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Dear Kim

Kundip Phase II Fauna Survey - Summary of Findings

Introduction

Tectonic Resources NL, as owners of the Phillips River Gold Project, aim to develop the gold/copper resource at the Kundip site and the polymetallic resource at the Trilogy site, located 17 and 27 kilometres southeast of Ravensthorpe respectively. An open cut pit is planned for the Trilogy deposit, whilst underground mining and an open cut pits are planned for the deposits at Kundip.

This letter summarises the findings of Phase I of the fauna survey, documented in greater detail in Biota (2004), and provides an overview of Phase II highlighting the key findings, particularly in respect of small mammal captures.

Fauna Survey Phase I

A field survey was conducted over a 10-day period between the 5/1/2004 and 14/1/2004, following a 12-month period of slightly above average rainfall, though this was preceded by an extended dry period.

The methodology utilised during the survey is described in Biota (2004).

The field survey recorded a combined total of 99 vertebrate species, including 62 species of bird, 11 native mammals, two introduced mammals, 21 reptiles and three frogs.

Over 30 invertebrate taxa were recorded from the Kundip study site, many of which were not identified beyond family level. Two species of mygalomorph spiders from the family Nemesiidae were recorded from the Kundip project area; *Aname mainae* and *Chenistonia tepperi*. Both species (as they are currently recognised) have broad distributions through the South-west of WA. A single *Bothriembryon* that was not known to Ms Shirley Slack-Smith (WA Museum) was collected during the survey from leaf litter at KU8. The conservation status of this taxon is unknown.

A search of the CALM Schedule and Priority Fauna database for species potentially occurring in the area yielded five Schedule 1 species, one Schedule 4 species and five Priority species. An additional Schedule 1, Schedule 4 and Priority taxon may occur in the area based on other information.

Schedule 1 Fauna

- *Carnaby's Cockatoo *Calyptorhynchus latirostris* (Endangered under EPBC Act 1999)

- Western Ground Parrot *Pezoporus wallicus flaviventris* (Endangered under EPBC Act 1999)
- *Malleefowl *Leipoa ocellata* (Vulnerable under EPBC Act 1999)
- Chuditch *Dasyurus geoffroyii* (Vulnerable under EPBC Act 1999)
- Dibbler *Parantechinus apicalis* (Endangered under EPBC Act 1999)
- Heath Rat *Pseudomys shortridgei* (Vulnerable under EPBC Act 1999)

Schedule 4 Fauna

- Peregrine Falcon *Falco peregrinus*
- Carpet Python *Morethia spilota imbricata*

Priority Taxa

- **Lerista viduata* (Priority 1)
- Quenda *Isoodon obesulus fusciventer* (Conservation Dependent, Priority 4)
- Tammar *Macropus eugenii derbianus* (Conservation Dependent, Priority 4)
- *Western Whipbird (southern WA subspecies) *Psophodes nigrogularis oberon* (Priority 4) (Vulnerable under EPBC Act 1999)
- Western Mouse *Pseudomys occidentalis* (Priority 4)
- *Western Brush Wallaby *Macropus irma* (Priority 4)

Species noted with an "*" were recorded during the Phase I survey.

Given the number of fauna of Conservation Significance that may occur in the project area it was recommended that:

1. The proponent should undertake an additional seasonal survey of the project area to more fully document the faunal assemblage and identify any additional constraints. This study could usefully target threatened fauna taxa not well represented during the current survey including Schedule listed rodent and bird species.

Of particular consideration was the possible presence of the Heath Rat *Pseudomys shortridgei* and the population size of the Western Whipbird *Psophodes nigrogularis oberon*.

Overall captures of rodents (even potentially abundant species such as *Rattus fuscipes*) was low, possibly reflecting a poor season. It was felt that if rodent numbers were generally low as was suggested by the trapping data (and comparisons to other studies (Chapman and Craig 1998, Chapman 2000)) then the chance of detecting rarer species such as the Heath Rat was greatly diminished.

It was agreed that the results of the seasonal survey could be written as a brief letter style report to be appended to the original report.

Fauna Survey Phase II

Methodology

The Phase II survey was completed between 16/11/04 – 23/11/04 and involved Dr. Michael Craig (Biota), Mr. Greg Harold (Consultant) and Mr. Andy Chapman (Consultant). The aim of the Phase II survey was to target threatened fauna taxa not well represented during the Phase 1 survey, including Scheduled rodent and bird species (see Biota 2004).

Minimum temperatures during the survey ranged from 4.0°C to 19.2°C and maximum temperatures ranged from 18.0°C to 37.4°C (Table 1). No rainfall was recorded during the survey but 27.9 mm had fallen in November 2004 prior to the survey.

Table 1: The minimum and maximum daily temperatures recorded in Ravensthorpe for the duration of the Phase II survey (compared to the November average minimum of 10.9 and average maximum of 24.8).

