FAUNA SURVEY

VERTEBRATE FAUNA OF THE MARANDOO TO GREAT NORTHERN HIGHWAY ROAD

A report to the Main Roads Western Australia, Pilbara Region, and the Shire of Ashburton from the Pilbara Region, Department of Conservation and Land Management.

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1. INTRODUCTION.

1.1 Background and Aims.

The Shire of Ashburton, in conjunction with the Main Roads Western Australia, propose to construct a new 76 km road linking the Marandoo Access Road to the Great Northern Highway. This road will traverse the Karijini National Park and parts of the Juna Downs pastoral lease. As part of the environmental review process, set at a Consultative Environmental Review (CER) level, the Environmental Protection Authority (EPA) identified key environmental issues to be addressed. Key issues specifically related to fauna included

- the protection of rare fauna, and the timing of surveys to determine the presence of rare fauna.
- the protection of fauna having significant conservation values.

To fulfil the EPA guidelines and associated review requirements, the proponents commissioned the Department of Conservation and Land Management's (CALM) Pilbara Region to undertake a survey of vertebrate fauna of the proposed road alignment. This survey addressed the specific objectives of the study brief, and was designed to comply with Departmental (CALM) and National Parks and Nature Conservation Authority (NPNCA) guidelines for biological surveys on Conservation Estate.

This report provides

A) - an inventory of vertebrate fauna species recorded on the proposed road alignment during this survey, including published and unpublished species records for the project area, and a listing of seasonal migrants and cryptic species likely to occur but as yet unrecorded by this survey.

B) - a review of fauna species considered to be rare and endangered, geographically restricted or represented by outlier populations within the study area.

C) - a assessment of the proposal upon pebble mound mouse communities (*Pseudomys chapmani*) along the alignment.

D) - a review of pest, declared or vermin animals.

E) - a review of fauna species in need of special consideration.

F) - an assessment of the relationship between vertebrates and the plant communities present in the survey area, and identification of habitats of special significance to vertebrates

G) - a review of the zoogeographic region as a whole, and an assessment of the regional and local conservation status of the survey area fauna.

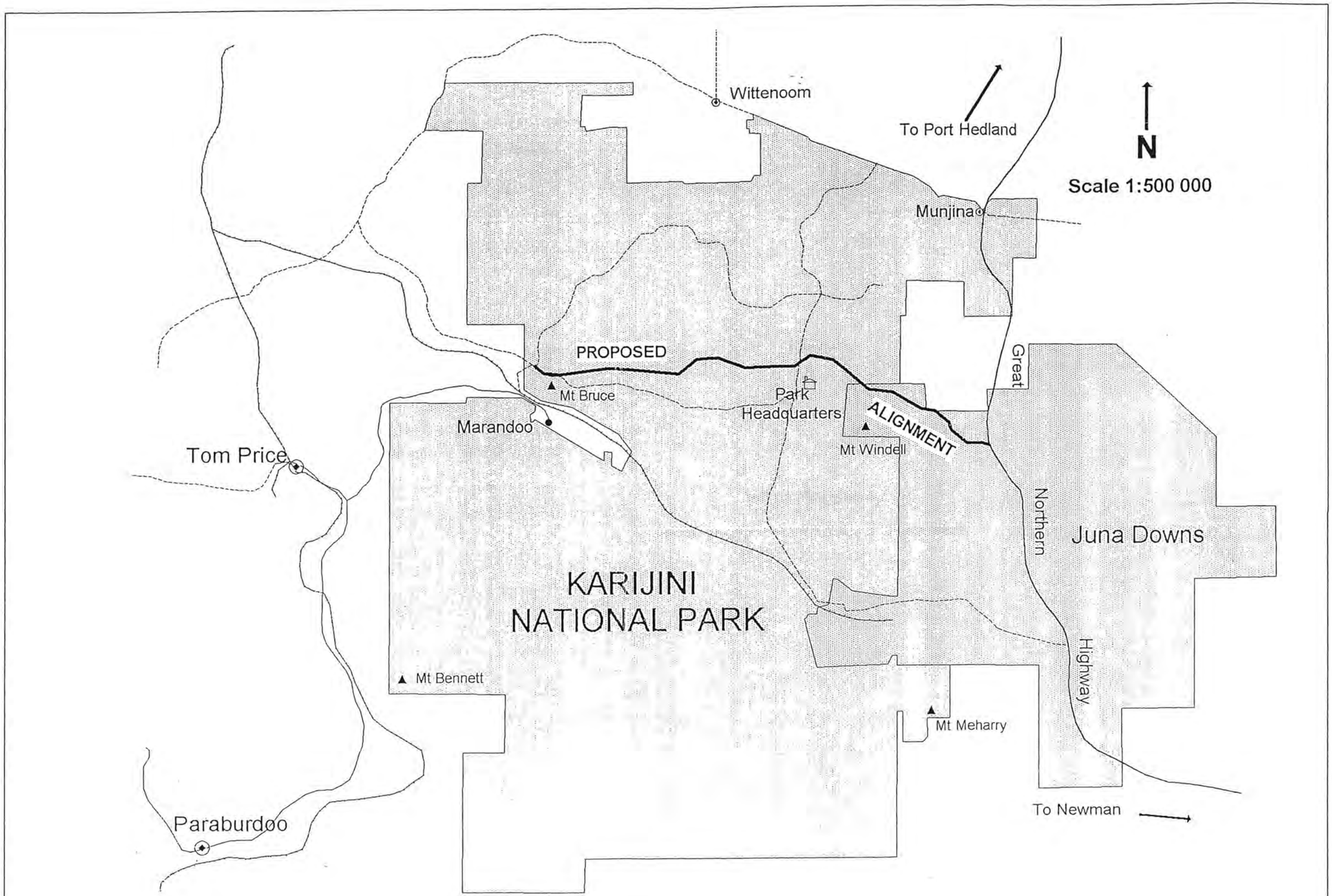
H) - an assessment of the value of the survey are in providing habitat and facilitating movement between conservation areas.

I) - provide information directed toward practical management techniques for improving the value of roadsides for conservation of fauna species known to exist within, or use, this survey area.

1.2 Location of Study Area.

The survey area is located in the central Pilbara Region of Western Australia (Figure 1). The proposed 76 km road links the Marandoo Access Road, via the Karijini Link Road in the west to the Great Northern Highway in the east. The alignment traverses the Karijini National Park and a portion of the Juna Downs Pastoral Lease. The proposed alignment does not follow existing transport infrastructure alignments, such as the existing Mount Bruce Flats Road. It passes to the north of the Mount Bruce Flats Road, Dinner Hill, Karijini National Park Headquarters and Mount Windell, and approximately follows an existing minor track to the Great Northern Highway.

Figure 1 Locality plan for the proposed Marandoo to Great Northern Highway Road.



LOCALITY PLAN
MARANDOO TO GREAT NORTHERN HIGHWAY ROAD

2. METHODOLOGY.

Vertebrate fauna survey was undertaken in two phases. An early concept of the proposed route was based upon upgrading the existing road between the Yampire Gorge Road and the Marandoo Access Road, therefore requiring new construction east of the Yampire Gorge Road only. However, subsequent changes to the proposed western alignment required fauna survey of sites in the western portion as well.

- Phase one consisted of nine vertebrate survey sites installed between the Great Northern Highway and the Yampire Gorge Road, adjacent to the existing minor track.

- Phase two consisted of fourteen vertebrate survey sites installed between the Karijini Link Road and Mount Windell.

