



ML70/836 & ML70/1113 / 70/1347 / 70/1315.

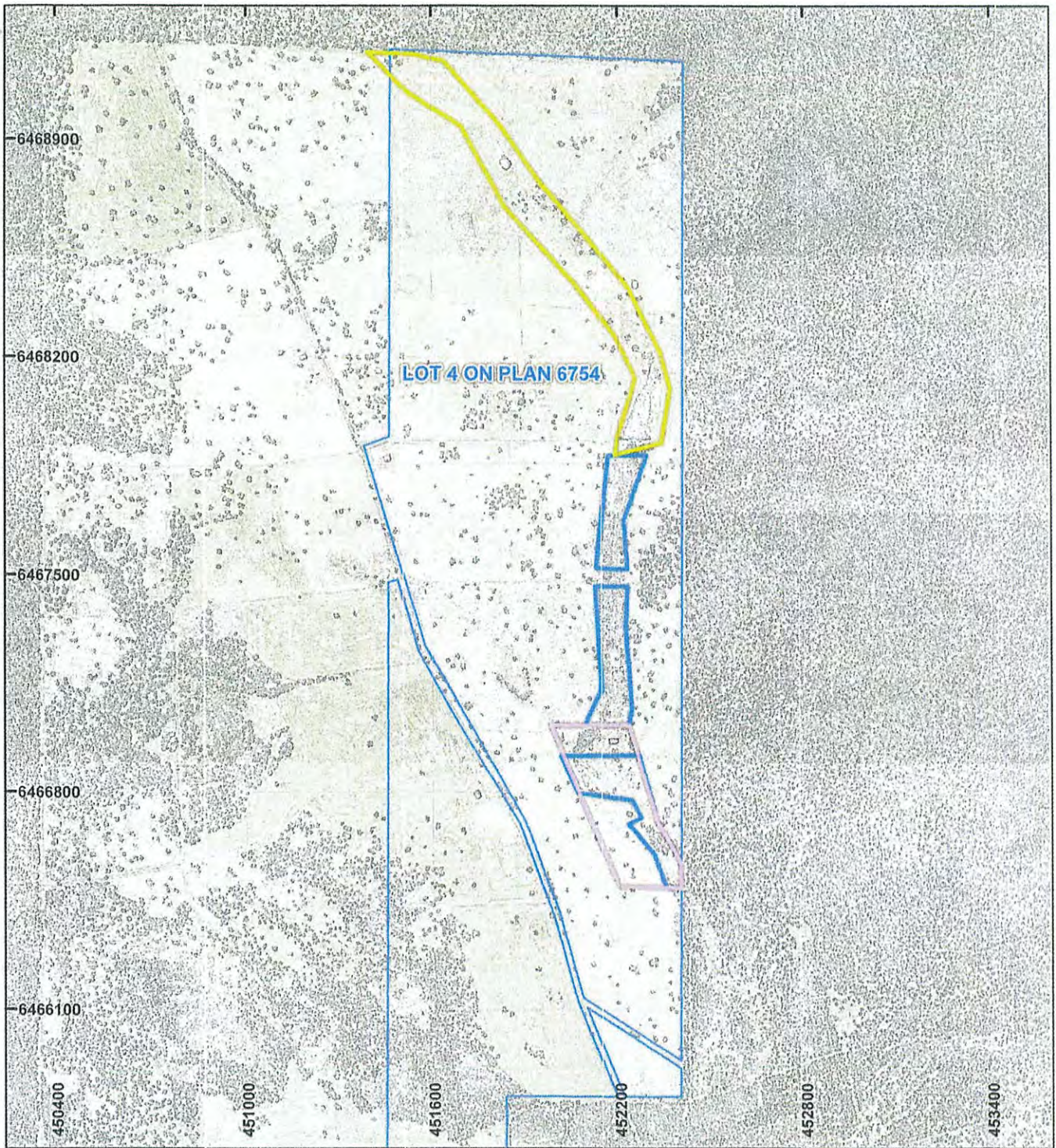
VEGETATION, FLORA AND FAUNA REPORT
&
DIEBACK AND COCKATOO REPORT

ACTION SAND SUPPLIES





GOODS ROAD, THE LAKES

NOVEMBER 2012

FUTURE PROPOSED EASTERN EXTENSION



LEGEND

-  Cadastre
 -  Proposed CPS 6900/1 offset
 -  Existing CPS 4187/4 offset
 -  Future Proposed Eastern Extension
- Orthophotography sourced from Landgate

S. M. [Signature]



Scale 1:18,000
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.



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Report Date: 3rd November 2012



Vegetation, Flora and Fauna Report
Action Sand Supply: Goods Rd, The Lakes, Shire of Northam
Mining Proposal Application M70/1113

Background:

Tuma Holdings Pty Ltd, trading as Action Sand Supply have operated a sand mining operation on Goods Road in the Lakes district in the Shire of Northam on Mining Lease M70/836. As this area is becoming exhausted of sand recourses, the company is seeking to continue its business by mining the adjacent area, being mining tenement M70/1113 (See Figures 1 and 2).

Tuma Holdings commissioned Bioscience to prepare a Vegetation, Flora and Fauna Report to support their mining application in accordance with the Mining Environmental Management Guidelines for Mining Proposals in WA issued by the (then) Department of Industry and Resources (Feb 2006).

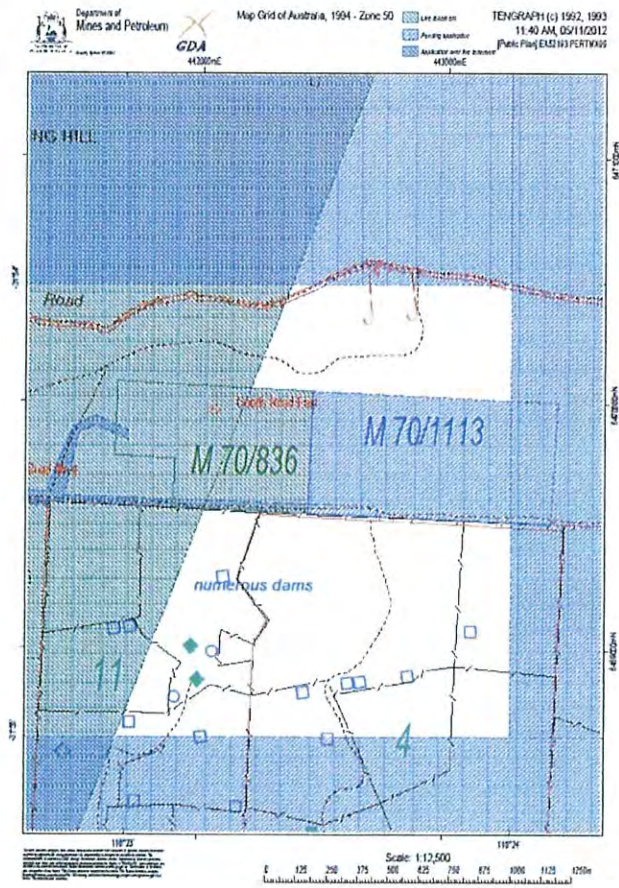
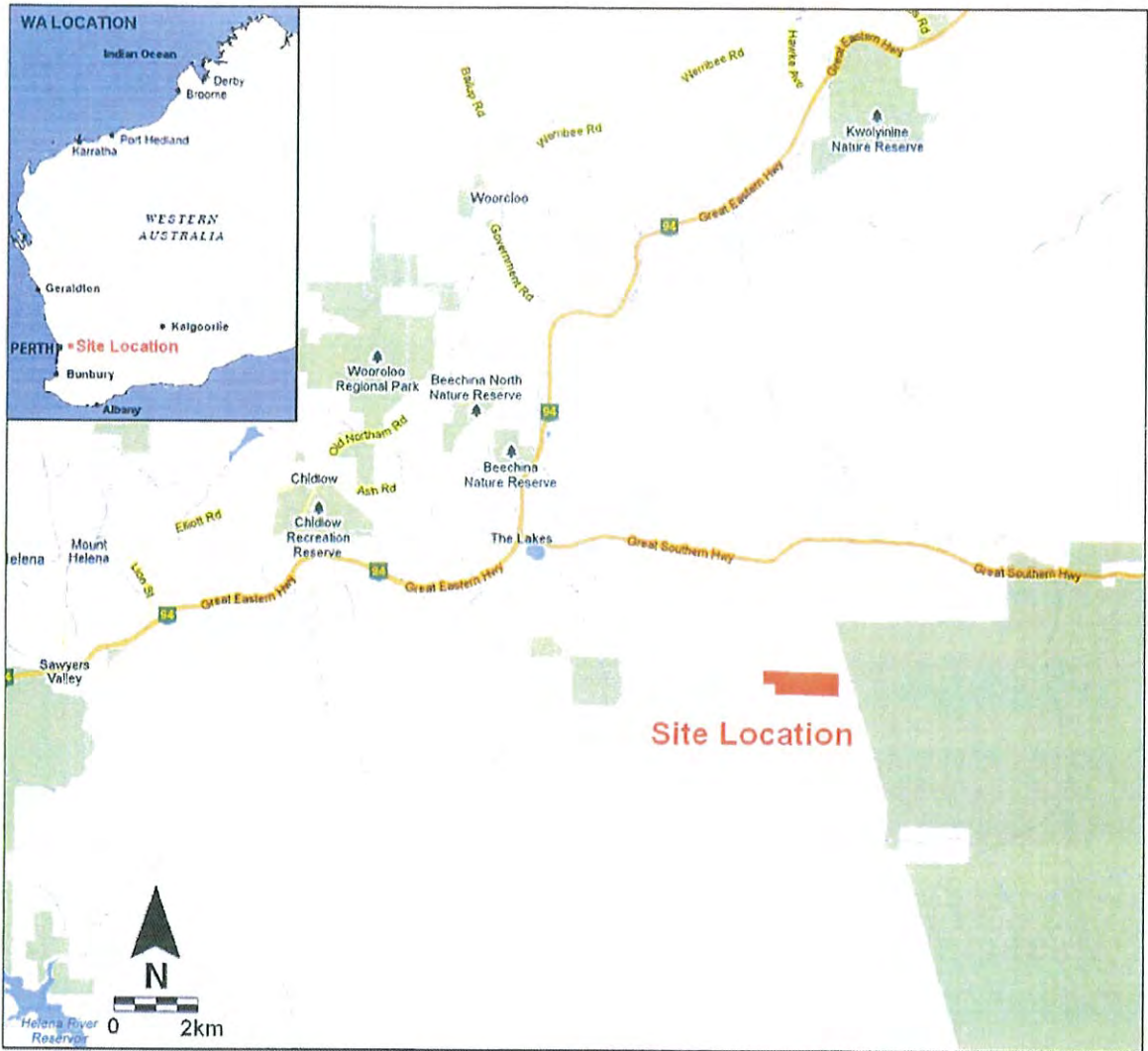


Figure 1: Mining Leases M70/836 and M70/1113



Figur2: Location of study area



1) Consultants:

The desk top investigations, field work and report were undertaken by: Peter Keating B.Sc(Hons) Ph.D who has over 20 years of experience in environmental science and land use planning, including the preparation and lodgement of numerous Level 1 and Level 2 surveys under the EPA's Guidance 51.

Megan Keating B.Sc, B.Tech who is a qualified zoologist with 2 years experience undertaking fauna studies and surveys according to EPA Guidance 56.

2) Methodology

The methodology employed commenced with desktop reviews of the general area, including geology, hydrology, previous flora and fauna studies and interrogating DEC's NatureMap database for known flora and fauna species in the area and the conservation status.

The site was then visited by both scientists operating in concert. They walked 5 east-west and 7 north south transects of the site walking about 10 m apart, taking field notes of observations made, and conferring where necessary. They independently wrote this report in regard to Vegetation and Flora (PK) and fauna (MK).

3) Season

Field work was undertaken in the spring (26th October) of 2012 at a time when there was a maximum likelihood of identifying flora on the basis of flowers being present. Dr Keating had previously visited the site in February 2012 for the purpose of investigating whether the site had been impacted by die-back caused by *Phytophthora cinnamomi*, and to determine whether the vegetation was significant habitat for endangered birds.

4) Limitations of the Survey

The survey was undertaken in mid to late spring on a single day. The previous winter had been relatively dry. Fire age of the site was estimated to be 5 years. Many annual native herbs flower in late winter and early spring, and others only germinate after fire. As such, the study undertaken cannot be considered as exhaustive, but rather is likely to represent around 75-80% of the native flora present.

Native fauna can seasonally occupy habitats and frequently occupy hidden areas under bark, in soils etc. Most native mammals are nocturnal whereas the study was undertaken during daylight. The fauna survey relied on the presence of habitat, and on the existence of scats and tracks to determine the likelihood of endangered fauna being present.



5) Results of Surveys

a) Vegetation

The site lies within the Jarrah Forest in the IBRA. It was classified by Mattiske in 1998 as having Yallanbee (Y5) vegetation:

Yallanbee(Y5) Vegetation Complex: Mixture of open forest of *Eucalyptus marginata* subsp *thalassica* - *Corymbia calophylla* and woodland of *Eucalyptis wandoo* on lateritic uplands in semi arid top perarid zones.

WA Geological Survey environmental geology mapping (Mundaring) describes the site as Sgc- Clayey gravelly sand, which is confirmed by on site drilling by Myer Water Environmental Solutions (2009) which demonstrated deep sands to about 30 m. Such deep sands would be expected to be leached on mineral nutrients, thus only able to support vegetation adapted to harsh conditions.

A list of flora known within 10 km of the site was obtained from Naturemap (Appendix 1) showed there are no known Declared Rare Flora in the area, but 10 Priority species are described (Table 1)

Species	Classification
<i>Acacia drummondii</i> subsp. <i>affinis</i>	P3
<i>Boronia tenuis</i>	P4
<i>Grevillea hislopii</i>	P2
<i>Grevillea pimeleoides</i>	P4
<i>Stylidium asteroideum</i>	P3
<i>Synaphea diabolica</i>	P3
<i>Synaphea rangiferops</i>	P2
<i>Trithuria australia</i>	P4
<i>Cyanicula ixiodes</i> subsp. <i>candida</i>	P2
<i>Cyanicula ixiodes</i> subsp. <i>ixiodes</i>	P4

Table 1: Priority flora documented in Naturebase as occurring within 10 km of the site.

After observing recent aerial photography of the site from Nearmap, the site was inspected to map the vegetation units present.

Three main vegetation units were found were:

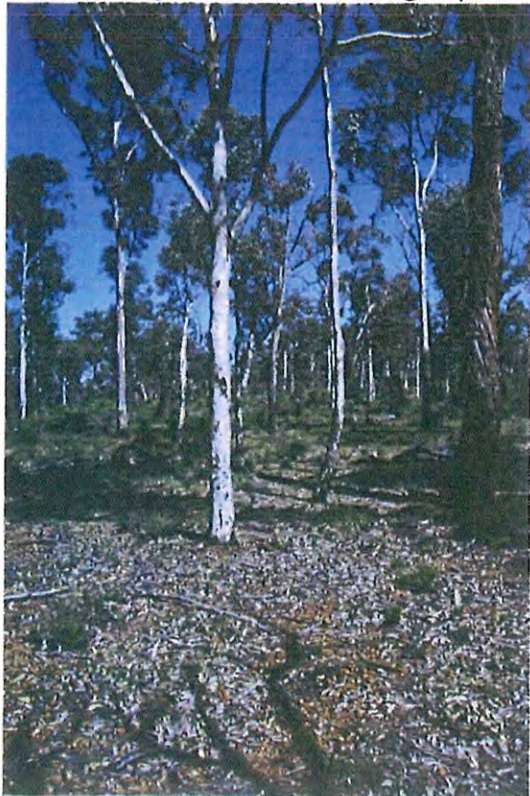
1) Jarrah Low Woodland: The majority of the site is covered by a low, very open woodland of *Eucalyptus marginata* subsp *thalassica*, with a generally sparse understory of scattered *Stirlingia latifolia*, *Banksia sessilis*, *Hibbertia heugelii*, *Xanthorrhoea gracilis* and *Mesomelaena tetragona*. (See photograph 1). This vegetation unit is associated with yellow sandy soil, and to the south, white sandy soil. In the white sandy soil *Desmocladius flexuosus* replaces *Mesomelaena* in the understory.