Date	16/11	17//11	18/11	19/11	20/11	21/11	22/11	23/11	Mean
Minimum	14.3	12.1	4.0	5.2	8.7	10.4	14.4	19.2	11.0
Maximum	31.2	20.5	18.0	21.8	26.8	29.3	33.4	37.4	27.3

The survey re-opened the seven systematic trapping grids (KU1 – KU7) and the cage transect (KU11) established during Phase I, and established an additional seven Elliott transects comprising 20 Elliott traps spaced approximately 10 m apart (KU14 – KU20) (Figure 1).

All grids were open for between five and seven nights giving a total trap effort of 1780 Elliott trap nights, 588 pit-trap nights and 224 cage trap nights (Table 2). An additional cage trap was added to each of the systematic trapping sites (i.e. KU1 – KU7).

Systematic avifauna censusing was not undertaken as part of this current survey, rather effort focussed on recording the distribution of the Western Whipbird *Psophodes nigrogularis oregon* and other Threatened or Rare taxa. However, notes were made of species additional to those recorded during Phase I (see Results and Discussion below). A total of 23 hours was spent conducting transects through all of the proposed pit and overburden areas to record the presence of threatened bird species (Figure 2).

Opportunistic collecting was also undertaken at locations likely to support fauna of conservation significance including Short Range Endemics.

Table 2: Trapping grid location and trap effort (WGS84 datum, Zone 51).

Site #	Location (AMG)	Trap Type	Date Opened	Date Closed	Nights Open	# of traps	Total effort (trap nights)
KU1	239670mE 6270247mN	Elliott	16/11/04	23/11/04	7	20	140
		Pit	16/11/04	23/11/04	7	12	84
		Cage	16/11/04	23/11/04	7	1	7
KU2	240563mE 6271172mN	Elliott	16/11/04	23/11/04	7	20	140
		Pit	16/11/04	23/11/04	7	12	84
		Cage	16/11/04	23/11/04	7	1	7
KU3	240342mE 6269570mN	Elliott	16/11/04	23/11/04	7	20	140
		Pit	16/11/04	23/11/04	7	12	84
		Cage	16/11/04	23/11/04	7	1	7
KU4	240288mE 6268814mN	Elliott	16/11/04	23/11/04	7	20	140
		Pit	16/11/04	23/11/04	7	12	84
		Cage	16/11/04	23/11/04	7	1	7
KU5	239894mE 6268754mN	Elliott	16/11/04	23/11/04	7	20	140
		Pit	16/11/04	23/11/04	7	12	84
		Cage	16/11/04	23/11/04	7	1	7
KU6	240113mE 6270410mN	Elliott	16/11/04	23/11/04	7	20	140
		Pit	16/11/04	23/11/04	7	12	84
		Cage	16/11/04	23/11/04	7	1	7
KU7	239820mE 6269724mN	Elliott	16/11/04	23/11/04	7	20	140
		Pit	16/11/04	23/11/04	7	12	84
		Cage	16/11/04	23/11/04	7	1	7
KU11	Transect	Cage	16/11/04	23/11/04	7	25	175
KU14	239369mE 6270241mN to 239372mE 6270120mN	Elliott	17/11/04	23/11/04	6	20	120

KU15	240229mE 6270175mN to 239996mE 6270079mN	Elliott	17/11/04	23/11/04	6	20	120
KU16	240744mE 6270798mN to 240821mE 6270613mN	Elliott	17/11/04	23/11/04	6	20	120
KU17	240897mE 6268881mN to 240888mE 6268711mN	Elliott	17/11/04	23/11/04	6	20	120
KU18	241007mE 6268894mN to 241010mE 6268707mN	Elliott	17/11/04	23/11/04	6	20	120
KU19	241222mE 6270367mN to 241236mE 6270179mN	Elliott	18/11/04	23/11/04	5	20	100
KU20	239131mE 6269112mN to 239025mE 6269332mN	Elliott	18/11/04	23/11/04	5	20	100
					Total	Elliott Pit Cage	1780 588 224

The new Elliott transects were placed in the following vegetation communities:

KU14 & 15 – *Melaleuca acuminata* Open woodland and thicket (dense to mid-dense shrubs <2m) along drainage lines.

KU16 – *Melaleuca stramentosa* Mallee and dense heath (shrubs <2m).

KU17 – From a mixture of *Eucalyptus clivicola* Low Forest and *Eucalyptus cernua* Dense Low Forest (mallee regrowth) into *Melaleuca rigidifolia* Open Mallee and Dense Heath (shrubs <1m).

KU18 – *Melaleuca rigidifolia* Open Mallee and Dense Heath (shrubs <1m).

KU19 – *Banksia lehmanniana* Open Mallee and Thicket/Scrub Heath (dense to open shrubs 0.5-5m).

KU20 – From *Banksia lehmanniana* Open Mallee and Thicket/Scrub Heath (dense to open shrubs 0.5-5m) into *Melaleuca hamata* Mallee.

