TERRESTRIAL ECOSYSTEMS

The Trustee for Thompson Family Trust
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Level 1 Fauna Risk Assessment for Southern Cross Goldfields Marda Project Area

Version 4 - March 2011

Prepared for:

Southern Cross Goldfields Ltd
PO Box 708,
West Perth,
WA 6872

By:
Terrestrial Ecosystems
10 Houston Place
Mt Claremont
WA 6010

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Front Cover: Shoemaker Frog - *Neobatrachus sutor*

Executive Summary

Southern Cross Goldfields is seeking to develop a gold mining operation in its Marda project area, which is approximately 114km north of Southern Cross. It is anticipated that the Marda project area will support four pits and numerous waste dumps. The development of these new mines at Marda will require the clearing of vegetation and construction of mining infrastructure. The project area that was assessed was approximately 990ha, however, the estimated total size of these four pits and the associated waste dumps (8.1ha, 4.9ha, 16.5ha, 11.0ha) is approximately 41ha.

From a fauna perspective, the project area can be divided into two broad habitat types; a) rocky hills that are mostly vegetated by shrubs and an occasional trees, and b) relatively flat areas that are mostly vegetated with open woodland over scattered shrubs. The flat areas had varying fauna habitats, including; open Eucalypt woodland with scattered shrubs, little leaf litter and a lot of bare ground; open mixed woodlands with varying densities of shrubs, often with patchy leaf litter; and ephemeral creek lines with denser vegetation that was similar to that of the surrounding vegetation. The substrate on the flat was typically either red sandy-clay or a stony surface over red sandy clay. There was evidence of previous mining activity, with exploration tracks, drill holes, mining shafts, remains of miners' accommodation and miners' earth works.

A preliminary search was undertaken for short range endemic (SRE) invertebrates. Two spiders were located and these specimens were vouchered with the Western Australian Museum. A report is anticipated early in 2011.

Mining developments nearby (e.g. Windarling/Mt Jackson Project, Koolyanobbing Expansion Project, Carina Prospect) and a DEC survey of the Helena and Aurora Range and a regional biological survey provided sufficient fauna survey data for similar habitats to the proposed mine sites, that an on-ground fauna survey was not required.

The proposed disturbance areas represent relatively small areas of fauna habitat that are abundant in adjacent areas. Given the extent of existing disturbance and habitat degradation and the scale of the disturbance, additional vegetation clearing is unlikely to significantly impact on the vertebrate fauna in a landscape or bioregional context. An effective rehabilitation program of disturbed areas, once they are no longer required, is likely to provide habitat of similar quality to that which currently exists.

Clearing native vegetation is likely to result in the loss of small vertebrate fauna on site that are unable to move away during the clearing process. The few larger animals, such as kangaroos, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a period of time until a balance is restored. Impacts associated with clearing vegetation in the project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as the proposed disturbance area is very small relative to the quantity of similar habitat in the bioregion.

Clearing of native vegetation in the project area is unlikely to have a significant impact on conservation significant fauna. There is a possibility that Crested Bellbirds (*Oreoica gutturalis gutturalis*) and Peregrine Falcons (*Falco peregrinus*) may infrequently be found in the vicinity of the project area. It is more probable that the Rainbow Bee-eater (*Merops ornatus*) will be seen in the area during late spring and summer and Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) all year around. These birds will move to adjacent areas once vegetation clearing commences. This might result in a period of instability in these assemblages until new territories are resolved for the sedentary species. There is a low possibility that the project area supports a very small number of Carpet Pythons and Chuditch. Implementation of the following management recommendations will reduce potential impacts on the fauna:

- an induction program that includes a component on managing fauna to be mandatory for employment on the Marda Project;
- where possible, access routes are to be aligned to existing roads, tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area;
- speed limits to be implemented and enforced on-site (travel speeds to be determined based on the quality and condition of the roads, but be a maximum of 80km/h);

- all areas disturbed during exploration or construction of the mines are rehabilitated immediately after they are no longer required;
- a rehabilitation plan is prepared for existing and proposed disturbance areas and is progressively implemented when the land is no longer required for mining operations;
- pets are not to be permitted on site; and
- a log of all on-site drill holes be maintained detailing when they were capped, how and by whom.

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1 INTRODUCTION

1.1 Background

Southern Cross Goldfields is seeking to develop a gold mining operation at its Marda project area, which is approximately 114km north of Southern Cross (Figure 1). Southern Cross is in the Shire of Yilgarn and is approximately 370km east of Perth. It is anticipated that the Marda project area will support four pits and numerous waste dumps (Figure 2). The development of these new mines at Marda will require the clearing of vegetation and construction of mining infrastructure.

1.2 Project Objectives and Scope of Works

Terrestrial Ecosystems was commissioned by Southern Cross Goldfields Ltd to undertake a Level 1 Fauna Risk Assessment to support a native vegetation clearing permit application. The purpose of this Level 1 Fauna Risk Assessment was to provide information to the Department of Mines and Petroleum (DMP) to enable it to assess the potential impact of mining on the vertebrate fauna assemblage in the project area. The methodology broadly follows that described in the Environmental Protection Authority (EPA) Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002), Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004) and the EPA/Department of Environment and Conservation (DEC) Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA / DEC 2010).

A Level 1 Fauna Risk Assessment involves undertaking a desktop review and site inspection. The objectives of this fauna risk assessment were to:

- provide an indication of the vertebrate fauna assemblage (reptile, small mammal and bird) on and in the vicinity of the project area so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- provide a preliminary indication of any short range endemic invertebrate fauna of interest to the DMP/DEC/EPA in the project area so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- identify the presence and/or potential risk of impact on species of conservation significance that are present or likely to be present in the project area;
- assess the impact and environmental risks associated with the proposed development on the fauna assemblage;
- determine if any additional surveys are required to assess the potential impact on fauna assemblages in the project area, in particular, impacts on species of conservation significance; and
- make recommendations that mitigate or minimise potential impacts on resident fauna.

To achieve these objectives, Terrestrial Ecosystems has:

- reviewed Terrestrial Ecosystems fauna survey database (includes Western Australian Museum (WAM) and DEC records) to identify potential vertebrate fauna within the area;
- reviewed DEC listed Threatened and Priority species as recorded in NatureMap that are likely to be in the area;
- searched the Commonwealth government's on-line database to identify fauna species of national environmental significance that are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*) potentially occurring in the area ;
- reviewed previous fauna surveys conducted in the region;
- undertaken a one-day site investigation to identify available fauna habitat types and condition;
- undertaken a preliminary site investigation for short range endemic invertebrates;
- undertaken an assessment of the potential risks to the fauna associated with clearing additional areas of native vegetation;

- provided a discussion of the likelihood of *EPBC Act 1999* and Western Australian (WA) *Wildlife Conservation Act 1950* listed species being present in the project area; and
- provided management recommendations to minimise potential impacts on the fauna in the project area.

2 EXISTING ENVIRONMENT

2.1 Survey Area

Southern Cross Goldfields proposed Marda mines are located in the Coolgardie (COO2 – Southern Cross) IBRA subregion. The project area that was assessed was approximately 990ha and is shown in Figure 2. Southern Cross Goldfields plan to develop four pits. The approximate areas of these four pits and the associated waste dumps (8.1ha, 4.9ha, 16.5ha, 11.0ha) is 41ha (Figure 2). The entire area was assessed to cover possible future mine expansions within existing tenements.

The Coolgardie IBRA Southern Cross subregion consists of gently undulating uplands dissected by broad valleys with bands of low greenstone (Cowan et al. 2002). The bioregion supports diverse Eucalypt woodlands (*Eucalyptus salmonophloia, E. salubris, E. transcontinentalis, E. longicornis*) that are rich in endemics. The subregion contains many playa salt lakes that only contain water after major rainfall events. Salt lakes are mostly surrounded by a shrubland of low samphire. Mallees (*Eucalyptus leptopoda. E. platycorpys, E. scyphocalyx*) are often found on the small rises and upland areas.

2.2 Climate

Plate 1 shows the average mean monthly maximum and minimum temperatures and rainfall for Southern Cross, the closest weather station. Temperatures are highest in December – February. Most rain comes in mid winter. Winter rain is the result of low pressure cells that move in an easterly direction from the south-west of the state, whereas, summer rain is often from thunderstorms that move in from either the west or the north-west.

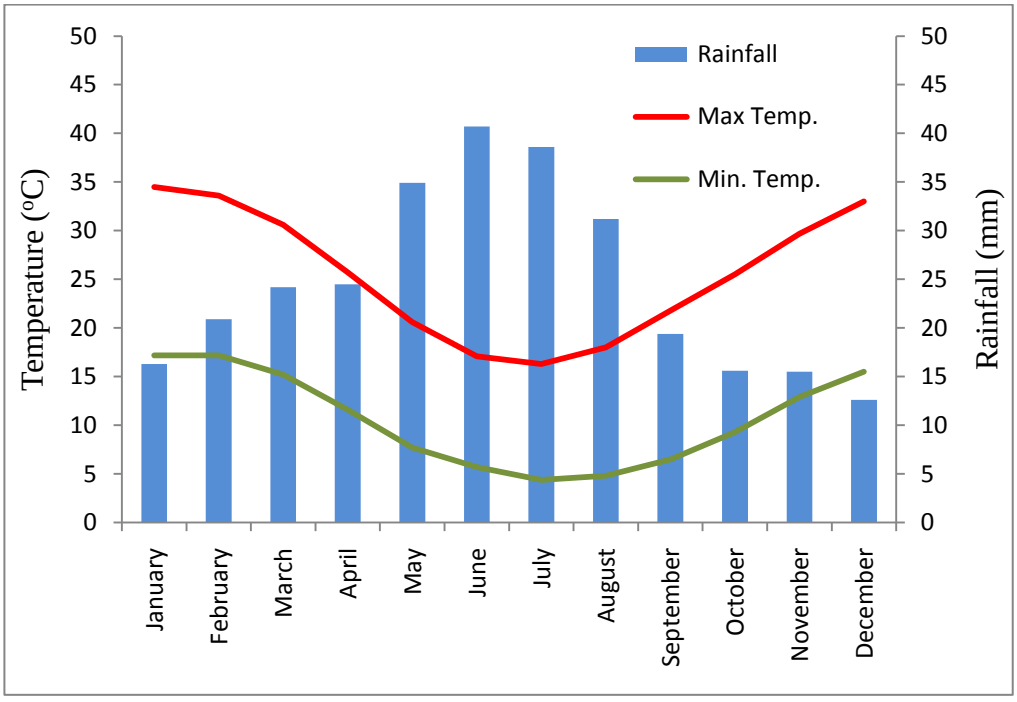


PLATE 1. MEAN MONTHLY MAXIMUM AND MINIMUM TEMPERATURES AND RAINFALL FOR SOUTHERN CROSS

2.3 Land Use History

The dominant land uses in this bioregion are cereal cropping, grazing, crown reserves and mining. Mining is evident in many areas around Southern Cross, with numerous small abandoned mines and open shafts throughout the Yilgarn landscape. Many of the larger trees in the bioregion were removed decades ago to

support the mining and power generation industries and these trees have often not been replaced by replanting programs.

