

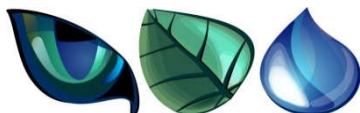


# WELCOME STRANGER EXPLORATION PROJECT

## Ravensthorpe, WA



Prepared on behalf of ACH Minerals Pty Ltd by:



**Animal Plant Mineral Pty Ltd**

Welcome Stranger Exploration Site:

E74/537

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## Clearing Principles for the Welcome Stranger NVCP Application

### The Project

ACH proposes to clear 0.35 ha of vegetation at their Welcome Stranger site for exploration purposes. The site is located in the Shire of Ravensthorpe, approximately 12 km south east of the town of Ravensthorpe, east of the Hopetoun-Ravensthorpe road (Figure 1). The site is located within an Environmentally Sensitive Areas (ESA). ESA's are declared by the Minister for Environment under section 51B of the *Environmental Protection Act 1986* (EP Act).

To undertake the exploration activity (the Project) ACH will be required to clear 23 drill pads and associated access tracks. Where practical, ACH commit to using existing exploration tracks to minimise the need to clear native vegetation both within and between drill pads.

### Scope of Work

In October 2018 Animal Plant Mineral (APM) visited the site and collected flora specimens present in 10 m x 10 m quadrats at each of the 23 proposed drill pad sites. Opportunistic collections were made between drill pads along the path most likely to be traversed by the drill rig to access the drill collar locations. Collections were made to confirm the vegetation type and determine the presence or absence of conservation significant flora. The drill pad locations are displayed in Figure 2.

### Clearing Principles

Clearing provisions under the Environmental Protection Act 1986 (EP Act) and Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Regulations) will be determined for the clearing of native vegetation at the Project upon consideration of the 10 clearing principles in the context of the proposed activities at Welcome Stranger.

- 1. *Native vegetation should not be cleared if it comprises a high level of biological diversity.***

The Project occurs within an area of high biological diversity. However, the scale and nature of the disturbance to native vegetation associated with the Project will not compromise the intrinsic biological diversity within the local area. ACH propose to clear up to 0.35 ha of native vegetation to execute the Welcome Stranger drilling program.

The 'greenstone' belts of the Yilgarn Craton that occur as hills and ranges when exposed above the surrounding plains are known to be repositories of endemic and rare plant taxa (Gibson et al 2010). The Ravensthorpe Range is one of these greenstone landforms of the Yilgarn Craton. Moreover, the Ravensthorpe Range is located within the South West Australian Floristic Region (SWAFR, sensu Hopper and Gioia 2004): a region known for its exceptional biological diversity. The SWAFR is one of 34 global diversity hotspots because of a combination of high species richness, endemism and habitat loss (Myers et al 2000, Myers 2003).

In a conservation context, the Ravensthorpe Range lies in the eastern sector of the Fitzgerald Biosphere which is a part-tenured management concept recognised by UNESCO as well as State and Commonwealth governments. The Fitzgerald Biosphere comprises a core area (the Fitzgerald River National Park (FRNP) 329,000 ha), a buffer zone (Crown land and some unvested reserves totalling 130,000 ha) and a zone of cooperation (private freehold farmland including 557,000 ha cleared and 160,000 ha uncleared). There are 9 Biosphere Reserves in Australia and this is the only one in Western Australia. Specifically, the Project is located within the south western lower foothills-plains of the Ravensthorpe Range and within the Fitzgerald Biosphere Buffer Zone, as it occurs on Unallocated Crown Land.

The floristics and vegetation of the Project have intrinsic conservation value by virtue of their location both within the Fitzgerald Biosphere and the SWAFR biodiversity hotspot. As a result a number of significant floristic surveys and vegetation mapping programs have been conducted in the Ravensthorpe Range over recent years. The most recent published large-scale surveys covering the proposed development are:

- Vegetation of the Ravensthorpe Range Western Australia: Mt Short to Kundip 1:10,000 scale (Craig *et al.* 2008), and
- Floristic Communities of the Ravensthorpe Range, Western Australia (Markey *et al.* 2012).

Craig *et al.* (2008) mapping places the Project in the vegetation type Edes/Alca: *Eucalyptus desmondensis/ Allocasuarina campestris* very open shrub mallee, which occupies 159.6 ha or 1.54% of the Craig *et al.* (2008) survey area. It occurs on the weathered granite /quartz diorite of the Kybalup System on gentle slopes and flat plains. *Eucalyptus desmondensis* is currently listed as Priority 4 flora. Craig *et al.* (2008) recorded 43 species across 11 survey sites within this vegetation type. This may be a slight underestimation of the true species richness as Craig *et al.* (2008) only recorded taxa that had at least 5 individuals within a localised area.