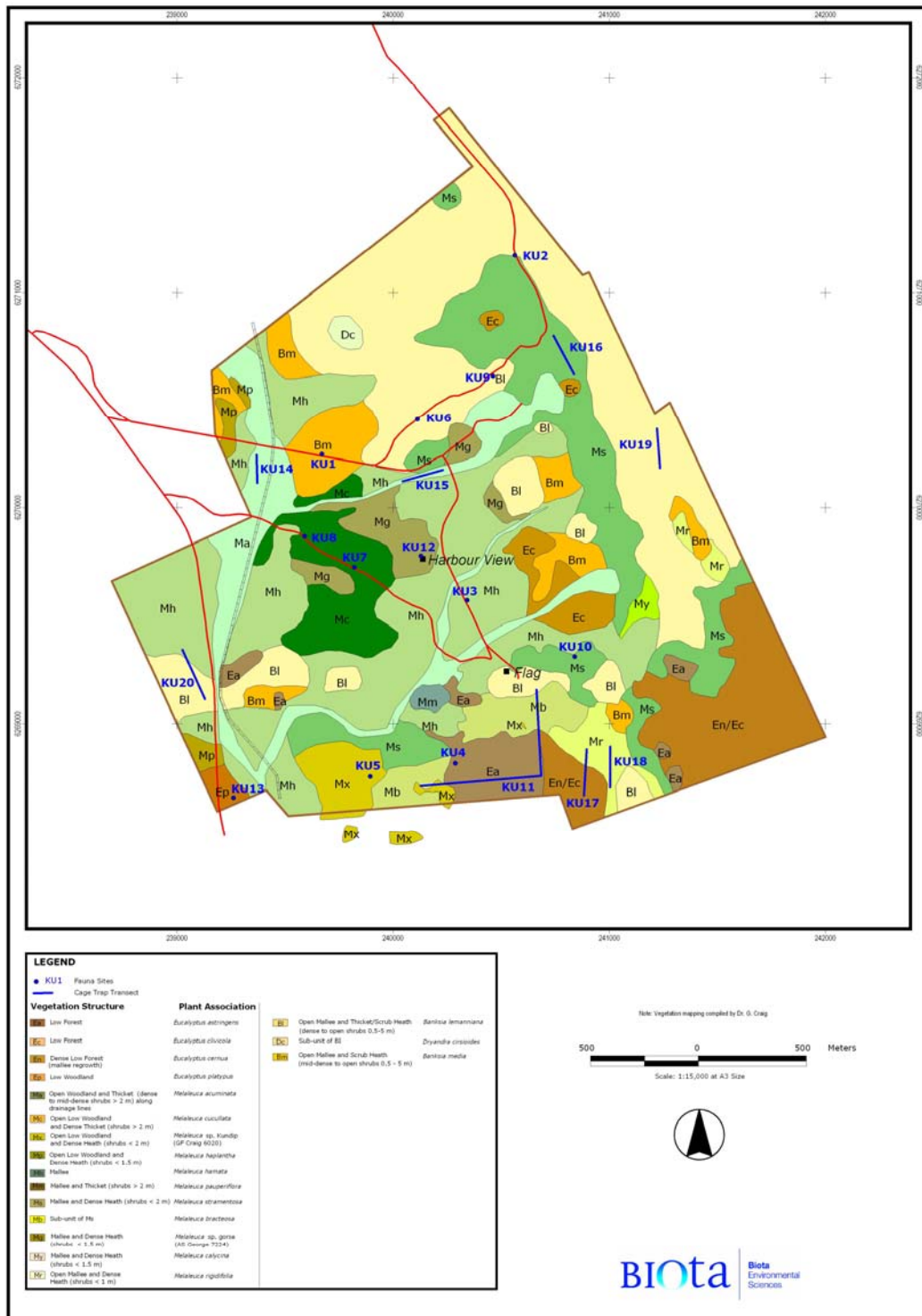


Figure 1. A map showing the location of the trapping sites and trapping transects overlain on vegetation communities. KU14 – KU20 represent an additional seven Elliot transect lines established for the phase II survey.