Evidence of previous mining activity is apparent in numerous locations within and just beyond the Marda project area. Tracks, presumably created by pastoralists and miners transect the project area and are mostly linked to the Bullfinch – Evanston Road that forms a north-south transport spine through the project area (Figure 2). The Bullfinch – Evanston Road is a well formed track that carries traffic from mining operations to the north presumably to other mines in the south and Bullfinch and Southern Cross.

2.4 Previous Biological Surveys in the Region

The frogs, reptiles, mammals and birds in the Southern Cross IBRA subregion have been previously surveyed. Surveys in the vicinity of the project area which have been reviewed as part of this assessment include:

- Bamford Consulting Ecologists and Metcalf, B. (2005) *Portman Iron Ore Windarling/Mt Jackson Project: Fauna Studies*. Unpublished report for Portman Iron Ore Ltd, Perth.
- Bamford et al. (2006) *Portman Iron Ore Windarling/Mt Jackson Project Report on the 2004/2005 Fauna Surveys*. Unpublished report for Portman Iron Ore Ltd, Perth.
- Bungalbin – unpublished data collected by J. Fraser (data provided privately to Terrestrial Ecosystems).
- Burbidge A.A., Fuller, P.J. and McKenzie, N.L. (1995) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia, Part 12 Barlee-Menzies Study Area. *Records of the Western Australian Museum*, Supplement 49, 208-245.
- Dell J and How RA (1985) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia Part 3; Jackson - Kalgoorlie. *Records of the Western Australian Museum*; Supplement No 23, 39-66.
- Dickman, C.R., Henry-Hall, N.J., Lloyd, H. and Romanow, K.A. (1991) A survey of the terrestrial vertebrate fauna of Mount Walton, western goldfields, Western Australia. *Western Australian Naturalist*, 18, 200-206.
- Ecologia Environmental (2003) *Koolyanobbing Expansion Project - Transport Corridor Fauna Assessment Survey*. Unpublished report for Portman Iron Ore Ltd, Perth.
- Ecologia Environmental Consultants (2001) *Koolyanobbing Expansion Project - Fauna Assessment Survey*. Unpublished report for Portman Iron Ore Ltd, Perth.
- Lyons MN and Chapman A (1997) *A Biological Survey of the Helena and Aurora Range; Eastern Goldfields Western Australia*. Unpublished report for Environment Australia, Canberra.
- Metcalf, B and Bamford Consulting Ecologists (2007) *Portman Iron Ore Windarling/Mt Jackson Project Fauna Monitoring 2004 / 2006*. Unpublished report for Portman Iron Ore Ltd, Perth.
- Metcalf, B and Bamford Consulting Ecologists (2008) *Windarling/Mt Jackson Project*. Unpublished report for Portman Iron Ore Ltd, Perth.
- Ninox Wildlife Consulting (2008a) *Interim Report on the First Field Survey of the Carina Prospect, Yilgarn Iron Ore Project*. Unpublished report for Polaris Metals NL, Perth.
- Ninox Wildlife Consulting (2008b) *Interim report on the First Field Survey of the Chamaeleon Prospect, Yilgarn Iron Ore Project*. Unpublished report for Polaris Metals NL, Perth.
- Ninox Wildlife Consulting (2009) *A Fauna Survey of the Carina Prospects; Yilgarn Iron Ore Project*. Unpublished report for Polaris Metals NL; Perth.

The location of survey sites associated with these fauna surveys are shown in Plate 2.

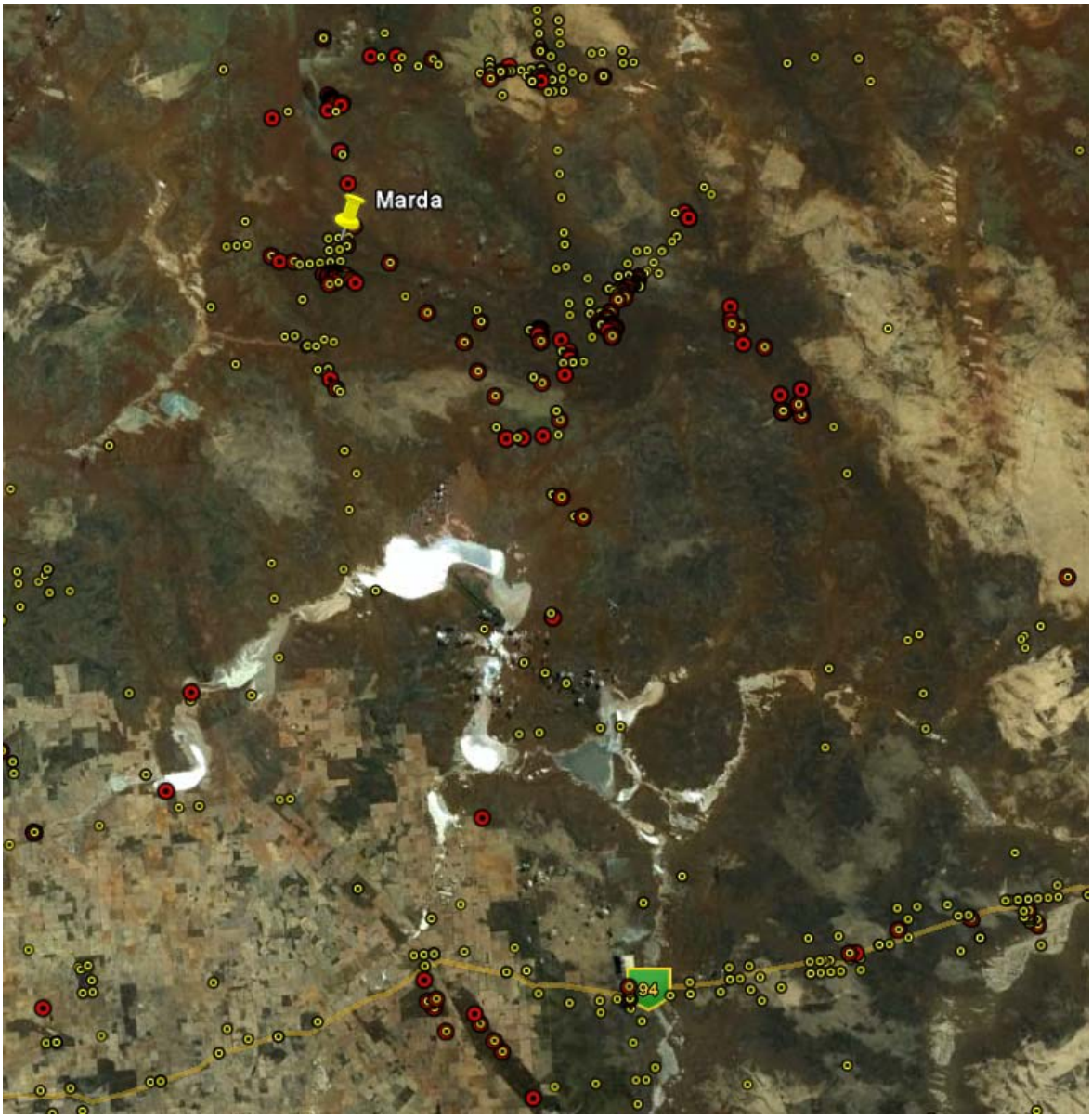


PLATE 2. TERRESTRIAL ECOSYSTEMS' FAUNA DATABASE SEARCH AREA WITH SURVEY SITES SHOWN AS RED DOTS AND INDIVIDUAL RECORDS AS YELLOW DOTS.

3 SURVEY METHODOLOGY

The assessment method adopted is aligned with the EPA's Guidance Statement No. 56 (EPA 2004), Position Statement No. 3 (EPA 2002) and the recently released Technical Guide on terrestrial fauna assessments (EPA/DEC 2010). A review of Guidance Statement No. 56 showed that based on the amount of existing information and proposed level of disturbance a Level 1 fauna risk assessment was appropriate for this project area.

3.1 Database Searches

A review of the *Environment Protection Biodiversity and Conservation* (*EPBC*) *Act 1999* list of protected species was undertaken to identify species of conservation interest to the Commonwealth Government. The search rectangle coordinates were -29.81 ^{o}S,120.48 ^{o}E; -29.42 ^{o}S,120.71 ^{o}E; -30.79 ^{o}S,119.37 ^{o}E and -30.91 ^{o}S,117.97 ^{o}E. In addition, a desktop search of the Terrestrial Ecosystems' database was used to develop an appreciation of the vertebrate fauna assemblages in relevant sections of the Southern Cross IBRA subregion. The Terrestrial Ecosystems' database search area is shown in Plate 2. The DEC threatened and priority species database was searched via the records in NatureMap.

Other more general texts were also used to provide supplementary information on vertebrates in the bioregion, including Tyler *et al.* (2000) for frogs; Storr *et al.* (1983, 1990, 1999, 2002) and Thompson and Thompson (2006) for reptiles; Johnstone and Storr (1998, 2004) for birds; and Van Dyck and Strahan (2008) for mammals.

Collectively these sources of information were used to create lists of species expected to utilise the project area and broader bioregion. It should be noted that these lists will include species that have been recorded in the general region but are possibly vagrants and they will not generally be found in the project area due to a lack of suitable habitat (e.g. water birds). Vagrants can be recorded almost anywhere. Many of the bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the general area but not in the specific survey area. Also, the ecology of many of these species is often not well understood and it can sometimes be difficult to indicate those species whose specific habitat requirements are not present in the survey area. As a consequence many species will be included in the lists produced from database searches but will not be present in the actual project area.

3.2 Site Assessment

A field assessment was undertaken on 18 December 2010. Conditions were suitable for the assessment as the weather was fine, although it was mostly overcast. All major fauna habitat types in the project area were visited. However, access to some areas was limited by a lack of vehicle access tracks.

The risk of impacting on conservation significant fauna was determined by the presence of suitable habitat types, taking into account its condition, vegetation structure, soil types, time since fire, landform, and the biological and ecological knowledge for each species.

3.3 Short Range Endemic Searches

A meeting with Dr Mark Harvey from the Western Australian Museum (WAM) indicated that short range endemic (SRE) invertebrates of interest in the Goldfields area included mygalmorph spiders, scorpions, terrestrial snails, millipedes and pseudoscorpions. During the site visit, time was allocated to search different habitats and areas for these SRE invertebrates. This was a preliminary search of the project area.

3.4 Vouchering Specimens

Spiders were vouchered with the Western Australian Museum.

3.5 Survey and Reporting Staff

The field assessment was undertaken by Dr Graham Thompson and Dr Tony Pusey and the report was written by Dr G. Thompson. Dr Scott Thompson reviewed the report.