Markey *et al.* (2012) mapped the Project area as *Eucalyptus desmondensis/ Allocasuarina* spp. tall mallee shrubland which occurs west of the main ridges in the southern half of the range, on upper to lower hill slopes of gentle to moderate gradients. Soils are grey-brown to red-brown clay loams, sandy loams and sandy clay. Data collected during Markey *et al.* (2012) enabled an estimate of species richness to be made which was averaged at 30.3 (+/- 2.5) per plot (total of 4 plots, 15 x 15 m). Markey *et al.* (2012) reports broad similarity in the distribution of vegetation types to that mapped by Craig *et al.* (2008).

The Craig *et al.* (2008) mapping places 22 of the 23 proposed drill pad locations in the Edes/Alca vegetation type. According to the Craig *et al.* (2008) mapping APM Site 3 (Figure 2) occurs on the boundary of Edes/Alca and vegetation type Espo: *Eucalyptus sporadica* tree mallee. Espo is a drainage system vegetation type, occupying 113.1 ha or 1.09% of the Craig *et al.* (2008) survey area (Figure 3). Espo occurs on colluvium and scree derived from different rock types on gentle slopes and sheetwash, low gradient slope, sheet flood and distal slope. It is generally a diverse thicket community with an overstorey of mallees.

APM confirmed the vegetation type across the Project as Edes/Alca: *Eucalyptus desmondensis/ Allocasuarina campestris* very open shrub mallee. Though the Craig *et al.* (2008) mapping indicates Site 3 is across the boundary into vegetation type Espo, the vegetation observed at Site 3 was more aligned with Edes/Alca. Species richness recorded by APM ranged from 9 to 22 species across the 23 quadrats sampled and the average species richness is 16.8. This is less than half of the species richness described by Craig *et al.* (2008) for Edes/Alca (Craig *et al.* 2008, Markey *et al.* 2012).

Therefore the vegetation located at the proposed drill pad locations of Welcome Stranger does not comprise a high level of floristic diversity and, therefore, clearing associated with the Project is not at variance with Principle 1.

**2. 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.**

The skink *Lerista viduata* is the only vertebrate fauna species recorded during field surveys that is endemic to the Ravensthorpe Range (Harris *et al.* 2008; Cogger, 2014). As such, it is the only species that could suffer impacts from the Project to whole or part the habitat upon which this species is dependant. As with other species from the *Lerista* genus, the Ravensthorpe Range Slider is found in loose soil or sand beneath stones, logs, termite mounds etc. The 23 proposed drill pads all occur on soils with a high clay content and that, coupled with the lack of stones and logs in the proposed disturbance area make the site unsuitable for this endemic skink. It is highly unlikely that the proposed Project will impact on populations or individuals of this species.

Table 1 lists fauna of conservation significance that may be found in the region and discusses the habitat requirements of these fauna in the context of what is available within the Project area. Although the habitat is suitable for a number of the species, the very small size of the clearing areas (10 m x 15 m, interspersed by >20 m vegetation buffers) means no individual species is likely to be threatened by the activity. If fauna are inhabiting the proposed clearing areas they will be able to escape into undisturbed surrounding vegetation.

Table 1. Conservation Significant fauna potentially occurring in the proposed development

Species	Common Name	Cons. Code		Habitat	Habitat Requirements Met	Comments
		Cth	State			
<i>Apus pacificus</i>	Fork-tailed Swift	IA	S5	The Fork-tailed Swift occurs on coastal plains and sometimes foothills (DoEE 2018). They are mostly found over dry or open habitats including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. This species is almost exclusively aerial (DoEE 2018).	Yes	This species is almost exclusively aerial and therefore will not be dependent on habitats within the proposed development. This species is unlikely to be impacted by the Project.
<i>Ardea ibis coromanda</i>	Cattle Egret	IA		The heaviest distribution of this species in WA is in the North East, and into the Northern Territory. In the non-breeding season, it can be found throughout most of Australia (DoEE 2018).	No	There is no suitable habitat in the proposed development. This species will not be impacted by the Project.
<i>Ardea modesta</i> (also known as <i>Ardea alba</i> )	Great Egret, White Egret	IA		The Great Egret occupies a wide variety of wet habitats including freshwater wetlands, dams, flooded pastures, estuarine mudflats, mangroves and reefs (Morcombe 2003). The species is also known to visit shallows of rivers, sewage ponds and irrigation areas (Pizzey & Knight 2012).	No	There is no suitable habitat in the proposed clearing area. Therefore, this species will not be impacted by the Project.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	S2	In Western Australia the species was formerly widespread in the south-west however is now thought to only occur on the western coastal plain, southern coastal region and inland to some wetlands in the Jarrah forests (DoEE 2018).	No	There is no suitable habitat in the proposed clearing area. This species will not be impacted by the Project.
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	EN	S2	Carnaby's Cockatoo is a postnuptial nomad and typically moves west soon after breeding. The species nests in hollows of smooth-barked eucalypts, particularly Salmon Gum ( <i>Eucalyptus salmonophloia</i> ) and Wandoo ( <i>E. Wandoo</i> ) but is not limited to these eucalypts. Diet consists of an array of Proteaceous and Eucalypt species. Foraging habitat, including <i>Banksia</i> woodlands, is habitat critical to the survival of the species (DPaW 2013).	Yes	The vegetation of the proposed development represents potential feeding habitat for this species. While the proposed development is located on the edge of the breeding range for Carnaby's Cockatoo, no hollow-bearing trees were found within the Project.  The Project may require the clearing of up to 0.35 ha of Black Cockatoo feeding habitat.