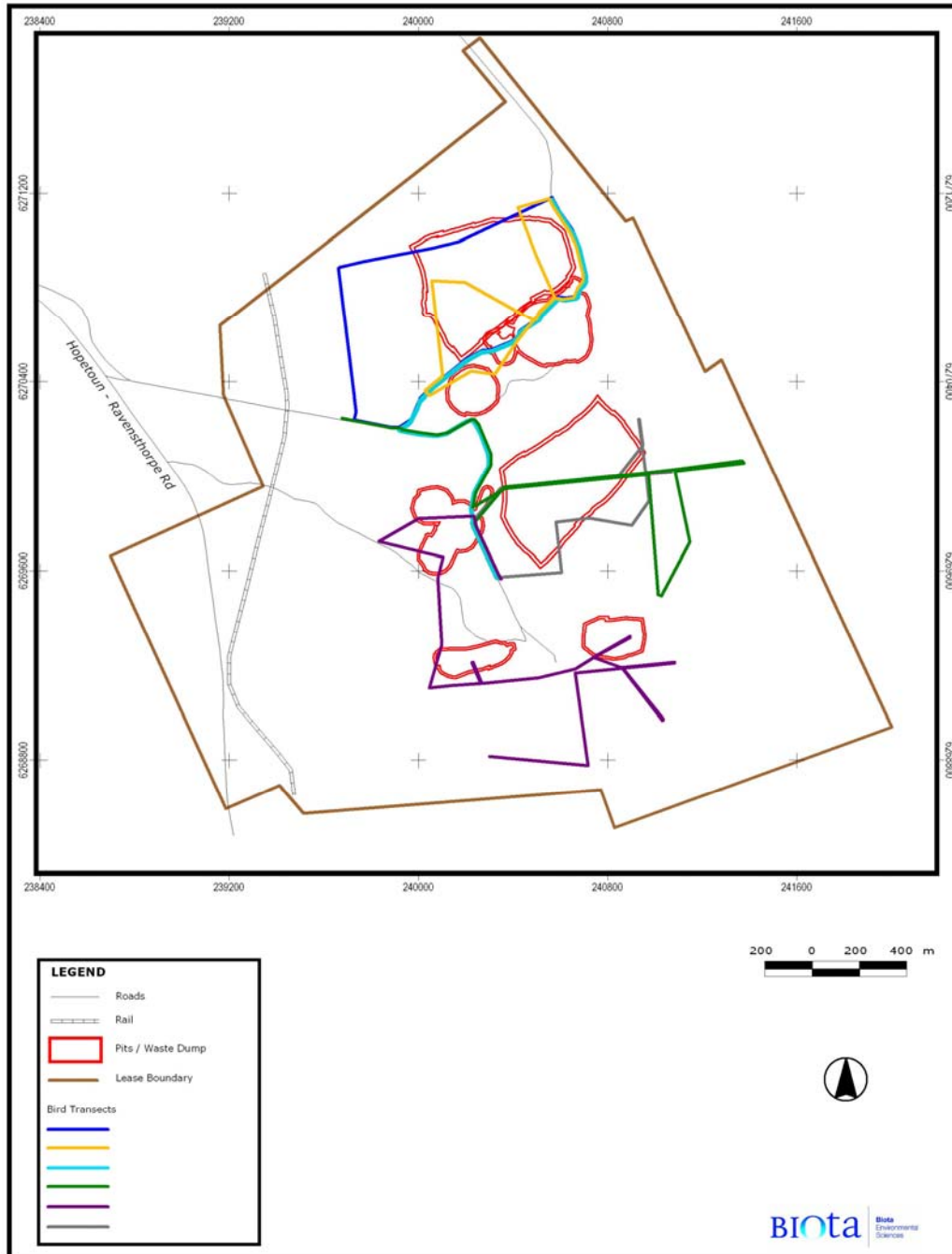


Figure 2. A map shown the location of transects conducted for threatened bird species in relation to the proposed pit and overburden areas. Each colour represents a different day.

Results and Discussion

The phase II survey recorded 37 vertebrate species including five mammals, nine birds (Tables 4, 5 and 6). Note that for the avifauna, only threatened taxa and species additional to those recorded during Phase I (Biota 2004) were recorded.

The tally included 11 species not recorded during the Phase I survey, highlighting the value of seasonal work. The additional species comprised *Amphibolurus norrisi*, *Elapognathus coronatus*, *Ramphotyphlops australis*, *Tiliqua occipitalis*, the Little Eagle *Aquila morphnoides*, Brown Falcon *Falco berigora*, Horsfield's Bronze Cuckoo *Chrysococcyx basalis*, Rufous Fieldwren *Calamanthus campestris*, Western Spinebill *Acanthorhynchus superciliosus*, White-cheeked Honeyeater *Phylidonyris nigra* and White-winged Triller *Lalage tricolor*. None of the additional species recorded are of special conservation significance, however the record of *Amphibolurus norrisi* extends further westward (by approximately 30 km) the known distribution of this species.

Of particular note was the increase in captures of rodent species (Table 5), though this can be explained, for the most part, by the inclusion of additional Elliott transects. During Phase I, six *Mus musculus* (House Mouse) and 12 *Rattus fuscipes* (Bush Rat) were recorded from the seven trapping grids (KU1 – KU7), with an additional four *R. fuscipes* recorded from cage traps (KU11). During Phase II, nine *M. musculus* and 18 *R. fuscipes* were recorded from the seven trapping grids (KU1 – KU7), with an additional 13 *M. musculus* and 130 *R. fuscipes* recorded from the Elliott transects (KU14 – KU20).

In comparison, Chapman (2000) documented 211 records of *Mus musculus* and 147 records of *Rattus fuscipes* using 480 pit-trap nights, 1000 Elliott trap nights and 200 cage trap nights across spring 1999 and autumn 2000 at Bandalup Hill. With respect to the rarer species, Chapman (2000) documented 17 records of the Western Mouse *Pseudomys occidentalis* (Southern Mouse) and five records of the Heath Rat *Pseudomys shortridgei* (Heath Rat).