The lead scientist for this assessment has appropriate post-graduate qualifications and numerous years of relevant field experience and is therefore appropriately trained and experienced for this task.

3.6 Limitations

This terrestrial fauna assessment of the survey area is based on a site visit, information contained in the Commonwealth Government database and other published and unpublished fauna survey data for the bioregion. It is acknowledged that multiple surveys conducted in different seasons, repeated over several years are necessary to fully appreciate the fauna assemblage in the project area; however, in this circumstance it is Terrestrial Ecosystems' opinion that adequate data were available to assess the potential impact of the proposed development on the terrestrial vertebrate fauna.

The *Guidance for Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56* (EPA 2004) suggests that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 1.

TABLE 1. FAUNA SURVEY LIMITATIONS AND CONSTRAINTS

Possible limitations	Constraint (yes/no); significant, moderate or negligible	Comment
Competency and experience of the consultant carrying out the survey	No	The scientists who prepared the report and conducted the field assessment are familiar with terrestrial fauna in the region and terrestrial fauna risk assessments.
Scope	No	All aspects of the scope of works have been addressed.
Proportion of fauna identified, recorded and/or collected	No	Not applicable.
Accuracy of previous survey work	Yes, negligible	Terrestrial Ecosystems' has reported fauna survey data recorded by various authors, but is not in a position to vouch for the accuracy of this information. It is acknowledged that the taxonomy of Western Australian vertebrates is continually being revised and the nomenclature of some of the species listed in the appendices may have changed since publication by the authors.
Sources of information	Yes, negligible	Vertebrate fauna information was available from an on-line database and unpublished and published reports of surveys conducted in the bioregion in a variety of habitat types. Many of these surveys employed a low level of trapping effort which significantly impacts on the capacity of these data to represent the fauna assemblages in the areas surveyed.
Proportion of the task achieved	No	All tasks completed.
Timing/weather/ season/ cycle	No	Weather was fine and the timing of the assessment was appropriate for the task.
Disturbances which affected results of the survey	Yes, negligible	The project area has been partially degraded by earlier exploration, mining and pastoral activity. This disturbance has been factored into the assessment.
Intensity of survey effort	No	The intensity of the on-ground assessment was proportional to the potential scale of impact in a degraded area and knowledge of fauna and fauna assemblages in the area.
Completeness	Yes, moderate	All major fauna habitat types were visited, but access to some areas was limited due to a lack of vehicle tracks. This lack of access is unlikely to affect this fauna risk assessment as all habitat types were visited.
Resources	No	Adequate resources were available.
Remoteness and/or access problems	Yes, moderate	Access to some areas was limited due to a lack of vehicle tracks. However, this lack of access is unlikely to affect this fauna risk assessment as all major habitat types were visited.
Availability of contextual information on the region	No	Terrestrial Ecosystems fauna database, *EPBC Act 1999* database and other surveys in the broader region were available. NatureMap had no conservation significant species recorded for the Southern Cross IBRA subregion which is clearly an error.

4 RESULTS

4.1 Fauna Habitats

Plates 3a-h provide a visual indication of the varying fauna habitat types found in the project area. From a fauna perspective, the project area can be divided into two broad habitat types;

- those areas that are rocky hills that are mostly vegetated by shrubs with an occasional tree (Plates 3a-b), and
- relatively flat areas that are mostly open woodland over scattered shrubs (Plates 3c-h).

The flat areas had varying fauna habitats, including;

- open Eucalypt woodland over scattered shrubs, little leaf litter and a lot of bare ground (Plates 3c-d);
- open mixed woodlands with varying densities of shrubs, often with patchy leaf litter (Plates 3e-h); and
- ephemeral creek lines with denser vegetation that was similar to that of the surrounding vegetation.

The substrate on the flat was typically either red sandy-clay or a stony surface over red sandy clay.

There was evidence of previous mining activity, with exploration tracks, drill holes, mining shafts, remains of miners' accommodation (Plate 4a) and mine-related earth works (Plate 4b).

4.2 Short Range Endemic Invertebrates

A preliminary search was undertaken for SRE invertebrates. Two spiders were located. One spider was in a burrow (Plate 5a) with an obvious circular opening, another was in a burrow that had a tangle of web around the entrance (Plate 5b). These specimens were vouchered with the WAM. A report is anticipated early in 2011.

4.3 Fauna Habitat Quality

Earlier mining activity was evident in a number of areas. In some cases the impact was limited and localised, while in other areas it was on a slightly larger scale. Exploration grid lines were also evident in many areas, but these seem to have had a minimal impact on the habitat from a fauna perspective. Cattle obviously graze on sections of the project area, and fauna habitat was seriously degraded around a small dam just beyond the eastern extremity of the project area. Most of the remaining area was in good condition and is likely to support an undisturbed natural fauna assemblage.

4.4 Fauna Habitat Value

The proposed Marda pits and waste dumps are located on flat or gentle undulating terrain that is vegetated with open woodland. Fauna habitats in the proposed disturbance areas are similar to that in the adjacent areas, and, as a consequence, the fauna assemblage in the project area is also likely to be similar to that in adjacent areas. Because of this, the fauna habitat in the project area was not rated as having a particular high value.

4.5 Bioregional Vertebrate Fauna

Appendix A provides a summary of the fauna survey data that are available in the vicinity of the project area and in the Southern Cross IBRA subregion. Although there are differences in the reptile, mammal and avian assemblages at each survey site reported in Appendix A; overall there is a relatively high level of similarity when the data are aggregated for each survey. It is not anticipated that fauna found in the Marda project area would be significantly different to similar habitat in adjacent areas.

Plate 3a. Rocky hill top vegetated in shrubs

Plate 3b. Rocky hill top vegetated in shrubs

Plate 3c. Open Eucalypt woodland over scattered chenopods and a lot of bare ground

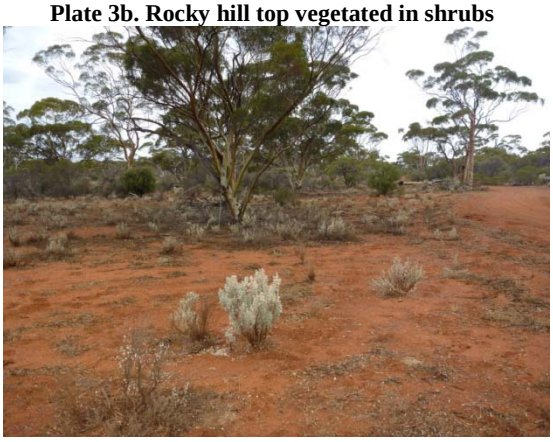


Plate 3d. Open Eucalypt woodland over scattered chenopods and a lot of bare ground

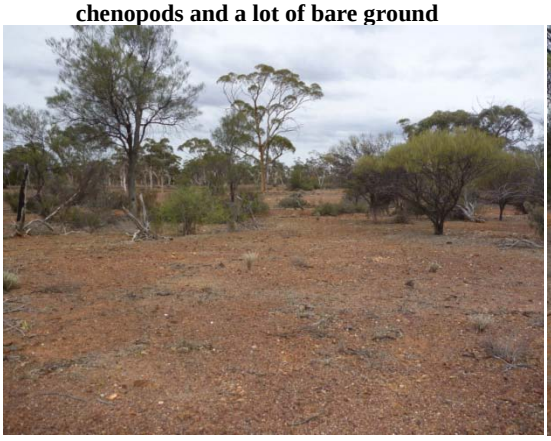


Plate 3e. Open mixed woodland over scattered shrubs on a stony surface

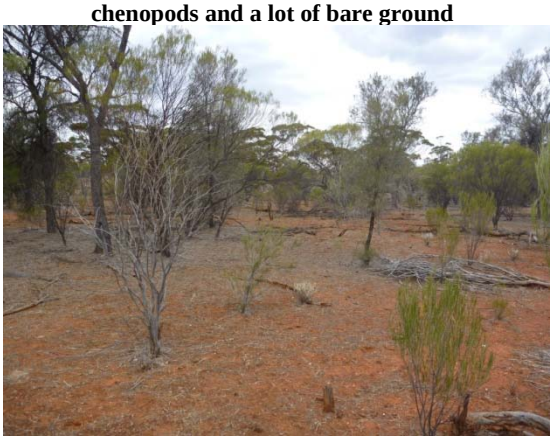


Plate 3f. Open mixed woodland over scattered shrubs on a clay substrate and some leaf litter

Plate 3g. Open mixed woodland over scattered with a good coverage of leaf litter on the ground

Plate 3h. Open Eucalypt woodland over scattered chenopods and some ground cover of dead annuals

PLATE 3 FAUNA HABITAT TYPES WITHIN PROJECT AREA.

Plate 4a. Evidence of previous mining activity

Plate 4b. Evidence of previous mining activity

PLATE 4. EVIDENCE OF PREVIOUS MINING ACTIVITY

Plate 5a Spider burrow

Plate 5b Spider burrow

PLATE 5 SPIDER BURROWS.

4.6 Significant Fauna Species Recorded From or Predicted to Occur in the Marda Project Area

Species listed under the *EPBC Act 1999* or the *Wildlife Conservation Act 1950* as being threatened or of conservation significance or are on the DEC Priority and Threatened Species list and are potentially in the vicinity of the Marda project area are shown in Table 2.

Conservation significant fauna are protected by the Commonwealth *Environment Protection and Biodiversity Conservation* (*EPBC*) *Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and the Western Australia (WA) *Wildlife Conservation Act 1950*. The Western Australian (WA) *Wildlife Conservation Act 1950* provides for the publishing of the *Wildlife Conservation (Specially Protected Fauna) Notice* that lists species under multiple categories. In addition, the Department of Environment and Conservation (DEC) maintains a list of fauna that require monitoring under five priorities based on the current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *Wildlife Conservation Act 1950* imply legislative requirements for the management of anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory protection, other than the DEC wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species. Definitions of the significant fauna under the *WA Wildlife Conservation Act* are provided in Appendix B.

The fauna species listed in Table 2 have special conservation status under State and/or Commonwealth government legislation. Each species has either been previously recorded or has been listed as having the potential to occur in the vicinity of the project area.

Five threatened species of fauna and two migratory species of birds identified under the *EPBC Act 1999* potentially occur in the project area. There are nine Schedule species listed under the WA *Wildlife Conservation Act 1950* and seven priority species listed on the DEC's Priority Fauna List that potentially occur in the project area. The following is an assessment of the likelihood of each of the species listed in Table 2 being found in the project area.

TABLE 2. SPECIES THAT ARE POTENTIALLY FOUND IN THE VICINITY OF THE PROJECT AREA AND THAT ARE LISTED AS BEING OF CONSERVATION SIGNIFICANCE UNDER STATE OR COMMONWEALTH GOVERNMENT LEGISLATION OR WITH DEC.

