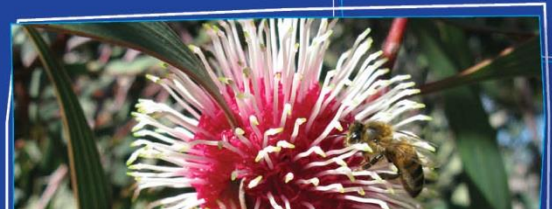
Updated Revegetation Management Plan

Shire of Esperance 2023-24 Strategic Purpose Permit
Site D – Farmers Road Gravel Pit

Report compiled by Shire of Esperance Environmental Team:

Julie Waters – BEnvSc (Hons), Environmental Coordinator
Katherine Walkerden – BSc, MEnvSc, Environmental Officer



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1. Revegetation plan

To meet the objectives of a successful scientific-based Revegetation Plan for 'Farmers Road Gravel Pit', numerous factors need to be considered and will be implemented, including the reference site, weed control, pest and disease hygiene practices, site preparation, species selection, completion criteria, monitoring and adaptive management practices in the need of contingency measures. These are outlined in Sections 1.1 to 1.7, with key points highlighted below:

- Revegetation works will consist of spreading the stockpiled cleared vegetation and topsoil containing the natural stored soil seed bank directly from the site accumulated during gravel extraction works.
- Revegetation works will be carried out over April-June prior to the onset of the main winter rains in the year post clearing.

Multispectral drone aerials will be conducted prior to clearing so that vegetation planned to be cleared can be used as a reference site.

1.1 Rehabilitation Methodology

A dozer will be used to remove vegetation, topsoil and the overburden (consisting of approximately 300 mm deep of soil). This valuable topsoil layer that contains large reservoirs of the soil seed bank and live clonal tissue will be stockpiled separately for rehabilitation after completion of the project.

Rehabilitation works will commence at the site between April – June. This will involve spreading the stockpiled topsoil containing the soil seed bank from prior to clearing evenly across the rehabilitation area. The site will be ripped to a depth of 200-350 mm deep and topsoil spread over the area. No direct tube stock planting or direct seeding will occur immediately, and only be used as a contingency measure if this method fails.

1.2 Weed Control

The site had significant weed issues on the astern edge of the road reserve where historical clearing had occurred for firebreaks and fenceline construction. Poaceae weeds were the biggest issue in this area and will require follow up control with grass selective herbicides application after rehabilitation.

There were areas of significant *Eucalyptus gomphocephala* infestation, presence of *Eucalyptus gomphocephala* seedlings in the rehabilitation area will require monitoring and may require control, appropriate control methods will depend on scope of Eucalyptus gomphocephala infestation.

Monitoring of broadleaf weed presence will also be required, additional control methods may be required, appropriate control methods will depend on scope of weed presence.

1.3 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 *P. cinnamomi or P. pseudocryptogea*. Data shows the closest positive *P. pseudocryptogea sample* is 500m south of project area along

Farmers Road. Hygiene measures to minimise the risk of diseases are a standard part of Shire of Esperance's practices when clearing vegetation, including:

- All machinery, plant and equipment shall be free of soil and vegetative matter prior to entering and leaving the site.
- Soil will only be moved during dry conditions.

1.4 Completion criteria

A high species richness was present at the site, due to a detailed flora survey being completed the 2023 survey can be used as a baseline for species richness. Multispectral drone aerials will be used to assess vegetation density, a drone aerial will be flown prior to the clearing to serve as a baseline for vegetation cover.

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	Diversity was high with 113 taxa present prior to clearing.	A majority of species richness has returned	70% of the native species diversity (79 taxa) are present during vegetation monitoring 3 years after rehabilitation completed
2	Vegetation Type A was classified as Kwongkan TEC prior to clearing with 21 proteaceous taxa present	Returns of 70% proteaceous taxa and Kwongkan TEC criteria met.	15 proteaceous taxa present during vegetation monitoring 3 years after rehabilitation completed
			2 or more Kwongkan TEC diagnostic species make up a significant vegetative component during vegetation monitoring 3 years after rehabilitation completed
3	Carnaby's black cockatoo foraging debris from *Banksia Baueri*, *Banksia violaceae* and *Banksia obovata* were present to the south of the project area.	Return of key foraging species (*Banksia baueri*, *Banksia violaceae* and *Banksia obovata*) to the revegetation area.	*Banksia Baueri*, *Banksia violaceae* and *Banksia obovata* are present within the project area.
4	Vegetation cover in unburnt areas in pre-clearing drone aerials.	A majority of vegetation cover has returned within the entire site	Drone aerial showing 60% of pre-clearing (unburnt areas) vegetative coverage throughout the site.
5	93% of vegetation was in a better or excellent condition.	Vegetation condition of revegetation area is comparable to pre-clearing condition.	93% of revegetation area is in a Very Good or Better condition

1.5 Monitoring

Monitoring of the rehabilitated area following gravel extraction will determine if completion criteria have been successful and if contingency measures are required (Section 1.6). 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 1. Monitoring will occur annually by the Shire of Esperance's Environmental Officers. Monitoring will coincide with the inspection period of the calendar year Annual Compliance report for the Shire of Esperance 2023/24 strategic purpose permit. Baseline drone aerials will be taken prior to clearing and drone aerials will begin two years after revegetation has occurred. This will continue until rehabilitation has been deemed successful.