Results from these two phases of survey are presented combined below.

2.1 Survey sites and site selection.

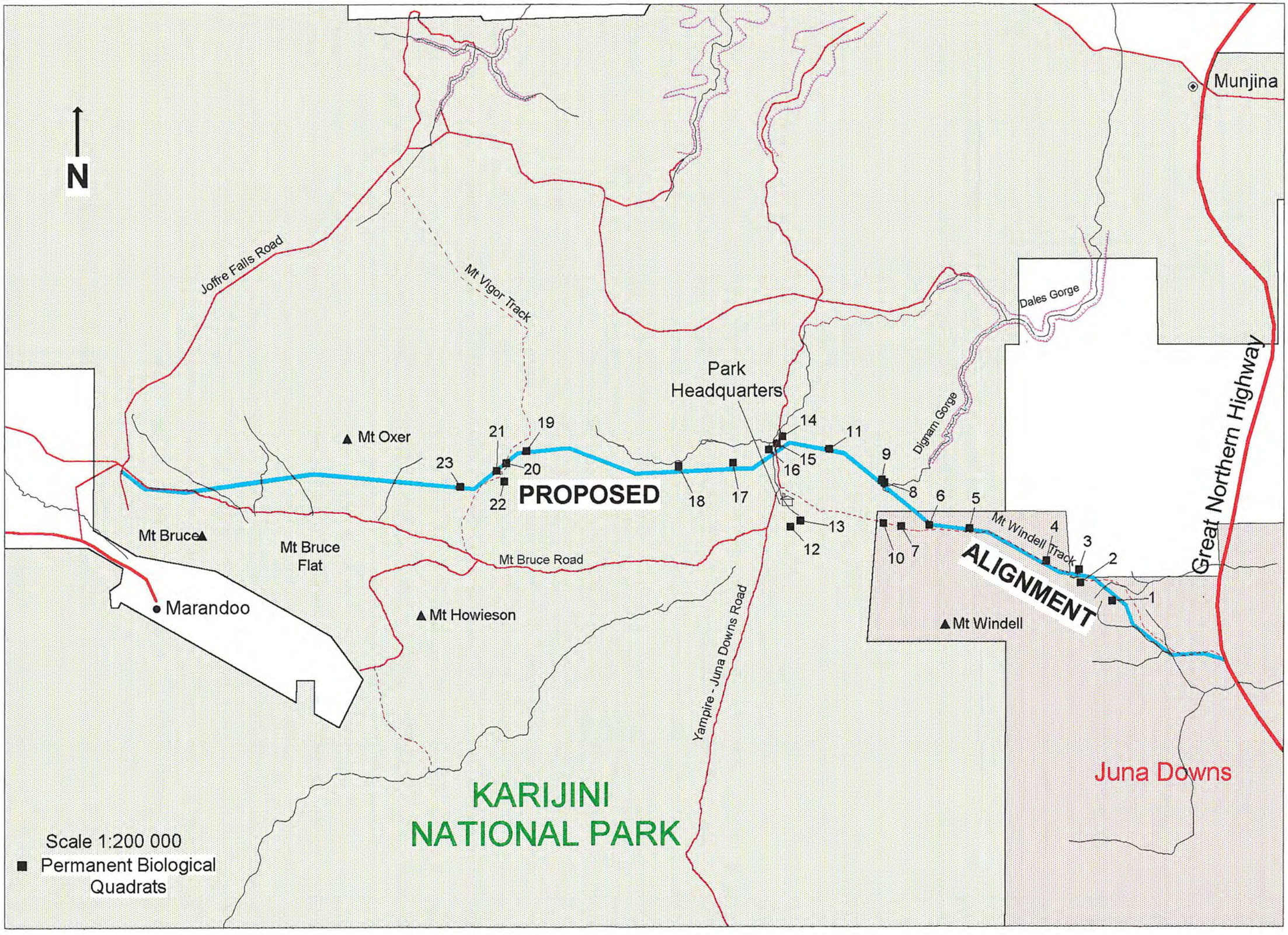
Twenty three vertebrate survey sites were established along the proposed alignment (Figure 2). Survey sites were selected following ground and air reconnaissance, to represent landform units and vegetation associations present. Where possible, replicate sites were installed in each habitat type. Table 1 gives Australian Map Grid coordinates for all 23 sites.

In all cases, vertebrate sampling sites were located adjacent to or within associated flora / vegetation survey quadrats.

Table 1. Australian Map Grid coordinates for the 23 vertebrate trapping sites. Location coordinates are derived from the datum point of the associated vegetation quadrat. Site locations are covered by the 'Mindi' and Mount Windell' 1:50 000 Topographic series (R712, sheets 2552 1 and 2652 4).

Site N°.	AMG Coordinates		Year Established
	Easting	Northing	
1	668054	7496414	1991
2	665206	7497060	1991
3	665207	7497183	1991
4	664385	7497715	1991
5	660035	7499545	1991
6	657751	7499610	1991
7	656209	7499708	1991
8	656228	7501492	1995
9	656143	7501616	1995
10	655239	7499841	1991
11	652225	7503993	1995
12	650012	7499739	1991
13	650558	7500072	1991
14	649604	7504756	1995
15	649286	7504360	1995
16	648826	7504026	1995
17	646308	7503619	1995
18	643761	7503152	1995
19	635258	7504183	1995
20	634165	7503238	1995
21	633733	7502873	1995
22	633957	7502388	1995
23	631499	7502154	1995

Figure 2 Locality plan for the 23 vertebrate sampling sites along the proposed road alignment.



Locality Plan - Permanent Biological Quadrats

2.2 Habitat types sampled.

Eight habitat types were identified from preliminary ground inspections of the study area. These are described below.

Mulga creeklines and washes (Mcrk). Drainage lines containing mulga (*Acacia anuera*) and dense *Themida* bunch grass, on heavy clay soils. Sites 12, 14, 16 and 17.

Mulga flats (Mflt). Flats valley floors containing grove/inter-grove mulga (*Acacia anuera*) over *Themida*, with annual herbs between mulga groves, on heavy clay soils. Sites 13 and 15.

Mulga slopes (Mslp). Stony colluvial slopes with scattered mulga (*Acacia anuera*) and other *Acacias*, over *Triodia* and *Plectrachne*. These mulga stands were often affected by burning. Sites 19 and 23.

***Plectrachne* flat (Pflt).** Sandy loam flats with dense *Plectrachne* cover, and scattered *Eucalyptus*. Site 18.

Snappy gum / mallee woodland (LGwld). *Eucalyptus leucophloeia* (snappy gum), *Eucalyptus gammophylla* (mallee), over *Triodia,* on stony loam soils. Sites 9 and 20.

***Acacia* shrubland over *Triodia* (Ashrb).** Mixed *Acacia* shrubland over *Triodia*, on stony loam soils. Sites 2, 3, 4, 6 and 11.

Mallee woodland over *Triodia* and *Plectrachne* (Gtrpl). Mallee woodland (*Eucalyptus gammophylla*) over *Triodia*, *Plectrachne*, on stony loam. Sites 5, 7, 10.

Snappy gum on rocky uplands (Rcky). *Eucalyptus gammophylla* and mixed *Acacia* shrubland over *Triodia*, on stony hills and breakaways. Soil development is minimal. Sites 1, 8, 21 and 22.