2) Wandoo Woodland: An area of sparse *Eucalyptus wandoo* open woodland occupies the central northern part of the site. Understorey is very sparse, consisting of scattered *Hibbertia heugelii*, *Mesomelaena tetragona* and *Xanthorrhoea preisii*. (see photograph 2)

3) Jarrah closed Banksia Woodland: The area to the north west of the site, where surface soils are lateritic has essentially similar vegetation to Unit 1 above, except there is a dense understory of *Banksia sessilis* to 2 m, and *Banksia grandis* is more common than in Unit 1. (Photograph 3).



Photograph 1: Vegetation Unit 1, with most Jarrah being coppiced from previous woodgetting, and demonstrating a sparse understorey.



Photograph 2: Vegetation Unit 2 has taller wandoo, and very sparse understorey.



Photograph 3: Vegetation unit 3 is similar in composition to Unit 1, but has *Banksia sessilis* forming a dense understorey in parts. This unit has lateritic surface soil, whereas the other two have sand.

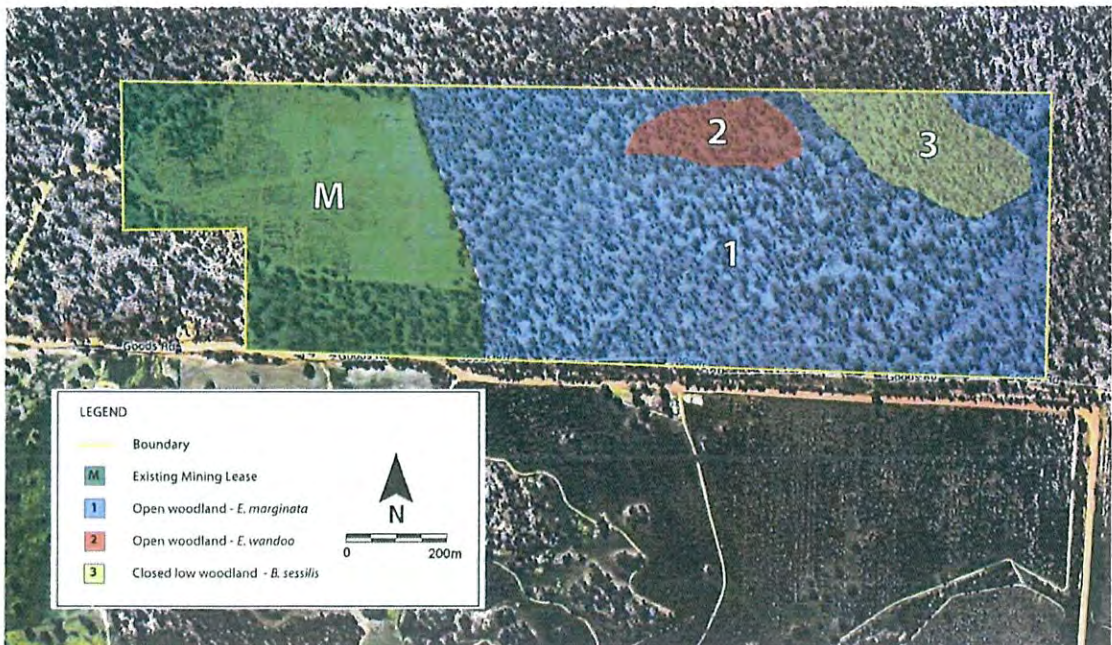


Figure 3 shows that Vegetation Unit 1 occupies the majority of the site.



b) Flora

A total of 71 species were found on the site, however as the site was visited in Late October, it is likely that early flowering species, particularly orchids would not have been recorded.

None of the species found were DRF or priority species. Whereas nearly 300 species are recorded in the surrounding area in DEC's NatureMap, this area can be considered to have generally lower diversity than surrounding areas.

Only three of the species found were weeds, and they were present only in low numbers near Goods Road.. The site is relatively weed free. None of the species found were outside their known range.

Species	Family	Occurrence
<i>Acacia alata</i>	Fabaceae	
<i>Acacia extensa</i>	Fabaceae	
<i>Acacia heugelii</i>	Fabaceae	
<i>Acacia nervosa</i>	Fabaceae	
<i>Acacia pulchella</i>	Fabaceae	
<i>Anigosanthos manglesii</i>	Haemodoraceae	VC
<i>Anigosanthus humilis</i>	Haemodoraceae	VC
* <i>Arctotheca calendula</i>	Asteraceae	
<i>Austrastipa semibarbata</i>	Poaceae	
<i>Astrolama pallidum</i>	Ericaceae	C
<i>Banksia armata</i>	Proteacea	
<i>Banksia grandis</i>	Proteacea	C
<i>Banksia sessilis</i>	Proteacea	VC
<i>Bossiaea eriocarpa</i>	Fabaceae	VC
<i>Bossiaea ornata</i>	Fabaceae	C
<i>Calytrix variabilis</i>	Myrtaceae	
<i>Conospermum acerosum</i>	Proteacea	
<i>Conospermum stoechadis</i>	Proteacea	C
<i>Canostephium pendulum</i>	Ericaceae	
<i>Conostylis aculeata</i> subs <i>bromelioides</i>	Haemodoraceae	VC
<i>Conostylis juncea</i>	Haemodoraceae	C
<i>Conostylis setigera</i>	Haemodoraceae	C
<i>Conostylis villasa</i>	Haemodoraceae	VC
<i>Dampiera alata</i>	Goodeniaceae	
<i>Dampiera linearis</i>	Goodeniaceae	
<i>Dasypogon bromelifolius</i>	Dasypogonaceae	
<i>Daviesia decurrens</i>	Fabaceae	
<i>Desmacladus flexuosus</i>	Restionaceae	VC
<i>Eucalyptus accedens</i>	Myrtaceae	
<i>Eucalyptus marginata</i>	Myrtaceae	VC
<i>Eucalyptus wandoo</i>	Myrtaceae	C
* <i>Galdiulus caryophyllaceus</i>	Iridaceae	
<i>Gompholobium tomentosum</i>	Fabaceae	
<i>Grevillea bipinnatifida</i>	Proteacea	



<i>Haemadorum discolour</i>	Haemodoraceae	
<i>Hakea erinaceo</i>	Proteaceae	
<i>Hakea incrassata</i>	Proteaceae	
<i>Hakea undulata</i>	Proteaceae	C
<i>Hardenbergia camptoniana</i>	Fabaceae	
<i>Hemiandra pungens</i>	Lamiaceae	
<i>Hibbertia huegellii</i>	Delleniaceae	VC
<i>Hibbertia hypericoides</i>	Delleniaceae	
<i>Hibbertia lasiopus</i>	Delleniaceae	C
<i>Hovea chorizemifolia</i>	Fabaceae	
<i>Hovea trisperma</i>	Fabaceae	
<i>Kennedia prostrata</i>	Fabaceae	
<i>Laxmannia grandiflora</i>	Asparagaceae	VC
<i>Leschenaultia biloba</i>	Goodeniaceae	
<i>Leucopogon propinquus</i>	Ericaceae	
<i>Mesomelaena tetragona</i>	Cyperaceae	VC
<i>Neurachne alopecuroidea</i>	Poaceae	
<i>Patersonia juncea</i>	Iridaceae	
<i>Patersonia occidentalis</i>	Iridaceae	C
<i>Petrophile striata</i>	Proteaceae	
<i>Ptilotus manglesii</i>	Amaranthaceae	C
<i>Ptilotus polystachyus</i>	Amaranthaceae	
<i>Scaevola platyphylla</i>	Goodeniaceae	
<i>Schaltzia invalucrata</i>	Myrtaceae	
<i>Sphaerolobium medium</i>	Fabaceae	
<i>Stirlingia latiflora</i>	Proteaceae	VC
<i>Stylidium amaenum</i>	Stylidiaceae	C
<i>Stylidium brunonianum</i>	Stylidiaceae	VC
<i>Stylidium ciliatum</i>	Stylidiaceae	C
<i>Stylidium diuraides</i>	Stylidiaceae	VC
<i>Synephea petiolaris</i>	Proteaceae	
<i>Thysanotis thyrsoideus</i>	Asparagaceae	C
* <i>Ursinia aanthemoides</i>	Asteraceae	
<i>Viminaria juncea</i>	Fabaceae	
<i>Xanthorrhoea gracilis</i>	Xanthorrhoeaceae	C
<i>Xanthorrhoea pressii</i>	Xanthorrhoeaceae	C

Table 2: List of plant species found. In the Occurrence column, VC means very common and C means common. Otherwise the occurrence was scattered.

c) Fauna

To determine vertebrate fauna assemblages present or likely to be present on the Goods Rd Site, and the impact of proposed developments on this fauna, a desktop study was conducted and followed by a reconnaissance survey. The desktop study comprised studying Nearmap satellite imaging of the site and the surrounding areas to analyse habitat, and a search of the DEC NatureMap database for species observed within ten kilometres of the site. The reconnaissance survey was a late morning site visit conducted



in October, 2012, during which vegetation and habitat was assessed and we looked for signs of fauna.

Desktop study

Satellite images

An examination of satellite images of the site and surrounds revealed that the site is open woodland with a wedge of denser open woodland running through it. To the west of the site is the existing sand mine. Immediately to the south of the site is approximately 600 hectares of cleared farming land, one third of which has been replanted with trees two to three years ago. Beyond these properties and to the east and south-east of the site is extensive forested land of the Mundaring Weir Catchment Area including state forest and national parks to the south-east. To the north is agricultural lands with substantial forested corridors throughout.

A Naturemap database search of species observed within ten kilometres of the site (results in Table 1) found a moderate assemblage of birds have been observed in the area: 75 species in total, seven of conservation significance including three *Calyptorhynchus* species. Eight native mammals have been observed in the area, six of which are of conservation significance. Seven species of reptile and ten species of amphibian have also been observed in the area, though none of conservation significance.

Reconnaissance survey

The reconnaissance survey confirmed the desktop study analysis of the available habitat on the site; open woodland of primarily Jarrah, Wandoo and other *Eucalyptus* over *Xanthorrhoea* over grasses and various herbaceous plants. There were some denser thickets or *Banksia sessilis*. The ground was sand and in places gravel, with no substantial rock formations except for lateritic caprock. There was a significant amount of dead wood throughout the site.

Many trees on the site offered hollows that would be suitable as nesting for a number of fauna species, particularly birds and potentially including the threatened cockatoo species observed in the area according to NatureMap, though most of the trees and hollows would have been too small to be suitable for cockatoos. During the reconnaissance survey several bird species were observed and still more species were evident by their song or distant sightings but not identified, however the overall number and species richness of birds observed was less than had been expected based on the NatureMap search and the available habitat. None of the conservation significant bird species were observed on the site with the exception of an unknown cockatoo (*Calyptorhynchus* sp.) which was briefly heard flying overhead.

The only evidence of native animals on the site was extensive traces of western grey kangaroos (*Macropus fuliginosus*) including skeletons, scats, tracks, and signs of feeding and resting, as well as a single cylindrical insectivore scat believed to be from a southern brown bandicoot (*Isodon obesulus*) although it was unusually large with a diameter of 15mm.

Evidence of introduced species was abundant on the site, particularly that of feral pigs (*Sus scrofa*) that had overturned much of the soil foraging for roots, as well as scats. A rabbit warren (*Oryctolagus cuniculus*) was found near the southern boundary of the site.



It is also probable due to their general abundance that feral predators (*Vulpes vulpes* and *Felis catus*) are present on the site. Considering the abundance of introduced competitors and predators, and the general lack of understory on the site to provide adequate cover, it is unlikely that other native mammals observed nearby according to NatureMap would be found on the site.

Impact assessment

The site provides some habitat suitable to native mammals, particularly those that live within trees and tree hollows as well as terrestrial species that do not depend on a dense understory. The site is dominated by introduced species and western grey kangaroos, however, leaving inadequate resources for it to be an ideal habitat for native species of conservation significance. The site is surrounded by copious forested land and extensive habitat corridors, and the removal of habitat on this site would not impede the movement of native species between adjacent areas. Removing the vegetation from this site to mine it will remove a small amount of available habitat for native animals, but this will have a minimal overall impact on habitat and native fauna in the general region. If the site is rehabilitated following mining operations, this impact will not be significant.

Table 3: Fauna species listed from a NatureMap search within 10 kilometres of 31° 54' 20" S, 116° 23' 33' and their conservation status.

Species	Common name	Conservation Status
Birds		
Acanthiza apicalis	Broad-tailed Thornbill	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	
Acanthiza inornata	Western Thornbill	
Acanthorhynchus superciliosus	Western Spinebill	
Accipiter fasciatus	Brown Goshawk	
Anas gracilis	Grey Teal	
Anthochaera carunculata	Red Wattlebird	
Anthochaera lunulata	Western Little Wattlebird	
Aquila audax	Wedge-tailed Eagle	
Aquila morphnoides	Little Eagle	
Ardea pacifica	White-necked Heron	
Artamus cinereus	Black-faced Woodswallow	
Artamus cyanopterus	Dusky Woodswallow	
Artamus personatus	Masked Woodswallow	
Cacatua pastinator	Western Long-billed Corella	
Cacomantis flabelliformis	Fan-tailed Cuckoo	
Calyptorhynchus banksii	Red-tailed Black-Cockatoo	
Calyptorhynchus banksii	Forest Red-tailed Black-Cockatoo	Threatened
Calyptorhynchus baudinii	Baudin's Cockatoo	Threatened
Calyptorhynchus latirostris	Carnaby's Cockatoo	Threatened
Chenonetta jubata	Australian Wood Duck	
Cincloramphus mathewsi	Rufous Songlark	
Climacteris rufa	Rufous Treecreeper	
Colluricincla harmonica	Grey Shrike-thrush	



<u>Coracina novaehollandiae</u>	Black-faced Cuckoo-shrike	
<u>Corvus coronoides</u>	Australian Raven	
<u>Cracticus nigrogularis</u>	Pied Butcherbird	
<u>Cracticus tibicen</u>	Australian Magpie	
<u>Cracticus torquatus</u>	Grey Butcherbird	
<u>Dacelo novaeguineae</u>	Laughing Kookaburra	
<u>Daphoenositta chrysoptera</u>	Varied Sittella	
<u>Dicaeum hirundinaceum</u>	Mistletoebird	
<u>Dromaius novaehollandiae</u>	Emu	
<u>Eopsaltria georgiana</u>	White-breasted Robin	
<u>Epthianura albifrons</u>	White-fronted Chat	
<u>Falco berigora</u>	Brown Falcon	
<u>Falco longipennis</u>	Australian Hobby	
<u>Falco peregrinus</u>	Peregrine Falcon	Protected (S)
<u>Falcunculus frontatus</u>	Western Shrike-tit	Priority 4
<u>Fulica atra</u>	Eurasian Coot	
<u>Gallirallus philippensis</u>	Buff-banded Rail	
<u>Gerygone fusca</u>	Western Gerygone	
<u>Glossopsitta porphyrocephala</u>	Purple-crowned Lorikeet	
<u>Grallina cyanoleuca</u>	Magpie-lark	
<u>Hirundo neoxena</u>	Welcome Swallow	
<u>Leipoa ocellata</u>	Malleefowl	Threatened
<u>Lichenostomus ornatus</u>	Yellow-plumed Honeyeater	
<u>Lichenostomus virescens</u>	Singing Honeyeater	
<u>Lichmera indistincta</u>	Brown Honeyeater	
<u>Malurus splendens</u>	Splendid Fairy-wren	
<u>Melithreptus brevirostris</u>	Brown-headed Honeyeater	
<u>Merops ornatus</u>	Rainbow Bee-eater	Protected (IA)
<u>Myiagra inquieta</u>	Restless Flycatcher	
<u>Neophema elegans</u>	Elegant Parrot	
<u>Ninox novaeseelandiae</u>	Boobook Owl	
<u>Pachycephala pectoralis</u>	Golden Whistler	
<u>Pachycephala rufiventris</u>	Rufous Whistler	
<u>Pardalotus punctatus</u>	Spotted Pardalote	
<u>Pardalotus striatus</u>	Striated Pardalote	
<u>Petroica goodenovii</u>	Red-capped Robin	
<u>Phaps chalcoptera</u>	Common Bronzewing	
<u>Phylidonyris novaehollandiae</u>	New Holland Honeyeater	
<u>Platycercus icterotis</u>	Western Rosella	
<u>Podargus strigoides</u>	Tawny Frogmouth	
<u>Rhipidura leucophrys</u>	Willie Wagtail	
<u>Sericornis frontalis</u>	White-browed Scrubwren	
<u>Smicrornis brevirostris</u>	Weebill	
<u>Strepera versicolor</u>	Grey Currawong	



Tachybaptus novaehollandiae	Australasian Grebe	
Tadorna tadornoides	Australian Shelduck	
Todiramphus sanctus	Sacred Kingfisher	
Zosterops lateralis	Grey-breasted White-eye	
Mammals		
Dasyurus geoffroii	Chuditch, Western Quoll	Threatened
Hydromys chrysogaster	Water-rat	Priority 4
Isoodon obesulus	Quenda, Southern Brown Bandicoot	Priority 5
Macropus fuliginosus	Western Grey Kangaroo	
Macropus irma	Western Brush Wallaby	Priority 4
Myrmecobius fasciatus	Numbat	Threatened
Phascogale tapoatafa	Southern Brush-tailed Phascogale	Threatened
Tachyglossus aculeatus	Echidna	
Reptiles		
Brachyurophis semifasciata	Southern Shovel-nosed Snake	
Crenadactylus ocellatus	Clawless Gecko	
Ctenophorus ornatus	Ornate Crevice Dragon	
Ctenotus fallens	West-coast Laterite Ctenotus	
Eremiascincus richardsonii	Broad-banded Sand Swimmer	
Nephrurus milii	Barking Gecko	
Parasuta gouldii	Gould's Hooded Snake	
Amphibians		
Crinia glauerti	Clicking Frog	
Crinia pseudinsignifera	Bleating Froglet	
Heleioporus albopunctatus	Western Spotted Frog	
Heleioporus barycragus	Hooting Frog	
Heleioporus eyrei	Moaning Frog	
Heleioporus inornatus	Whooping Frog	
Heleioporus psammophilus	Sand Frog	
Limnodynastes dorsalis	Western Banjo Frog	
Neobatrachus pelobatoides	Humming Frog	
Pseudophryne guentheri	Crawling Toadlet	



Conclusions on Conservation Significance:

The Jarrah Forest area of the IBRA is one of the largest reserved areas of uncleared land in the south west of WA, due to very large state forest reserves. This site is at the northern end of the Jarrah forest and near cleared farmland.