Species	Status under the Wildlife Conservation Act / DEC	Status under the EPBC Act	Comment on potential impact on conservation significant species
Myrmecobius fasciatus Numbat	Schedule 1	Vulnerable	A small population of numbats is recorded in the vicinity of the project area in the EPBC web site database, but an extensive search of the literature has failed to find any recent record of numbats in this area. It has therefore been concluded that the potential impact on this species is likely to be very low.
Calyptorhynchus latirostris Carnaby's Black-Cockatoo	Schedule 1	Endangered	It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because they are unlikely to be found in this area and can easily move to adjacent undisturbed areas once clearing commences.
Leipoa ocellata Malleefowl	Schedule 1	Vulnerable	It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it is unlikely to be in the area.
Dasyurus geoffroii Chuditch	Schedule 1	Vulnerable	It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it is unlikely to be in the area.
Acanthiza iredalei iredalei Slender-billed Thornbill (western)		Vulnerable	It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Merops ornatus Rainbow Bee-eater		Migratory	It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Apus pacificus Fork-tailed Swift		Migratory	It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Platycercus icterotis xanthogenys (Mallee) Western Rosella	Schedule 1		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it is unlikely to be found in this area and can easily move to adjacent undisturbed areas once clearing commences.
Lophochroa leadbeateri Major Mitchell's Cockatoo	Schedule 4		Major Mitchell's Cockatoo are in the general area. Clearing vegetation outside the breeding periods will not significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Falco peregrinus	Schedule 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the

Species	Status under the Wildlife Conservation Act / DEC	Status under the EPBC Act	Comment on potential impact on conservation significant species
Peregrine Falcon			associated waste dumps will significantly impact on this species because ity can easily move to adjacent undisturbed areas once clearing commences.
Morelia spilota imbricata Carpet Python	Schedule 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it is unlikely to be in the area.
Aspidites ramsayi Woma (southwestern)	Schedule 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it is unlikely to be in the area.
Calamanthus cautus whilocki Shy Heathwren	Priority 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Oreoica gutturalis gutturalis Crested Bellbird	Priority 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Burhinus grallarius Bush Stone-curlew	Priority 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Nyctophilus(timoriensis) sp. 1 Greater Long-eared Bat	Priority 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.
Charadrius rubricollis rubricollis Hooded Plover (western subspecies)	Priority 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it is unlikely to be in the general area due to a lack of suitable habitat.
Calamanthus camestris montananellus Rufous Fieldwren	Priority 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it is unlikely to be in the general area due to a lack of suitable habitat.
Pomatostomus superciliosus ashbyi White-browed Babbler	Priority 4		It is unlikely that vegetation clearing or the construction of a series of small pits and the associated waste dumps will significantly impact on this species because it can easily move to adjacent undisturbed areas once clearing commences.

4.6.1 Potential Impact on Species of Conservation Significance

Numbat *(Myrmecobius fasciatus)* - Schedule 1 under the *Wildlife Conservation Act 1950* and Vulnerable under the *EPBC Act 1999.*

Numbats were once present across southern semi-arid and arid Australia, including parts of NSW, SA and southern NT, as well as the south-west of Western Australia. In Western Australia, there are small residual populations at Dryandra and Perup, with recent translocations at Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve. Numbats are essentially solitary, forage during the day in winter and in the early morning and late afternoon in summer.

A small population of numbats is recorded in the vicinity of the project area in the EPBC web site database, but an extensive search of the literature has failed to find any recent record of numbats in this area. Terrestrial Ecosystems has therefore concluded that the potential impact on local representatives of this species is likely to be very low.

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) – Schedule 1 under the *Wildlife Conservation Act 1950* and Endangered under the *EPBC Act 1999.*

Carnaby's Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of *Banksia, Dryandra, Hakea, Eucalyptus, Grevillea, Pinus* and *Allocasuarina* spp.. It is nomadic often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 – 12m above the ground and has an entrance of 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell). Loss of habitat, in particular, feeding areas near breeding sites is considered to be a major threat to this species.

The Marda project area is outside the eastern fringe of their normal geographic distribution (Johnstone and Storr 1998), but Davies (1966) reported Carnaby's Cockatoo as far east as Norseman, but this was a rare occurrence and given the recently reported reduction in the population, it is unlikely to be seen this far east again.

No evidence was found in the project area of the characteristic chewed nuts or flowers which would indicate Carnaby's Black-Cockatoo have foraged in the area. Terrestrial Ecosystems' assessment is that they are probably infrequent visitors to the area, and clearing of the vegetation in the project area is unlikely to significantly impact on this species.

Malleefowl (*Leipoa ocellata)* - Schedule 1 under the *Wildlife Conservation Act 1950* and Vulnerable under the *EPBC Act 1999.*

Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed or are perching for the night. Historically, Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Recently their range has contracted due to fox predation and land clearance. Their abundance in the eastern Goldfields is low and they are sparsely distributed, favouring those areas that are more densely vegetated. Malleefowl build distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. These nest mounds range in diameter but can span more than five metres and may be up to one metre high. Malleefowl are generally monogamous and, once breeding commences, they pair for life. The presence of nest mounds provides an indication of the presence of Malleefowl in the area.

The available habitat across the majority of the project area was unsuitable for Malleefowl, as there was generally insufficient understorey to provide the necessary protection for this species. However, there were some small patches of relatively dense vegetation suitable for Malleefowl, but these were generally small and isolated. here are records of Malleefowl and Malleefowl mounds in the general vicinity of the Marda Brown project area (Dell and How 1985, Ecologia Environmental Consultants 2001, Ninox Wildlife Consulting 2008b); however, many of these records are old mounds as Malleefowl are now only found in scattered

populations in the Goldfields, most in densely vegetated areas. It is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Chuditch (*Dasyurus geoffroii*) – Schedule 1 under the *Wildlife Conservation Act 1950* and Vulnerable under the *EPBC Act 1999*.

The Chuditch is the largest carnivorous marsupial in Western Australia (WA). It is usually active from dusk to dawn. Formally known from over 70% of Australia, the Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-west WA and other isolated areas. Chuditch are solitary animals for most of their life and den in hollow logs, burrows, culverts, etc and have also been recorded in tree hollows and rock cavities. Chuditch are opportunistic feeders, and forage primarily on the ground at night. Their diet can include other mammals, birds, lizards, bird and reptile eggs but the majority is a mixture of large invertebrates (e.g. spiders, scorpions and crickets).

The Terrestrial Ecosystems fauna survey database records a Chuditch being sighted south-west of the Marda project area, but they are obviously in very low numbers if they still persist in the general area. This area has not been adequately surveyed for Chuditch, so it is potentially in the general area. However, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Slender-billed Thornbill (*Acanthiza iredalei iredalei*) – Vulnerable species under the *EPBC Act 1999*.

The Slender-billed Thornbill has a preference for chenopod shrubland in close association with samphire flats. Johnstone and Storr's (2004) distribution maps for this species indicate that it is unlikely to occur in this area. The preferred habitat for this species is very different to that found in the project area. It is therefore Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have any significant impact on this species.

Fork-tailed Swift (*Apus pacificus*) - Migratory under the *EPBC Act 1999*.

The Fork-tailed Swift breeds in north-east and mid-east Asia and winters in Australia and New Guinea. It arrives in the Kimberley in late September and in central and southern WA in November and leaves in late April. The Fork-tailed Swift may be an infrequent visitor to the area although it has not been recorded in previous surveys.

Given that the proposed land clearing represents a very small fraction of similar habitat in the general area, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Rainbow Bee-eater (*Merops ornatus*) - Migratory under the *EPBC Act 1999*.

The Rainbow Bee-eater is widespread during late spring and summer in the southern section of WA, particularly in sandy areas that have access to water. This species was recorded in numerous fauna surveys in the vicinity of the project area (Appendix A).

Given that the proposed land clearing represents a very small fraction of similar habitat in the general area, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species. This species will readily move to other areas if it is disturbed.

Carpet Python (*Morelia spilota imbricata*) - Schedule 4 under the *Wildlife Conservation Act 1950*.

The Carpet Python is a large snake found across the south-west of WA, north to Geraldton and Yalgoo, and east of Kalgoorlie, Fraser Range and Eyre. It inhabits forest, heath or wetland areas and shelters in hollow logs or in branches of large trees. It feeds on a variety of vertebrates including small mammals and reptiles. Carpet Python assemblages are generally found in low numbers and are dispersed across a relatively large area; except during the breeding season when aggregations have been recorded.

There are no records in Terrestrial Ecosystems fauna survey database of Carpet Pythons being seen/caught in the vicinity of the Marda project area. However, if they are present then its numbers are likely to be very low, and the probability of them being in the project area is very low. Given that the proposed land clearing represents a very small fraction of similar habitat in the general area, and the project area contains is highly degraded section, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Shy Heathwren (*Calamanthus cautus whitlocki*) – Priority 4 with DEC.

The Shy Heathwren is a small ground species that is found in the semi-arid interior of WA, including much of the southern wheatbelt. Its habitat includes shrubland in the understorey of Eucalypt woodland, often on sandy soils. Johnstone and Storr (2004) recorded it as locally moderately common or common, but generally scarce or uncommon and patchily distributed, and reported that the Marda project area is within its geographic distribution. It was recorded in a couple of other fauna surveys in the vicinity of the project area.

Given that the proposed land clearing represents a very small fraction of similar habitat in the area, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species. If it is in the area, then it will move once vegetation clearing commences.

Western Rosella (*Platycercus icterotis xanthogenys*) – Schedule 1 under the *Wildlife Conservation Act 1950* and Vulnerable under the *EPBC Act 1999.*

The mallee form of the Western Rosella is found mostly in Eucalypt and Casuarina woodland and shrublands, especially Wandoo, Flooded Gums and Salmon Gums. This species was sighted by McKenzie and Rolfe during the Boorabin-Southern Cross biological survey (1995), but it was not seen in any of the other fauna surveys around the Marda project area (Appendix A). Johnstone and Storr (1998) indicate that the Marda project area is north of its known distribution.

Given that the proposed clearing represents a very small fraction of similar habitat in the area, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) – Schedule 4 under the *Wildlife Conservation Act 1950*

Major Mitchell's Cockatoo's geographic distribution includes some of the semi-arid and arid zones of Australia. It has a disjunct geographic distribution in WA with a population in the semi-arid area east of Geraldton to include Lake Moore and Lake Barlee and the Marda project area. Major Mitchell's Cockatoo is most often seen high in the branches of Salmon Gums (*Eucalyptus salmonophloia*) and other large eucalypts, in heavily timbered creek-lines or roadside verges in various parts of the WA wheatbelt. Major Mitchell's Cockatoo breeds in the hollows of large eucalypts. It is scarce throughout most of WA and the primary cause for its decline is land clearing for agriculture and subsequent fragmentation of remaining habitat. A flock of 20 birds and another pair were recorded on the road between Southern Cross and the Marda project area. It is therefore probable that they would visit the project area on occasions.