Species	Common Name	Cons. Code		Habitat	Habitat Requirements Met	Comments
		Cth	State			
<i>Dasyornis longirostris</i>	Western Bristlebird	VU	S3	<p>The Western Bristlebird inhabits floristically diverse low dense coastal heathland.</p> <p>It occurs in three distinct locations: Fitzgerald River National Park, Hassell (Cheynes) Beach/Waychinicup National Park/Two Peoples Nature Reserve, and a translocated population near Walpole, though this last population may no longer occur there. There is also a record of two Western Bristlebirds at Kundip Nature Reserve from December 2003. However, it is unknown if this record represents a permanent subpopulation or was a record of vagrant or dispersing birds (DoEE, 2018).</p>	No	The proposed clearing is not in the preferred range for this species. It is unlikely that this species utilises the Project area and therefore it is unlikely to be impacted by the Project.
<i>Falco peregrinus</i>	Peregrine Falcon	OS	S7	A well-known falcon, the Peregrine inhabits a vast array of environs in Australia. It is usually regarded as uncommon and is a migratory species (Pizzey & Knight, 2012). This species lays its eggs in recesses of cliff faces, tree hollows or large abandoned nests.	Yes	<p>Individuals would forage over the site as part of a broader foraging territory. However, nesting is unlikely due to lack of suitable natural habitat.</p> <p>As foraging occurs broadly, clearing associated with the Project will not impact this species.</p>
<i>Leipoa ocellata</i>	Malleefowl	VU	S3	Malleefowl habitat requirements are quite specific. The species requires unburnt mallee and woodland with low scrub and abundant litter to use in nesting mounds (Morcombe, 2003).	Yes	<p>One historically inactive mound has been located within the Kundip Mine Site in the 'Low Woodland Mallee and Heath habitat' and individuals were recorded during the APM 2016 survey foraging in the 'Low Woodland and Mallee Heath' habitat around the Kundip Battery and running across the Hopetoun-Ravensthorpe Road adjacent to the Kundip Mine Site entrance. In 2017 APM sighted one individual dashing across the main road further towards the town of Ravensthorpe.</p> <p>No active or recently inactive mounds were located in the proposed Project impact footprint and the limited evidence of the presence of Malleefowl relative to the survey effort</p>

Species	Common Name	Cons. Code		Habitat	Habitat Requirements Met	Comments
		Cth	State			
						invested around the Kundip mine site suggest numbers of this species may be low in the local area, including around Welcome Stranger. Therefore drilling is unlikely to impact this species.
<i>Merops ornatus</i>	Rainbow Bee-eater	IA		The Rainbow Bee-eater is a common species which occupies numerous habitats including open woodlands with sandy loamy soil, sand ridges, sandpits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves and rainforests. The Rainbow Bee-eater avoids heavy forest that would hinder the pursuit of its insect prey (Morcombe, 2003).	No	The lack of open ground, the high clay content of the soils and the lack of loose soil required for the construction of nest burrows suggest that this species is unlikely to use the Project area and, as such, will not be adversely impacted by the proposed clearing.
<i>Motacilla cinerea</i>	Grey Wagtail	IA	S5	The Grey Wagtail prefers the banks and rocks of fast-running fresh water habitats. It occurs in open and forested areas but can be found anywhere during migration (Johnstone and Storr, 2004).	No	There is no fast-running fresh water habitat available in the Project area. Therefore this species will not be impacted by the Project.
<i>Pandion haliaetus</i>	Osprey	IA		The Osprey is found in coastal areas (Johnstone and Storr, 1998).	No	The Project area is not adjacent to the coast and, therefore, there is no potential for impact to this species.
<i>Pezoporus occidentalis</i>	Night Parrot	EN	S1	The Night Parrot requires treeless or sparsely wooded spinifex <i>Triodia</i> species near water (Johnstone and Storr, 1998).	No	There is no habitat suitable for this species in the Project area and, therefore, there is no potential for impact to this species.
<i>Psophodes nigrogularis oregon</i>	Western Whipbird (Mallee)	-	P4	The Western Whipbird is restricted to four races in small fragmented populations including Two Peoples Bay, Kangaroo Island, and 'Murray Mallee' (Pizzey & Knight, 2012). This species prefers dense long unburnt thickets of healthy shrubs, low Eucalypts and mallee trees (Pizzey & Knight, 2012).	Yes	There is little evidence of recent fire in the Project area except at site 24 where fire was < 3 yrs. Therefore, most of the Project area may be suitable for this species. However, the loss of 0.35 ha of vegetation does not constitute significant disturbance as this species occupies a habitat type that is well represented across the Ravensthorpe Range.