Of these eight habitat types, three were encountered only on the alignment surveyed in 1995. These were Mulga (*Acacia aneura*) slope communities (Mslp), *Plectrachne* flats (Pflt), and scattered *Eucalyptus leucophloeia* over *Triodia* hummock grasses (LGwdl). The other five community types were represented in both the 1991 and 1995 surveys.

2.3 Survey design and techniques.

Standard vertebrate survey techniques (pitfall traps, Elliott traps, hand searching, spotlighting and observation) were used at all sites.

Twenty-litre Rheem buckets were installed as pit traps, in arrays of twelve pits at each site. Pits were placed in pairs, approximately 5 metres apart, lying centrally along a 10 metre drift fence (aluminium flywire). Pairs were separated by between 20 - 30 metres. When not in use, pit traps were capped and buried. Pits were not

baited, due to very high ant activity at some sites. Pit traps were occasionally closed due to ants, and were cleared twice daily (early morning and late afternoon).

Seventeen medium sized Elliott traps were placed at each site for as many nights as possible, baited with universal bait (peanut paste, rolled oats, sultanas and sardines). Elliott traps were placed 20 to 30 metres apart, along a transect running both through and partly encircling the survey site. Elliott traps were inspected once or twice daily, and rebaited either daily or every two days, depending on trap success and insect activity.

Hand searching in debris, leaf litter *etc* was undertaken at all sites for a minimum of two person/hours, but usually for at least four person/hours or more. Night-time searching by head torch and spot light was undertaken for at least two person/hours at each site. Observation of birds and larger fauna were made opportunistically. No systematic survey for bats was attempted. Trapping effort varied between sites due to the time available. Table 2 shows the trapping effort for all sites.

Table 2. Trapping effort used on the 23 vertebrate trapping sites, for pitfall traps and Elliott traps.

		Trapping effort (trap/nights)	
Site N°.	N°. nights	Pit nights	Elliott nights
1	16	192	272
2	16	192	272
3	16	192	272
4	16	192	272
5	16	192	272
6	5	60	85
7	16	192	272
8	5	60	85
9	5	60	85
10	16	192	272
11	5	60	85
12	16	192	272
13	16	192	272
14	5	60	85
15	5	60	85
16	5	60	85
17	5	60	85
18	5	60	85
19	5	60	85
20	5	60	85
21	5	60	85
22	5	60	85
23	5	60	85

Voucher specimens were collected for most species encountered, excluding those where identification was unambiguous and specimens were of little value. Specimens were forwarded to the WA Museum for specific determinations. Animals not required as vouchers were released at their point of capture following identification.

Distribution of pebble mound mice (*Pseudomys chapmani*) was determined by the occurrence of mounds. The entire proposed route was inspected by vehicle, using two observers. Location of mounds which appeared to be active were mapped onto 1:50 000 topographic maps. Mounds deemed to be active were those which had small piles of freshly turned pebbles on their upper surfaces. These 'active' mounds were not checked individually to confirm the presence of *P. chapmani*. However, this was deemed sufficient to identify those areas containing the species.

Proposed borrow pit locations were checked specifically for the presence of *P. chapmani* mounds. Trapping was not undertaken to confirm the presence of *P. chapmani* within the pit locations. Locations of pits are given in Table 3.

Species distributions and nomenclatures used here follow the authorities listed below. More recent taxonomic treatments are used where appropriate.

Amphibians - Tyler *et al* . (1984).
Reptiles - Storr *et al.* (1981, 1983, 1986, 1990) and Wilson and Knowles (1988).
Birds - Blakers *et al.* (1984) and Storr (1984).
Mammals - Strahan (1983).

Table 3. Australian map Grid coordinates for the ten borrow pits investigated for the presence of pebble mound mouse (*Pseudomys chapmani*) during the survey of the proposed Marandoo to Great Northern Highway Road.

Borrow Pit	AMG Coordinates	
	Easting	Northing
1	674100	7492600
2	673100	7492800
3	670900	7493200
4	665300	7496700
5	662600	7499500
6	657700	7500100
7	650400	7507800
8	610700	7503400
9	613400	7507700
10	618200	7512200

2.4 Personnel.

The following personnel were involved in the fauna survey.

Principal Investigator (Zoologist)	Peter Kendrick (CALM).
Technical Assistance	Michael Hughes (CALM). John Angus (CALM volunteer). Stephen van Leeuwen (CALM). Robert Bromilow (CALM).
Field Assistance	Maitland Parker (CALM). Karijini Aboriginal Corporation
(contractors).	
	Ruth Hodson (CALM volunteer). Maria Vina-Cerdiera (CALM volunteer). Matthew Inman (CALM volunteer). David Hunt (CALM volunteer).
Specimen Identification	Norah Cooper (WA Museum). Laurie Smith (WA Museum).

3. RESULTS.

3.1 General patterns.

This survey recorded by observation or collection three amphibian, 49 reptile, 67 bird, one monotreme and 14 mammal species. Table 4 summarises the total numbers of species recorded for each of the habitat types examined.

Table 4. Total numbers of species recorded from the eight habitat types examined during the survey. See sections 3.3.2, 3.3.3 and 3.3.4 below for details.

Habitat abbrev.	Mcrk	Mflt	Mslp	Pflt	LGwld	Ashrb	Gtrpl	Rcky
Amphibians	3	1	2	0	0	0	0	1
Reptiles	13	20	6	1	11	24	16	20
Birds	46	30	12	6	11	25	20	21
Monotremes	0	0	0	0	0	0	0	1
Native Mammals	9	6	4	0	3	9	5	7
Introduced Mammals	1	2	1	1	0	3	1	0
TOTAL	**72**	**59**	**25**	**8**	**25**	**61**	**42**	**50**

Highest species richness was recorded from mulga (*Acacia aneura*) communities low in the landscape (creeks, washes and grove/intergrove flats), and *Acacia* shrublands (from 59 to 72 species in each). The poorest community type was *Plectrachne* grassland, with a total of eight vertebrate species. That this community was represented by only one site, and that site was only sampled for five nights trapping no doubt contributed to the low number of species recorded.

Sampling of sites surveyed in 1991 was over three times more intense than for sites surveyed in 1995. The results of mammal and reptile trapping reflect this difference in effort, as described for each of the fauna groups below.

3.2 Amphibians and Reptiles.

Table 5 lists the amphibian and reptile species collected or observed during this survey.

More species were recorded from sites which were more intensively trapped. Sites trapped in 1991 (192 trap nights per site) recorded more species per site (mean ± SE, 9.2 ± 1.1) than those sites trapped in 1995 (60 trap nights each: mean ± SE, 5.6 ± 0.9). This is expected, considering the large number of reptile species thought to occur at low densities or are cryptic, with resulting slow species accumulation curves during survey.

As expected, the herpetofauna species list recorded for the Hamersley Range area exceeds that obtained by this survey. Johnstone (in Dawe *et al.* 1983) lists 92 species of reptile and amphibian, in 11 families. Of these families, the only one absent in the present survey were the Cheluidae (represented in the Pilbara by *Chelodina steindachneri*, a fresh water tortoise). This is expected, due to the absence of permanent water within the study area.

Three frog species were recorded, out of a probable total of five. Species like *Pseudophryne douglasi* are present id gorge habitats close to the study area, but would not be expected within the habitats sampled. It is possible that the valley habitats sampled during the study were unsuitable for *Cyclorana platycephalus*, as this species was not recorded despite rain falling during the survey.