The most significant potential impact on this species would be the removal of trees that contained nests with eggs or chicks. Clearing of trees outside of the breeding period (August – October) will minimise the potential impact on this species. It is Terrestrial Ecosystems' assessment that the proposed vegetation clearing in the project area is unlikely to have a significant impact on this species as there is plenty of similar habitat in adjacent areas, and this can be further reduced by removing trees outside the August to October period.

Crested Bellbird (*Oreoica gutturalis gutturalis*) – Priority 4 with DEC.

Johnstone and Storr (2004) reported the geographic distribution for the Crested Bellbird to include the greater part of WA. Its preferred habitat is scrub and thickets (but not near edges). In the south-west of WA it is found mostly in wooded areas, including open Banksia scrub and heathland. It was seen in numerous fauna surveys in the bioregion (Appendix A).

It is Terrestrial Ecosystems' assessment that the proposed clearing of a section of the project area of vegetation is unlikely to have any significant impact on this species. If it is in the area then it will move to more suitable habitat in adjacent areas and will not be significantly impacted on by small scale vegetation clearing.

Bush Stone-curlew (*Burhinus grallarius*) – Priority 4 species with DEC.

The Bush Stone-curlew is a large bird that is often found in lightly wooded areas. The Bush Stone-curlew demonstrates some site fidelity but its home range appears quite large relative to the size of areas to be cleared. There are no records of the Bush Stone-curlew in any of the other fauna surveys in the vicinity of the project area.

Given that the proposed vegetation clearing represents a very small fraction of similar habitat in the general area, it is Terrestrial Ecosystems' assessment that the proposed clearing in the project area is unlikely to have a significant impact on this species.

Hooded Plover (*Charadrius rubricollis*) – Priority 4 species with DEC.

This species frequents the margins and shallows of salt lakes, and also along coastal beaches, where it forages for invertebrates. It is found along the southern coast and salt lakes north to Port Gregory, Three Springs, Mt Gibson, Lake Brown, Lake Barlee, Lake Cowan and Eyre. It is an uncommon to common resident on the southern sea beaches from Cape Naturaliste east to Eyre. It probably breeds in the samphire habitat along the boundary of some of the salt lakes in the bioregion.

The proposed clearing is not in habitat frequented by this species. It is Terrestrial Ecosystems' assessment that the proposed vegetation clearing in the project area is unlikely to have a significant impact on this species.

Peregrine Falcon (*Falco peregrinus*) – Schedule 4 *Wildlife Conservation Act 1950*.

The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It favours hilly or mountainous country and open woodlands and may be an occasional visitor to the project area. Nesting sites include ledges along cliffs, granite outcrops and quarries, hollow trees near wetlands and old nests of other large bird species. There is no evidence to suggest any change in status in the last 50 years. Peregrine Falcons were seen during numerous fauna surveys in the bioregion (Appendix A), so they are in the area.

It is Terrestrial Ecosystems' assessment that the proposed vegetation clearing in the project area is unlikely to have a significant impact on this species as there is plenty of similar habitat in adjacent areas.

Central Long-eared Bat (*Nyctophilus* (*timorensis*) sp.) – Priority 4 with DEC.

This species is probably the species referred to by Churchill (2008) as the Central Long-eared Bat (*Nyctophilus* sp. 1). This species is distributed across the southern and central wheatbelt, southern part of the Great Victoria Desert and the Nullarbor coast. The Marda project area is on the north-western boundary of its known distribution. It roosts in tree cavities, foliage and under loose bark.

Given that the proposed vegetation clearing represents a very small fraction of similar habitat in the general area, it is Terrestrial Ecosystems' assessment that the proposed clearing of vegetation in the project area is unlikely to have a significant impact on this species.

Woma (southern form: *Aspidites ramsayi*) – Schedule 4 under the *Wildlife Conservation Act* 1950.

This python was once common in a crescent shaped distribution from Shark Bay through the wheatbelt to Kitchener. The Western Australian Museum has records of them being caught in the vicinity of the Great Eastern Highway from around Southern Cross and east toward Coolgardie. It is now only found in one small population east of the wheatbelt, around Shark Bay and east of Kalgoorlie. It is mostly found in sand plain habitat which is not present in the project area.

Terrestrial Ecosystems' assessment is that the Woma is highly unlikely to be found in the project area as it has not been recorded this far north of Southern Cross.

Crested Shrike-tit (south-western subspecies: *Falcunculus frontatus leucogaster*) – Priority 4 with DEC.

The Crested Shrike-tit is found in the semi-arid interior of WA from Moora south-east to Hyden and east of Norseman and south almost to the coast. It has a preference for woodlands, scrubs and open Eucalypt forests. Johnstone and Storr (2004) indicated that it was generally scarce or rare in the south-west of WA. It was not seen in any of the fauna surveys in the bioregion.

It is Terrestrial Ecosystems' assessment that it is unlikely to be seen in the project area, and if it was then it would quickly move to adjacent areas once vegetation clearing commences. The clearing of vegetation in the project area is therefore unlikely to significantly impact on this species.

Rufous Fieldwren (*Calamanthus camestris montananellus*) – Priority 4 with DEC.

The Rufous Fieldwren geographic distribution extends from Exmouth south to Dongara along the coast and then in the eastern part of the wheatbelt and along the southern coast to Eyre (Johnstone and Storr 2004). Its known geographical distribution includes the Marda project area. It has a preference for heaths and other low shrubland on sandplains and lateritic ridges, shrub steppes (*Maireana*, *Atriplex* and *Halosarcia* samphires) on limestone plains and around salt lakes (Johnstone and Storr 2004), none of which are present in the project area.

As it is likely to move once vegetation clearing commences, the impact of mine development on this species is unlikely to be significant.

White-browed Babbler (*Pomatostomus superciliosus ashbyi*) - Priority 4 with DEC.

Johnstone and Storr (2004) reported the geographic distribution to include most of WA south of the Tropic of Capricorn. It prefers arid and semi-arid areas, on the edges of thickets and scrub, including Mulga, Wattle and Acacia. It was seen during the biological survey of the Boorabbin – Southern Cross project area (McKenzie and Rolfe 1995) and during other surveys in the bioregion. It is therefore in the general area.

It is Terrestrial Ecosystems' assessment that the proposed clearing of vegetation in the project area is unlikely to have any significant impact on this species. If the White-browed Babbler was recorded in the project area, it will move to adjacent areas once vegetation clearing commences.

5 DISCUSSION

5.1 Adequacy of Available Vertebrate Fauna Data

The EPA *Terrestrial Biological Surveys as an Element of Biodiversity Protection:* Position Statement No. 3 (EPA 2002), *Guidance Statement for Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia No. 56* (EPA 2004) and the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA / DEC 2010) are the three relevant documents to assess the adequacy of the available information and reporting for vertebrate fauna surveys in Western Australia. They indicate that for small scale developments with a low potential for a significant impact on the environment, a Level 1 fauna risk assessment of the terrestrial fauna is adequate.

No fauna trapping surveys have been undertaken for the Southern Cross Goldfields Marda project area. However, the nearby mining developments in similar habitat [e.g. Windarling/Mt Jackson Project (Bamford and Metcalf 2005, Bamford Consulting Ecologists 2006, Metcalf and Bamford 2007, Metcalf and Bamford Consulting Ecologists 2008), Koolyanobbing Expansion Project (2001, Ecologia Environment Consultants 2003), Carina Prospect (Ninox Wildlife Consulting 2008a)] and a DEC survey of the Helena and Aurora Range (Lyons and Chapman 1997) provide sufficient fauna survey data for similar habitats as occur in the project area to preclude the need for an additional fauna surveys.

5.2 Biodiversity Values

The EPA Position Statement No. 3 indicates an ecological assessment of a site must consider its biodiversity value at the genetic, species and ecosystem levels, and its ecological functional value at the ecosystem level (EPA 2002).

From a fauna perspective, much of the vegetation in the project area could be described as in good condition; however, there are some areas that have been degraded by exploration, earlier mining and pastoral activity. All vertebrate species potentially present in the project area are wide-ranging and have been recorded in various other surveys in the bioregion (Appendix A).

5.2.1 Condition of Fauna Habitat and Extent of Habitat Degradation

Although large sections of the assessed area are relatively undisturbed, there are other areas where exploration, mining and pastoral activities have degraded the habitat and cleared native vegetation. Exploration tracks are evident in many areas, and many of these linear clearings appear to have existed for many years. The majority of the project area is in reasonably good condition and the fauna assemblage is likely to be similar to those in adjacent areas that have been undisturbed.

5.2.2 Ecological Linkages

The project area currently does not provide any important ecological linkage or fauna movement corridor. There are pastoral and mine tracks that dissect the project area and a relatively well used Bullfinch-Evanstone Road that bisects the project area. Most of the tracks are relatively narrow and are unlikely to provide a barrier that would inhibit the movement of fauna within the general area.

5.2.3 Size and Scale of the Proposed Disturbance and Potential Impacts

Southern Cross Goldfields plan to develop four mining pits and associated waste dumps (8.1ha, 4.9ha, 16.5ha, 11.0ha) with a total disturbance footprint of approximately 41ha. This disturbance area encompasses only relatively small areas of fauna habitat that is abundant in adjacent areas. Given the extent of existing disturbance and habitat degradation, additional vegetation clearing is unlikely to result in a significant impact on the fauna in a landscape or bioregional context. Effective rehabilitation of disturbed areas, once they are no longer required, is likely to provide habitat of similar quality to that which currently exists.

5.2.4 Abundance and Distribution of Similar Habitat in the Adjacent Areas and the Bioregion

The proposed disturbance areas represent a small fraction of similar habitat in the bioregion and in adjacent areas. Stony hills that are present in the project area are beyond the footprint of the proposed pits and waste dump(s). Fauna habitat present in the project area is abundant in adjacent areas and unlikely to provide important habitat for conservation significant fauna. Clearing sections of the vegetation is therefore unlikely to result in a significant loss of important fauna habitat.

5.2.5 Ecological Functional Value of the Site

Exploration, earlier mining and pastoral activity have all had a noticeable impact of the fauna habitat in the project area. There are many small sections that are highly disturbed, but overall the fauna assemblage present is likely to be similar to that in adjacent undisturbed areas. The limited size of the proposed pit and waste dump areas and the availability of similar habitat in adjacent areas suggest that the limited clearing proposed is unlikely to have a significant impact on the ecological functional value of this type of fauna habitat when considered in a bioregional context.

5.2.6 Potential Impacts on Ecosystem Function

Clearing native vegetation is likely to result in the loss of small vertebrate fauna on site that are unable to move away during the clearing process. Larger animals, such as kangaroos, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a period of time until a balance is restored. Impacts associated with clearing vegetation in the project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as the proposed disturbance area is very small relative to the quantity of similar habitat in the bioregion.