At the same study site in spring 2000, Biota (2000) recorded six *M. musculus* and 39 *R. fuscipes* using 534 pit-nights, 1100 Elliott trap nights and 60 cage trap nights. They also recorded one *Pseudomys albocinereus* (Ash-grey Mouse), two *P. occidentalis* and one *P. shortridgei* (Table 5).

The capture success of other small ground mammals during the current Phase II was comparable to Phase I of the trapping program at Kundip: three captures of *Sminthopsis griseoventer* (Grey-bellied Dunnart) versus nine during phase 1; 59 captures of *Cercartetus concinnus* (Western Pygmy Possum) versus 56 during Phase I; and 71 captures of *Tarsipes rostratus* (Honey Possum) versus 84 during Phase 1.

Despite being recorded in Phase I, neither the Malleefowl *Leipoa ocellata* (Schedule 1), Western Brush Wallaby *Macropus irma* (Priority 4) nor *Lerista viduata* (Priority 1) were recorded during Phase II. Vehicle transects were conducted for the former two of these species and raking of leaf litter and debris was undertaken for *L. viduata*.

As noted above, additional effort was directed towards documenting the occurrence of Western Whipbirds and other rare birds in the project area.

- Western Whipbird *Psophodes nigrogularis oberon* (Priority 4 under *Wildlife Conservation Act 1998* (WA); Vulnerable under the *EPBC Act 1999* (Cth)) We recorded this species on 12 occasions from four different vegetation types (Figure 3). Most records (eight) were from *Banksia lemanniana* (BI) open mallee and thicket scrub/heath. There were two records from *Melaleuca rigidifolia* open mallee and dense heath with single records from each of *Melaleuca stramentosa*

(Ms) mallee and dense heath and *Banksia media* open mallee and scrub heath (Figure 3). This compares to six records across sites KU1 (*Banksia media* open mallee and scrub heath) KU2 (*Banksia lemniiana* open mallee and thicket/scrub heath) and KU3 (*Melaleuca hamata* mallee-heath).

Table 3. Home range estimates for the subspecies of the Western Whipbird.

Subspecies	Home range estimate (ha)	Reference
<i>oberon</i>	6.45*	Cody 1991
<i>oberon</i>	10.53*	Cody 1991
<i>nigrogularis</i>	12.6	Smith 1991
?	2.8 to 5.6	Serventy & Whittell 1976
<i>leucogaster</i>	<20	Woinarski et al. 1988

* estimated from densities

None of the Western Whipbird records fell within the proposed impact areas (i.e. pit and overburden stockpiles). However, the impact area does intersect two (BI and Ms) of the four vegetation types from which this species was recorded, with an overall loss of 47ha of the total 235.42ha mapped for these two vegetation types within the project area (Table 7). Given a typical territory size of between 7ha and 10ha (see Table 3), the worst case scenario would be that either (1) between 5 and 7 pairs may be lost assuming only vegetation types in which they were recorded were suitable, or (2) between 8 and 12 pairs if all vegetation types are suitable. However, there are several reasons to believe that the actual number is likely to be lower than this. Firstly, no Western Whipbirds were recorded from any of the proposed pit or overburden areas during the Phase II survey. While a short survey of that kind does not indicate that whipbirds are not present in those areas, it does suggest that they are likely to be present at lower than average densities. Secondly, a large proportion of the northern and central pit areas are already heavily disturbed or cleared of their natural vegetation. Therefore, we would expect whipbirds to occur only marginally in both of these areas. Lastly, most of the records during Phase II are from *Banksia lemniiana* (BI) open mallee and thicket scrub/heath which will not be heavily disturbed (Table 7) and densities are likely to be lower than average in most of the other habitats.

The call from this species is conspicuous and may carry up to 200m (Johnstone and Storr 2004). The diet comprises invertebrates, mainly insects (Higgins and Peter 2002), but also snails (Johnstone and Storr 2004). The species is considered to be sedentary remaining in its home range from year to year (Higgins and Peter 2002).

The taxonomy surrounding the geographical variation in this species is not fully understood (Higgins and Peter 2002; cf. Johnstone and Storr 2004; see also Schodde and Mason 1999). Higgins and Peter (2002) recognise four subspecies of *P. nigrogularis* with two of these, *P. n. nigrogularis* and *P. n. oberon*, occurring in Western Australia. In contrast, Johnstone and Storr (2004) do not recognise *P. n. oberon*, rather treat all WA specimens as *P. n. nigrogularis*. Schodde and Mason (1999) elevate *P. n. nigrogularis* to full species and treats *oberon* as a sub-species of the newly recognised *P. leucogaster*. Both the State and Commonwealth listings recognise the taxonomy presented by Higgins and Peter (2002) as does this document. *P. n. nigrogularis* has the same conservation significance under both State and Federal listings. It is listed as Endangered under the *EPBC Act 1999* and as Schedule 1 (Vulnerable) under the *Wildlife Conservation Notice 2003*. The State and Federal listings do not, however,

recognise the same level of conservation significance for *P. n. oberon*. According to State listings *P. n. oberon* is listed as Priority 4 i.e.

Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

whilst the Commonwealth listing recognises *P. n. oberon* as Vulnerable.

Johnstone and Storr (2004) consider the western whipbird in WA to be uncommon to moderately common in the east of its range (i.e. about Ravensthorpe). There are no estimates of population size in WA though Teale *et al.* (in prep.) have compiled 165 records from 76 sites across the Fitzgerald Biosphere Reserve.

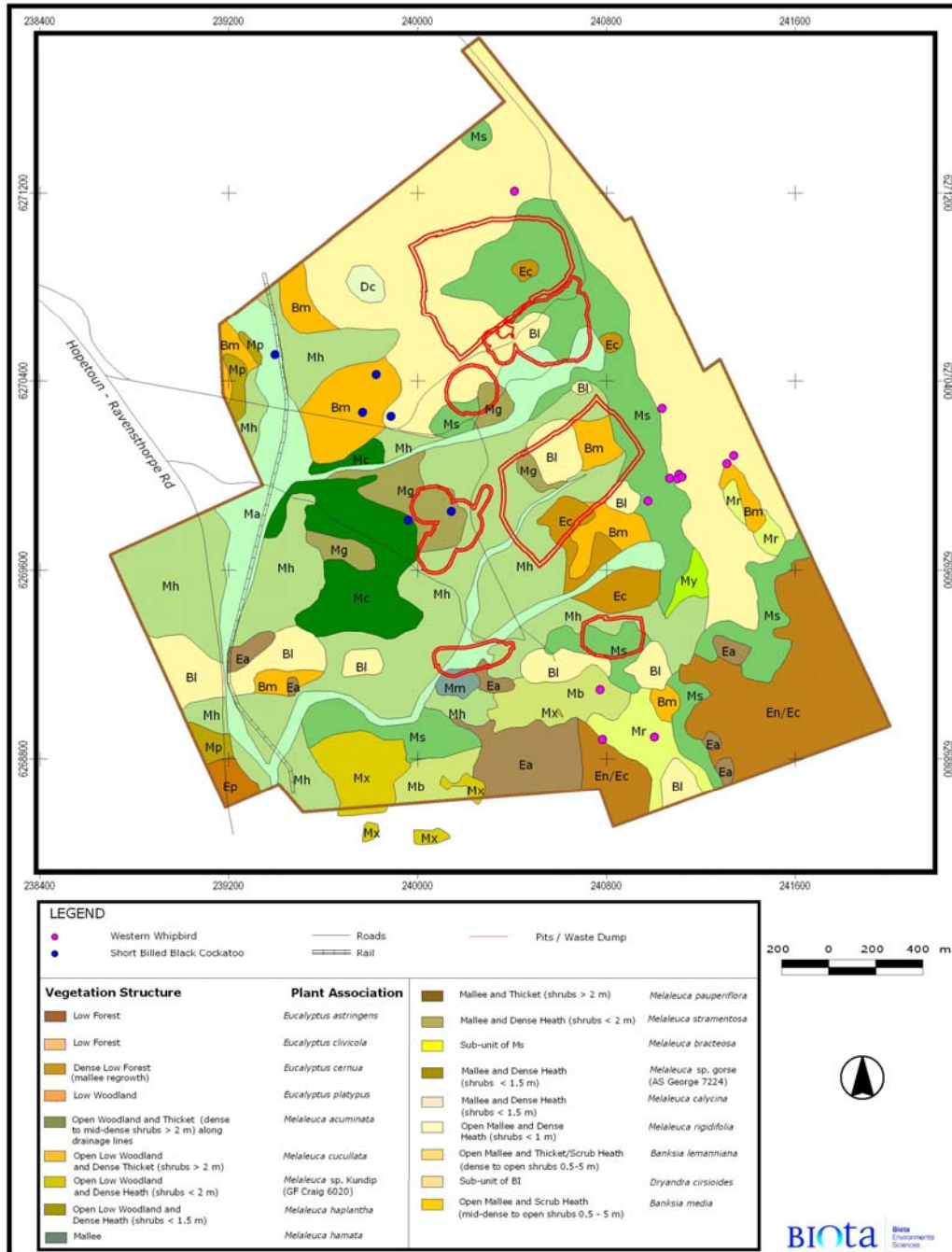


Figure 3. A map showing the location of all Western Whipbird and perched Carnaby’s Black-Cockatoos during the Phase II survey in relation to vegetation communities and the proposed pit and overburden sites.

Table 4: Mammal Site x Species matrix for Phase II of the Kundip fauna survey.

Species Name	Total	KU1	KU2	KU3	KU4	KU5	KU6	KU7	KU14	KU15	KU16	KU17	KU18	KU19	KU20
<i>Tachyglossus aculeatus</i>	S								S						S
<i>Cercartetus concinnus</i>	59	14	4	6	5	11	6	13							
<i>Mus musculus</i>	22	3	1	2		1	2					2	6	4	1
<i>Rattus fuscipes</i>	148	1		1	2	14			28	19	13	8	20	16	26
<i>Sminthopsis griseoventer</i>	3					1		1					1		
<i>Tarsipes rostratus</i>	71	12	14	19	2	8	12	4							

Table 5: Trap effort and murid rodent capture success at Kundip and the Bandalup Hill Study Site.