Species	Common Name	Cons. Code		Habitat	Habitat Requirements Met	Comments
		Cth	State			
				This species was previously recorded by Biota 2004 and again during the APM (2017) at nearby Kundip Mine Site. On all occasions the species was recorded in the 'Low Woodland Mallee and Heath' and one record location was the same for the Biota and APM surveys in the centre of the Kundip development envelope.		
<i>Pezoporus flaviventris</i>	Western Ground Parrot	CR	S1	<p>Heathland dominated by <i>Banksia</i> and <i>Hakea</i> and in low open mallee in swampy areas. The species prefers vegetation that has been unburnt for at least six years (DoEE 2018).</p> <p>The primary population of Western Ground Parrot occurs within the Fitzgerald River National Park, with smaller populations to the west in the Cheyne Beach/Waychinicup area and to the east in Cape Arid National Park and Nuysland Nature Reserve.</p>	No	There is no suitable habitat in the proposed clearing area. This species will not be impacted by the Project.
<i>Lerista viduata</i>	Ravensthorpe Range Slider skink	-	P1	As with other species from the <i>Lerista</i> genus, the Ravensthorpe Range Slider is found in loose soil or sand beneath stones, logs, termite mounds etc. This species has only been recorded in the Ravensthorpe Range (Cogger, 2014).	No	Clay content of soils and the lack of rocks and logs means the habitat is of low quality. This species is unlikely to occur and therefore there will be no impact as a result of this project.
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	VU	S3	Following European settlement, the range of this species contracted dramatically, from much of the continent to a small area in the south west. It currently only occurs in areas dominated by sclerophyll forest or drier woodland, heath and mallee shrubland (Van Dyck & Strahan, 2008). The majority of records are from the contiguous Jarrah forests of the south west of WA (DoEE, 2018). Recent records exist within the Gngangara pine forest and Walyunga National Park.	Yes	<p>Potentially the mallee shrubland is an important habitat type for this species.</p> <p>However, the loss of 0.35 ha of vegetation does not constitute significant disturbance as this species occupies a habitat type that is well represented across the Ravensthorpe Range. It is also agile and highly mobile.</p> <p>Therefore, the Project should have little to no impact on this species.</p>

Species	Common Name	Cons. Code		Habitat	Habitat Requirements Met	Comments
		Cth	State			
<i>Hydromys chrysogaster</i>	Water Rat/Rakali	-	P4	The Water Rat is found in a range of habitats including subalpine streams, slow inland rivers, lakes, farm dams and sheltered marine waters (Menkhorst and Knight, 2004).	No	No suitable habitat and, therefore, no potential for impact.
<i>Isodon obesulus fusciventer</i>	Quenda, Southern Brown Bandicoot	-	P4	The Quenda or Southern Brown Bandicoot exists only in a fragmented distribution to its former range in southern south western and eastern Australia. It is found in forest, woodland, heath and shrub communities in these regions. Preferred habitat usually consists of a combination of sandy soils and dense heath vegetation (Van Dyck & Strahan 2008).	No	No suitable habitat and therefore no potential for impact.
<i>Macropus eugenii derbianus</i>	Tammar Wallaby	-	P4	The Tammar Wallaby is thought to have persisted in disjunct mainland populations for up to 10,000 years however given the large-scale vegetation clearing since the arrival of Europeans, the range of this species has contracted. In the south-west of Western Australia, this species occurs in several reserves in the Wheatbelt and national parks in the Great Southern Region (Van Dyck & Strahan 2008).	Yes	This species has the potential to be using the Project area when foraging or retreating to thicker heath and scrub for refuge during the day. Clearing for the proposed Project is unlikely to impact this species. There are only 2 recordings of this species as roadkill reported on the Ravensthorpe-Hopetoun Road.
<i>Macropus irma</i>	Western Brush Wallaby	-	P4	The Western Brush-wallaby occurs in the south-west of Western Australia. Its preferred habitat consists of open sclerophyll forest or woodland and favours open flats over scrub thickets. It is also found in larger areas of mallee and heathland in the wheat belt and is uncommon in wet sclerophyll forest (Van Dyck & Strahan 2008).	Yes	The species was recorded as roadkill at the entrance of the Kundip Mine Site by Biota (2004) and more recently near the Myamba site by APM (2017). Therefore, this species is likely present. However, the small amount of clearing required for the Project would see this highly mobile species move out of the way and avoid impact.
<i>Myrmecobius fasciatus</i>	Numbat, Walpurti	VU	S2	Originally widespread, the Numbat now only persists in two remnant populations at Dryandra and Perup in Western Australia with several reintroduced populations in the Western Australian Wheatbelt (DPaW, 2017).	No	This species would no longer be present in the region.