1.6 Contingency measures

Where the rehabilitation is deemed unsuccessful by comparison to the completion criteria (Section 1.4), contingency measures will be undertaken, until the completion criteria are met sufficiently. This is an adaptive process and dependent on what completion criteria has failed. A few standard techniques are outlined below:

- 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.
- If the density of cover does not meet criteria, then the area will be infill planted and/or seeded with species from the preclearing species list (Appendix 1) during the next revegetation season from April to August.
- If listed environmental weeds exist in the site then herbicide and or manual control will be applied to affected areas.

1.7 Species selection

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 2023 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.

Appendix 1: Incidental flora species list

Family	Genus	Species	Weed	WA Cons Status	Herbarium Reference
Aizoaceae	*Carpobrotus*	*virescens*			
Apiaceae	*Xanthosia*	*huegelii*			
Araliaceae	*Trachymene*	*pilosa*			
Asparagaceae	*Dianella*	*revoluta*			
Asparagaceae	*Laxmannia*	*paleacea*			
Asparagaceae	*Lomandra*	*collina*			
Asparagaceae	*Lomandra*	*mucronata*			
Asparagaceae	*Thysanotus*	*triandrus*			
Asteraceae	*Arctotheca*	*calendula*	X		
Asteraceae	*Euchiton*	*sphaericus*			
Asteraceae	*Hypochaeris*	*radicata*	X		
Asteraceae	*Senecio*	*quadridentatus*			
Asteraceae	*Sonchus*	*oleraceus*	X		
Asteraceae	*Ursinia*	*anthemoides*	X		
Asteraceae	*Vittadinia*	*gracilis*			
Brassicaceae	*Raphanus*	*raphanistrum*	X		
Casuarinaceae	*Allocasuarina*	*huegeliana*			KSW07623 ACC 10518
Casuarinaceae	*Allocasuarina*	*humilis*			
Casuarinaceae	*Allocasuarina*	*lehmanniana subsp. ecarinata*			
Crassulaceae	*Crassula*	*exserta*			KSW07423 ACC 10518
Cyperaceae	*Caustis*	*dioica*			
Cyperaceae	*Gahnia*	*ancistrophylla*			
Cyperaceae	*Lepidosperma*	*caespititius*			
Cyperaceae	*Lepidosperma*	*carphoides*			
Cyperaceae	*Lepidosperma*	*leptostachyum*			
Cyperaceae	*Lepidosperma*	*sp.*			KSW07323 ACC 10518
Cyperaceae	*Lepidosperma*	*tuberculatum*			
Cyperaceae	*Mesomelaena*	*stygia*			
Cyperaceae	*Mesomelaena*	*tetragona*			
Cyperaceae	*Schoenus*	*breviculmis*			
Cyperaceae	*Schoenus*	*caespititius*			
Cyperaceae	*Schoenus*	*submicrostachyus*			
Cyperaceae	*Tricostularia*	*compressa*			
Dasypogonaceae	*Calectasia*	*valida*			KSW07523 ACC10518
Droseraceae	*Drosera*	*sp. Branched Styles*			
Droseraceae	*Drosera*	*zonaria*			