Among the geckos, *Diplodactylus* were particularly poorly represented in this survey, with two out of the nine possible species recorded. Other genera (and most species) were represented, with the exception of *Oedura*. Eight of the seventeen gecko species probably occurring in the area were recorded.

Of the Pygopodidae, *Lialis burtonis* and *Pygopus nigriceps,* and several species of *Delma*, were not recorded in the present survey. *Lialis* and *Pygopus* were expected, as these species' are widespread and fairly common. Of the eight Pygopodids probably occurring along the proposed alignment, four were recorded in this survey.

Agamids were well represented; five species were recorded from a probable eight species occurring in the study area. *Caimanops amphiboluroides* was not recorded, although it is known to occur in mulga flat communities nearby. Several species of *Ctenophorus* were not recorded.

Fifteen skink species were recorded, out of a potential total of 23 species. Unexpected omissions from the list included *Cryptoblepharus plagiocephalus, Ctenotus helenae, Ctenotus leonhardii, Egernia formosa* and *Eremiascincus richardsonii*. Species like *Lerista chalybura* and/or *Lerista chalybura* were not collected along the proposed alignment, although they are known to inhabit gorge habitats close by.

Most Varanids probably occurring in the study area were recorded (six of a possible eight species). Although *Varanus gouldii* was not encountered, Johnstone (in Dawe *et al.* 1983) did not indicate that this species is common in the Hamersley range area, apparently being replaced by *V. panoptes*. *Varanus pilbaraensis* was also not encountered, although it is known to occur within rocky habitats such as gorges close to the study area.

Snakes were fairly well represented (11 species out of a possible 20 species), considering that these animals are often shy and occur at low density. Blind snakes have very cryptic habits, and this probably accounts for only one species of the several known from the area being recorded. The Pilbara olive python (*Morelia olivaceus barroni*) and pygmy python (*Morelia perthensis*) are known to occur in the vicinity of the survey area, but were not recorded in this survey. Elapids were well represented by eight species, although the burrowing snakes (*Vermicella*) and death adder (*Acanthophis pyrrhus*) were not recorded. Considered together, only two of the 11 species of snake recorded during this survey were represented by more than a single individual.

Table 5 Species of reptile and amphibian recorded from the eight habitat types recognised in this survey. Habitat abbreviations are those given in section 3.2.2 (above).

Habitat abbrev. Site numbers	Mcrk 12,14 16,17	Mflt 13,15	Mslp 19,23	Pflt 18	LGwld 9,20	Ashrb 2,3,4, 6,11	Gtrpl 5,7,10	Rcky 1,8,21, 22
AMPHIBIANS								
LEPTODACTYLIDAE								
Limnodynastes spenceri	+							
HYLIDAE								
Cyclorana maini	+		+					
Litoria rubella	+	+	+					+
REPTILES								
GEKKONIDAE								
Diplodactylus elderi						+		
Diplodactylus stenodactylus					+	+	+	
Gehyra pilbara						+	+	+
Gehyra punctata								+
Gehyra variegata	+	+						
Heteronotia binoei	+	+				+	+	+
Nephrurus wheeleri cinctus						+		
Rhynchoedura ornata	+	+						
PYGOPODIDAE								
Delma butleri		+	+				+	
Delma nasuta						+		
Delma pax						+	+	+
Delma tincta								+
AGAMIDAE								
Ctenophorus isolepis isolepis						+		
Ctenophorus c. caudicinctus		+	+		+	+	+	+
Pogona minor minor	+	+				+	+	+
Diporiphora valens					+			
Gemmatophora longirostris						+		+
SCINCIDAE								
Carlia munda	+	+	+		+	+	+	+
Carlia triacantha						+		
Ctenotus grandis titan		+						
C. pantherinus ocellifera	+	+	+	+	+	+	+	+
Ctenotus duricola					+	+		+
Ctenotus rubicundus					+			+
Ctenotus rutilans					+	+	+	+
Ctenotus saxatilis	+	+			+			+
Ctenotus schomburgkii	+	+	+				+	
Cyclodomorphus melanops		+	+			+	+	
Lerista muelleri	+					+		
Menetia greyii		+						
Morethia ruficauda exquisita					+			+
Proablepharus reginae		+						
Teliqua multifasciata						+		

Table 5 (continued)

Habitat abbrev.	Mcrk	Mflt	Mslp	Pflt	LGwld	Ashrb	Gtrpl	Rcky
Site numbers	12,14 16,17	13,15	19,23	18	9,20	2,3,4, 6,11	5,7,10	1,8,21, 22
VARANIDAE								
Varanus acanthurus					+			+
Varanus brevicauda						+	+	
Varanus caudolineatus	+							+
Varanus giganteus								+
Varanus panoptes rubidus						+		+
Varanus tristis tristis	+	+						
BOIDAE								
Aspidites melanocephalus		+						
Morelia s. stimsoni								+
ELAPIDAE								
Demansia rufescens	+							
Demansia psammophis cupriceps		+						
Denisonia fasciata							+	
Furina ornata							+	
Pseudechis australis		+						
Pseudonaja modesta						+		
Pseudonaja nuchalis		+				+		
Rhinoplocephalus monachus	+						+	
TYPHLOPIDAE								
Ramphotyphlops grypus		+						

3.3 Birds.

Table 6 lists the bird species recorded during this survey. Johnstone (in Dawe *et al.* 1983) lists 135 species from the vicinity of Karijini (then Hamersley Range) National Park, and others may also be present. Many species not recorded by the present survey were water birds (whose habitats did not lie within the study area), or migratory or uncommon species.

Survey effort did not appear to significantly influence the number of bird species recorded at sites during the survey. 1991 sites (16 days per site) recorded less species on average per site (mean ± SE; 9.0 ± 1.5) than those sites trapped in 1995 for five nights each (mean ± SE; 10.3 ± 1.7).

Some species of interest were noted. Johnstone (in Dawe *et al.* 1983) notes *Tyto alba* (Barn owl) as uncommon; one was observed by the present survey while spotlighting. *Podargus strigoides* (Tawny frogmouth) were common throughout the study area, although Johnstone records it as scarce. Both *Malurus leucopterus leuconotus* (White winged fairy wren) and *Stipiturus ruficeps ruficeps* (Rufous-crowned emu-wren), described by Johnstone as uncommon, were recorded in rocky country, and in mulga stands and *Eucalyptus gammophylla* woodlands. A population of *Acanthiza chrysorrhoa* (Yellow rumped thornbill), recorded from mulga stands along a creek, lies close to the northern limit of its range in the Pilbara. This species is locally uncommon.

A single *Falco hypoleucos* (Grey falcon) was recorded from mulga stands along a large creek line, in 1991. Johnstone (in Dawe *et al.* 1983) does not list this species in the area, and Storr (1984) note it as 'scarce visitor' to the Pilbara. This species is listed as 'Threatened', although it appears to be sparsely, though widely distributed in the arid zone.

A single *Conopophila whitei* (Grey honeyeater) was observed building a nest in grove-intergrove mulga in late June 1995. This species is listed as Threatened.

Table 6 Bird species recorded from the eight habitat types recognised in this survey. Habitat abbreviations and site numbers are those given in Section 2.2 and Table 1.