Species	Common Name	Cons. Code		Habitat	Habitat Requirements Met	Comments
		Cth	State			
<i>Parantechinus apicalis</i>	Dibbler	EN	S2	The Dibbler appears to be able to occupy a range of habitats. They seem to prefer vegetation with a dense canopy greater than 1 m high, unburnt for at least 10 years. In some areas, the presence of Proteaceous and Myrtaceous flowering shrubs may also be important (DoEE 2018).	Yes	The proposed development has a dense canopy and Myrtaceous and Proteaceous shrubs. Therefore, suitable habitat may occur. Unless individuals are buried in burrows during clearing, individuals should be capable of moving away from harm during clearing.
<i>Phascogale calura</i>	Red-tailed Phascogale, Kenngoor	VU	S6	The Red-tailed Phascogale is found in the branches of Rock Sheoak ( <i>Allocasuarina huegeliana</i> ) with a tail the same colour as the exposed wood from this plant. It is restricted to areas that receive an annual rainfall of 300-600 mm in isolated patches of forest. Its preferred habitat is the denser and taller communities with Wandoo and Rock Sheoak with hollows in Wandoo providing nesting sites. Information from Van Dyck & Strahan (2008).	No	There is no habitat suitable for this species in the Project area.
<i>Pseudomys occidentalis</i>	Western Mouse	-	P4	The Western Mouse is a nocturnal species that live in burrows during the day (20-30cm deep) consisting of a single vertical entrance shaft connected to a horizontal loop 2-3 metres in diameter. The nesting chamber is directly opposite the entrance. The entrance shaft is commonly located in dense leaf litter. Capture sites of the Western Mouse have long unburnt vegetation (30-50 years) with layers of extremely dense vegetation at 0.5-2.5 metres high. Dominant upperstorey includes <i>Eucalyptus</i> , <i>Isopogon</i> , <i>Acacia</i> , <i>Casuarina</i> and <i>Melaleuca</i> (Van Dyck & Strahan 2008).	No	Habitat for this species is described as shrublands that have not been burnt for 15-30 years on clay loams, usually with a laterite component (Lee 1995). Laterite is not present within the proposed development.  It is unlikely that the Project will impact this species.
<i>Pseudomys shortridgei</i>	Heath Mouse, Dayang	EN	S3	The Heath Mouse is found in lowland heath, woodlands and sclerophyll forests (AoLA 2016). Largely confined to habitats with a mallee overstory on variable soils including loamy-sands and sandy-loams with a laterite component, stony clays	No	Habitat for this species is described as shrublands that have not been burnt for 15-30 years on clay loams, usually with a laterite component (Lee 1995). Laterite is not present within the proposed Project area. However, clay soils over dense shrub does provide habitat value. A large targeted survey was done for this species at the nearby Kundip mine site but

Species	Common Name	Cons. Code		Habitat	Habitat Requirements Met	Comments
		Cth	State			
				and sandy light clay on greenstone (Cooper <i>et al.</i> 2003; R. Teale unpublished data).		the species was not located. The proposed Project is unlikely to impact this species. .

The clearing associated with the Project is not at variance with Principle 2.

**3. Native vegetation should not be cleared if it includes or is necessary for the continued existence of rare flora.**

The Priority 4 species *Eucalyptus desmondensis* is common across the proposed disturbance. Table 2 contains the sites and densities of the species recorded by APM. Locations of survey sites are displayed in Figure 2.

Table 2. Locations and densities of *Eucalyptus desmondensis* (P4) recorded from the proposed development.

Species	Conservation Code	Survey site number	% Cover
<i>Eucalyptus desmondensis</i>	P4	1	5
		2	10
		3	10
		5	2
		6	20
		7	10
		9	10
		10	20
		11	1
		12	1
		13	5
		14	5
		15	2
		16	2
		18	1
		19	20
		20	20

The species is listed as the dominant canopy species by both Craig *et al.* (2008) and Markey *et al.* (2012) for the vegetation types Edes/Alca and 21 respectively. Craig *et al.* (2008) also recorded the species in low densities in the 32.6 ha of *Allocasuarina huegeliana* (Alhu) tall shrub community and the 138.3 ha of *Eucalyptus suggrandis/ Melaleuca* spp. Open Shrub Mallee (Esug/Mspp).

The Atlas of Living Australia (AoLA 2018) which collates herbarium records from across Australia, indicates the distribution of *E. desmondensis* covers approximately 25 x 25 km and is distributed across both sides of the Ravensthorpe Range including from within the Kundip Nature Reserve. Despite the proposed clearing of individuals of *E. desmondensis* it is not anticipated this will have a significant impact on the species population in the locality or the region, with a reduction of 1 % of the range where the species is a dominant canopy component.