5.2.7 Potential Impacts on Conservation Significant Species and Ecosystems

Clearing of native vegetation in the project area is unlikely to have a significant impact on conservation significant fauna. There is a possibility that Crested Bellbirds (*Oreoica gutturalis gutturalis*) and Peregrine Falcons (*Falco peregrinus*) may infrequently be found in the vicinity of the project area. It is more probable that the Rainbow Bee-eater (*Merops ornatus*) will be seen in the area during late spring and summer and Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) all year around. These birds will move to adjacent areas once vegetation clearing commences. This might result in a period of instability in these assemblages until new territories are resolved for the sedentary species. There is a low possibility that the project area supports a very small number of Carpet Pythons (*Morelia spilota imbricata*) and Chuditch (*Dasyurus geoffroii*), if so, then the potential impact on these species would not be significant.

5.3 Potential Impacts of the Proposed Development on the Vertebrate Fauna in the Marda Project Area

Clearing of vegetation will potentially affect vertebrate fauna in a number of ways, including:

- Death/injury of fauna during clearing, grading and impacts with vehicles;
- Loss of habitat;
- Fragmentation of habitat;
- Increase in feral fauna around the mining development; and
- Disturbance of fauna in nearby areas from light, noise and dust.

Although some short term impacts on fauna are anticipated, the clearing of vegetation is considered unlikely to result in significant long term impacts on fauna habitat and fauna assemblages. The overall impact on fauna species and species of conservation significance will be minimal provided the recommended management procedures are implemented and adhered to.

The most significant environmental impact arising from the proposed mining activity will be the clearing of native vegetation and consequent loss and alteration of fauna habitat. Besides the initial deaths of fauna during the clearing process there will also be an ongoing indirect impact, largely consisting of the loss and degradation of foraging and shelter sites for fauna in neighbouring areas. Habitat degradation may also occur through factors associated with the exploration and mining processes (e.g. noise, vibration, dust, etc) or the increased level of human activity (e.g. feral animals, fires, etc.).

5.3.1 Direct Impacts

Clearing vegetation and activities associated with the mining development will result in the loss of small fauna that retreat to burrows, such as reptiles and mammals. Nocturnal species are unlikely to be active when most of the land clearing and construction work is taking place which may result in these individuals being adversely impacted when they attempt to escape. This loss of vegetation is unlikely to have a significant impact when considered in a bioregional context.

Clearing of vegetation can have an equally significant or greater impact due to 'edge effects'. Edge effects can lead to the disruption of ecological processes such as predation and dispersal, animal movements and can change assemblage structure. The consequence is that the impact area will extend beyond the area cleared. Given the small scale of the proposed disturbance, edge effects are likely to be small.

5.3.2 Secondary Impacts

Increased human activity is often associated with an altered fire regime, increased dust or fauna deaths on access tracks, which lead to a degradation of natural ecosystems. Fire has been identified as one of the threatening processes for some conservation significant species as a number of small mammal and bird species rely on long unburnt vegetation. Provided that fire management strategies are implemented, fires are unlikely to be a significant threat to native fauna species in the vicinity of the project area.

5.3.3 Potential Impacts on Ecosystem Function

Clearing native vegetation is likely to result in the loss of small vertebrate fauna on site that are unable to move away during the clearing process. The few larger animals, such as kangaroos, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a period of time until a balance is restored. Impacts associated with clearing vegetation in the project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as the proposed disturbance area is very small relative to the quantity of similar habitat in the bioregion.

5.3.4 Potential Impacts on Conservation Significant Species and Ecosystems

Clearing of native vegetation in the project area is unlikely to have a significant impact on conservation significant fauna. There is a possibility that Crested Bellbirds (*Oreoica gutturalis gutturalis*), Western Rosellas (*Platycercus icterotis xanthogenys*) and Peregrine Falcons (*Falco peregrinus*) may infrequently be found in the vicinity of the project area. It is more probable that the Rainbow Bee-eater (*Merops ornatus*) will be seen in the area during spring and summer and the Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) throughout the year. These birds will move to adjacent areas once vegetation clearing commences. This might result in a period of instability in these assemblages until new territories are resolved for the sedentary species. There is a low possibility that the project area supports a very small number of Carpet Pythons (*Morelia spilota imbricata*) and Chuditch (*Dasyurus geoffroii*).

5.3.5 Mining Voids

Steep sided mining voids that are partially filled with water can attract and trap large animals such as kangaroos and emus. Physically limiting access to these areas, supplemented by effective strategies to deal with animal entrapment should such occur, would adequately obviate this risk.

5.3.6 Habitat Fragmentation

In addition to clearing for mine pits, waste dumps and the associated infrastructure, linear clearing for haul roads, power lines or conveyors often associated with mining developments have the potential to fragment habitat. This can result in the isolating fauna in pockets of vegetation, making them more vulnerable to impacts of fire and local extinction because of low population numbers. This impact can be minimised by co-locating infrastructure, by utilising existing infrastructure corridors (e.g. existing tracks), planning the clearing of vegetation to facilitate the movement of species out of the disturbance areas into suitable adjacent habitat and maintaining as much connectivity between undisturbed areas as possible.

Southern Cross Goldfields plan to truck the ore mined off-site for processing. For this to occur, a haul road will need to be developed, as existing roads/tracks are unsuitable for this purpose. It is preferable that the proposed haul road should be developed based on existing tracks or located along the boundary of vegetation assemblages to minimise the potential to fragment fauna habitat types.

5.3.7 Road Fauna Deaths

Roads and tracks inevitably bisect home ranges for numerous individuals. An increase in road fauna deaths is likely to occur with increased vehicle traffic; in particular impacting on kangaroos and nocturnal birds. This can be minimised by limiting speeds and education of staff.

5.3.8 Feral Fauna

An increase in human activity is often associated with an increase in the abundance of feral species such as the house mouse (*Mus musculus*) and feral cat (*Felis catus*). This increase may be due to a decline in habitat health, increased road kills and poor waste disposal practices.

The house mouse and cat were recorded in other fauna surveys in the general area. The cat is a particularly damaging predator on native fauna and any increase in their numbers could have a detrimental effect on local native fauna (Kinnear 1993, Bamford 1995); hence it is important to ensure that populations of the feral predators, such as cats remain under control.

Minimising road kills, removing carcasses and good rubbish management practices around areas of exploration activity and the mine sites will assist in reducing these problems.

5.3.9 Dust

Dust generated from blasting, cleared areas, waste dumps and vehicle traffic can potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas may potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising mining impacts on fauna in areas adjacent to the mine.

5.3.10 Uncapped Drill Holes

An ongoing potential risk to terrestrial fauna is the presence of uncapped drill holes within the project area. Small animals, particularly lizards and mammals, can become trapped in the drill holes and eventually die. Therefore drill holes that are open for periods of months or years can be particularly detrimental to small animal populations (Malnic 1997).

5.3.11 Noise, Lighting and Vibration

Noise, light spill and vibration associated with mining activity can impact on nearby resident fauna. The noise and vibrations associated with blasting and drilling may force some animals to move from the area. Continuous operations mean that much of the site will be lit at night. Artificial lighting can attract species

that forage nocturnally on invertebrates that are attracted to the light and force other species to move away from the area. Both of these outcomes may alter the local fauna assemblages.

5.3.12 Haul Roads

Southern Cross Goldfields plan to truck the ore mined off-site for processing. For this to occur, a series of haul roads will be required, as existing roads/tracks are unsuitable for this purpose. The Bullfinch-Evanstone Road is a wider and better formed road than many of its feeders tracks. It is preferable that the proposed haul roads should be developed based on existing tracks or located along the boundary of vegetation assemblages to minimise the potential to fragment fauna habitat types.

5.4 Risk Assessment

Fauna surveys to support ecological impact assessments (EcIAs) are part of the environmental risk assessment undertaken to consider what potential impacts a development might have on the biodiversity of a particular area and region. Potential impacts to fauna from the proposed development are identified and briefly described above. Tables 3-5 provide a summary of the risk assessment associated with clearing additional native vegetation in this project area.

Results from this assessment indicate that the risks of significantly impacting on native fauna, fauna assemblages and fauna habitat are low when placed in a regional context, and if the recommended management strategies are implemented, then the risks will be further reduced.

TABLE 3. FAUNA IMPACT RISK ASSESSMENT DESCRIPTORS

Any risk assessment is a product of the likelihood of an impact occurring and the consequences of that impact. Likelihood and consequences are categorised and described below. The assessed risk level (likelihood x consequences) is then calculated as the overall risk for the development. This is followed by an assessment of the acceptability of the risk associated with each of the impacts. Disturbances and vegetation clearing have an impact on the fauna at multiple scales – site, local, landscape and regional. Each of these is considered in the risk assessment. This assessment should be considered in the context of the summary in Table 5.

Likelihood		
Level	Description	Criteria
A	Rare	The environmental event may occur or one or more conservation significant species may be present in exceptional circumstances.
B	Unlikely	The environmental event could occur or one or more conservation significant species could be present at sometime.
C	Moderate	The environmental event should occur or one or more conservation significant species should be present at sometime.
D	Likely	The environmental event will probably occur or one or more conservation significant species will be present in most circumstances.
E	Almost certain	The environmental event is expected to occur or one or more conservation significant species is expected be present in most circumstances.
Consequences		
Level	Description	Criteria
1	Insignificant	Insignificant impact on fauna of conservation significance or regional biodiversity, and the loss of individuals will be insignificant in the context of the availability of similar fauna or fauna assemblages in the area.
2	Minor	Impact on fauna localised and no significant impact on species of conservation significance in the project area. Loss of species at the local scale.
3	Moderate	An appreciable loss of fauna in a regional context or a limited impact on species of conservation significance in the project area.
4	Major	Significant impact on conservation significant fauna or their habitat in the project area and/or regional biodiversity and/or a significant loss in the biodiversity at the landscape scale.
5	Catastrophic	Loss of species at the regional scale and/or a significant loss of species categorised as ‘vulnerable’ or ‘endangered’ under the *EPBC Act (1999)* at a regional scale.
Acceptability of Risk		
Level of risk	Management Action Required	
Low	No action required.	
Moderate	Avoid if possible, routine management with internal audit and review of monitoring results annually.	
High	Externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually. Will require a referral to the Commonwealth under the *EPBC Act 1999*.	
Extreme,	Unacceptable, project should be redesigned or not proceed.	