Relative to other parts, species richness is relatively low, probably because firstly it is towards the lower rainfall area of the Jarrah Forest, and it is an area of deep sands which do not retain moisture or nutrients. No declared rare or priority flora were found. The lack of dense understorey means that fauna habitat is low. The study found no permanent water sources for fauna.

The site is relatively undisturbed, and has few weeds. The major disturbance is feral pigs and rabbits.

We conclude that the site does not have any substantial conservation significance which would prevent sand mining. Rehabilitation of the area after sand mining would result in virtually no environmental impact from such a mining operation.

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Senior Consultant



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SITE VISIT REPORT: 17 January 2012
CLIENT: Action Sand Supplies
LOCATION: Goods Rd, The Lakes

Background: Bioscience was asked to visit a sand mine in the Darling Range (Mining Lease M70/836) to investigate whether a bushland area to the east of existing operations was likely to be effected by dieback, and whether it was likely to be a breeding habitat for cockatoos. The site was visited by Dr Peter Keating on 13th February 2012.

Dr Keating has been involved in plant pathology diagnostics and research for over 25 years, runs a company which provides laboratory analytical services for die-back using both classic and DNA-based methods, and has supervised post graduate research projects on die-back control.

The Site: The site lies about 50 km east of the Perth CBD. Three stages of operation are present, with the central part being the open excavation face, haul roads, screening and stockpiles. The western area has been mined and is currently undergoing rehabilitation. The eastern third is bush land which is proposed for clearing and mining.

The bushland area is low open jarrah woodland (*Eucalyptus marginata*) over *Xanthorrhoea preissii* and *Stirlingia latifolia* over open herb land of mixed Proteaceae and Myrtaceae. Soil is yellow sand. Although quite open, the vegetation is in very good condition with no weeds evident. Native fauna are evident based on scats and diggings.

The presence of large stumps indicates the site was logged in the distant past. There was is no other obvious signs of disturbance. Fire age is estimated to be 10 – 15 years.

Die Back: Dieback is a serious cause of native vegetation decline, cause by the introduced Oomycete fungus, *Phytophthora cinnamomi*. This fungus infects a large number of native species which occupy jarrah woodlands by penetrating roots and destroying initially root tissue, then eventually woody tissues. Plants usually die with the onset of hot conditions in early summer as they lose the ability to obtain sufficient water from the soil.

Within native bush land, the fungus can spread (generally slowly) by root-root contact underground. The spread from site-to-site is usually due to contaminated soils being carried in by vehicles or shoes. In the jarrah forest, the fungus is worst in lateritic soils, but it can also be present in sandy soils.



Signs of the presence of *Phytophthora* include the gradual decline of susceptible tree species, with dying limbs evident and dead leaves which generally remain on trees rather than abscise in the usual way. In smaller shrubs and in *Banksia*, death is typically more rapid and plant die quite suddenly.

About 40% of plant species in Western Australia are susceptible to *Phytophthora* die-back. Some species are particularly sensitive, and these have become known as indicator species, in that their absence from vegetation units where they would be expected is usually a reliable sign that die-back is present. In the early stages of disease, it is the younger specimens which disappear first, so lack of recruitment is a sensitive indicator. Disease is confirmed by testing soils and dead or dying plant tissues.

Site Observations: In the context of the above description of dieback indicators, the following observations are salient:

- *Jarrah* is a key indicator species, and is the dominant tree on the site. None of the trees observed showed any signs of decline. There was no recruitment of seedling found.
- *Banksia grandis* is a particularly sensitive indicator species. In the central section of the bushland there were four healthy mature specimens and on dead one. There were many healthy saplings around the larger trees so strong recruitment was evident.
- *Xanthorrhoea preissii* is a dominant species in the middle story and there was no evidence of disease or decline. There was ample recruitment of young specimens.
- *Hibbertia sp.* A number of species of small low shrubs were present.
- *Xylomelum occidentale*: A number of quite old healthy wood pears were present.

Conclusion – Phytophthora:

Based on the absence of any disease symptoms in the vegetation, and the presence of many species which are known to be particularly sensitive to phytophthora, we conclude the site is free of die-back.

Cockatoos:

There are four species of black cockatoo endemic to Western Australia, one of which, Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) is classified as endangered under the federal Environment Protection and Biodiversity Conservation Act 1999, and "Specially protected fauna" under the Western Australian Wildlife Conservation Act 1950).

Carnaby's Black Cockatoo lives throughout the southwest. Breeding only occurs in the wheatbelt and Great Southern in Wandoo and Salmon Gum mature woodlands.

They feed on a wide range of foods including flowers, seed and insects. They have adapted to eating exotic foods such as pine nuts. Generally their preferred feeding habitat is Kwongan shrub where they feed on dryandra, hakea grevillia, banksia and marri seed.



The major threat to Carnaby's Black Cockatoo is habitat fragmentation. Because they breed and feed in different habitats, there needs to be proximity of Wandoo woodland and Kwongan Scrub, as occurred in the grain belts which have now been largely cleared.

The Red Tailed Black Cockatoo *Calyptorhynchus banksii naso* is not as endangered as Carnaby's Black Cockatoo, but is still listed as Vulnerable under federal and state acts.

Its breeding hollows are in mature mostly Marri, but also Jarrah, Wandoo and Karris trees, usually in quite dense closed forests. It feeds over a wide range on marri, jarrah, blackbutt, Karri and Sheoak seed.

Conclusion- Cockatoos

There is a possibility that cockatoos are occasional visitors to the site. The vegetation complex present does not contain many of their preferred feed plants, and those present are in small numbers. There are no breeding areas for them (jarrah trees are too small, sparse and immature for red-tailed breeding). Accordingly, the clearing of the site for sand mining is not expected to have any impact on endangered or vulnerable cockatoos.

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Principal consultant.

ASSESSMENT OF REHABILITATION

Sand Extraction, M70/836
Goods Road, The Lakes

TUMA HOLDINGS PTY LTD

15 July 2016

Prepared by

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1.0 Introduction

ML 70/836 lies in State Forest at The Lakes approximately 8 km from Great Eastern Highway, along Flynn and Good Roads.

As part of the rehabilitation plan the existing rehabilitation was assessed for compliance and new standards developed. Field work was conducted on 6 April 1998 and in subsequent years.

The latest revegetation was again assessed on 7 July 2016.

1.2 Study Methods - Purpose

In 1998 – 2012 the vegetation ahead of mining was assessed for species richness and diversity and a 100 m² permanent plot marked out. The spacing of the trees and vegetation cover were also assessed.

The pre-mined vegetation was assessed in spring 1998 to provide baseline vegetation data. Additional studies were completed in most subsequent years until 2012, during annual assessments of the revegetation, with reviews of the adjoining vegetation.

The existing areas of rehabilitation were assessed for species density and richness and three permanent plots of 2 x 100 m² and 1 x 50 m² marked out. The most successful species were noted on the basis of growth rates.

In November 2012 BioScience completed a Vegetation, Flora and Fauna Report combined with a Dieback and Cockatoo Study of the area to the east of the active pit, including M70/1113 and M70/1113.

This updated study assess the rehabilitation at July 2016 to determine whether the completion criteria are being met and sustained.

The 2016 study used 10m² plots, similar to the original plots. These are not permanently marked in the field and are shown on the attached aerial photograph. In most areas of revegetation the plots were selected as representative, the lowest and highest quality revegetation, to present a most representative picture of the rehabilitation, rather than randomised sample plots which can be subject to sample bias.

All species noted were recorded, the species richness and plant density determined.

The number of tree species was determined by 20 metre long transects, counting the trees to 2.5 metres either side of the line to provide a tree density in 50m². This was then multiplied to provide a density per hectare.

2.0 Existing Environment

2.1 Geology, Hydrology and Soils

The original land surface consists of a series of alluvial terraces formed during Tertiary times, prior to widespread lateritisation. The terraces are composed of coarse quartz sands with basal sandy clays and recent surface clay sands around the edges. The terraces were either deposited as alluvium in a broad perhaps braided river system or a deltaic type deposit. In either case it would appear that the sediments have filled a small dammed valley. The origin of the sediments is from weathered basement granite rock with the composition changes being related to altered climatic regimes.

The initial soils of the site are quartz sands with small but variable amounts of duricrust on the surface. The sand is very porous, but frequently coated with yellow or red iron oxides which are highly phosphate absorbing.

They are well drained with no surface water runoff and low levels of water retention through summer. The pre-mining water table was perhaps 15 - 20 metres below the surface. Therefore the vegetation is sparser than in other areas. The basal beds are enriched in clay, thus at the end of sand excavation the final floor is two metres above the water table with sandy soils containing significant proportions of clay.

2.2 Pre-Excavation Vegetation

In order to provide a completion criteria a sample plot ahead of excavation was located on sand which has minor laterite rock associated with it (species richness 23 /50m², density 5.52 /m²). On the other hand the permanent plot adjacent to the pit is located on sand with significant laterite and has a similar species richness and density (species richness 19 /50m², density 4.77 /m²).

Tree density is low and was measured ahead of excavation in 5 randomly selected 20m x 20m plots. The only trees present were Jarrah *Eucalyptus marginata* although isolated *Banksia grandis* did occur in the general area. Other species of trees occurred closer to the stream line and in more clay rich soils that are outside the proposed area of excavation. These include *Eucalyptus patens*, *E. wandoo* and *E. accedens*. In addition *Eucalyptus rudis* occurs on stream lines in the area.

Trees	> 5 metres high (all regrowth)	0.65 stems /50m ²
Tree species	< 5 metres tall (all suckers)	0.28 stems /50m ²

This equates to 186 trees, suckers and regrowth stems per hectare. However it should be noted that this overstates the number of trees per hectare because each sucker from a large rootstock was counted separately. A more appropriate figure is likely to be about 150 stems/hectare.

2.3 Rare Vegetation Species

No Rare or Endangered species were noted during the field surveys.

Pre-Mining Vegetation Statistics

Average Perennial Species Richness		21 species /50m²
Perennial Plant Density (data from Table 1)		5.1 plants /m²
Trees > 5 metres high (all regrowth)		0.65 stems /50m²
Tree species < 5 metres tall (all suckers) (data from 5 random 20x20 m sample plots)		0.28 stems /50m² 186 stems per hectare
Vegetation cover	Trees	5% - 10%
	Low understorey/ground covers	50%
(data from 5 random 20x20 m sample plots)		

Current rehabilitation uses **best practice and will be directed towards achieving 80 % of the original forest in terms of species richness, diversity and structure**, measured at 15 months following rehabilitation. **The cut off criteria will be 50%**. Areas which do not achieve the required standards will have additional rehabilitation techniques applied to them to bring them up to the required standards.

The latest rehabilitation in the current pit well exceeds this establishment criteria for species richness and density. However at 200 tree stems per hectare the tree criteria of 625 per hectare is not met. Considering the pre-mined vegetation of Open Low Jarrah Woodland the 625 is too high and reflects a forest. The pre-mining tree density is 150 stems/hectare see data from vegetation survey.

A establishment criteria of 200 tree stems per hectare is considered appropriate considering the pre-mining tree stem density and the fact that the surrounding vegetation is open woodland and not forest.

It should be noted that the soils following excavation will be different to pre-mining and this is likely to affect the structure and the percentage of certain species. In addition the age structure of the pre-existing vegetation will result in different percentage cover and probably changed species composition.

Completion Criteria for ML 70/836

- **Nitrogen fixing species** **1 per 3 m².**
- **Trees** **200 stems per hectare.**
- **Plant density** **Aim** **4.1 perennial shrub/tree plants per m².**
 Cut off **2.6 shrubs and trees per m².**

•	Species richness	Aim	16.8 perennial shrub and tree species per 50 m ²
		Cut off	10.5 perennial shrub and tree species per 50 m ² .
•	Areas of 0.1 ha or greater are to be reseeded the following season.		

Table 1 Species recorded - 6 April 1998
Natural Vegetation Communities Pre-Mining

Note Species labelled (#) are yet to be confirmed
X Indicates the presence of the species in the rehabilitation
0.2 Indicates the number of stems/m² in half the permanent plot or /50m².

	Jarrah Woodland (ahead of mining)	Jarrah Woodland (permanent plot adjacent to excavation)	Present mainly at lower elevations near stream
Acacia alata	X		
Acacia extensa	X		
Acacia huegelii	0.04	0.02	
Acacia nervosa			X
Acacia pulchella	X	X	
Acacia stenoptera	0.16		
Allocasuarina huegeliana			X
Allocasuarina humulis	X	X	
Anigozanthos manglesii	0.02	0.12	
Anigozanthos humilis	X	X	
Astroloma pallidum	X	X	
Baeckea camphorosmae	0.10	X	
Banksia grandis	X		
Bossiaea eriocarpa	0.44	0.72	
Bossiaea ornata	0.16	X	
Conostephium pendulum	X	X	
Conostylis juncea	X	0.04	
Conostylis setigera	0.08	0.46	
Damperia alata	X	X	
Damperia linearis	0.18	0.28	
Dasyopogon bromeliifolius	X	X	
Daviesia decurrens	0.28	0.46	
Daviesia triflora?	X		
Dryandra armata			X
Dryandra bipinnatifida	X	X	
Dryandra lindleyiana	0.78	0.3	
Dryandra sessilis	X	X	X
Dryandra squarrosa/(carduacea)	X		
Eucalyptus accedens	X		
Eucalyptus calophylla	X	X	
Eucalyptus marginata	0.02	X	
Eucalyptus patens			X
Eucalyptus wandoo	X	X	
Gompholobium tomentoseum	0.02	1.0	
Grevillea bipinnatifida	0.02	X	
Haemodorum discolor	0.02	X	
Hakea erinacea	X		
Hakea incrassata	X		
Hakea lissocarpha	X		
Hakea prostrata	X		X
Hakea ruscifolia	X		X
Hakea stenoptera			X

Hakea undulata			X
Hemiandra pungens	X	0.02	
Hibbertia huegellii	0.60	0.28	
Hibbertia hypericoides	0.20	0.14	
Hibbertia lasiopus	X	0.06	
Hovea chorizemifolia	X	X	
Hovea elliptica	X	0.02	
Hovea trisperma	0.02	X	
Laxmannia sp	0.04	0.10	
Lepidosperma angustatum	X	X	
Leptospermum erubescens			X
Leschenaultia biloba	0.26	X	
Leucopogon propinquus	0.02	X	
Mesolaena tetragona	X	X	
Mirbelia dilatata			X
Nemica capitata	X	X	
Neurachne alopecuroides	0.04	X	
Patersonia juncea	0.06	X	
Persoonia longifolia	X	0.04	
Petrophile stricta	X	0.14	X
Ptilotus polystachyus	X	X	
Scaevola platyphylla?	X	0.10	
Scholtzia involucrata	X	X	
Sphaerolobium medium	X		
Stephelia tenuiflora	X	X	
Stipa semibarbata	X	X	
Stirlingia latifolia	1.96	0.74	
Synaphea petiolaris?	X	X	
Viminaria juncea			X
Xanthorrhoea preissii	X	X	
Perennial Species Richness	23 /50m²	19 /50m²	
Perennial Plant Density	5.52 /m²	4.77 /m²	

3.0 Previous Rehabilitation

In general the areas at lower elevations containing a proportion of clay have been successfully rehabilitated, whereas those areas located on sloping sandy banks or where the proportion of clay is significant have been less successful. Part of this has been due to selection of inappropriate species and inadequate ground preparation.