Flora from the genus *Lepidosperma* were common within the proposed disturbance. Although the specimens collected were not identified as being of conservation significance, there is a lack of information regarding the taxonomy of *Lepidosperma* listed as of conservation significance in the Ravensthorpe area. Florabase lists 8 Conservation significant *Lepidosperma* in the Ravensthorpe Shire (Table 3), however they have not been comprehensively described. Advice from the Western Australian Herbarium (Michael Hislop 23/10/2018) regarding this matter was sought, to which the reply was:

“The genus *Lepidosperma* is currently in the early stages of revision by Russell Barrett, formerly of Kings Park but who is now based in Canberra and **not** working on *Lepidosperma*. Russell has so far adopted very narrow species concepts and in addition to the published taxa and formally recognised phrase names there are many others waiting in the wings. This has left users with the problem of how to distinguish previously described species from the numerous formal and informal phrase names that Russell recognises, in the absence of detailed documentation of the character differences that he is using. This basically means that the W.A. Herbarium is now in the unsatisfactory position of frequently being unable to provide authoritative identifications in the genus, even when the specimen quality is high.”

Table 3. *Lepidosperma* taxa of conservation significance listed on Florabase as occurring in the Ravensthorpe Shire which have not been comprehensively described.

Taxa	Conservation Code
<i>Lepidosperma</i> sp. Archer Drive (S. Kern & R. Jasper LCH 18300)	P1
<i>Lepidosperma</i> sp. Elverdton (R. Jasper et al. LCH 16844)	P1
<i>Lepidosperma</i> sp. Hopetoun Road (S. Kern et al. LCH 16552)	P1
<i>Lepidosperma</i> sp. Maydon (S. Kern, R. Jasper, H. Hughes LCH 17844)	P1
<i>Lepidosperma</i> sp. Mt Chester (S. Kern et al. LCH 16596)	P1
<i>Lepidosperma</i> sp. Mt Short (S. Kern et al. LCH 17510)	P1
<i>Lepidosperma</i> sp. Steere River (S. Kern, R. Jasper, H. Hughes LCH 17764)	P1
<i>Lepidosperma</i> sp. Shoemaker Levy (L. Ang & O. Davies 10815)	P3

As such, although no *Lepidosperma* of conservation significance have been identified from the proposed disturbance, until the taxonomic revision of the genus is completed it is not possible to rule out the possibility. A specimen of *Lepidosperma* sp. Mt Short was collected in 2007 lodged with the Western Australian Herbarium from approximately 400m to the north east of the proposed disturbance but is within a different vegetation type. *Lepidosperma* sp. Elverdton was also collected in 2007 from approximately 200m to the

south west, across the Steere River tributary and in a different vegetation type. Craig *et al.* (2008) and Markey *et al.* (2012) did not list any conservation significant *Lepidosperma* as occurring in this vegetation type.

Five occurrences of flora were recorded by APM that remain indeterminate due to a lack of fertile material. Vegetatively they appear to be from the genus *Darwinia*. There is one P2 *Darwinia* in the Shire of Ravensthorpe *Darwinia* sp. Thumb Peak (K.R. Newbey 4847). There are an additional 14 conservation significant *Darwinia* in the Esperance Plains Bioregion, however these are all remote (more than 200 km away) from the proposed disturbance and mostly highly restricted in distribution. The occurrence of the indeterminate specimens is listed in table 4.

Table 4. Distribution of Indeterminate specimens

Specimen number	Survey Site	% Cover
018-007	18	1
021-003	21	1
(Same as) 018-007	21	1
007-010 (superficially same as Survey site 18-007)	7	1
007-007 (superficially same as 021-003)	7	10

The clearing associated with the Project may be at variance with Principle 3.

**4. 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.**

The List of threatened ecological communities endorsed by the Western Australian Minister for Environment, Department of Biodiversity Conservation and Attractions, published on 28 June 2018 lists 3 Threatened Ecological Communities in the Esperance Sandplain Bioregion.

29. Montane Thicket of the eastern Stirling Range

74. Herblands and Bunch Grasslands Herblands and Bunch Grasslands on gypsum lunette dunes alongside saline playa lakes

102. *Eucalyptus acies* mallee heath Thumb Peak, Mid mount Barren, Woolburnup Hill (Central Barren Ranges)/*Eucalyptus acies* mallee heath Esperance Sandplain

The known distribution of these communities is remote from the proposed disturbance. The landform and species composition of the proposed disturbance does not resemble those of the listed communities.

Two TECs listed under the EPBC Act were identified as potentially occurring in the Project area through a search of the PMST:

- Proteaceae dominated Kwongkan shrublands of the Southeast Coastal Floristic Province of WA; and
- *Banksia laevigata* – *Banksia lemniiana* proteaceous thicket.

There are seven Priority Ecological Communities present in the Ravensthorpe Range, a number of which were mapped by Craig et al (2008) and Markey et al (2012). Three PECs listed under the WC Act were also identified as potentially occurring in the Project area by searches of the DBCA databases:

- Proteaceae dominated Kwongkan shrublands of the Southeast Coastal Floristic Province of WA (P3);
- Very open mallee over *Melaleuca* sp. Kundip dense heath (P1); and
- Heath on Komatiite of the Ravensthorpe Range area (P3).

Descriptions of these communities are provided in Table 5.