Habitat abbrev. Site numbers	Mcrk 12,14 16,17	Mflt 13,15	Mslp 19,23	Pflt 18	LGwld 9,20	Ashrb 2,3,4, 6,11	Gtrpl 5,7,10	Rcky 1,8, 21,22
CASUARIIDAE								
Emu	+	+				+		
Dromaius novaehollandiae novaehollandiae								
ACCIPITRIDAE								
Wedge-tailed eagle	+				+			+
Aquila audax								
Black-shouldered kite	+							
Elanus caeruleus notatus								
Spotted harrier	+							
Circus assimilis								
FALCONIDAE								
Grey falcon	+							
Falco hypoleucos								
Brown falcon	+		+			+	+	
Falco berigora berigora								
Little falcon	+							
Falco longipennis longipennis								
Australian kestrel						+		
Falco cenchroides cenchroides								
TURNICIDAE								
Little button quail	+	+	+				+	+
Turnix velox								
COLUMBIDAE								
Diamond dove	+							+
Geopelia cuneata								
Common bronzewing	+					+		+
Phaps chalcoptera								
Spinifex pigeon								+
Geophaps plumifera								
Crested pigeon	+	+	+			+		
Ochyphaps lophotes								
PSITTACIDAE								
Budgerigar	+		+		+	+	+	+
Melopsittacus undulatus								
Ring-necked parrot						+	+	
Platycercus zonarius zonarius								
Galah	+	+						
Cacatua roseicapilla								
Little corella	+	+						
Cacatua pastinator westralensis								
CUCULIDAE								
Pallid cuckoo	+	+			+	+		+
Cuculus pallidus								
Horsfields bronze cuckoo	+	+						
Chrysococcyx basalis								
STRIGIDAE								
Barn owl						+		
Tyto alba delicatula								

Table 6 (continued)

Habitat abbrev. / Site numbers	Mcrk 12,14 16,17	Mflt 13,15	Mslp 19,23	Pflt 18	LGwld 9,20	Ashrb 2,3,4, 6,11	Gtrpl 5,7,10	Rcky 1,8, 21,22
PODARGIDAE								
Tawny frogmouth *Podargus strigoides*	+	+				+		
AEGOTHELIDAE								
Australian owlet-nightjar *Aegotheles cristatus cristatus*					+			+
CAPRMULGIDAE								
Spotted nightjar *Eurostopodus argus*	+	+				+	+	+
ALCEDINIDAE								
Red-backed kingfisher *Halcyon pyrrhopygia*	+		+	+		+	+	
Sacred kingfisher *Halcyon sancta sancta*								+
CAMPEPHAGIDAE								
Black-faced cuckoo-shrike *Coracina novaehollandiae subpallida*	+		+					
White-winged triller *Lalage sueurii tricolor*	+	+						
PACHYCEPHALIDAE								
Red-capped robin *Petroica goodenovii*		+						
Hooded robin *Petroica cucullata*	+	+			+	+	+	
Grey shrike-thrush *Colluricincla harmonica rufiventris*	+					+	+	
Rufous whistler *Pachycephala rufiventris rufiventris*	+	+					+	+
Crested bellbird *Oreoica gutturalis*	+				+	+	+	
MONARCHIDAE								
Willie wagtail *Rhipidura leucophrys leucophrys*	+	+	+	+	+	+		
ORTHONYCHIDAE								
Grey-crowned babbler *Pomatostomus temporalis*	+	+						
ACANTHIZIDAE								
Western flyeater *Gerygone fusca fusca*	+	+		+			+	
Weebill *Smicrornis brevirostris*								+
Broad-tailed thornbill *Acanthiza (pusilla) apicalis*	+							
Chestnut-rumped thornbill *Acanthiza uropygialis*		+						
Yellow-rumped thornbill *Acanthiza chrysorrhoa*	+							

Table 6 (continued)

Habitat abbrev. / Site numbers	Mcrk 12,14 16,17	Mflt 13,15	Mslp 19,23	Pflt 18	LGwld 9,20	Ashrb 2,3,4, 6,11	Gtrpl 5,7,10	Rcky 1,8, 21,22
MALURIDAE								
Rufous-crowned emu-wren *Stipiturus ruficeps ruficeps*	+						+	
Variegated fairy-wren *Malurus lamberti assimilis*	+	+				+		+
White-winged fairy-wren *Malurus leucopterus leuconotus*								+
SYLVIIDAE								
Rufour songlark *Cincloramphus mathewsi*	+	+						
Spinifex bird *Eremiornis carteri*					+	+	+	+
CLIMACTERIDAE								
Black-tailed treecreeper *Climacteris melanura wellsi*					+			+
PARDALOTIDAE								
Striated pardalote *Pardalotus striatus murchisoni*						+		+
MELIPHAGIDAE								
Brown honeyeater *Lichmera indistincta indistincta*	+	+		+		+		
Pied honeyeater *Certhionix niger*						+	+	
Singing honeyeater *Meliphaga virescens*	+	+	+			+		+
Grey-headed honeyeater *Meliphaga keartlandi*						+		
White-plumed hoeyeater *Meliphaga penicillata*	+							
Black-chinned honeyeater *Melithreptus gularis laetior*	+							
Spiny-cheeked honeyeater *Acanthagenys rufogularis*	+	+						
Grey honeyeater *Conopophila whitei*		+						
Yellow-throated miner *Manorina flavigula*	+	+	+				+	+
Crimson chat *Epthianura tricolor*							+	
PLOCEIDAE								
Painted finch *Emblema pictum*	+	+						+
Star finch *Neochmia ruficauda clarescens*	+							
Zebra finch *Poephila guttata castanotis*	+	+						
GRALLINIDAE								
Australian magpie-lark *Grallina cyanoleura*	+					+		

Table 6 (continued)

Habitat abbrev. / Site numbers	Mcrk 12,14 16,17	Mflt 13,15	Mslp 19,23	Pflt 18	LGwld 9,20	Ashrb 2,3,4, 6,11	Gtrpl 5,7,10	Rcky 1,8, 21,22
ARTAMIDAE								
Black-faced woodswallow *Artamus cinereus melanops*	+	+	+	+	+		+	
Little woodswallow *Artamus minor*				+	+		+	
Masked woodswallow *Artamus personatus*	+		+					
CRACTICIDAE								
Grey butcherbird *Cracticus torquatus torquatus*		+						
Pied butcherbird *Cracticus nigrogularis*		+				+	+	+
Australian magpie *Cracticus tibicen tibicen*							+	
CORVIDAE								
Little crow *Corvus bennetti*	+	+	+					

3.4 Mammals.

Table 7 lists all mammal species recorded during the survey. Fifteen native species (including the Monotreme *Tachyglossus*) and three introduced mammal species were recorded. None of these species were unexpected for the survey area.

As with herpetofauna, more species were recorded from sites which were more intensively trapped than from those with less intensive trapping. 1991 sites, sampled by 464 trap/nights (272 Elliotts + 192 pits, over 16 nights) recorded more species per site (mean $\pm$ SE; 5.2 $\pm$ 0.6) than those sites trapped in 1995 by 145 trap/nights (85 Elliotts + 60 pits, over 5 nights; mean $\pm$ SE; 3.7 $\pm$ 0.8).

Most of the mammal species recorded were fairly widely distributed among different habitat types. The most localised species within the present survey was the rock rat *Zyzomys argurus*, found only in rocky break-away habitats.

Pebble mound mice (*Pseudomys chapmani*) were trapped or active mounds were observed in four habitats, associated with stony or pebbly slopes or uplands. *Pseudomys chapmani* is listed on Schedule 1 of the Wildlife Conservation Act (fauna which is rare or likely to become extinct), and as Vulnerable under the IUCN Red List Categories Version 2.2. However, it appears to be relatively common and widespread within the central Pilbara,. including the vicinity of the proposed road. Figure 3 shows the occurrence of areas containing pebble mounds located during this survey.