Other vital factors were the un-availability of topsoil with its enclosed indigenous seed supply, and the final soils being different from the pre-mined soils which will require some modification to the species composition to be used in rehabilitation.

The current pit has been rehabilitated by a variety of means including direct transference of top soil, seeding and tube planting. This rehabilitation has been successful but will require monitoring to ensure the methods used are capable of producing a self sustaining vegetation cover of local species.

There are numerous examples of older plants reseeding which lift the latest plant density measurements to high levels and illustrate that the revegetation is sustainable in the longer term.

Three permanent plots were established in 1998 in the western part of M70/836, in the various rehabilitation areas to assess the success of additional seeding and long term survival rates of rehabilitation to determine the most suitable techniques to be used. Parts of these have been impacted by changes to road works and safety bunding.

From the 1998 to 2012 studies it can be seen that the most recent rehabilitation using top soil is substantially better than previous rehabilitation and will meet all establishment criteria. On the other hand, although some areas technically meet the completion criteria, visual appraisal shows that ground covers and shrub species are restricted and that growth rates are currently unacceptable. These areas have been over seeded in 1998 using the seeding rates and species recommended later.

Rehabilitation completed in the current pit uses direct transference of topsoil and thus is of a higher standard.

Plant density species richness and the tree density continues to meet the completion criteria.

50 species were observed in the latest rehabilitation with a total of 96 species observed in the rehabilitation generally. The species richness is achieved from the good topsoil management.

The older areas of rehabilitation are sustainable and by meeting the completion criteria even after 10 years of excavation have demonstrated that re-seeding and recruitment is occurring. Many species are seeding and new plants germinating. The rates of seeding will ensure sustainability even if the revegetation was burnt.

There is no evidence of dieback in the rehabilitation.

The only weed species observed is *Gladiolus* sp which is naturalised in the South West of Western Australia and appears to be originating from the topsoil. It has a bulb and is a small weed that does not significantly impact on native vegetation and is present in probably all of the *Banksia* Woodlands in the wetter areas of the South West. Little can be done to control this species without significantly damaging the rehabilitation.

Fertiliser is not required and has not been used in recent years because it tends to encourage any weed species.

Similarly the need to assess nitrogenous species is not now required because the plants are germinating and developing well.

It is still relevant to add additional Proteaceae Shrubs and Eucalypt trees as these continue not to germinate as readily from the topsoil.

Table 2 Success of previous rehabilitation 1998 - 2012

Note X Indicates the presence of the species in the rehabilitation
0.2 Indicates the number of stems/m² in the sample plot
* Indicates origin from topsoil
No trees captured in sample grid, or total captured excessive

SPECIES DENSITY IN PREVIOUS REHABILITATION	AREA A	AREA C	AREA D	AREA J	AREA O	CURRENT PIT AREAS L M N
<i>Acacia alata</i>	X	X	X			
<i>Acacia drummondii</i>				0.08		
<i>Acacia latericola</i>				X	X	
<i>Acacia longifolia</i>				X	X	
<i>Acacia nervosa</i>	X	X	X	0.02		
<i>Acacia pulchella</i>				1.26	0.30	
<i>Acacia rostellifera</i>	X	X	X			
<i>Acacia saligna</i>	X	X	X	0.06	X	
<i>Acacia stenoptera</i>						X*
<i>Allocasuarina humulis</i>	0.40	X	X	X	0.1	0.06
<i>Anigozanthos manglesii</i>	X	X	X			0.10*
<i>Astroloma pallidum</i>	X	X	X			
<i>Baeckea camphorosmae</i>	X	X	X	X	X	
<i>Banksia grandis</i>	0.05			X	X	
<i>Bossiaea eriocarpa</i>	X	X	0.05	0.26	X	X*
<i>Bossiaea ornata</i>	X	X	0.35	X	X	
<i>Callitris preissii</i>				X	X	
<i>Callistemon phoeniceus</i>	0.05	X	X	X	X	
<i>Calothamnus quadrifidus</i>	X	0.05	0.05	0.26	X	
<i>Casuarina obesa</i>				0.08		
<i>Conostylis setigera</i>	X	X	X	X	X	0.06*
<i>Damperia linearis</i>			0.10			
<i>Daviesia decurrens</i>			0.20			X*
<i>Dryandra sessilis</i>	X	X	X			
<i>Dryandra squarrosa/carduacea</i>)				X	X	
<i>Eucalyptus accedens</i>	X	0.70	X	0.04	0.2	
<i>Eucalyptus calophylla</i>	0.05	X	X	0.14	0.2	0.08
<i>Eucalyptus camaldulensis</i>				X	X	
<i>Eucalyptus maculata</i>	X	X	X	X	X	X
<i>Eucalyptus marginata</i>	0.05	0.15	X			0.02
<i>Eucalyptus rudis</i>	X	X	X			
<i>Eucalyptus wandoo</i>	X	X	X	0.06	1.1	
<i>Gompholobium tomentoseum</i>	0.05	X	X	0.04	X	0.04*
<i>Haemodorum discolor</i>	X	X	0.15			X*
<i>Hakea incrassata</i>					0.1	
<i>Hakea prostrata</i>	X	X	X			X

<i>Hardenbergia comptoniana</i>				X	X	
<i>Hemiandra pungens</i>	0.05	X	0.20			0.34*
<i>Hibbertia huegellii</i>	0.05	0.05	0.30	X	X	0.02*
<i>Hibbertia hypericoides</i>	X	0.05	0.05			X*
<i>Hibbertia lasiopus</i>						0.02*
<i>Hovea elliptica</i>	X	0.05	X			0.04*
<i>Hovea trisperma</i>	X	X	X			
<i>Hypocalymma angustifolium</i>				X	X	
<i>Juncus palidus</i>				X	X	
<i>Kennedia coccinea</i>	X	X	0.05			X
<i>Kennedia prostrata</i>				0.20	0.1	0.04
<i>Kunzea ericifolia</i>	0.05	X	X	X	X	1.82
<i>Lepidosperma angustatum</i>	0.05	X	0.10			0.06*
<i>Leptospermum erubescens</i>	X	X	X	X	X	
<i>Leschenaultia biloba</i>	X	X	X			
<i>Leucopogon propinquus</i>	X	X	X			
<i>Loxocarya sp</i>	X	X	X			
<i>Melaleuca preissiana</i>				0.08	X	
<i>Melaleuca scabra</i>	0.05	X	X	0.02		
<i>Mesolaena tetragona</i>						0.02*
<i>Mirbelia dilatata</i>	X	X	X			
<i>Neurachne alopecuroides</i>						0.02*
<i>Patersonia juncea</i>				X	X	
<i>Ptilotus polystachyus</i>	X	X	X			
<i>Scaevola platyphylla?</i>	X	X	0.10			0.02*
<i>Stipa semibarbata</i>						0.02*
<i>Stirlingia latifolia</i>	0.25	X	0.15	X	X	0.04*
<i>Stylidium sp</i>						0.04*
<i>Synaphea petiolaris?</i>	X	X	0.35	X	X	0.08*
<i>Thysanotus sp</i>			0.15	X	X	
<i>Tricoryne elatior</i>	X	0.05	X			
<i>Viminaria juncea</i>				0.08	0.2	
Perennial Species Richness	16	10	20	15	10	27
species	/20m ²	/20m ²	/20m ²	/20m ²	/50m ²	/50m ²
Perennial Plant Density	1.35	1.25	2.95	2.88	2.5	5.28
	/m ²	/m ²	/m ²	/m ²	/m ²	/m ²
Shrubs /m ²	0.65	1.0	0.5 /m ²	1.92	0.7	1.92
	/m ²	/m ²		/m ²	/m ²	/m ²
Trees per hectare	1500	8500	0 #	4000	15 000 #	1000
	/ha	# /ha		/ha	/ha	/ha

Table 3 Success of previous rehabilitation 7 July 2016

Note X Indicates the presence of the species in the rehabilitation

A total of 50 species were identified in the rehabilitation examined on 7 July 2016.

Only one weed species was noted, Gladiolus, a common weed in Banksia Woodlands on sandy soils through the coastal south west of Western Australia. Gladiolus is difficult to eradicate as it is naturalised and survives via bulbs. Any eradication normally damages the surrounding or adjoining plants.

SPECIES DENSITY IN PREVIOUS REHABILITATION	AA	AB	AC	AD	AE	
Acacia alata						
Acacia drummondii						
Acacia huegelii		X				
Acacia latericola						
Acacia longifolia						
Acacia microbotrya		X				
Acacia nervosa		X			X	
Acacia pulchella						
Acacia rostellifera						
Acacia saligna						
Acacia stenoptera						
Alexgeorgea nitens?	X	X	X	X		
Allocasuarina huegeliana			X	X		
Allocasuarina humulis						
Anigozanthos manglesii	X	X	X	X	X	
Astroloma pallidum	X					
Austrostipa compressa	X		X	X	X	
Baeckea camphorosmae		X	X	X	X	
Banksia grandis						
Bossiaea eriocarpa			X			
Bossiaea ornata	X	X				
Callitris preissii						
Callistemon phoeniceus		X				
Calothamnus quadrifidus						
Casuarina obesa						
Conostylis setigera	X	X	X	X		
Damperia linearis	X	X			X	
Daviesia decurrens	X	X			X	
Desmocladus fasciculatus		X				
Desmocladus flexuosus	X			X		
Drosera sp						
Dryandra lindleyana			X		X	
Dryandra sessilis						
Dryandra squarrosa/carduacea)						
Eucalyptus accedens	X	X		X	X	
Eucalyptus calophylla	X		X	X		
Eucalyptus camaldulensis						
Eucalyptus forestiana						
Eucalyptus maculata						

Eucalyptus marginata					
Eucalyptus rudis					
Eucalyptus wandoo	X	X	X	X	X
Gompholobium marginatum	X	X			
Gompholobium tomentoseum					
Grevillea synaphea			X	X	
Haemodorum discolor					
Hakea incrassata					
Hakea prostrata					
Hakea ruscifolia					
Hardenbergia comptoniana					
Hemiandra pungens					
Hibbertia huegellii			X	X	
Hibbertia hypericoides					
Hibbertia lasiopus			X		
Hovea chiorizemofolia				X	X
Hovea elliptica					
Hovea trisperma					
Hypocalymma angustifolium					
Hypolaena exsulca	X				
Juncus palidus					
Kennedia coccinea					
Kennedia prostrata			X		
Kunzea glabrescens	X	X	X		X
Kunzea recurva		X			
Laxmania ramosa?		X	X	X	X
Lepidosperma gracilis	X	X	X	X	X
Lepidosperma squamatum					
Leptospermum erubescens	X	X	X	X	X
Leschenaultia biloba	X			X	X
Leucopogon propinquus	X				
Loxocarya sp					
Lyginia barbata					
Melaleuca preissiana					
Melaleuca scabra					
Mesomalaena pseudostygia	X				
Mesomalaena tetragona	X				
Mirbelia dilatata			X	X	
Nemica capitata	X	X	X	X	
Neurachne alopecuroides					
Patersonia juncea	X			X	
Patersonia pygmaea				X	
Ptilotus polystachyus					
Regelia sp			X	X	
Scaevola platyphylla?	X	X		X	
Scholtzia involucrata					
Stirlingia latifolia	X	X	X		X
Stylidium brunonianum		X			
Stylidium luteum		X			
Stylidium sp		X			
Synaphea petiolaris?	X	X			X
Thysanotus sp					
Tricoryne elatior					
Viminaria juncea					
Xanthorrhoea gracilis			X		

Xanthorrhoea preissii				X		
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Plant density and Species Richness – 7 July 2016

Sample Area	AA	AB	AC	AD	AE	AF
Age						
Perennial Species Richness species (average)	13 /10m ²	7.3 /10m ²	4.3 /10m ²	8.7 /10m ²	9.5 /10m ²	12.5 /10m ²
Perennial Plant Density (average)	3.3 /m ²	11.9 /m ²	4.45 /m ²	3.27 /m ²	5.3 /m ²	3.95 /m ²
Trees per hectare (average)	400 /ha	< 100 /ha	420 /ha	300 /ha	153 /ha	1000 /ha

Sample Area	AG	AI	AJ	AK	AL	AM
Age						
Perennial Species Richness species (average)	21 /10m ²	10 /10m ²	8 /10m ²	9.5 /10m ²	14.3 /10m ²	7.5 /10m ²
Perennial Plant Density (average)	4.85 /m ²	5.8 /m ²	3.0 /m ²	3.45 /m ²	5.53 /m ²	7.7 /m ²
Trees per hectare (average)	400 /ha	< 100 /ha	420 /ha	300 /ha	153 /ha	1000 /ha

4.0 Conclusions

The rehabilitation of M70/836 continues to meet the completion criteria for the key indicators.

Plant density species richness and the tree density continues to meet the completion criteria.

50 species were observed in the latest rehabilitation with a total of 96 species observed in the rehabilitation generally.

The older areas of rehabilitation are sustainable and by meeting the completion criteria even after 10 years of excavation have demonstrated that re-seeding and recruitment is occurring. Many species are seeding and new plants germinating. The rates of seeding will ensure sustainability even if the revegetation was burnt.

There is no evidence of dieback in the rehabilitation.

The only weed species observed is *Gladiolus* sp which is naturalised in the South West of Western Australia and appears to be originating from the topsoil. It has a bulb and is a small weed that does not significantly impact on native vegetation and is present in probably all of the *Banksia* Woodlands in the wetter areas of the South West. Little can be done to control this species without significantly damaging the rehabilitation.

The species richness is achieved from the good topsoil management.

Fertiliser is not required and has not been used in recent years because it tends to encourage any weed species.

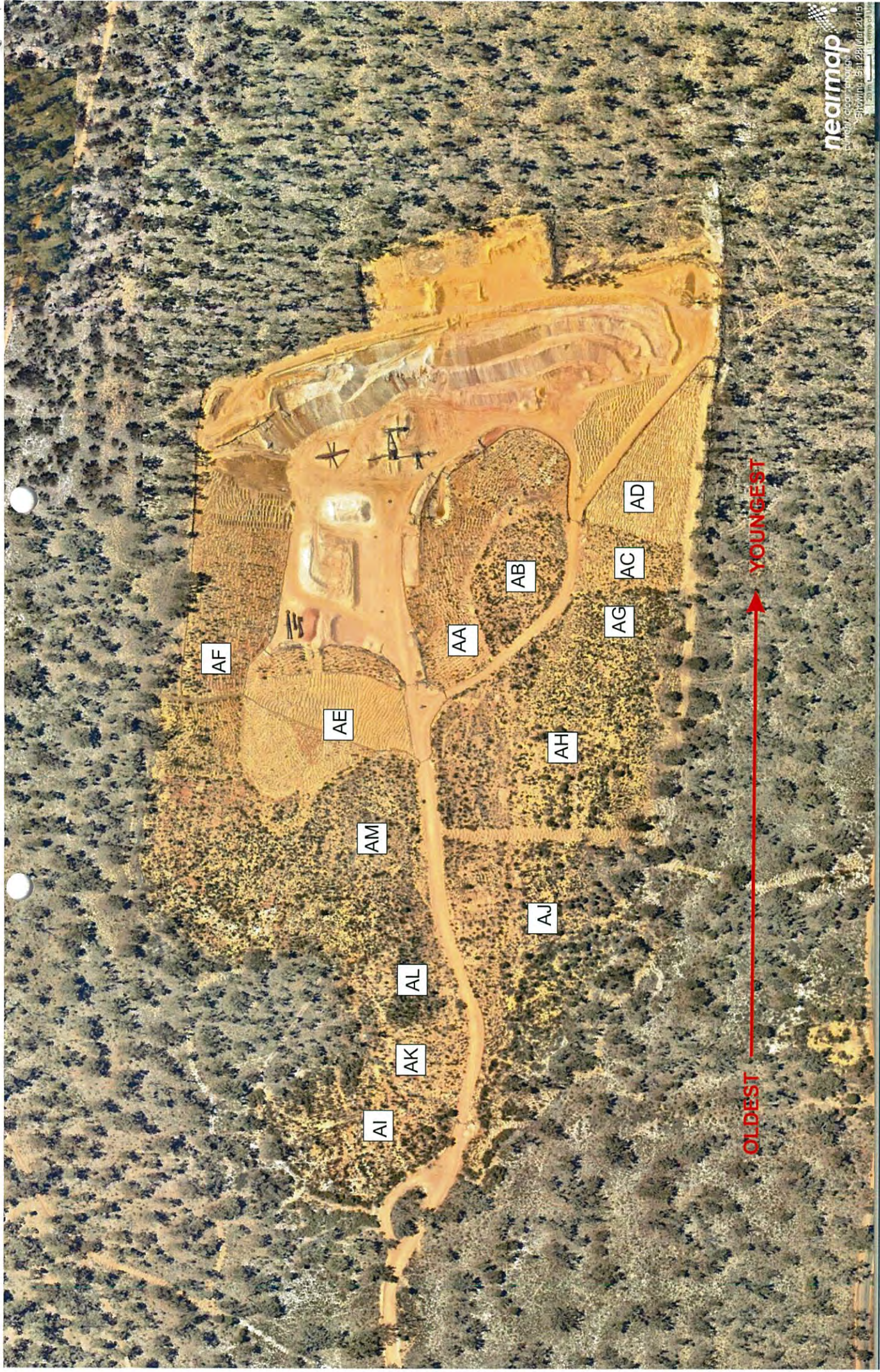
Similarly the need to assess nitrogenous species is not now required because the plants are germinating and developing well.