Ericaceae	*Leucopogon*	*sp. Coujinup*			
Ericaceae	*Styphelia*	*sp. South Coast*			
Ericaceae	*Styphelia*	*woodsii*			
Euphorbiaceae	*Monotaxis*	*paxii*			
Fabaceae	*Acacia*	*aemula*			
Fabaceae	*Acacia*	*cochlearis*			
Fabaceae	*Acacia*	*crispula*			
Fabaceae	*Acacia*	*cyclops*			
Fabaceae	*Acacia*	*myrtifolia*			
Fabaceae	*Daviesia*	*teretifolia*			
Fabaceae	*Gompholobium*	*knightianum*			
Fabaceae	*Hovea*	*pungens*			
Fabaceae	*Jacksonia*	*condensata*			
Fabaceae	*Jacksonia*	*venosa*			
Fabaceae	*Kennedia*	*coccinea*			
Fabaceae	*Trifolium*	*subterraneum*	X		
Geraniaceae	*Erodium*	*botrys*	X		
Goodeniaceae	*Coopernookia*	*strophiolata*			
Goodeniaceae	*Goodenia*	*incana*			
Haemodoraceae	*Conostylis*	*lepidospermoides*		T	
Haemodoraceae	*Conostylis*	*seorsifolia subsp. seorsifolia*			
Haemodoraceae	*Haemodorum*	*discolor*			
Iridaceae	*Morea*	*setifolia*	X		Acc 10471 KSW04223
Iridaceae	*Patersonia*	*lanata*			
Iridaceae	*Patersonia*	*limbata*			
Lamiaceae	*Microcorys*	*subcanescens*			
Loranthaceae	*Nuytsia*	*floribunda*			
Malvaceae	*Lasiopetalum*	*rosmarinifolium*			
Myrtaceae	*Apectospermum*	*spinescens*			
Myrtaceae	*Beaufortia*	*micrantha*			
Myrtaceae	*Calothamnus*	*gracilis*			
Myrtaceae	*Calothamnus*	*quadrifidus*			
Myrtaceae	*Chamelaucium*	*ciliatum*			
Myrtaceae	*Conothamnus*	*aureus*			
Myrtaceae	*Eucalyptus*	*gomphocephala*	X		
Myrtaceae	*Eucalyptus*	*leptocalyx*			
Myrtaceae	*Eucalyptus*	*micranthera*			
Myrtaceae	*Eucalyptus*	*pleurocarpa*			
Myrtaceae	*Eucalyptus*	*tetraptera*			
Myrtaceae	*Kunzea*	*affinis*			

Myrtaceae	*Leptospermopsis*	*maxwellii*			
Myrtaceae	*Melaleuca*	*acuminata subsp. acuminata*			
Myrtaceae	*Melaleuca*	*scabra*			
Myrtaceae	*Melaleuca*	*tuberculata var tuberculata*			
Myrtaceae	*Melaleuca*	*undulata*			
Myrtaceae	*Micromyrtus*	*elobata subsp. elobata*			
Myrtaceae	*Micromyrtus*	*imbricata*			
Myrtaceae	*Phymatocarpus*	*maxwellii*			
Myrtaceae	*Taxandria*	*spathulata*			
Myrtaceae	*Verticordia*	*chrysanthella*			
Myrtaceae	*Verticordia*	*inclusa*			
Myrtaceae	*Verticordia*	*sieberi*			
Olacaceae	*Olax*	*benthamiana*			
Orchidaceae	*Caladenia*	*attingens subsp. gracillima*			
Orchidaceae	*Caladenia*	*flava*			
Orchidaceae	*Caladenia*	*pachychila*			
Orchidaceae	*Cyanicula*	*gemmata*			Acc 10518 KSW08523
Orchidaceae	*Disa*	*bracteata*	X		
Orchidaceae	*Erythraea*	*brunonis*			
Pittosporaceae	*Billardiera*	*fusiformis*			
Poaceae	*Amphipogon*	*turbinatus*			
Poaceae	*Avena*	*fatua*	X		
Poaceae	*Eragrostis*	*curvula*	X		
Poaceae	*Lagurus*	*ovatus*	X		
Poaceae	*Lolium*	*sp.*	X		
Poaceae	*Vulpia*	*myuros*	X		
Primulaceae	*Lysimachia*	*arvensis*	X		
Proteaceae	*Adenanthos*	*cuneatus*			
Proteaceae	*Banksia*	*armata*			
Proteaceae	*Banksia*	*baueri*			
Proteaceae	*Banksia*	*blechnifolia*			
Proteaceae	*Banksia*	*nivea*			
Proteaceae	*Banksia*	*obovata*			
Proteaceae	*Banksia*	*pteridifolia*			
Proteaceae	*Banksia*	*repens*			
Proteaceae	*Banksia*	*violacea*			
Proteaceae	*Grevillea*	*concinna subsp. concinna*			
Proteaceae	*Hakea*	*nitida*			

Proteaceae	*Hakea*	*pandanicarpa*			
Proteaceae	*Hakea*	*trifurcata*			
Proteaceae	*Isopogon*	*polycephalus*			
Proteaceae	*Isopogon*	*trilobus*			
Proteaceae	*Lambertia*	*inermis var. drummondii*			
Proteaceae	*Lambertia*	*inermis var. inermis*			
Proteaceae	*Persoonia*	*striata*			PERTH 09616195
Proteaceae	*Petrophile*	*fastigiata*			
Proteaceae	*Petrophile*	*squamata subsp. Ravensthorpe*			
Proteaceae	*Synaphea*	*media*			
Restionaceae	*Chordifex*	*sphacelatus*			
Rhamnaceae	*Cryptandra*	*myriantha*			
Rutaceae	*Cyanothamnus*	*inconspicuus*			
Rutaceae	*Cyanothamnus*	*ramosus subsp. anethifolia*			
Sapindaceae	*Dodonaea*	*caespitosa*			
Xanthorrhoeaceae	*xanthorrhoea*	*platyphylla*			