TABLE 4. LEVELS OF ACCEPTABLE RISK

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequences	Insignificant (1)	Low	Low	Low	Low	Low
	Minor (2)	Low	Low	Low	Moderate	Moderate
	Moderate (3)	Low	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	High	High	Extreme
	Catastrophic (5)	Moderate	High	High	Extreme	Extreme

TABLE 5. A RISK ASSESSMENT OF THE IMPACT OF GROUND DISTURBANCE ACTIVITY ON FAUNA

		Before Management				With Management		
Factor	Potential Impact	Inherent Risk			Risk Controls / Management	Residual Risk		
		Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Inadequate fauna survey data.	Unknown loss of fauna, fauna of conservation significance, fauna assemblage(s) in the project area.	B	2	Low	Refer to section 5.1			
Inadequate knowledge of potential impacts.	Unknown or poorly assessed impact(s) on the fauna assemblage and conservation significant species.	B	2	Low	Refer to section 5.3			
Inadequate bioregional data for contextual purposes.	Incomplete analysis of data and appreciation of impacts on biodiversity values in a regional context.	B	2	Low	Refer to section 5.2			
Removal of habitat – site scale.	Almost complete loss of terrestrial fauna in cleared areas, severe impact on local fauna assemblage.	E	2	Moderate	Minimise the extent of clearing and avoid leaving isolated remnants.	E	1	Low
Significant reduction of habitats – local scale.	Loss of fauna and fauna habitat and impacts on the local fauna assemblage (excluding conservation significant species).	B	2	Low				
Significant reduction of habitats – landscape scale.	Loss of fauna and fauna habitat and impacts on fauna in a landscape context (excluding conservation significant species).	B	1	Low				
Significant reduction of habitats – regional scale.	Loss of fauna and fauna habitat and impacts on fauna in a bioregional context (excluding conservation significant species).	B	1	Low				
Impact on resident conservation significant terrestrial species.	Death of conservation significant species.	B	1	Low				
Impact on Malleefowl	Death of Malleefowl	A	3	Low				
Impact on Major Mitchell's Cockatoos	Death of Major Mitchell's Cockatoo chicks or eggs	B	2	Low	Clearing outside the breeding season (August –October)	A	2	Low
Resident avian species.	Loss of conservation significant species.	B	3	Low				
Migratory avian species.	Loss of conservation significant species.	B	1	Low				
Habitat fragmentation.	Isolation of fauna assemblages.	C	2	Low	Avoid creation of isolated vegetation remnants by retaining movement corridors to adjacent vegetation areas.			

5.5 Native Vegetation Clearing Principles

The *Environmental Protection Act (1986)* outlines 10 principles (Table 6) that are to be used in the assessment of native vegetation clearing permit applications which are also applicable for other assessments and approvals. Native vegetation should not be cleared if any of the following principles are comprised.

TABLE 6: ASSESSMENT OF IMPACT USING THE NATIVE VEGETATION CLEARING PRINCIPLES

Principle	Response
It comprises a high level of biological diversity.	Clearing vegetation will not comprise a high level of biodiversity.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Clearing the vegetation will not result in the loss of significant habitat for indigenous fauna.
It includes, or is necessary for the continued existence or, rare flora.	N/A
It comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	The area does not contain a threatened ecological community.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	The area is not a remnant.
It is growing in, or in association with, an environment associated with a watercourses or wetland.	The area does not contain a wetland.
The clearing of the vegetation is likely to cause appreciable land degradation.	N/A
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing of vegetation is unlikely to impact on the environmental values of the bioregion.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	N/A
The clearing of the vegetation is likely to cause, or exacerbate the incidence of flooding.	N/A

5.6 A Summary of the Fauna Risk Assessment

Clearing of approximately 41ha of vegetation in the project area is likely to have a low impact on the vertebrate fauna assemblage in the bioregion. It is unlikely that any threatened fauna will be significantly impacted by the proposed vegetation clearing.

5.7 Management Issues and Recommendations

The EPA objective for terrestrial fauna is to maintain the abundance, species diversity and geographic distribution of terrestrial fauna and protect specially protected (Threatened) fauna consistent with the provisions of the *Wildlife Conservation Act 1950*. If management procedures proposed below are adopted the potential impact to terrestrial fauna and the effect on the conservation status of specially protected and significant species will be minimised.

5.7.1 Induction and Awareness

All contractors and people involved in exploration or construction of the mine should be made aware of Southern Cross Goldfields' policy to protect fauna and minimise disturbance effects. Protection of fauna should be a publicly stated policy and incorporated into all staff induction programs.

Recommendation 1: An induction program that includes a component on managing fauna to be mandatory for employment on the Marda Project.

5.7.2 Haul Roads

Ore mined in the project area will be transported by road to an off-site processing plant. Heavy vehicles used to transport this ore will mean that a series of haul roads will be required. It is strongly recommended that where feasible, existing roads/tracks be upgraded to avoid increasing vegetation clearing, and if new roads are to be constructed then they are located on the boundaries of vegetation assemblages to minimise the potential to create isolated fauna communities.

Construction and operation of a mine will result in increased traffic in an area that currently would see very few vehicles, and a consequential increase the number of fauna killed on roads and tracks. To minimise the impact of road fauna deaths on large animals (such as kangaroos and emus) and ground dwelling fauna (such as reptiles, frogs and mammals) it is important to ensure that low speeds are maintained along all internal roads. A maximum speed limit of 80 km/h is recommended. Signage should be erected to indicate appropriate travelling speeds and should also indicate the possible presence of wildlife crossing roads. These problems are particularly acute at night when kangaroos are actively foraging.

Recommendation 2: Where possible, access routes are to be aligned to existing roads, tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area.

Recommendation 3: Vehicle speed is limited to 80km/hr on mine roads.

5.7.3 Minimise the Areas to be Cleared and Habitat Fragmentation

Clearing vegetation impact on the local terrestrial fauna and destroys fauna habitat. The areas to be cleared should therefore be minimised. Locating the waste dumps near the mining pit would reduce the size of the disturbance footprint.

Recommendation 4: All areas disturbed during exploration or construction of the mine are rehabilitated immediately after they are no longer required.

Recommendation 5: A rehabilitation plan is prepared for existing and proposed disturbance areas and is progressively implemented when the land is no longer required for mining operations.

5.7.4 Control of Feral and Pest Species

The populations of feral fauna located within the project area have the potential to increase as a result of the proposed development. In particular, populations of house mice and feral cats tend to increase near areas of human habitation and activity. Implementation of the Fauna Management Plan should address this issue, which will describe the appropriate remedial action to be taken.

Recommendation 6: Pets are not to be permitted on site.

5.7.5 Uncapped Drill Holes and Disused Mining Pits

Uncapped drill holes can pose a serious threat to small animals, including ground dwelling reptiles, frogs and small mammals. Disused mining pits and open mine shafts can also entrap larger animals. A log of all on-site drill holes should be maintained detailing when they were capped, how and by whom.

All drill holes should be temporarily capped on completion of drilling and permanently capped as soon as possible after exploration activities have ceased. Concrete caps may be used but often cause damage to the plastic piping particularly as the plastic degrades after years of exposure to the environment. They can also be dislodged by cattle. Solid plastic caps are therefore a better temporary solution. Infilling of disused drill holes is the best long-term solution.

Recommendation 7: A log of all on-site drill holes to be maintained detailing when they were capped, how and by whom.

6 REFERENCES

Bamford Consulting Ecologists. 2006. Portman Iron Ore Windarling/Mt Jackson Project Report on the 2004/2005 Fauna Surveys. Perth.

Bamford, M. and B. Metcalf. 2005. Portman Iron Ore Windarling/Mt Jackson Project: Fauna Studies.

Bamford, M. J. 1995. Predation by feral cats upon lizards. Western Australian Naturalist **20**:191-196.

Burbidge, A. A., P. J. Fuller, and N. L. McKenzie. 1995. Vertebrate fauna. Records of the Western Australian Museum **Supplement No. 49**:208-245.

Churchill, S. 2008. Australian Bats. Jacana Books, Crows Nest, NSW.

Cowan, M., G. Graham, and N. McKenzie. 2002. Coolgardie 2 (COO2 - Southern Cross subregion). Pages 143-155 A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002. Department of Conservation and Land Management, Perth.

Davies, S. J. J. F. 1966. The movements of the White-tailed Black Cockatoo (*Calyptorhynchus baudini*) in south-western Australia. Western Australian Naturalist **10**:33-42.

Dell, J. and R. A. How. 1985. Vertebrate fauna. In The Biological Survey of the Eastern Goldfields of Western Australia Part 3; Jackson - Kalgoorlie. Records of the Australian Museum **Supplement No 23**:39-66.

Dickman, C. R., N. J. Henry-Hall, H. Lloyd, and K. A. Romanow. 1991. A survey of the terrestrial vertebrate fauna of Mount Walton, western goldfields, Western Australia. Western Australian Naturalist **18**:200-206.

Ecologia Environment Consultants. 2003. Koolyanobbing Expansion Project - Transport Corridor Fauna Assessment Survey., Perth.

Ecologia Environmental Consultants. 2001. Koolyanobbing Expansion Project - Fauna Assessment Survey. Perth.

Environmental Protection Authority. 2002. Terrestrial Biological Surveys as an Element of Biodiversity Protection: Position Statement No. 3. Environment Protection Authority, Perth.

Environmental Protection Authority. 2004. Guidance for the Assessment of Environmental Factors. Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia No. 56. Perth.

Environmental Protection Authority and Department of Environment and Conservation (Eds Hyder, B. M., Dell, J. and Cowan, M.A.),. 2010. Technical Guide - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment. Environmental Protection Authority, Perth.

Johnstone, R. E. and G. M. Storr. 1998. Handbook of Western Australian Birds. Volume 1 - Non-Passerines (Emu to Dollarbird). Western Australian Museum, Perth.

Johnstone, R. E. and G. M. Storr. 2004. Handbook of Western Australian Birds, Volume II Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth.

Kinnear, J. 1993. Masterly marauders: the cat and the fox. Landscope **8**:20-28.

Lyons, M. N. and A. Chapman. 1997. A Biological Survey of the Helena and Aurora Range; Eastern Goldfields Western Australia. Canberra.

Malnic, J. 1997. Uncapped drill holes are silent killers. Australia's Mining Monthly **March**:16.

McKenzie, N. L. and J. K. Rolfe. 1995. Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia, Part 4 Lake Johnston - Hyden Study Area. Records of the Western Australian Museum **Supplement No 49**:31-65.

Metcalf, B. and Bamford Consulting Ecologists. 2008. Windarling/Mt Jackson Project Perth.

Metcalf, B. and M. Bamford. 2007. Portman Iron Ore Windarling/Mt Jackson Project Fauna Monitoring 2004 - 2006. Perth.

Ninox Wildlife Consulting. 2008a. Interim Report on the first field survey of the Carina Prospect, Yilgarn Iron Ore Project. Perth.

Ninox Wildlife Consulting. 2008b. Interim Report on the first field survey of the Chamaeleon Prospect, Yilgarn Iron Ore Project. Perth.

Ninox Wildlife Consulting. 2009. Interim Report on the first field survey of the Chamaeleon Prospect, Yilgarn Iron Ore Project. Perth.

Storr, G., L. Smith, and R. Johnstone. 1983. Lizards of Western Australia. II: Dragons and Monitors. Western Australian Museum, Perth, Western Australia.

Storr, G., L. Smith, and R. Johnstone. 1990. Lizards of Western Australia. III: Geckos and Pygopods. Western Australian Museum, Perth.

Storr, G., L. Smith, and R. Johnstone. 1999. Lizards of Western Australia. I: Skinks. Western Australian Museum, Perth.