	Pits	Elliotts	Cages	<i>Rattus fuscipes</i>	<i>Mus musculus</i>	<i>Pseudomys albocinereus</i>	<i>Pseudomys shortridgei</i>	<i>Pseudomys occidentalis</i>
Bandalup†	480	1000	200	147	211	0	5	17
Bandalup*	534	1100	60	39	6	1	1	2
Kundip If	516	800	125	16	6	0	0	0
Kundip II°	588	1780	224	148	22	0	0	0

†Chapman (2000)

*Biota (2000)

f Biota (2004)

° This document

Table 6: Herpetofauna Site x Species matrix for Phase II of the Kundip fauna survey (species denoted with an * were not recorded during Phase I).

Species Name	Total	KU1	KU2	KU3	KU4	KU5	KU6	KU7	KU14	KU15	KU16	KU17	KU18	KU19	KU20	Opp
<i>Litoria cyclorhyncha</i>	1															1
<i>Amphibolurus norrisi*</i>	2					2										
<i>Ctenophorus maculatus griseus</i>	4													2		2
<i>Varanus rosenbergi</i>	12	1			3	1	2	2		1	1			1		
<i>Christinus marmoratus</i>	5					2		2								1
<i>Crenadactylus ocellatus ocellatus</i>	2			1												1
<i>Diplodactylus g. granariensis</i>	8						7	1								
<i>Underwoodisaurus milii</i>	4			1	1	1		1								
<i>Delma australis</i>	1		1													
<i>Delma fraseri fraseri</i>	3		1				1									1
<i>Cryptoblepharus virgatus clarus</i>	11				6	1	3	1								
<i>Ctenotus impar</i>	2		1	1												
<i>Hemiergis initialis initialis</i>	14		2	1												11
<i>Hemiergis peronii tridactyla</i>	4		1	1	1			1								
<i>Lerista distinguenda</i>	5	1	2	1			1									
<i>Menetia greyii</i>	1			1												
<i>Morethia obscura</i>	15	2	4	5	1	1	1									1
<i>Tiliqua occipitalis*</i>	1												1			
<i>Tiliqua rugosa rugosa</i>	6			1			1		1			1			2	
<i>Ramphotyphlops australis*</i>	3	1		1				1								
<i>Elapognathus coronatus*</i>	1															1
<i>Notechis scutatus</i>	1												1			
<i>Pseudonaja affinis affinis</i>	4	1				1	2									

- Carnaby's (Short-billed) Black-Cockatoo *Calyptorhynchus latirostris* (Endangered under *Wildlife Conservation Act 1998* (WA); Endangered under the *EPBC Act 1999* (Cth))

This species was frequently observed flying through the study area but was only observed perching on six occasions. On each of the latter occasions birds were also seen foraging, so food species were recorded. Of the six observations, two were in *Banksia media* open mallee and scrub heath with single records in each of *Melaleuca acuminata* open woodland and thicket, *Melaleuca cucullata* open low woodland and dense thicket, *Melaleuca* sp. Gorse (AS George 7724) mallee and dense heath and *Banksia lemmaniana* open mallee and thicket scrub/heath (Figure 3). In these habitats, there were three observations of birds feeding in *Eucalyptus pleurocarpa*, two observations of birds feeding in *Hakea laurina* and one observation of birds feeding in *Eucalyptus astringens*. There was also an additional record of signs of Carnaby's Black-Cockatoo feeding in *Eucalyptus platypus* low woodland in the south-west corner of the study area. There were no records of breeding during the survey. During Phase I this species was recorded flying over the project area on three occasions.

Table 7: Total area of each vegetation type mapped within the project area and expected area of disturbance associated with mine development (Vegetation codes are given in Figure 2).

Plant Association	Vegetation Code	Total area mapped (ha)	Total area to be disturbed (ha)	Remaining area undisturbed (ha)
<i>Banksia lemmaniana</i>	Bl ⁺⁺	158.46	22.88	135.58
<i>Banksia media</i>	Bm [†]	31.75	3.32	28.43
<i>Dryandra cirsioides</i>	Dc	1.92		1.92
<i>Eucalyptus astringens</i>	Ea	18.69	0.18	18.51
<i>Eucalyptus clivicola</i>	Ec	11.32	3.27	8.05
<i>Eucalyptus cernua</i>	En/Ec	47.27		47.27
<i>Eucalyptus platypus</i>	Ep	2.76		2.76
<i>Melaleuca acuminata</i>	Ma [†]	46.96	4.25	42.71
<i>Melaleuca bracteosa</i>	Mb [*]	15.39		15.39
<i>Melaleuca cucullata</i>	Mc [†]	26.10	0.03	26.07
<i>Melaleuca</i> sp. Gorse	Mg [†]	16.26	6.83	9.43
<i>Melaleuca hamata</i>	Mh	135.12	16.04	119.08
<i>M. pauperiflora</i>	Mm	1.77	0.29	1.48
<i>Melaleuca haplantha</i>	Mp	4.32		4.32
<i>Melaleuca rigidifolia</i>	Mr [*]	11.23		11.23
<i>M. stramentosa</i>	Ms [*]	76.96	24.12	52.84
<i>Melaleuca</i> sp. Kundip	Mx	12.71		12.71
<i>Melaleuca calycina</i>	My	2.13		2.13
		621.12	81.21	539.91