It is still relevant to add additional Proteaceous Shrubs and Eucalypt trees as these continue not to germinate as readily from the topsoil.

The species list if topsoil is not available

SPECIES TO BE USED IN REHABILITATION		FUTURE REHABILITATION REQUIREMENTS PER HECTARE IN ADDITION TO DIRECT TRANSFER OF TOPSOIL	
		PIT FLOOR	SANDY BANKS
Acacia alata	#		
Acacia huegelii	#		
Acacia nervosa	#		
Acacia pulchella	*	50 g	50 g
Acacia saligna		50 g	50 g
Acacia stenoptera	#		
Allocasuarina fraseriana			50 g
Allocasuarina huegeliana		50 g	
Allocasuarina humilis	#		
Casuarina obesa		50 g	
Anigozanthos manglesii	#		
Anigozanthos humilis	#		
Astroloma pallidum	#		
Baeckea camphorosmae	#		
Banksia grandis		50 seeds	50 seeds
Bossiaea eriocarpa	#		
Bossiaea ornata	#		
Callitris preissii			
Calothamnus quadrifidus		50 g	50 g
Conostephium pendulum	#		
Conostylis juncea	#		
Conostylis setigera	#		
Damperia alata	#		
Damperia linearis	#		
Dasyogon bromeliifolius	#		
Daviesia decurrens	#		
Dryandra armata		50 seeds	50 seeds
Dryandra bipinnatifida	*		
Dryandra lindleyiana	*		
Dryandra sessilis		50 seeds	50 seeds
Dryandra squarrosa/carduacea)		25 seeds	25 seeds
Eucalyptus accedens		50 g or 100 tubes	50 g or 100 tubes
Eucalyptus calophylla		50 g or 100 tubes	75 g or 150 tubes
Eucalyptus marginata			75 g or 150 tubes
Eucalyptus patens		50 g or 100 tubes	
Eucalyptus rudis		50 g or 100 tubes	
Eucalyptus wandoo		50 g or 100 tubes	50 g or 100 tubes
Gompholobium tomentoseum	#		
Grevillea bipinnatifida	#		
Haemodorum discolor	#		
Hakea erinacea			
Hakea incrassata	*		
Hakea lissocarpha	*		
Hakea prostrata (upright)		25 g	25 g
Hakea ruscifolia			
Hakea stenoptera			

Hakea undulata			
Hardenbergia comptoniana		100 g	100 g
Hemiandra pungens	#		
Hibbertia huegellii	#		
Hibbertia hypericoides	#		
Hibbertia lasiopus	#		
Hovea chorizemifolia	#		
Hovea elliptica	#		
Hovea trisperma	#		
Hypocalymma angustifolium			
Kennedia coccinea		100 g	100 g
Kennedia prostrata		100 g	100 g
Kunzea ericifolia		50 g	50g
Lepidosperma angustatum	#		
Leptospermum erubescens		100 g	100 g
Leschenaultia biloba	#		
Leucopogon propinquus	#		
Loxocarya sp	#		
Macrozamia riedlei		200 g	200 g
Melaleuca preissiana		50 g	
Mesolaena tetragona	#		
Mirbelia dilatata		50 g	50 g
Nemica capitata	#		
Patersonia juncea	#		
Ptilotus polystachyus	#		
Scaevola platyphylla?	#		
Scholtzia involucrata	#		
Sphaerobium medium	#		
Stirlingia latifolia	#		
Synaphea petiolaris?	#		
Viminaria juncea		100 g	100 g
Xanthorrhoea preissii		50 g	50 g
Nitrogen fixing seed /ha		850 g	800 g
Tree seed /ha		250 g	250 g



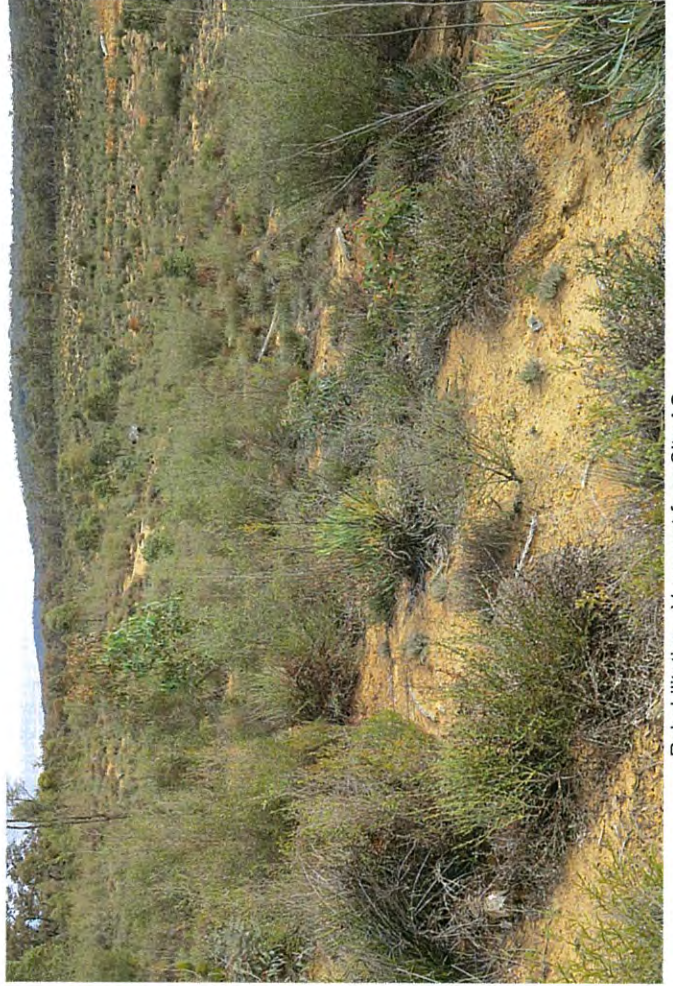
M70/836 REVEGETATION LOCATION OF SAMPLE AREAS - Note that at each site 2 to 4 10 m2 sample plots were assessed



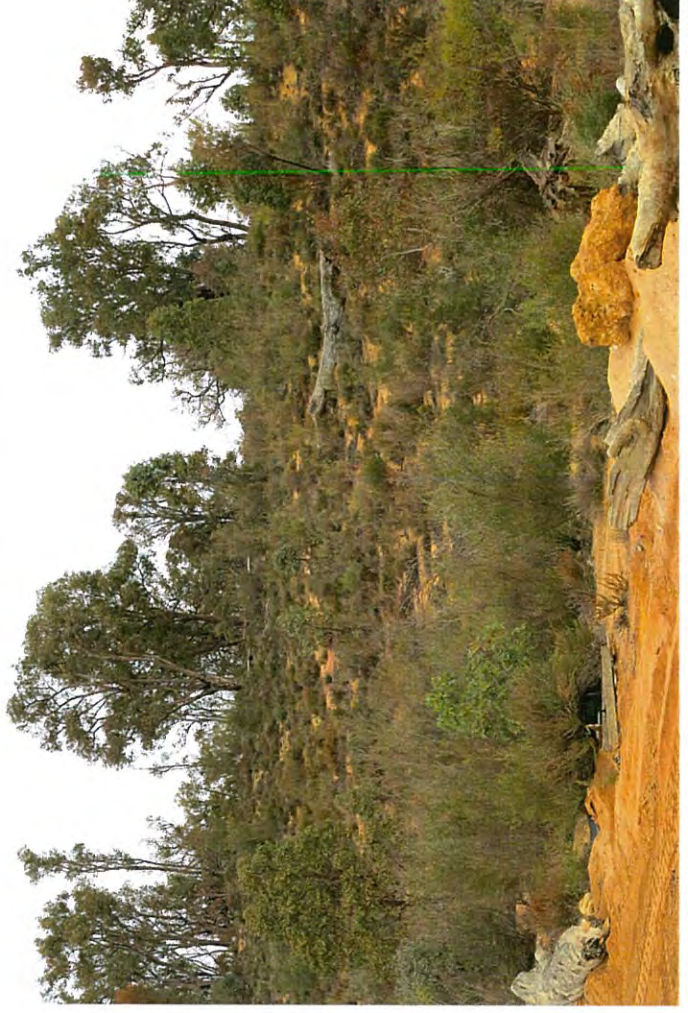
Vegetation ahead of excavation



Vegetation ahead of excavation



Rehabilitation - View west from Site AG



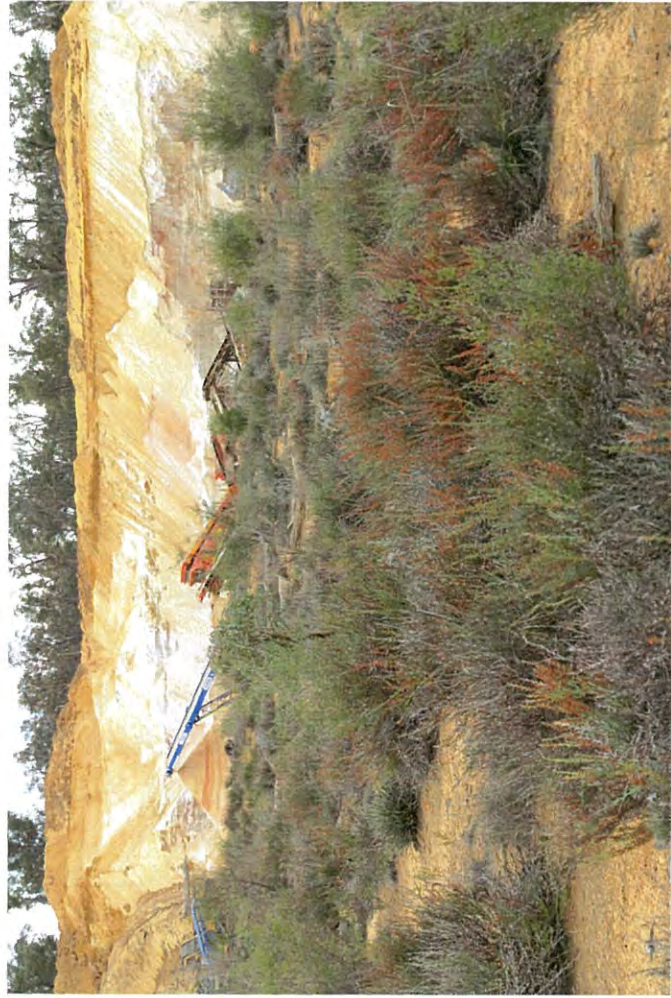
Revegetation at Site AH

M70/836 REVEGETATION

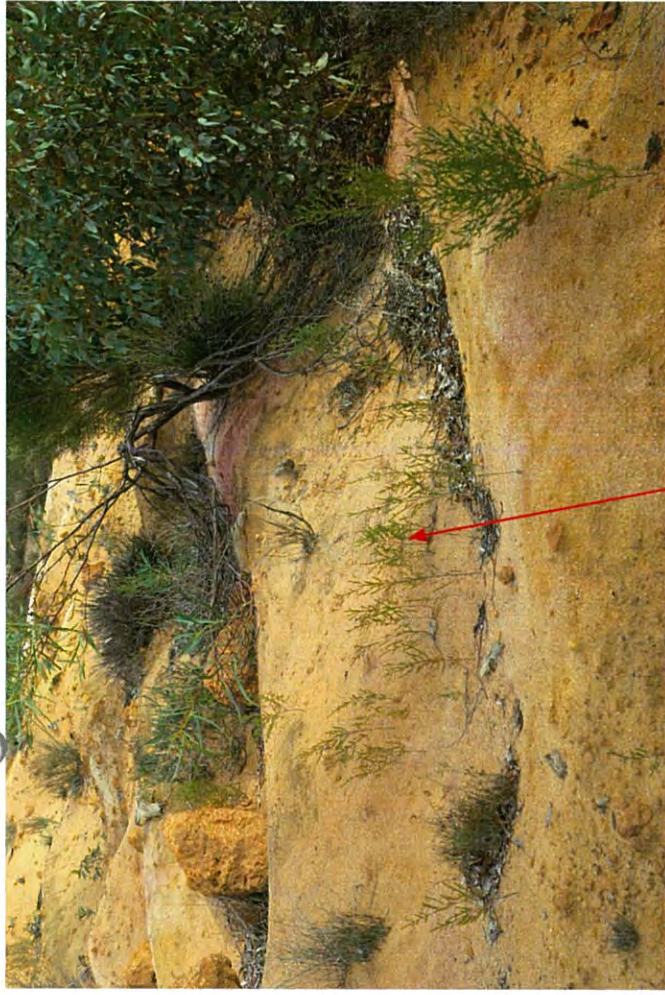
7 July 2016



View of Area AH



View of Area AA



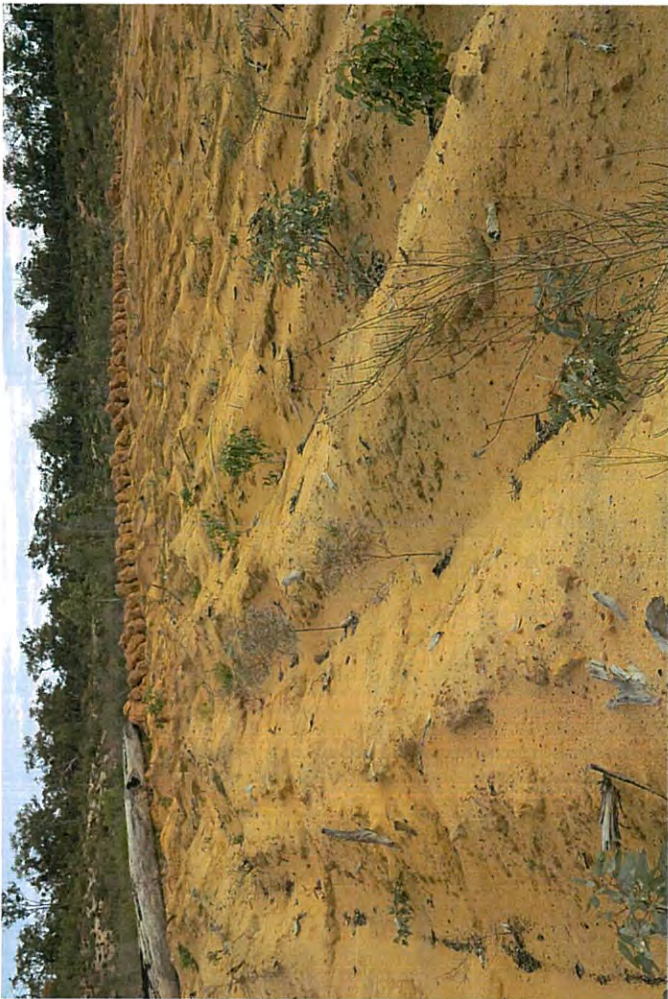
Germination of young plants from self seeding