A number of species known to occur within the vicinity from WA Museum collections, Dawe *et al.* (1983) and the Marandoo surveys (Hamersley Iron Pty Ltd 1992) were not recorded during the present survey. Excluding bats, native species not recorded include *Dasyurus hallucatus, Pseudantechinus macdonnellensis, Planigale ingrami, Notomys alexis* and *Petrogale rothschildii*. Of these, *P. macdonnellensis* and *P. ingrami* are uncommon and are rarely trapped. *Notomys alexis* was thought to be rare or absent from the central Hamersley Plateau. Rothschilds rock wallaby (*Petrogale rothschildii*) frequents gorge habitats which were not present within the survey area (although populations occur in Dales, Dignams and Munjina Gorges, just to the north of the survey area). In addition to these species, *Sminthopsis longicaudata* are known from the southern margins of the Hamersley plateau. *Sminthopsis longicaudata* is very rarely trapped, but is possibly present in rocky country within the study area.

Echidnas (*Tachyglossus aculeatus*) were probably present in all sites, but sign was only observed at one rocky site among breakaways.

Limited effort was put into bat collection, and only three common and widespread species (*Vespadalus* (*Eptesicus*) *finlaysoni, Chaerophon jobensis* and *Chalinolobus gouldi*) were recorded from mulga creekline habitats.

Table 7. Monotreme and mammal species recorded from the eight habitat types recognised in this survey. Habitat abbreviations are those given in section 3.2.2 (above).

Habitat abbrev. Site numbers	Mcrk 12,14 16,17	Mflt 13,15	Mslp 19,23	Pflt 18	LGwld 9,20	Ashrb 2,3,4, 6,11	Gtrpl 5,7,10	Rcky 1,8, 21,22
TACHYGLOSSIDAE								
Tachyglossus aculeatus								+
DASYURIDAE								
Dasykaluta rosamondae		+	+			+	+	
Sminthopsis ooldea						+	+	+
Sminthopsis macroura	+	+			+	+	+	
Ningaui timealeyi	+	+	+			+	+	+
Planigale maculata					+			+
MACROPODIDAE								
Macropus robustus	+	+				+		+
Macropus rufa	+	+				+		
MOLOSSIDAE								
Chaerophon jobensis	+							
VESPERTILIONIDAE								
Chalinolobus gouldi	+							
Vespadalus finlaysoni	+							
MURIDAE								
Pseudomys chapmani			+		+	+		+
P. hermansburgensis	+	+	+			+	+	+
Zyzomys argurus								+
MURINAE								
Mus musculus	+	+	+	+		+		
CANIDAE								
Canis familiaris dingo	+					+		
FELIDAE								
Felis catus		+				+		
BOVIDAE								
Bos taurus						+	+	

3.5 Significant species.

3.5.1 Pebble mound mouse, *Pseudomys chapmani.*

Listed on Schedule 1 (Wildlife Conservation Act; rare or likely to become extinct), *P. chapmani* is common in suitable habitat across the Hamersley plateau. Figure 3 shows areas of the proposed road alignment along which *P. chapmani* is known to occur, either though trapping of individuals or the presence of active pebble mounds. Pebble mounds were judged to be active if pebbles on the surface appeared to be freshly rearranged, and if the surface of the mound showed well developed conical entry/exit points.

Pseudomys chapmani appears to be secure within its present range, and suitable habitat is widespread. This project will impose localised impacts upon the species within a small part of its current range.

3.5.2 Grey falcon, *Falco hypoleucos.*

Listed on Schedule 1 (Wildlife Conservation Act), *Falco hypoleucos* is uncommonly recorded over much of its range. It probably occurs throughout the Pilbara, but at low density. Very little is known about the species, and it is therefore difficult to know what effect, if any, the proposed road will have. However, it is unlikely that construction of the road would have major impact upon the local populations of *F. hypoleucos.*

3.5.3 Grey honeyeater, *Conopophila whitei.*

Listed on Schedule 1 (Wildlife Conservation Act), *Conopophila whitei* is locally common (Storr 1984) but generally sparsely distributed. Little is known of this species, but its preferred habitat is *Acacia aneura* and *A. citrinoviridis* communities. The size of this population is unknown, as is its occurence other areas of mulga in the area.

3.5.4 Yellow rumped thornbill, *Acanthiza chrysorrhoa.*

Listed as scarce by Johnstone (in Dawe *et al.* 1983), *A. chrysorrhoa* was known from two locations in the vicinity of the survey area (mulga- eucalypt at Mt Bruce, and 14 kilometres SW of Dales Gorge). The second of these corresponds very closely with the location at which this species was observed during the present survey (Site 14).

These localities must be close to the northern limits of the species within the Pilbara. However, the presence of *A. chrysorrhoa* in adjacent areas of suitable habitat is unknown. It is clearly uncommon, and appears to depend upon large mulga stands. Its presence in mulga areas already bisected by roads may indicate that it will not be threatened by the proposed route.

3.5.5 Pilbara olive python, *Morelia olivaceus barroni.*

Although not recorded by this survey, *Morelia olivaceous barroni* has been observed by CALM staff in the vicinity of the proposed alignment in the past. This species is listed on Schedule 1 (Wildlife Conservation Act), as fauna which is rare or likely to become extinct. This species is known to occur in most habitats within the study area, but is most commonly found in or near rocky areas and gorges. The proposed alignment may impact upon this species in the vicinity of the rock areas traversed to the north of Dinner Hill and to the north of Mount Windell, but the species appears to be well represented throughout the Karijini National Park and elsewhere within the Pilbara.

Figure 3 General locations of 'active' *Pseudomys chapmani* pebble mounds located during the survey along the proposed road alignment.