* Vegetation units from which the Western Whipbird *Psophodes nigrogularis oberon* was recorded.

† Vegetation units from which the Carnaby's (Short-billed) Black-Cockatoo *Calyptorhynchus latirostris* was recorded.

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- Malleefowl *Leipoa ocellata* (Vulnerable under *Wildlife Conservation Act 1998*; Vulnerable under the *EPBC Act 1999*)

This species is associated with mallee, particularly floristically rich dense mallee associations. Mounds are typically constructed where there is deep litter and soil allowing construction (Marchant and Higgins 1993; Johnstone and Storr 1998). Soils are typically sands or sandy-loams allowing drainage; heavier soils such as clays and clay-loams are often avoided.

Birds show long-term monogamy (Marchant and Higgins 1993), probably for the adult life. Home range estimates during breeding season (in South Australia) vary from 1.7 to 4.6km² (Marchant and Higgins 1993); they have been reported as smaller (0.49 – 0.75km²) during the non-breeding season in Victoria (Marchant and Higgins 1993).

There were no sightings of Malleefowl during the current survey though a single individual was reported during Phase I (Biota 2004). According to Angela Sanders, there were regular sightings around the Kundip townsite several years ago. In view of this it is suggested that a sweep of the impact areas using the "human chain" technique be undertaken prior to clearing. It is recommended that the Malleefowl Preservation Group be contacted in respect of methodology and subsequent management.

- Invertebrate Taxa

The survey recorded a number of invertebrate taxa that are awaiting identification. Amongst the specimens collected were three mygalomorph spiders of the family Nemesiidae. Previously at Kundip we recorded the widespread *Aname mainae* and *Chenistonia tepperi* (Family Nemesiidae) (Biota 2004).

No additional *Bothriembryon* (land snails) were collected from the study area despite targeted searches for these and other short range endemic taxa. These would be more readily collected during rainfall events in winter or following heavy summer rainfall.

Conclusion

The Phase II survey added an additional 11 species to those recorded during Phase I. Significantly, no additional species of conservation significance were recorded over and above those recorded during Phase I.

The baseline survey work at Kundip has now utilised 4184 trap nights comprising 1104 pit-fall trap nights, 2780 Elliott trap nights and 300 cage trap nights to assess the ground fauna. The persons undertaking the field-work have experience with small ground mammals in the region (eg. Andy Chapman re-discovered *Pseudomys shortridgei* in his survey work of the Ravensthorpe Range). However, no ground mammals of conservation significance have been recorded from the Kundip project area.

Survey work at Bandalup Hill using the same field personnel and comparable survey effort has recorded two rodent species of conservation significance (see Table 5). It would seem that if *P. shortridgei* or other small ground mammals do occur in the study area, then they are either at numbers not readily detectable by the trapping effort deployed to date and/or occur in adjacent areas not sampled. Given that the pit traps are still in the ground, the opportunity presents itself to undertake further trapping in the future.

There were at least several pairs of Western Whipbirds recorded in the study area. It is difficult to predict how many pairs are likely to be affected by the proposed development, but it will depend on the habitat preference of the species in the study

and the home range of the species. The home range of the species in the study area is unknown but there are several estimates from the literature (see above). A typical home range for *Psophodes nigrogularis oregon* appears to be around 7 to 10 ha for a pair. This would correlate to a maximum of between 7 (only Bl, Bm, Ma, Mc, Mg vegetation types and 10ha home range) and 8 (all vegetation types and 7ha home range) pairs being lost depending on habitat preference and actual home range size. The above estimates compare to a maximum of between 54 and 77 pairs potentially remaining outside of the impact area, again dependent on habitat preference and home range size. Naturally, home ranges may not neatly coincide with boundaries of impact areas, rather it is more likely that some home ranges will straddle to a greater or lesser degree the edge of the impact areas resulting in a greater loss than predicted by area calculations alone. On the other hand, there are several reasons to expect that the number of pairs lost is likely to be lower than the maximum given above although the exact number cannot be accurately predicted based on current knowledge.

Given that the status of the *Bothriembryon* sp. remains unclarified it is suggested that a collection be made following significant rainfall events and that the specimens be forwarded to Ms. Shirley Slack-Smith of the Museum of Western Australia and Dr Mike Johnson from the University of Western Australia.

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Yours faithfully,

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