Germination of young plants from self seeding

M70/836 REVEGETATION

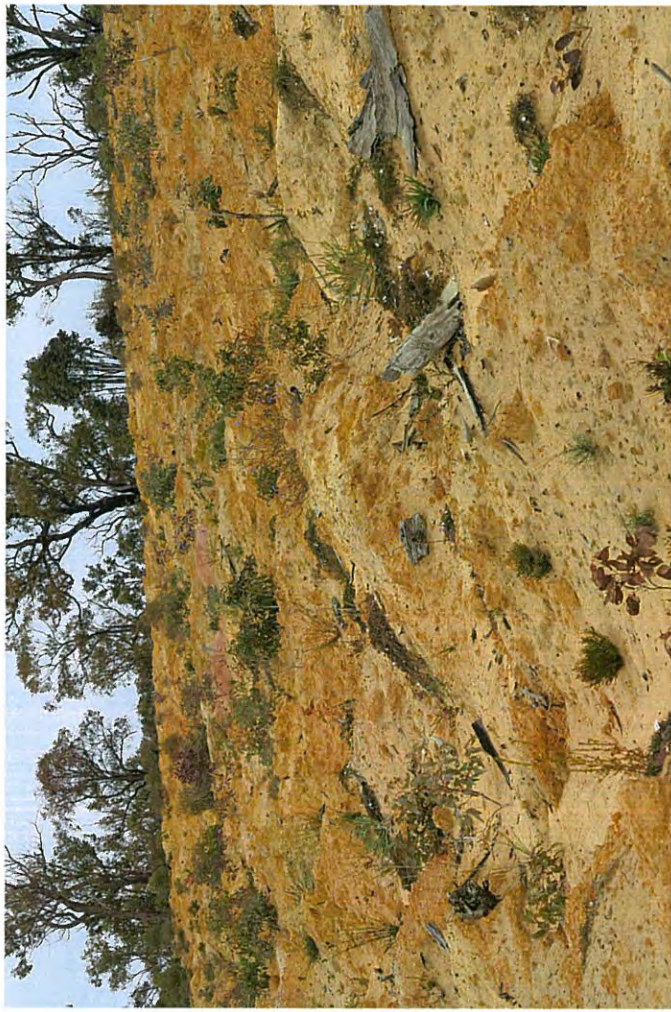
7 July 2016



Rehabilitation less than 2 years old Area AE



Rehabilitation less than 2 years old



Rehabilitation less than 2 years old Area AF



Rehabilitation less than 2 years old

M70/836 REVEGETATION

7 July 2016



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	6900/1
Permit Holder:	Tuma Holdings Pty Ltd
Duration of Permit:	22 April 2017 to 22 April 2027

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

- 1. Land on which clearing is to be done**
Mining Lease 70/836
- 2. Purpose for which clearing may be done**
Clearing for the purpose of sand extraction
- 3. Area of Clearing**
The Permit Holder must not clear more than 5 hectares of native vegetation. All clearing must be within the area cross-hatched yellow on attached Plan 6900/1A.
- 4. Period in which clearing is authorised**
The Permit Holder shall not clear native vegetation unless actively mining within 6 months of the authorised clearing being undertaken.
- 5. Application**
This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

PART II – MANAGEMENT CONDITIONS

- 6. Avoid, minimise etc clearing**
In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:
 - (i) avoid the clearing of native vegetation;
 - (ii) minimise the amount of native vegetation to be cleared; and
 - (iii) reduce the impact of clearing on any environmental value.

7. Dieback and weed control

When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:

- (i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (ii) shall only move soils in *dry conditions*;
- (iii) ensure that no *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
- (iv) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

8. Fencing

Prior to 31 August 2019 the permit holder shall construct and maintain a fence to exclude all classes of livestock from the area cross-hatched red on attached Plan 6900/1B (Lot 4 on Plan 6754).

9. Revegetation and Rehabilitation

(a) Prior to 31 August 2019 the permit holder must, at an *optimal time plant* a minimum of 1000 stems per hectare using *local provenance* Acacia, Eucalyptus, Melaleuca and Casuarina species within the area cross-hatched red on attached Plan 6900/1B (Lot 4 on Plan 6754).

(b) Within 12 months of undertaking *planting* in accordance with Condition 9(a) of this Permit, the Permit holder shall:

- (i) engage an *environmental specialist* to determine the survival rate of the Acacia, Eucalyptus, Melaleuca and Casuarina species *planted* in accordance with Condition 9(a); and
- (ii) where in the opinion of an *environmental specialist*, the survival rate of the Acacia, Eucalyptus, Melaleuca and Casuarina species determined under Condition 9(b)(i) of this Permit will not result in a survival rate of a minimum of 850 stems per hectare, undertake additional plantings until a minimum survival rate of 850 stems per hectare is achieved.

(c) Where additional *planting* of Acacia, Eucalyptus, Melaleuca and Casuarina species is undertaken in accordance with Condition 9(b)(ii) of this Permit, the Permit Holder shall repeat Condition 9(b)(i) and 9(b)(ii) within 12 months of undertaking the additional *planting* of Acacia, Eucalyptus, Melaleuca and Casuarina species.

(d) Where there is a determination by an *environmental specialist* that the survival rate of 850 stems per hectare is achieved, as determined in Condition 9(b)(i) and (ii) of this permit, that determination shall be submitted for the Director Operations, Environment, Department of Mines and Petroleum's consideration. If the Director Operations does not agree with the determination made under Condition 9(b)(ii), the Director Operations may require the Permit Holder to undertake additional *planting* in accordance with the requirements under Condition 9(b)(ii).

PART III - RECORD KEEPING AND REPORTING

10. Records to be kept

The Permit Holder must maintain the following records for activities done pursuant to this Permit:

(a) In relation to the clearing of native vegetation authorised under this Permit,

- (i) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
- (ii) the date that the area was cleared;
- (iii) the size of the area cleared (in hectares); and
- (iv) purpose for which clearing was undertaken.

(b) In relation to the revegetation and rehabilitation of areas pursuant to Condition 9 of this Permit:

- (i) the location of any areas revegetated and rehabilitated, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
- (ii) a description of the activities undertaken; and
- (iii) the size of the area revegetated and rehabilitated (in hectares).

11. Reporting

- (a) The Permit Holder shall provide a report to the Director Operations, Environment, Department of Mines and Petroleum by 31 July each year for the life of this permit, demonstrating adherence to all conditions of this permit, and setting out the records required under Condition 10 of this permit in relation to clearing carried out between 1 July and 30 June of the previous financial year.
- (b) Prior to 22 April 2027, the Permit Holder must provide to the Director, Operations, Environment, Department of Mines and Petroleum a written report of records required under Condition 10 of this Permit where these records have not already been provided under Condition 11(a) of this Permit.

DEFINITIONS

The following meanings are given to terms used in this Permit:

CEO means the Chief Executive Officer of the Department of Environment Regulation or an Officer with delegated authority under Section 20 of the *Environmental Protection Act 1986*;

dieback means the effect of *Phytophthora* species on native vegetation;

dry conditions means when soils (not dust) do not freely adhere to rubber tyres, tracks, vehicle chassis or wheel arches;

environmental specialist means a person who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit, or who is approved by the *CEO* as a suitable environmental specialist;

fill means material used to increase the ground level, or fill a hollow;

local provenance means native vegetation seeds and propagating material from natural sources within 100 kilometres of the area to be planted the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area to be planted;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

optimal time means the period from April to August for undertaking planting;

plant/ing means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species;

weed/s means any plant –

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Parks and Wildlife Regional Weed Summary, regardless of ranking; or
- (c) not indigenous to the area concerned.



Dan Machin | Acting Director Operations
Operations, Environment
30 March 2017

Officer with delegated authority under Section 20
of the *Environmental Protection Act 1986*


PLAN 6900/1A



LEGEND

 Mining Tenements

Clearing Instruments

 Areas Approved to Clear

Orthophotography sourced from Landgate



Scale 1:4,000
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

Dan Macdonald

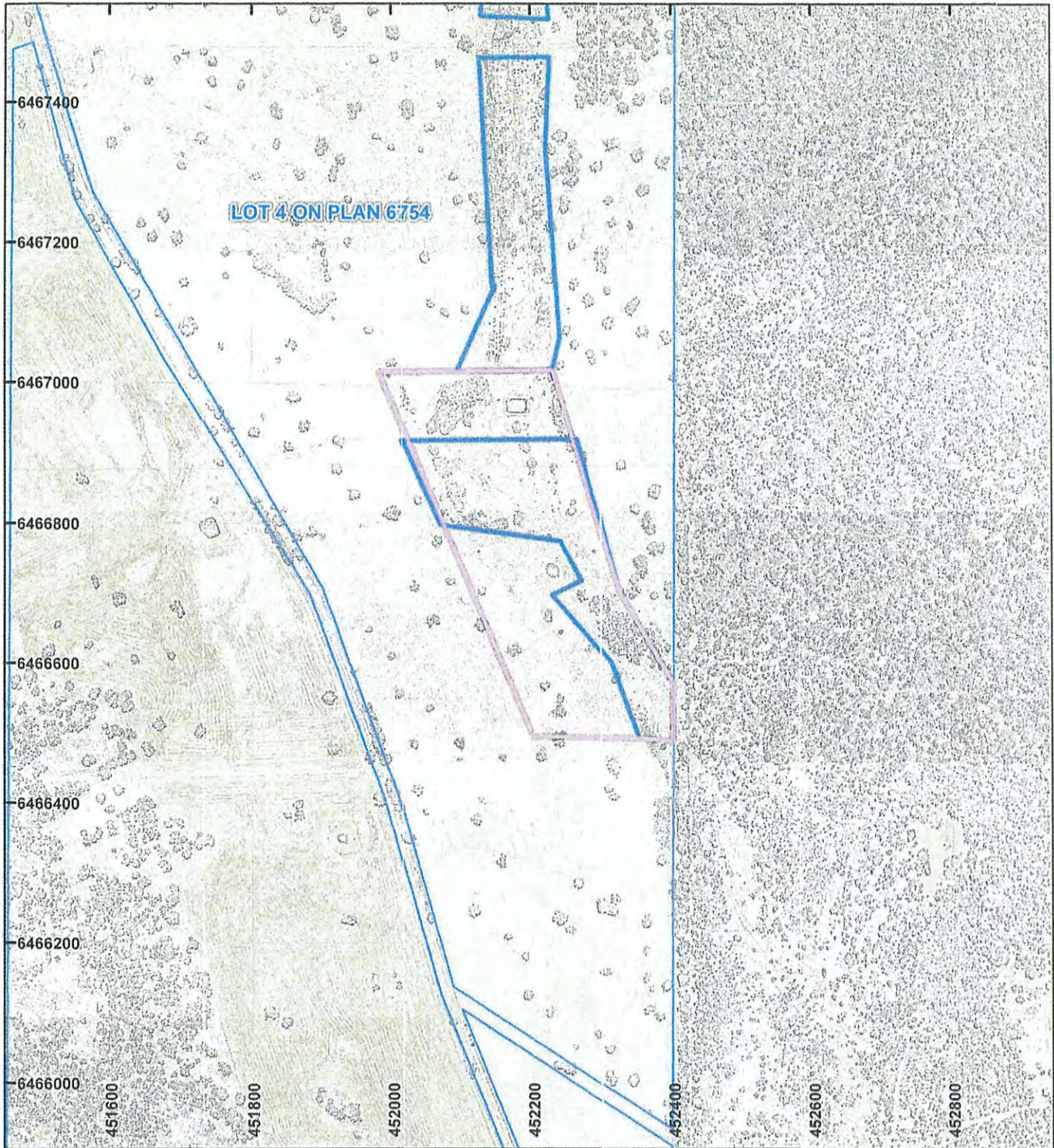
DAN MACDONALD Date 30 / 03 / 2017
Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.






WA Crown Copyright 2002

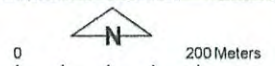
CPS 6900/1 PROPOSED OFFSET AREA



LEGEND

-  Cadastre
-  Proposed CPS 6900/1 offset
-  Existing CPS 41874 offset

Orthophotography sourced from Landgate

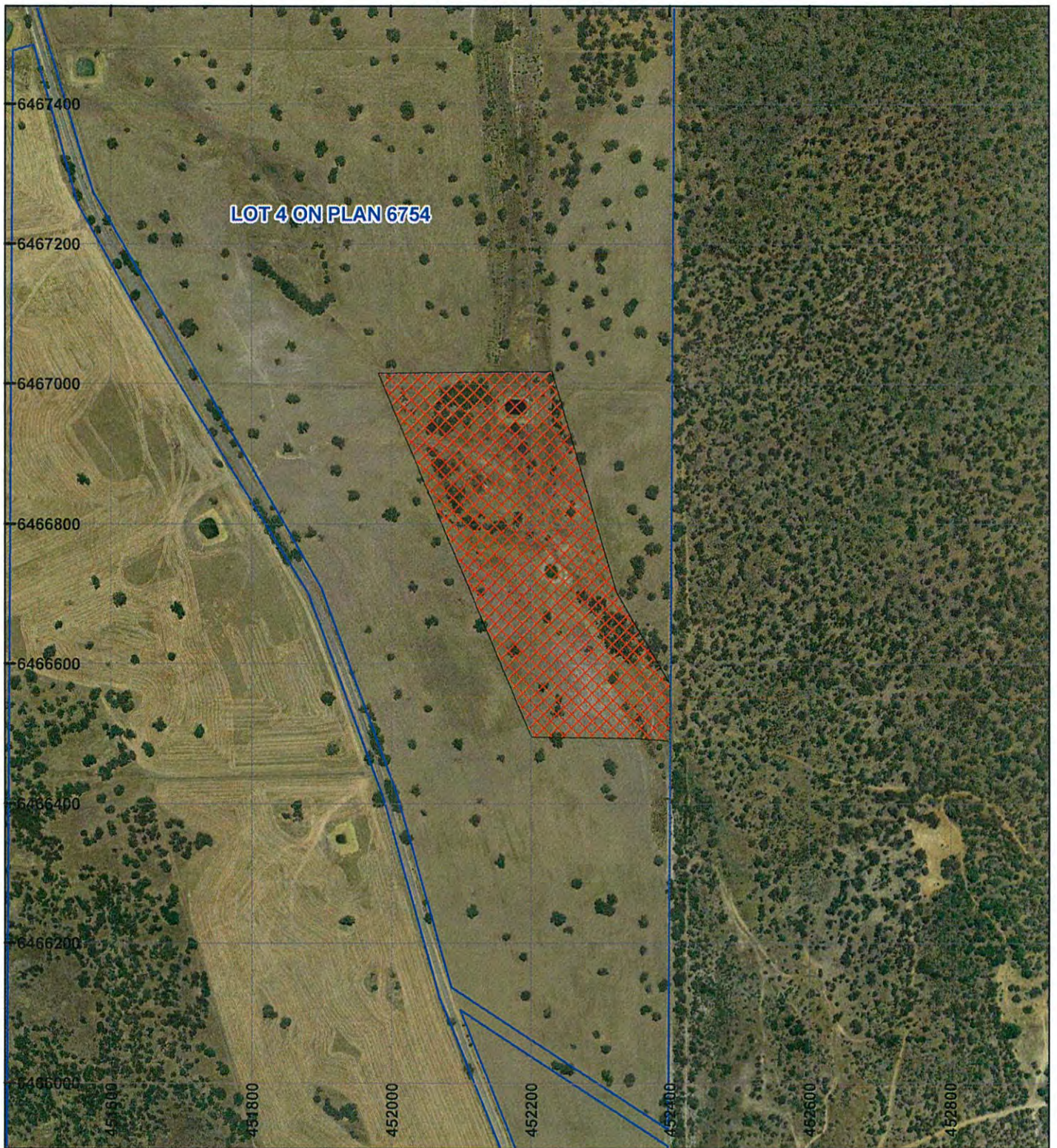


Scale 1:8,000
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.


PLAN 6900/1B



LEGEND

 Cadastre

Clearing Instruments

 Areas Subject to Conditions

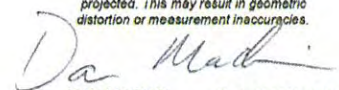
Orthophotography sourced from Landgate



Scale 1:8,000
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.