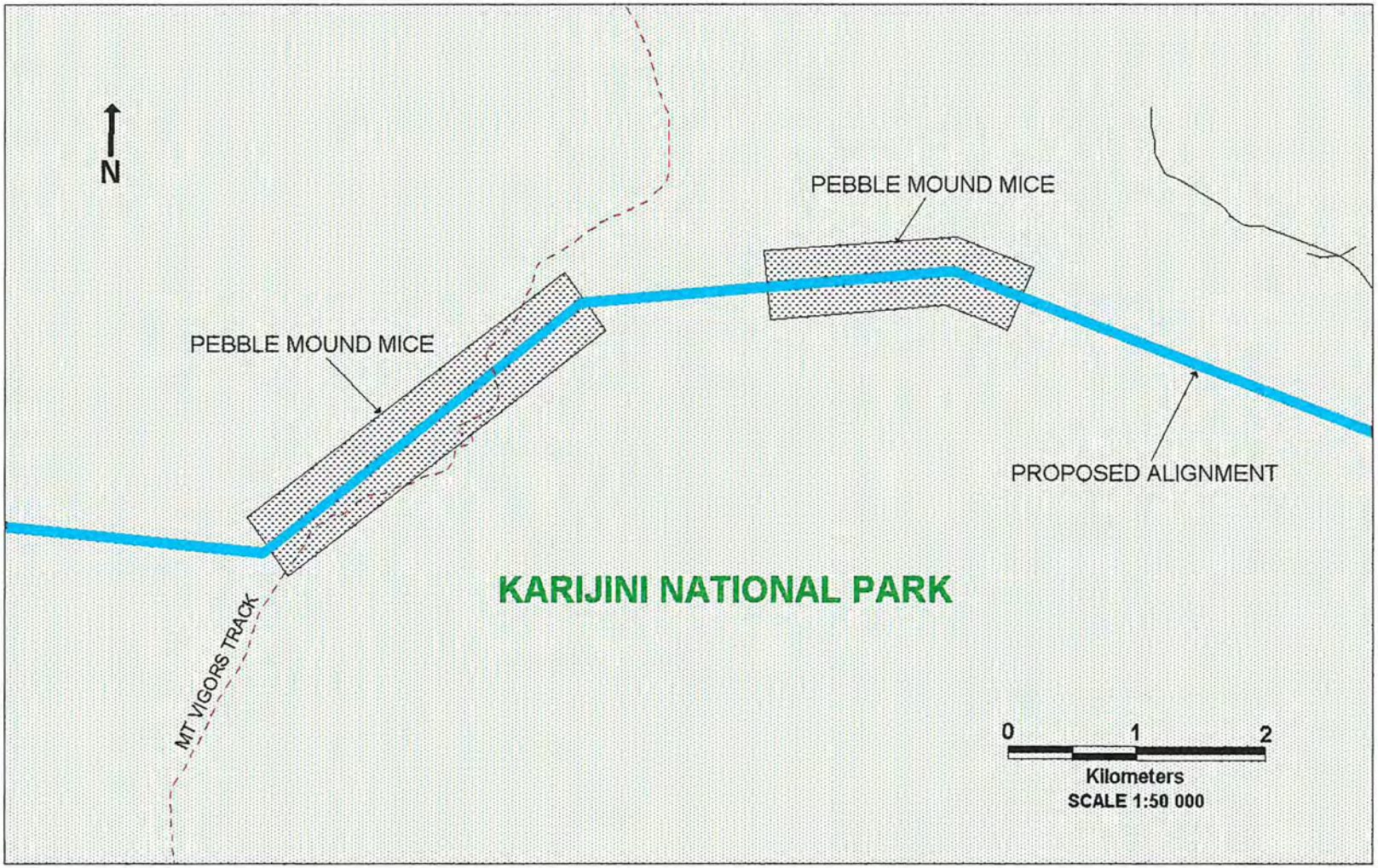


FIG. 3a LOCATION OF PEBBLE MOUND MICE, *Pseudomys chapmani*

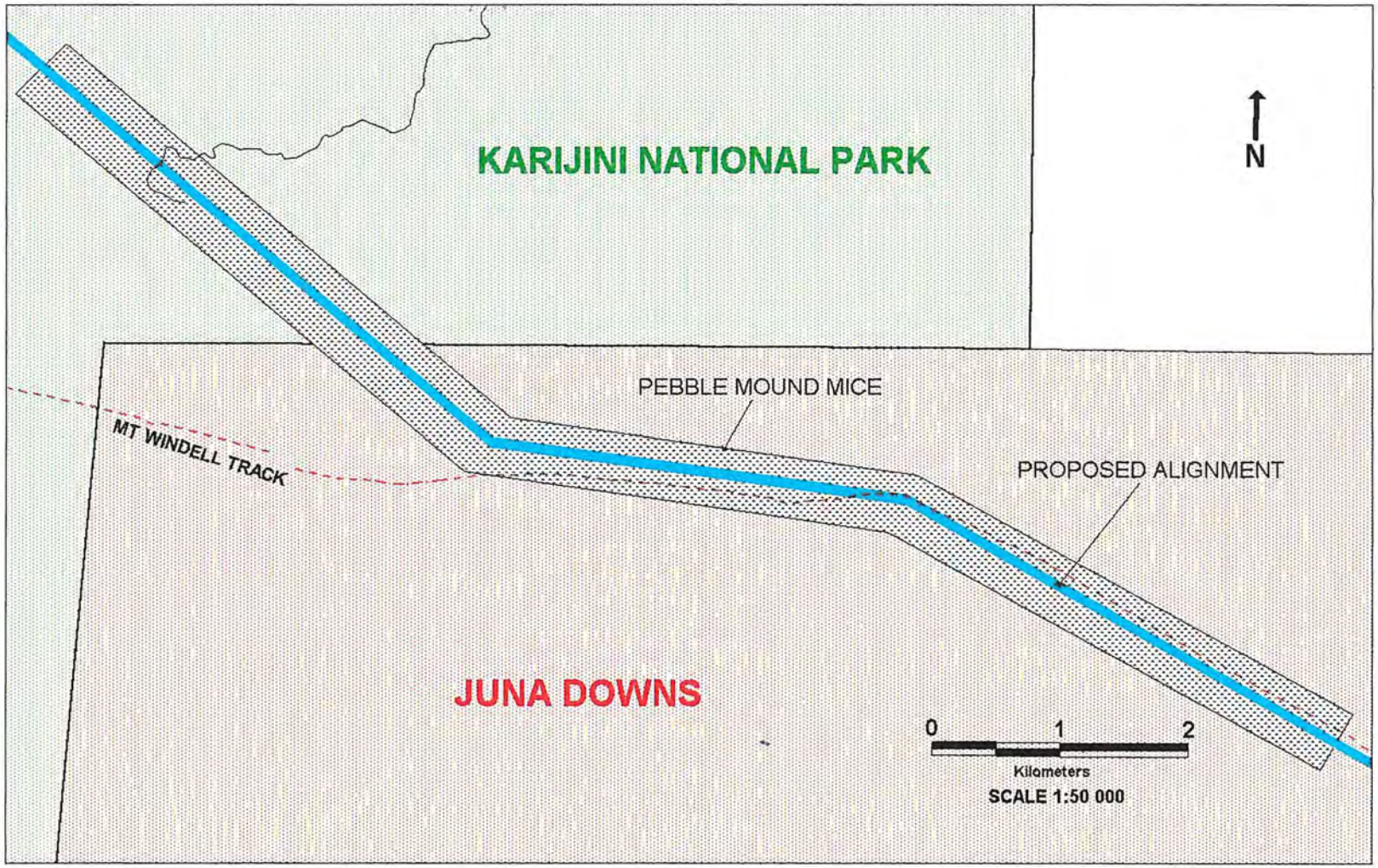


FIG. 3b LOCATION OF PEBBLE MOUND MICE, *Pseudomys chapmani*

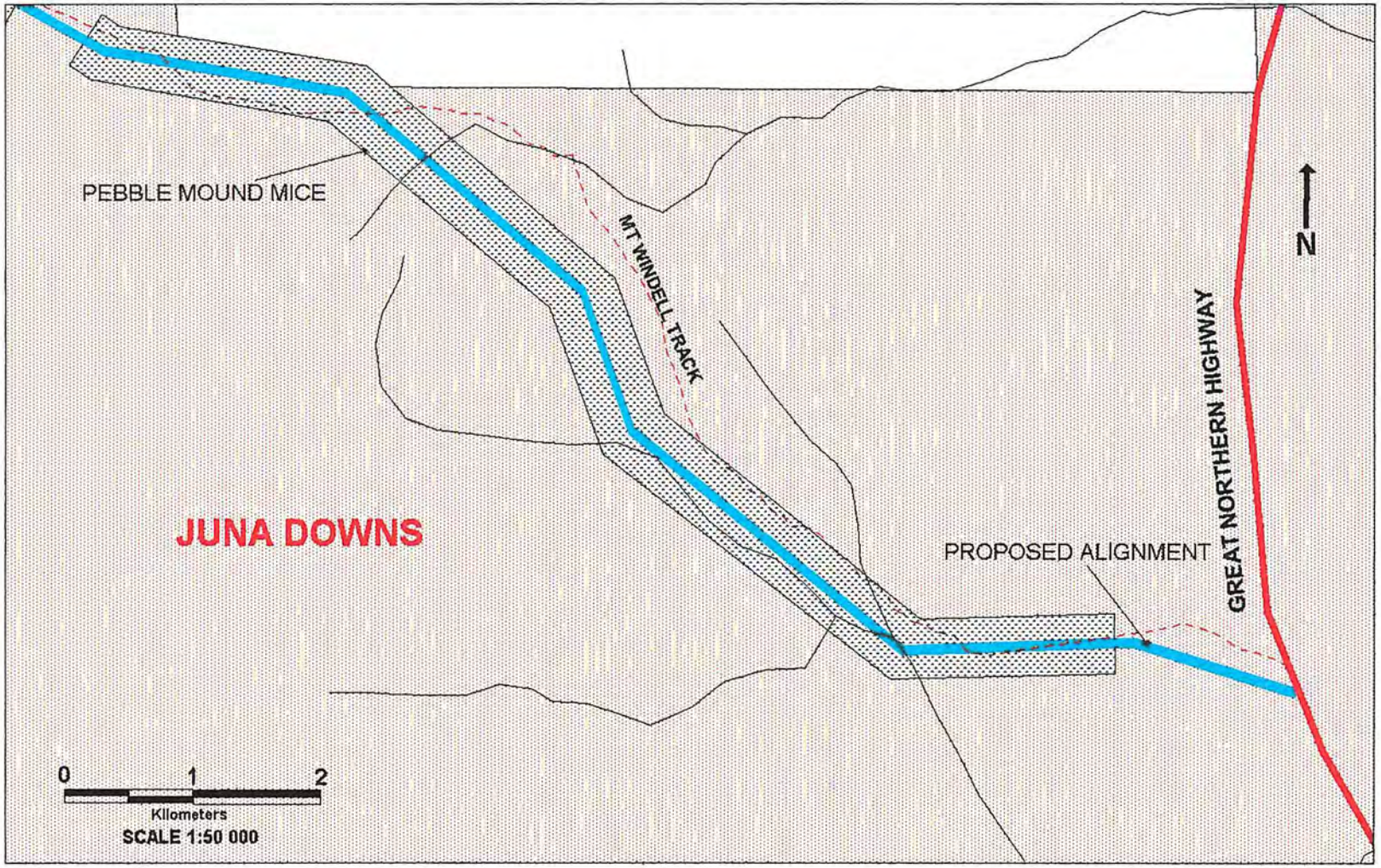


FIG. 3c LOCATION OF PEBBLE MOUND MICE, *Pseudomys chapmani*

3.6 Pest and Declared Vermin Species.

The only declared pest species recorded by this survey was the dingo (*Canis familiaris dingo*). While this species is controlled throughout the pastoral zone, a secure population exists within the Karijini National Park.

Introduced pest species recorded were mice (*Mus musculus*) and cat (*Felis catus*). Both of these species are now naturalised throughout the Australian continent, and may occur in almost any habitats (although *us* appear to favour more productive habitats such as creeklines and wetlands).

Other pest and declared vermin species have been recorded in the vicinity of the proposed road alignment. Rabbit, donkey, camel, fox and feral horse have been recorded at Marandoo and elsewhere in the Karijini National Park. None of these were recorded in the present survey, although it is possible some of them may only occur episodically or occasionally in the area. These species are controlled by CALM (with assistance from the Agriculture Protection Board and adjacent pastoral lease holders) within the National Park. Construction of the proposed road would have little impact upon pest of declared vermin species.

3.7 Borrow pit locations.

A listing of potential borrow pit locations was obtained from the MRD. These sites were examined specifically for presence of *P. chapmani*. Only pit numbers 2, 3 and 4 contained evidence of *P. chapmani* (presence of apparently 'active' mounds).

4. DISCUSSION AND RECOMMENDATION.

With the exception of Dawe *et al.* (1983), vertebrate survey work within the Hamersley Plateau has been a consequence of iron ore developments within the area, including the Marandoo, Brockman and Channar. Fauna survey associated with the Marandoo project area, located adjacent to Mount Bruce, extended back to 1975 (Hamersley Iron Pty Ltd 1992).

These studies have resulted in a large body of vertebrate fauna data from the central Pilbara / Hamersley Plateau area, and have demonstrated that the central Pilbara has a substantial and distinctive vertebrate fauna. The present survey recorded a fairly large proportion of the known fauna of the area, considering that some important landforms characteristic of the area were excluded from the study area. These proportions area given in Table 8.

Table 8. Numbers of species recorded from the probable total number of species present.

Group	Number of Species recorded	Probable Total number of species
Amphibians	3	5
Reptiles	49	85
Birds	67	107
Monotremes	1	1
Native Mammals (excl bats)	11	14
Introduced Mammals	3	6

