		lissocarpha				
		newbeyana				
	Isopogon	*polycephalus*	Clustered Coneflower			
		sp. Fitzgerald River				
	Persoonia	*helix*				
	Petrophile	*fastigiata*				
		squamata subsp. Northern				
Restionaceae	*Desmocladus*	*myriocladus*				
Rhamnaceae	*Cryptandra*	*nutans*				
	Spyridium	*minutum*				
	Trymalium	*elachophyllum*				
Rutaceae	*Boronia*	*baeckeoides*				
		crassifolia				
Rutaceae	*Boronia*	*crenulata*	Aniseed Boronia			
		inornata	Desert Boronia			

Family	Genus	Species	Common Name	Invasive	WA Conservation Status	Herbarium Reference
	Phebalium	*obovatum*				
Santalaceae	*Exocarpos*	*aphyllus*	Broom Ballart			
	Santalum	*acuminatum*	Quandong			
	Solanum	*nigrum*	Blackberry Nightshade	X		
	Leptomeria	*pachyclada*				
Sapindaceae	*Dodonaea*	*divaricata*				