DAN MACHIN Date 30 / 03 / 2017
Officer with delegated authority under Section 20 of
the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



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**Government of Western Australia
Department of Mines and Petroleum**

Our Ref: A0088/201601 - CPS 6900/1
Enquiries: Adam Buck Tel: (08) 9222 3563 Fax: (08) 9222 3860
Email: adam.buck@dmp.wa.gov.au

Mr Richard Van Beelen
CEO
Tuma Holdings Pty Ltd
108 Riverside Drive
SOUTH GUILDFORD WA 6055

Dear Mr Van Beelen

**Permit to Clear Native Vegetation under the *Environmental Protection Act 1986*
Tuma Holdings Pty Ltd – Goods Road Sand Project (CPS 6900/1)**

Please find enclosed your permit to clear native vegetation granted under s.51E of the *Environmental Protection Act 1986*. This authorisation gives you approval to clear, subject to certain terms, conditions or restrictions. A copy of your permit is now available for the public to view, as required by the regulations.

Read your permit carefully. If you do not understand your permit, contact this Department immediately. There are penalties for failing to comply with the requirements of your permit.

If you are aggrieved by a decision of the Department of Mines and Petroleum, an appeal may be lodged with the Minister for Environment. If you choose to appeal, it must be in writing, clearly setting out the grounds of your appeal, and received by the Minister for Environment within **21** days of being notified. More information on lodging an appeal is available from the Office of the Appeals Convenor on telephone (08) 6467 5190. Completed appeals should be posted or delivered to:

**Office of the Appeals Convenor
Level 22 Forrest Centre
221 St Georges Terrace
PERTH WA 6000**

**Tel: (08) 6467 5190
Fax: (08) 6467 5199
Email: admin@appealsconvenor.wa.gov.au
Web: www.appealsconvenor.wa.gov.au**

Third parties may also appeal against the issue of this permit. **Please note that clearing must not commence until the date stated on the permit (22 April 2017) or until notified on the outcome of any appeal. In addition, clearing must not commence until all other environmental approvals have been obtained.**

Under Condition 11 of your permit to clear native vegetation, you are required to submit an annual clearing permit report. This clearing report should be forwarded to the Director Operations, Environment, prior to the due date.

Compliance with the terms, conditions or restrictions of this permit does not absolve the Permit Holder from responsibility for compliance with the requirements of all Commonwealth and State legislation.

If you have any queries regarding this decision, please do not hesitate to contact Adam Buck, Senior Environmental Officer on (08) 9222 3563 or email adam.buck@dmp.wa.gov.au.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Dan Machin', written in a cursive style.

Dan Machin | Acting Director Operations
Operations, Environment
30 March 2017

Officer with delegated authority under Section 20
of the *Environmental Protection Act 1986*



Clearing Permit Decision Report

1. Application Details

1.1. Permit application details

Permit application No.: 0510/17
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: Tuma Holdings Pty Ltd

1.3. Property details

Property: Mining Lease 71/636
Local Government Area: Shire of Northam
Colloquial name: Goods Road Sand Project

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of
5		Mechanical Harvest	Sand Extraction

1.5. Decision on application

Decision on Permit Application: Granted
Decision Date: 30 March 2017

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description: Broad vegetation associations have been mapped for the whole of Western Australia. Two broad vegetation associations have been mapped within the application area:

4: **Meriam Woodland** (red soil woodley) and
503b: **Medium forest** (iron & rain on sands w/ wattle) in valleys, sandy benches with heath and banks.

A flow chart was undertaken of adjacent Mining Lease 71/112 which also included areas of Mining Lease 71/636 immediately east of the application area (Bancroft, 2012). The vegetation within Mining Lease 71/636 was described as:

Open Low Woodland: The majority of the site is covered by a low, very open woodland of *Eucalyptus marginata* ssp. *pedunculata*, with a generally sparse understorey of scattered *Scaevola aemula*, *Sarcola caesia*, *Hibbertia divaricata*, *Xanthorrhoea gracilis* and *Melicopeles integrans*. The vegetation soil is associated with yellow sandy soil, and to the south, where sandy soil, in the north sandy soil. *Desmodium illinoense* replaces *Melicopeles* in the understorey.

The area of vegetation termed silt in the west of the application area was mapped in 1925 (Landform Research, 1999) and described the area as:

- **Open Low Forest Woodland:** Species comprised of scattered regrowth of *Eucalyptus marginata* with scattered *Sarcola caesia* over an understorey dominated by *Scaevola aemula*, *Desmodium illinoense*, *Corymbia hillebrandii* and *Richardia hauptii*.

Clearing Description

Goods Road Sand Project
Tuma Holdings Pty Ltd proposes to clear up to 5 hectares of native vegetation within an application area of approximately 5.88 hectares for the purpose of sand extraction. The application area is located approximately 50 kilometres east of Perth within the Shire of Northam.

Vegetation Condition

Very Good: Vegetation structure intact, obvious signs of disturbance (Veitch, 1994).

Context

The application area is located adjacent to an existing sand mining operation to the north and bounded to the south. The application area is bordered by native vegetation to the east. The vegetation is located within the Bushland Fair Use Zone.

The vegetation condition was assessed by botanists from Bancroft. The site survey was conducted during October and in 2017, it is likely that early flowering species would not have been recorded (Bancroft, 2012).

Part of the application area was previously approved under CPS 4187/1 but was never cleared. The boundary was amended during amendment CPS 4187/3 to remove this area from the permit.

3. Assessment of application against clearing principles

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Comments **Proposal is not likely to be at variance to this Principle**

The application area is located within the Northern Jarrah Forest subregion of the Jarrah Forest Interim Biogeographic Regionalisation of Australia (IBRA) bioregion (GIS Database). The vegetation of the subregion comprises of Jarrah-Marri forest in the west with Bullich and Blackbutt in the valleys, grading to Wandoo and Marri woodlands in the east with Powderbark on breakaways (CALM, 2002).

The vegetation within the application area has been described as Jarrah Low Woodland (Bioscience, 2012; Landform Research, 1998). A site inspection by the Department of Environment and Conservation on 14 April 2005 of the vegetation adjacent to the application area determined the vegetation to be regrowth jarrah forest (Department of Environment and Conservation, 2007). None of the vegetation within the application area has been identified as a Threatened or Priority Ecological Community (Bioscience, 2012; Landform Research, 1998; GIS Database).

Bioscience (2012) has recorded a total of 71 flora species from an area on Mining Lease 70/836 adjacent to the application area and adjacent tenement Mining Lease 70/1113. Landform Research (2006) also recorded a total of 60 flora species from 39 genera within an area of Jarrah woodland on Mining Lease 70/836 adjacent to the application area. Given the similarity of vegetation types on Mining Lease 70/836, it is likely that the number and type of flora taxa recorded by these surveys would be comparable to the vegetation within the application area.

No species of Threatened or Priority flora have been recorded within the application area (Bioscience, 2012; Landform Research, 1998; GIS Database). There are several species of Priority flora recorded within 10 kilometres of the application area (GIS Database). None of these species have been recorded on Mining Lease 70/836 (Bioscience, 2012; Landform Research, 1998). Similar areas of habitat are present throughout the Mundaring State Forest so it is not likely that the proposed clearing will have a significant impact on Priority flora species (GIS Database).

The application area is located within a large tract of vegetation within the Mundaring State Forest. Given this large area of intact vegetation and the application area's location adjacent to an existing sand mine and agricultural land, it is not likely to contain a high level of faunal diversity (GIS Database).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology Bioscience (2012)
CALM (2002)
Department of Environment and Conservation (2007)
Landform Research (1998)

GIS Database:
- Dieback Occurrence
- IBRA Australia
- Imagery
- Threatened and Priority Flora

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments **Proposal is not likely to be at variance to this Principle**

The habitat within the application area comprised of open woodland of primarily Jarrah, Wandoo and other *Eucalyptus* over *Xanthorrhoea* over grasses and various herbaceous plants (Bioscience, 2012). The application area is located within the Mundaring Weir Catchment Area, and Smith et al. (2007) confirm that virtually all the native forest within the catchment has been previously logged. Bioscience (2012) observed a number of trees in the adjacent areas that offered hollows suitable for nesting for a number of fauna species. However, the majority of these trees are too small to provide hollows large enough for Baudin's Cockatoo (*Calyptorhynchus baudinii* - Endangered), Carnaby's Cockatoo (*Calyptorhynchus latirostris* - Endangered) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso* - Vulnerable) (Bioscience, 2012). The presence of *Eucalyptus marginata* and *Banksia grandis* within and adjoining the application area indicates that the vegetation may provide suitable foraging habitat for these species.

The proposed clearing is located adjacent to an existing sand mining operation but is situated within the large expanse of native vegetation within the Mundaring State Forest covering an area in excess of 50,000 hectares. The application area is unlikely to provide an important ecological link or corridor for native fauna species.

Given that the application area is contiguous with large tracts of native vegetation which form part of the Mundaring State Forest and considering the disturbance associated with the existing sand mining operation it is not likely that the vegetation applied to be cleared comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology Bioscience (2012)
Smith et al. (2007)

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments **Proposal is not likely to be at variance to this Principle**
According to available databases, there are no records of any Threatened flora species within the local area (10 kilometre radius) (GIS Database). No Threatened flora species have been recorded by flora surveys on Mining Lease 70/836 (Bioscience 2012, Landform Research, 1998).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology Bioscience (2012)
Landform Research (1998)

GIS Database:
- Threatened and Priority Flora

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Comments **Proposal is not likely to be at variance to this Principle**
There are no records of Threatened Ecological Communities (TECs) within the local area (10 kilometres radius). The nearest known TEC is located approximately 32 kilometres west of the application area (GIS Database).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology GIS Database:
- Threatened and Priority Ecological Communities (TEC/PEC) - Boundaries

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments **Proposal is not at variance to this Principle**
The application area falls within the Jarrah Forrest Biogeographic Regionalisation of Australia (IBRA) bioregion in which approximately 53.76% of the pre-European vegetation remains (see table) (Government of Western Australia, 2015; GIS Database).

The vegetation of the application area has been mapped as Beard vegetation associations 4 and 3003. Beard vegetation 3003 is still well represented with over 50% remaining at a state and bioregional level (Government of Western Australia, 2015). Beard vegetation association 4 is considered to be vulnerable at a state and bioregional level with approximately 28% remaining (Government of Western Australia, 2015). This is below the 30% threshold level recommended in the National Objectives Targets for Biodiversity Conservation below which, species loss appears to accelerate exponentially at an ecosystem level (EPA, 2000). Within the Northern Jarrah Forrest subregion the representation is above the 30% threshold (see table). Approximately 1.4 hectares of the application area is comprised of Beard vegetation association 4 (GIS Database). Whilst this vegetation association is vulnerable to impacts from clearing, the proposed clearing of 1.4 hectares is not likely to have a significant impact on its existence.

The Shire of Northam has been extensively cleared with only approximately 24% of its pre-European vegetation extent remaining (Government of Western Australia, 2015). The application area forms part of a large expanse of native vegetation that is located in Mundaring State Forest in the west of the Shire. Whilst the application area is within an area that has been extensively cleared, it is not a significant remnant and the proposed clearing of 5 hectares is not likely to have a significant impact on the remnant in which it is located.

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-European % in DPaW Managed Lands (and post clearing %)
IBRA Bioregion - Jarrah Forrest	4,506,660	2,422,782	53.76	Least Concern	39 (69)
IBRA Subregion - Northern Jarrah Forrest	1,898,780	1,110,305	58.47	Least Concern	43 (69)
Local Government - Shire of Northam	143,131	33,842	23.64	Vulnerable	6 (25)

Beard vegetation associations - State					
4	1,054,279	293,916	27.88	Vulnerable	7 (23)
3003	66,451	39,080	58.81	Least Concern	29 (46)
Beard vegetation associations - Bioregion					
4	1,022,712	286,845	28	Vulnerable	7 (23)
3003	66,451	39,080	58.81	Least Concern	29 (46)
Beard vegetation associations - subregion					
4	614,200	199,214	32.43	Depleted	10 (30)
3003	66,451	39,080	58.81	Least Concern	29 (46)

* Government of Western Australia (2015)

** Department of Natural Resources and Environment (2002)

Based on the above, the proposed clearing is not at variance to this Principle.

Methodology Department of Natural Resources and Environment (2002)
EPA (2000)
Government of Western Australia (2015)

GIS Database:
- IBRA Australia
- Imagery
- Pre-European Vegetation

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments Proposal is not likely to be at variance to this Principle

According to available databases, there is a minor non-perennial watercourse that passes through the western edge of the application area (GIS Database). This drainage line runs from agricultural land to the south of the application area and is intercepted by a dam and Goods Road before entering the application area and flowing into the existing quarry (GIS Database). Given this drainage line has already been highly altered, the proposed clearing is unlikely to have any significant impact. The vegetation within the application area has not been identified as being associated with any watercourses or wetlands (Bioscience, 2012).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology Bioscience (2012)

GIS Database:
- Imagery
- Hydrography, linear

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments Proposal is at variance to this Principle

The soils on Mining Lease 70/836, within which the application area lies, consist of quartz sands with small but variable amounts of duricrust (Landform Research, 1998). The sand is very porous, with no surface water runoff and low levels of water retention through summer (Landform Research, 1998). The high porosity of the sandy soils is likely to minimise the risk of water erosion, however, due to the sandy nature of the soils there is a potential for wind erosion to occur should native vegetation be removed. The potential impacts of erosion may be minimised by the implementation of a staged clearing condition.

Given the high porosity of the soils within the application area it is likely that a high proportion of rainfall that occurs on site will infiltrate to groundwater. Groundwater recharge and discharge influence the quality and flow of surface water that enters into the nearby Wariin Brook (situated approximately 210 metres north of the application) which is ultimately held by Mundaring Weir on the Helena River (Smith et al., 2007).

A seepage area is located approximately 1.2 kilometres west of the application area and this area is situated immediately adjacent to a previously mined area on Mining Lease 70/233. Topographic contour information

demonstrates that the seepage area is located down slope from the application area (GIS Database). This area is clearly evident in aerial imagery and located approximately 80 metres from Wariin Brook (GIS Database). The salinity of the water at the seep has been measured at 950 milligrams per litre Total Dissolved Solids (MWES, 2009).

The proposed clearing of 5 hectares of native vegetation and mining of the underlying soils will increase groundwater recharge which will subsequently continue or increase brackish to saline groundwater discharge into Wariin Brook. With an increase in the volume of water discharged at the seep it is probable that there will be an increased risk of waterlogging to a larger area at this seepage site, and this may make the area prone to increased salinisation during summer due to increased capillary evaporation and resultant salt deposition (MWES, 2009).

However, advice provided by the Department of Water (2016a) identifies that any clearing salinity impact could be mitigated by pit rehabilitation (which is required under conditions placed upon the mining tenement in accordance with the *Mining Act 1978*) and the establishment of a vegetation offset. Tuma Holdings Pty Ltd have committed to expanding the previous offset which was established under adjacent clearing permit CPS 4187/4. The revegetation offset area lies within the very high salinity risk part of the Mundaring Weir Catchment. The Department of Water have identified that the siting of the revegetation area along a stream line degraded by clearing induced salinisation meets the Department of Water requirements of not increasing the salinity levels within the catchment (Department of Water, 2016a).

The proposed clearing of 5 hectares of native vegetation is likely to increase recharge and continue or increase waterlogging and salinisation to land down gradient from the application area, and in Wariin Brook. However, these land degradation impacts may be mitigated through the implementation of a revegetation condition requiring the development of a revegetation offset within the very high salinity risk part of the Mundaring Weir Catchment. Pit rehabilitation which is required under conditions placed upon the mining tenement in accordance with the *Mining Act 1978*, will also contribute to mitigating the longer term impacts of land degradation.

Based on the above, the proposed clearing is at variance to this Principle.

Methodology Department of Water (2016a)
Landform Research (1998)
MWES (2009)
Smith et al. (2007)

GIS Database:
- Hydrography, linear
- Imagery
- Topographic Contours, Statewide

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Comments Proposal may be at variance to this Principle

The application area is located within the Mundaring State Forest which is vested by the Conservation Commission for the purpose of State Forest (GIS Database). Wandoo National Park is located approximately 3 kilometres east of the application area (GIS Database), and Woottating Nature Reserve, Beechina Nature Reserve, Beechina North Nature Reserve and Inkpen Road Nature Reserve are located within 10 kilometres of the application area (GIS Database).

The application area is located directly adjacent to an existing sand mining operation. The Mundaring State Forest covers an area in excess of 50,000 hectares and the proposed clearing will not impact on any ecological linkages to any of the surrounding conservation areas (GIS Database).