Table 5. Priority and Threatened Ecological Communities potentially in the Welcome Stranger Project area

Community	Description	Conservation Status
Proteaceae dominated Kwongkan shrublands of the Southeast Coastal Floristic Province of WA	Consists of predominantly obligate seeding proteaceous shrubland and heath (kwongkan) and mallee heath on sandplain, duplex sand/clay and gravels overlying Eocene sediments, quartzite, schist, Yilgarn and Albany Fraser granite and greenstone ranges. Its flora is characterised by high species diversity and a high degree of endemism, particularly in the Stirling Range, Fitzgerald River National Park, Ravensthorpe Range and Russell Ranges. Due to the high levels of endemism, there are few species that exist across the entire range of the dense, obligate seeding Proteaceae dominated shrublands and kwongkan of the Esperance Sandplains, however particular species have been identified as common dominant species in each of its ecodistricts.	TEC, EPBC Act; PEC (Priority 3), WC Act
<i>Banksia laevigata</i> – <i>Banksia lemniiana</i> proteaceous thicket	This community occurs on laterised ridges and breakaways. Associated species generally include <i>Eucalyptus pleurocarpa</i> , <i>Adenanthos oreophilus</i> , <i>Leptospermum maxwellii</i> , <i>Beaufortia orbifolia</i> , <i>Taxandria spathulata</i> and <i>Stylidium albomontis</i> .	TEC, EPBC Act
Very open mallee over <i>Melaleuca</i> sp. Kundip dense heath	Very open mallee over <i>Melaleuca</i> sp. Kundip (Collection number GF Craig 6020, now <i>Melaleuca sophisma</i> Lepschi) dense heath. Open mallee over dense shrub heath (1.0-1.5) dominated by <i>Melaleuca</i> sp. Kundip on pale grey loamy sand with quartz rubble, occupies hill slopes. Associated species include <i>Melaleuca</i> sp. Kundip (GF Craig 6020) (P1) (dominant), <i>M. haplantha</i> , <i>M. stramentosa</i> (P1), <i>M rigidifolia</i> , <i>M. bracteosa</i> , <i>Melaleuca</i> sp. Gorse, <i>Pultenaea</i> sp. Kundip (GF Craig 6008) (P1), <i>Eucalyptus cernua</i> , <i>E. phaenophylla</i> , <i>E. pileata</i> , <i>Dodonaea trifida</i> (P3), <i>Acacia durabilis</i> (P3), <i>Leucopogon infuscatus</i> and <i>Hibbertia psilocarpa</i> ms. On its eastern	PEC (Priority 1), WC Act



Community	Description	Conservation Status
	boundary, the community abuts <i>Eucalyptus astringens</i> open low woodland and in this area, there is an intergrade community.	
Heath on Komatiite of the Ravensthorpe Range area	Dense heath on alkaline red clay over komatiite (ultra-mafic rock) and associated carbonates. Note: very open tree mallee over heath B in Hale Bopp orebody area. Dominant species: <i>Beyeria cockertonii</i> (DRF), <i>Acacia ophiolithica</i> , <i>Hakea verrucosa</i> , <i>Grevillea fastigiata</i> , <i>Melaleuca ulicoides</i> , <i>Allocasuarina hystricosa</i> (P3), <i>Verticordia oxylepis</i> , <i>Grevillea oligantha</i> , <i>Hybanthus floribundus</i> , <i>Pomaderris brevifolia</i> ssp. <i>brevifolia</i> , <i>Pultenaea wudjariensis</i> (P1), <i>Melaleuca pomphostoma</i> , <i>Nematolepis phebalioides</i> , <i>Philotheca gardneri</i> subsp. <i>gardneri</i> , <i>Gyrostemon sessilis</i> , <i>Calothamnus quadrifidus</i> , <i>Calytrix tetragona</i> , <i>Halgania anagalloides</i> , <i>Coleanthera myrtoides</i> , <i>Beyeria cockertonii</i> , <i>Pultenaea wudjariensis</i> , <i>Grevillea fastigiata</i> and <i>Gyrostemon sessilis</i> are narrow range endemics.	PEC (Priority 3), WC Act

The vegetation within the Project area is *Eucalyptus desmondensis*/ *Allocasuarina campestris* very open shrub mallee, and as such is not a TEC listed under the EPBC Act or a priority Ecological Community according to Version 27 of the listing (June 2017).

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice for Proteaceae Dominated Kwongkan Shrublands of the southeast coastal floristic province of Western Australia advises that the TEC is characterised by having 30% or greater cover of Proteaceae species across all layers where these shrubs occur (crowns measured as if they are opaque). Proteaceous species were recorded at 11 of the 23 sites, at densities of 1-5 % cover, except at site 24 where cover was 20% and thus do not reach the required threshold.

The clearing associated with the Project is not at variance with principle 5.

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

Although habitat loss is a known threat in the Fitzgerald Biosphere, the vegetation of the Ravensthorpe Range is relatively intact because the topography is not suitable for agriculture. The proposed development would clear 0.35 ha for the drill pads (twenty-three 15 m x 10 m pads spaced 40 m apart), with many existing access roads already cleared. Craig *et al.* (2008) mapped 159.6 ha of the vegetation type Edes/Alca within an area approximately 4.5 km by 2 km (Figure 3). The proposed disturbance would impact 0.2% of the known distribution.