With a few exceptions, the species not detected are generally cryptic, may not occur locally in the habitats sampled, or are rare. As no single survey is ever likely to record all species known to occur within an area, the results of the present survey are considered to be robust.

4.1 Significant Species.

Five significant species are either documented to occur within the proposed alignment, or are highly likely to occur within the alignment. Of these species, *Pseudomys chapmani* and *Morelia olivaceus barroni* are believed to have secure populations within their current ranges in the Pilbara. *Acanthiza chrysorrhoa* is known to occur in mulga habitats which are already bisected by roads, and it is unlikely that this proposed road will affect this population differently. The last two species, *Falco hypoleucos* and *Conopophila whitei* are scarce animals about which little is known. *Falco hypoleucos* is a widespread species occurring at low density. It is unlikely that the single individual seen during this survey is dependent upon that patch of mulga. Similarly, *Conopophila whitei* is recorded as being locally common. The single record observed in this survey may have been a vagrant individual, or a bird occupying a patch of mulga only infrequently used. In either case, construction of the proposed road would have little effect.

- **Recommendation**

  That the Proponent obtain the required permits under Regulation 17 (Wildlife Conservation Act), to take individuals of the Pebble mound mouse, *Pseudomys chapmani*, during construction of the proposed Marandoo to Great Northern Highway Road, including borrow pits 2, 3 and 4 (lying at AMG coordinates E673100, N7492800; E670900, N7493200; E665300, N7496700).

5. SUMMARY.

The vertebrate fauna occurring along the proposed alignment of the Marandoo to Great Northern Highway is representative of that of the Hamersley Plateau. This fauna is well represented within the Karijini National Park.

A total of 134 species of vertebrate were recorded on the proposed alignment: three amphibians, 49 reptiles, 67 birds, one monotreme and 14 mammals. Three of the mammal species were introduced. Four of these species were of conservation significance, either because of their listing under the Wildlife Conservation Act, or because they were populations occurring at the extreme of their geographic range.

One of these species, *Pseudomys chapmani* (Pebble mound mouse) is known to reside on significant sections of the proposed alignment. The other species listed (Grey falcon, Grey honey-eater and Yellow-rumped thornbill) were probably not dependant upon that part of their habitat which is to be impacted upon by construction of the road.

This report recommends that the necessary permits be obtained to take *Pseudomys chapmani* during the construction of the proposed road. It is unlikely that construction will take, or otherwise impact the other species of conservation significance.

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