Phytophthora dieback is known within the Mundaring State Forest with areas of inferred infestation within 10 kilometres of the application area (GIS Database). A flora survey on Mining Lease 70/836 did not observe any indications of dieback in the area; however, the proposed clearing activities have the potential to introduce and spread dieback and weeds within the Mundaring State Forest (Bioscience, 2012). Potential impacts from the spread of dieback and weeds may be minimised by the implementation of a dieback and weed management condition.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology Bioscience (2012)

GIS Database:
- DPAW Tenure
- Imagery

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments Proposal is at variance to this Principle

The application area is located within the Mundaring Weir Catchment Area. This catchment has been subject to *Country Areas Water Supply Act 1947* (CAWS Act) native vegetation clearing controls since December 1978. The application area is located in Zone A, a very high salinity risk part of the catchment (Department of Water, 2016a).

The Mundaring Weir is located approximately 17 kilometres south-west of the application area (GIS Database). The Mundaring Reservoir supplies the Goldfields and Agricultural areas. The reservoir has a desired potable saline limit of 500 milligrams per litre (Total Dissolved Solids) (Smith et al., 2007), and this resource has always been sensitive to even small areas of clearing. The small residual clearings within the catchment total only 3% but remain a significant concern for the salinity of inflow to the reservoir (Smith et al., 2007).

The application area is located within the Helena River sub-catchment of the Mundaring Weir Catchment. This sub-catchment is known to contribute 63% of the reservoirs salt load and only 30% of the inflow. The salinity of water entering the Mundaring Reservoir from the Helena River sub-catchment alone has been measured at approximately 1,500 milligrams per litre (Total Dissolved Solids). The Mundaring Reservoir inflow salinity, with a mean of 510 milligrams per litre (Total Dissolved Solids), is above the desired potable limit (Smith et al., 2007).

A seepage area is located approximately 1.2 kilometres west of the application area and this area is situated immediately adjacent to a previously mined area on Mining Lease 70/233. Topographic contour information demonstrates that the seepage area is located down slope from the application area (GIS Database). This area is clearly evident in aerial imagery and located approximately 80 metres from Warriin Brook (GIS Database). The salinity of the water at the seep has been measured at 950 milligrams per litre Total Dissolved Solids (MWES, 2009).

Tuma Holdings set up two groundwater monitoring bores in 2009 to measure the water level and salinity content of each bore. Both groundwater monitoring bores are located west and down gradient of the application area. Groundwater salinity from these bores was measured as 2,940 milligrams/Litre total dissolved solids (TDS) and 3,480 milligrams/Litre TDS (Department of Water, 2016b). Another monitoring bore was set up approximately 200 metres east of the existing quarry and measured groundwater salinity of 2,280 milligrams/Litre TDS (Department of Water, 2016b).

Tuma Holdings interpretation of flow and salt movement in the area is that salt load to the groundwater of the paleochannel aquifer appears to occur from lateral inflow from the cleared farmland area to the south of the application area and not from quarry activities (Department of Water, 2016b). Whilst it is only based on one site, the Department of Water (2016b) agrees with the interpretation.

The Department of Water (2016a) identify that the application area is located in Zone A of the Mundaring Weir Catchment area and would normally oppose any proposed clearing because there would be an increased salinisation of water resources following the removal of native vegetation. Taking into account the history of Tuma Holdings mining on Mining Lease 70/836, the Department of Water (2016a) considers that any salinity impact from clearing could be mitigated by pit rehabilitation and the establishment of a vegetation offset of an equivalent area.

An offset of revegetation planting was established for adjacent clearing permit CPS 4187/4. The proposed offset planting for this application will expand and incorporate the existing offset area for CPS 4187/4. The salinity impacts associated with the proposed clearing of native vegetation may be mitigated through the implementation of a revegetation condition requiring the development of a vegetation offset within the very high salinity risk part of the Mundaring Weir Catchment and pit rehabilitation which is required under conditions placed upon the mining tenement in accordance with the *Mining Act 1978*.

Based on the above, the Proposed clearing is at variance to this Principle.

Methodology Department of Water (2016a)
Department of Water (2016b)
MWES (2009)
Smith et al. (2007)

GIS Database:
- Country Area Water Supply Act Part IIA Clearing Control Catchments
- Hydrography, linear
- Imagery
- Topographic Contours, Statewide

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments Proposal is not likely to be at variance to this Principle

Topographic contour information indicates that the application area is not associated with any low-lying drainage area (GIS Database). The soils within the application area are characterised by deep, coarse quartz yellow or red sands which are considered to be well drained (Landform Research, 1998) and the proposed clearing is not considered likely to cause, or exacerbate, the incidence or intensity of flooding.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology Landform Research (1998)

GIS Database:

- Topographic Contours, Statewide

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

The permit area is within the South West Native Title Settlement area (Department of Aboriginal Affairs, 2017). This settlement resolves Native Title rights and interests over an area of approximately 200,000 square kilometres within the south west of Western Australia. The mining tenure has been granted in accordance with the future act regime of the *Native Title Act 1993* and the nature of the act (i.e. the proposed clearing activity) has been provided for in that process, therefore the granting of a clearing permit is not a future act under the *Native Title Act 1993*.

There is one registered Aboriginal Site of Significance within the application area (Department of Aboriginal Affairs, 2017). It is the proponent's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

It is the proponent's responsibility to liaise with the Department of Environment Regulation, Department of Parks and Wildlife and the Department of Water, to determine whether a Works Approval, Water Licence, Bed and Banks Permit, or any other licences or approvals are required for the proposed works.

The clearing permit was advertised on 25 January 2016 by the Department of Mines and Petroleum inviting submissions from the public. Following changes to the application it was readvertised on 30 January 2017. No submissions were received during either comment period.

Methodology Department of Aboriginal Affairs (2017)

4. References

- Bioscience (2012) ML70/836 & ML70/1113 Vegetation, Flora and Fauna Report & Dieback and Cockatoo Report. Report prepared for Action Sand Supplies, by Bioscience, November 2012.
- CALM (2002) A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions. Jarrah Forest 1 (JF1 - Northern Jarrah Forest subregion. Department of Conservation and Land Management, Perth, Western Australia.
- Department of Aboriginal Affairs (2017) Aboriginal Heritage Inquiry System. Department of Aboriginal Affairs. <http://maps.dia.wa.gov.au/AHIS2/> (Accessed on 25 March 2017).
- Department of Environment and Conservation (2007) Advice received in relation to Clearing Permit Application CPS 365/1, Department of Environment and Conservation, Western Australia.
- Department of Natural Resources and Environment (2002) Biodiversity Action Planning. Action planning for native biodiversity at multiple scales; catchment bioregional, landscape, local. Department of Natural Resources and Environment, Victoria.
- Department of Water (2016a) Advice received in relation to Clearing Permit Application CPS 6900/1, Department of Water, Western Australia, March 2016.
- Department of Water (2016b) Advice received in relation to Mining Lease Application M 70/1113, Department of Water, Western Australia, March 2016.
- EPA (2000) Environmental protection of native vegetation in Western Australia. Clearing of native vegetation, with particular reference to the agricultural area. Position Statement No. 2. December 2000. Environmental Protection Authority, Western Australia.
- Government of Western Australia (2016) 2015 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of June 2015. WA Department of Parks and Wildlife, Perth.
- Keighery, B. J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.
- Landform Research (1998) Vegetation Study and Rehabilitation Plan, ML 70/836, The Lakes. Report prepared for Action Sand Supplies, by Landform Research, 21 July 1998.
- MWES (2009) Action Sand Supply, Salinity Risk Assessment, Action Sand Quarry. Report prepared for Action Sand Supply, by Meyer Water Environmental Solutions, 12 October 2009.
- Smith, R. A., Bari, M. A., Dixon, R. N. M. & Rowlands, D. W. (2007) Helena River Salinity Situation Statement, Western Australia Department of Water, Water Resource Technical Series, no WRT 34, 190p.

Glossary

ACRONYMS:

BOM	Bureau of Meteorology, Australian Government
DAA	Department of Aboriginal Affairs, Western Australia
DAFWA	Department of Agriculture and Food, Western Australia
DEC	Department of Environment and Conservation, Western Australia (now DPAW and DEPR)
DEE	Department of the Environment and Energy, Australian Government
DER	Department of Environment Regulation, Western Australia
DMP	Department of Mines and Petroleum, Western Australia
DRF	Declared Rare Flora
DSE	Department of the Environment, Australian Government (now DEE)
DWF	Department of Water, Western Australia
DPAW	Department of Parks and Wildlife, Western Australia
DSIR/PAIC	Department of Sustainability, Environment, Water, Population and Communities (now DEE)
EPA	Environmental Protection Authority, Western Australia
EP Act	Environmental Protection Act 1986, Western Australia
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Federal Act)
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
PEC	Priority Ecological Community, Western Australia
RWW Act	Rights in Water and Irrigation Act 1974, Western Australia
TEC	Threatened Ecological Community

Definitions:

(DPAW (2015) Conservation Codes for Western Australian Flora and Fauna. Department of Parks and Wildlife, Western Australia):-

T	Threatened species: Published as Specially Protected under the Wildlife Conservation Act 1950, listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora) Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act. Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23(1) of the Wildlife Conservation Act. The assessment of the conservation status of these species is based on their national extent and trend according to their level of threat using IUCN Red List categories and criteria as detailed below.
CR	Critically endangered species Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.
EN	Endangered species Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.
VU	Vulnerable species Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.
EX	Presumed extinct species Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the Wildlife Conservation Act 1950, in

Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

- IA Migratory birds protected under an international agreement**
Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.
- CD Conservation dependent fauna**
Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.
- OS Other specially protected fauna**
Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.
- P Priority species**
Species which are poorly known; or
Species that are adequately known, are rare but not threatened, and require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.
- P1 Priority One - Poorly-known species:**
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
- P2 Priority Two - Poorly-known species:**
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
- P3 Priority Three - Poorly-known species:**
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
- P4 Priority Four - Rare, Near Threatened and other species in need of monitoring:**
(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

VEGETATION ESTABLISHMENT AREA AGREEMENT

Subject to the grant of an *Environmental Protection Act 1986* clearing Permit on M70/836 and M70/1113:

I: Richard Van
Beelen
(Proprietor of mining lease M70/836)

Of: Tuma Holdings Pty Ltd, trading as Action Sand
Supply
108 Riverside Drive, South Guildford WA 6055

And

I: Clive Owen
(Landowner of Lot 4 on Plan 6764, West Talbot Road Woottating)

Agree that Tuma Holdings Pty Ltd will revegetate the parts of Lot 4 on Plan 6754 certificate of title Volume 1197 Folio 594 that is outlined purple on attached plan "CPS 6900/1 Proposed Offset Area", and outlined yellow on attached plan "Future Proposed Eastern Extension", with native vegetation of local provenance, including under and over storey species, but excluding any poison plants including the genera *Gastrolobium* and *Oxylobium*, and in accordance with the following:

1. Between 1 May 2017 and 31 August 2019, Tuma Holdings Pty Ltd shall plant a minimum of 1,000 plants per hectare local provenance native shrub and tree species evenly distributed over the CPS 6900/1 Proposed Offset Area.
2. Tuma Holdings Pty Ltd shall each year of this Agreement, between 1 June and 31 August, re-plant and maintain the species required in condition 1 until establishment of a minimum of 850 of the specified plants per hectare is achieved and is deemed sustainable by the Department of Water, unless a lesser density of plants is approved by the Department of Water for part or all of the CPS 6900/1 Proposed Offset Area.
3. Tuma Holdings Pty Ltd shall notify the Department of Water in writing within twelve months of complying with condition 1 and 2 describing when the activity was carried out and include a description of the species and condition of the vegetation that has been propagated.
4. Tuma Holdings Pty Ltd shall erect and maintain, to the satisfaction of the Landowner, a fence on the boundary of the CPS 6900/1 Proposed Offset Area that is adequate to exclude livestock therein.
5. All fencing above mentioned remain the property of Tuma Holdings Pty Ltd.
6. Tuma Holdings Pty Ltd will revegetate the Future Proposed Eastern Extension marked yellow on the attached plan subject to future determination by relevant Authorities.

Signed:

Name: Richard Van Beek Date:

Proprietor of mining leases M70/836 and M70/1113

Signed:

Name: C.M. OWEN Date: 6.3.17

Landowner of Lot 4 on Plan 6754



Government of **Western Australia**
Department of **Mines and Petroleum**

Our Ref: A0309/201101 / CPS 4187/4
Enquiries: Adam Buck Tel: (08) 9222 3563 Fax: (08) 9222 3860
Email: adam.buck@dmp.wa.gov.au

Mr Richard Van Beelan
Action Sand Supplies
108 Riverside Drive
SOUTH GUILDFORD WA 6055

Dear Mr Van Beelan

NOTICE OF INTENTION TO AMEND CLEARING PERMIT CPS 4187/3

I refer to your recent application to amend clearing permit CPS 4187/3 for the purpose of amending the dates in Conditions 9 and 10 (now Conditions 8 and 9) to 31 August 2017.

I have enclosed a copy of the proposed draft amended clearing permit CPS 4187/4, for your perusal.

Before considering this amendment I invite you to make any comments within 28 days as to why this proposed action of amending the clearing permit should not be undertaken. Your comments should be in writing and directed to:

Director Operations
Environment Division
Department of Mines and Petroleum
100 Plain Street
East Perth WA 6004

Under section 51M (5)(a) of the *Environmental Protection Act 1986* you may waiver the 28 days notice period in writing.

In accord with Section 51M (11), the notice of an amended clearing permit will be in the form of a revised clearing permit.

If you have any queries regarding this notice, please contact Adam Buck, Senior Environmental Officer on (08) 9222 3563 or email adam.buck@dmp.wa.gov.au.

Yours sincerely

Marnie Leybourne | Director Operations
Operations, Environment
29 December 2016

Officer with delegated authority under Section 20
of the *Environmental Protection Act 1986*

Encs

11. Reporting

- (a) The Permit Holder shall provide a report to the Director Operations, Environment, Department of Mines and Petroleum by 31 July each year for the life of this permit, demonstrating adherence to all conditions of this permit, and setting out the records required under Condition 10 of this permit in relation to clearing carried out between 1 July and 30 June of the previous financial year.
- (b) Prior to 7 May 2021, the Permit Holder must provide to the Director, Operations, Environment, Department of Mines and Petroleum a written report of records required under Condition 10 of this Permit where these records have not already been provided under Condition 11(a) of this Permit.

DEFINITIONS

The following meanings are given to terms used in this Permit:

dieback means the effect of *Phytophthora* species on native vegetation;

dry conditions means when soils (not dust) do not freely adhere to rubber tyres, tracks, vehicle chassis or wheel arches;

environmental specialist means a person who is engaged by the Permit Holder for the purpose of providing environmental advice, who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit;

fill means material used to increase the ground level, or fill a hollow;

local provenance means native vegetation seeds and propagating material from natural sources within 100 kilometres of the area cleared;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

optimal time means the period from April to August for undertaking planting;

plant/ing means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species;

weed/s means any plant –

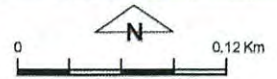
- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Parks and Wildlife Regional Weed Summary, regardless of ranking; or
- (c) not indigenous to the area concerned.

DRAFT PLAN 4187/4A



LEGEND

- Mining Tenements
- Clearing Instruments
- Areas Approved to Clear
- Orthophotography sourced from Landgate



Scale 1:4,000
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

..... Date

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.




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DRAFT PLAN 4187/4B



LEGEND

 Cadastre

Clearing Instruments

 Areas Subject to Conditions

Orthophotography sourced from Landgate



Scale 1:8,000
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

..... Date

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



WA Crown Copyright 2002



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	4187/4
Permit Holder:	Tuma Holdings Pty Ltd
Duration of Permit:	7 May 2011 to 7 May 2021

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

- 1. Land on which clearing is to be done**
Mining Lease 70/836
- 2. Purpose for which clearing may be done**
Clearing for the purpose of Sand Extraction
- 3. Area of Clearing**
The Permit Holder must not clear more than 5 hectares of native vegetation. All clearing must be within the area cross-hatched yellow on attached Plan 4187/4A.
- 4. Period in which clearing is authorised**
The Permit Holder shall not clear native vegetation unless actively mining within 6 months of the authorised clearing being undertaken.
- 5. Application**
This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

PART II – MANAGEMENT CONDITIONS

- 6. Avoid, minimise etc clearing**
In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:
 - (i) avoid the clearing of native vegetation;
 - (ii) minimise the amount of native vegetation to be cleared; and
 - (iii) reduce the impact of clearing on any environmental value.