The proposed disturbance lies immediately to the south east of an existing 50 ha disturbance associated with the abandoned Elverdton Mine, which was not included in the Craig *et al.* (2008) mapping. Prior to disturbance, given the landscape, this would likely have contained at least some of the same vegetation as the proposed disturbance. As *Eucalyptus desmondensis*, a dominant canopy species within the community, is present over a 25 km by

25 km area, it is possible that there is significantly more of the undisturbed vegetation type than has been mapped by Craig *et al.* (2008).

Beard (1973, 1976) provided a coarser scale but broader scope of vegetation mapping. The proposed development occurs within the described e27Si Shrubland: Mallee in Valleys – *E. redunca-E. uncinata* (Ravensthorpe and Esperance Systems). Sheppard *et al.* (2001) reports that 60.6% of the pre-European extent of that unit remained and 18.9% was within IUCN Class I-V Reserves.

The clearing associated with the Project is not at variance with principle 5.

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

The Project is in the Culham Inlet/Phillips/West/Steere Catchment and adjacent to a tributary of the Steere River, downstream of the abandoned Elverdton Mine. The historical Elverdton mining has clearly added large amounts of silt to the tributary of the Steere River. Site 3 (Figure 2) is the closest proposed disturbance, at 15 m from the Steere River. The Project will need to implement satisfactory controls such as siltation fencing and leaving a vegetation buffer to ensure no erosion and transport of materials into the Steere River.

There are no defined wetlands in the vicinity of the Project.

Due to the proximity of the Steere River tributary, the clearing associated with the Project may be at variance with principle 6.

**7. *Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.***

All vegetation clearing must be carried out in a manner that enhances restorative capacity of the land, and minimises unnecessary land degradation.

The minimum possible clearing is undertaken to achieve the necessary exploration outcomes. Good planning and site management will reduce the risk of excessive clearing. In particular:

- Staged clearing will be undertaken where a raised blade on a dozer will be used followed by a period whereby any fauna that may have been present are allowed to disperse.
- Woody vegetation to be cleared and stored in wind rows for use in restoration.
- Vegetation is to be cleared in 23 small (10 m x 15 m) areas with vegetation buffers of approximately 20 m wide between cleared areas.

The strict adherence to machine hygiene will be required to ensure no spread of *Phytophthora* or weeds into the area. Although no weeds were identified in the Project area by APM there

are known weed infestations at the abandoned Elverdton Mine nearby. Rehabilitation of the site needs to be completed as soon as possible to reduce the likelihood of weed spread into disturbed soil.

Given adequate controls are in place, the clearing associated with the Project will not be at variance to Principle 7.

***8. 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.***

The closest conservation area to the proposed development is the Kundip Nature Reserve approximately 12 km to the south east. The Fitzgerald River National Park is approximately 18 km to the south west of the proposed development. The proposed clearing of 0.35 ha in an area of otherwise contiguous vegetation will not cause habitat fragmentation or threats to ecological linkages in the landscape.

The small size of the clearing and the distance from the conservation areas will ensure there is no impact.

The clearing associated with the Project will not be at variance with Principle 8.

***9. 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.***

Appropriate surface water land management will occur as outlined in (7), prohibiting the movement of turbid or erosive surface flows. Soils at the site are clay loams, sandy loams or clay sand. Landforms are gentle slopes or flat. This combination of soil type and topography are unlikely to result in excessive surface flow conditions; however, the clay content can make drainage slow and water erosion of sloping cultivated land is a common problem over the Ravensthorpe area (Overheu 1995). Subsoils may also be highly dispersive, and care must be taken not to allow soil samples and sample bags to deteriorate, or for the topsoil to be cleared greater than 10 cm to limit exposure of the dispersive subsoils.

At the local scale, vegetation removal is likely to increase deep drainage of water into below ground storage, as removal of stored soil water by plants is ceased. This is unlikely to have a negative impact on below ground water sources as the area of clearing is very small compared to the continuous vegetation cover in the surrounding region.

The Bureau of Meteorology Groundwater Dependent Ecosystems (GDE) Atlas (BoM 2018) does not identify any Aquatic GDE's as occurring in the project area. Subterranean GDE's have not been assessed in the area. The entire Ravensthorpe Range is assessed as being of High potential terrestrial GDE under the National assessment. Clearing of native vegetation is unlikely to lead to changes in water regimes of, or result in breaches of environmental water provisions for, groundwater-dependent ecosystems (GDEs) on or off site or subsequent degradation of the biological communities associated with these systems

The clearing associated with the Project is unlikely to be at variance with Principle 9.

**10. Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.**

No such consequences are anticipated from the clearing proposed in this application as clearing is restricted to 0.35 ha distributed in 23 sites with vegetation buffers approximately 20m wide between cleared areas.

The clearing associated with the Project is not expected to be at variance with Principle 10.

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