Storr, G., L. Smith, and R. Johnstone. 2002. Snakes of Western Australia. Western Australian Museum, Perth.

Thompson, S. A. and G. G. Thompson. 2006. Reptiles of the Western Australian Goldfields. Goldfields Environmental Management Group, Kalgoorlie, WA.
Tyler, M. J., L. A. Smith, and R. E. Johnstone. 2000. Frogs of Western Australia. Western Australian Museum, Perth.
Van Dyck, S. and R. Strahan. 2008. The Mammals of Australia. Reed New Holland Sydney.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2010-033-f01.dgn

TERRESTRIAL ECOSYSTEMS

Drawn: G. Thompson | Date: 22 Dec 2010

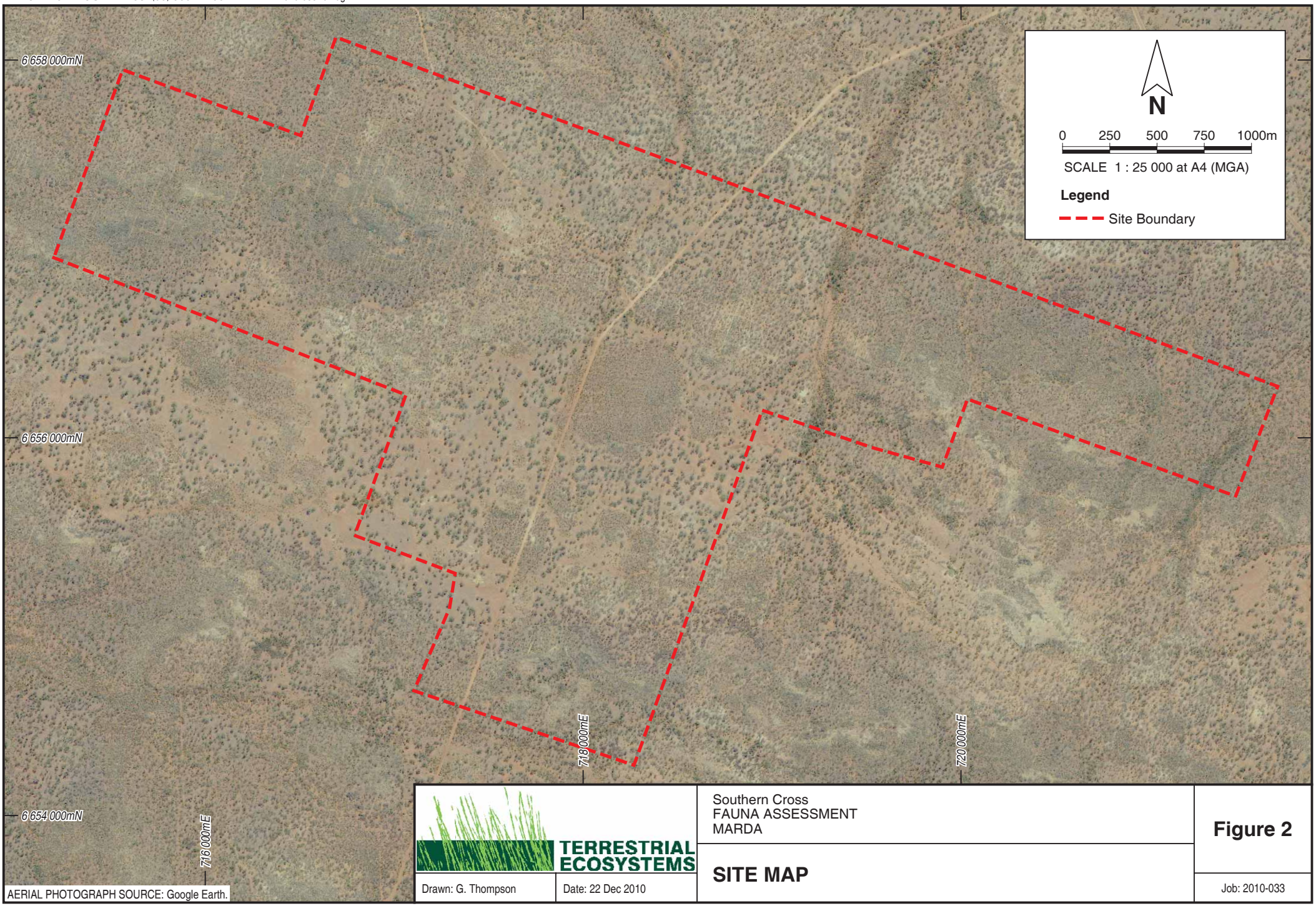
Southern Cross
FAUNA ASSESSMENT
MARDA

REGIONAL LOCATION

Figure 1

Job: 2010-033

PINPOINT CARTOGRAPHICS (08) 9562 7136 2010-033-f02.dgn



AERIAL PHOTOGRAPH SOURCE: Google Earth.

TERRESTRIAL ECOSYSTEMS

Drawn: G. Thompson | Date: 22 Dec 2010

Southern Cross
FAUNA ASSESSMENT
MARDA

SITE MAP

Figure 2

Job: 2010-033

Appendix A
Vertebrate Fauna Recorded in Biological Surveys in the Region

Vertebrate Fauna Assessment – Marda Project

APPENDIX A(1). SUMMARY OF FAUNA SURVEY DATA IN THE VICINITY OF THE PROJECT AREA

		Surveys	A																		B	C										D								
Family	Species	Common Name	Clay pan	Dam	Die Hardy Range	Olby Rock	Salmon Gum Woodland	Sand Plain	Site BM10	Site BM12	Site BM13	Site BM16	Site BM20	Site BM21	Site BM23	Site BM3	Site BM5	Site BM6	Site ME	Site MM	Bungalbin	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam
Birds																																							
Accipitridae	*Lophoictinia isura*	Square-tailed Kite																	X	X																			
	Hamirostra melanosternon	Black-breasted Buzzard																		X																			
	Haliastur sphenurus	Whistling Kite																		X																			
	Accipiter fasciatus	Brown Goshawk														2			X	X													1						
	Accipiter cirrocephalus	Collared Sparrowhawk																		X																			
	Circus assimilis	Spotted Harrier																	X																			
	Aquila audax	Wedge-tailed Eagle														1			X	X			1																
	Hieraaetus morphnoides	Little Eagle																	X	X			1															
Anatidae	*Cygnus atratus*	Black Swan																	X																			
	Tadorna tadornoides	Australian Shelduck																	X																			
	Chenonetta jubata	Australian Wood Duck																	X																			
	Malacorhynchus membranaceus	Pink-eared Duck																	X																			
	Anas gracilis	Grey Teal							1										X																			
	Anas superciliosa	Pacific Black Duck																	X																			
	Aythya australis	Hardhead																	X																			
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar																	X	X																		
Podargidae	*Podargus strigoides*	Tawny Frogmouth								2							1		X	X																		
Casuariidae	*Dromaius novaehollandiae*	Emu																	X	X		1									2							
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover																	X																			
	Elseyornis melanops	Black-fronted Dotterel																	X																			
	Thinornis rubricollis	Hooded Plover																	X																			
	Erythrogonys cinctus	Red-kneed Dotterel																	X																			
	Vanellus tricolor	Banded Lapwing																	X	X																		
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull																	X																			
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt																	X	X																		
	Recurvirostra novaehollandiae	Red-necked Avocet																	X																			
	Cladorhynchus leucocephalus	Banded Stilt																	X																			
Turnicidae	*Turnix velox*	Little Button-quail							1						1				X	X																		
Ardeidae	*Ardea pacifica*	White-necked Heron																	X																			
	Egretta novaehollandiae	White-faced Heron																	X																			
Columbidae	*Phaps chalcoptera*	Common Bronzewing																	X	X								1		1					1	1	
	Ocyphaps lophotes	Crested Pigeon																	X																			
Alcedinidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher																	X	X						1					1		2	1			
Meropidae	*Merops ornatus*	Rainbow Bee-eater												1					X											1	2						
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo								1					2				X	X											1	1					
	Cacomantis pallidus	Pallid Cuckoo										3	1						X	X											3					
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar																	X	X																	
Falconidae	*Falco cenchroides*	Nankeen Kestrel							1							1			X	X																	
	Falco berigora	Brown Falcon																	X	X										2	2	1					
	Falco longipennis	Australian Hobby																	X	X																	
	Falco peregrinus	Peregrine Falcon																	X	X																	
Megapodiidae	*Leipoa ocellata*	Malleefowl																	X																		
Otididae	*Ardeotis australis*	Australian Bustard																																		2	

		Surveys	A																					B	C									D								
Family	Species	Common Name	Clay pan	Dam	Die Hardy Range	Olby Rock	Salmon Gum Woodland	Sand Plain	Site BM10	Site BM12	Site BM13	Site BM16	Site BM20	Site BM21	Site BM23	Site BM3	Site BM5	Site BM6	Site ME	Site MM	Bungalbin	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam
Rallidae	*Fulica atra*	Eurasian Coot																	X																			
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat									4				2				X	X		1		1														
	Smicrornis brevirostris	Weebill								5	7	9	12	15	1	1	4		X	X		10	4	10			2			3 0	4	1 2						
	Gerygone fusca	Western Gerygone									1																											
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill																	X	X		7																
	Acanthiza iredalei	Slender-billed Thornbill																	X																			
	Acanthiza apicalis	Inland Thornbill								7	4		3	2	1		4	9	X	X		4		6						8		3						
	Aphelocephala leucopsis	Southern Whiteface													1	2			X	X																3		
	Acanthiza uropygialis	Chestnut-rumped Thornbill							2	2		2	11	7	6	3	1	X	X				6							6		6						
Acrocephalidae	*Cincloramphus mathewsi*	Rufous Songlark																	X																			
Acrocephalidae	*Cincloramphus cruralis*	Brown Songlark																	X																			
Artamidae	*Artamus personatus*	Masked Woodswallow																	X	X																	8 0	
	Artamus cinereus	Black-faced Woodswallow							3	1									X	X																		
	Artamus cyanopterus	Dusky Woodswallow																		X															2	2	4		
	Artamus minor	Little Woodswallow																	X	X																2	1		
	Cracticus torquatus	Grey Butcherbird													1		1	X	X		2	1		1	1					2	1	1	1	2	2		
	Cracticus nigrogularis	Pied Butcherbird										5	1	1	1				X	X		2				2	1				1						
	Cracticus tibicen	Australian Magpie																	X	X			1				2				2		1				
	Strepera versicolor	Grey Currawong																	X	X		2															
Campephagidae	*Coracina maxima*	Ground Cuckoo-Shrike																	X							1											
	Coracina novaehollandiae	Black-faced Cuckoo-Shrike										3	1	1					X	X		1									2	2	1	1	1		
	Lalage sueurii	White-winged Triller								1	1				1				X	X											2			2			
Climacteridae	*Climacteris affinis*	White-browed Treecreeper												1					X	X																	
	Climacteris rufa	Rufous Treecreeper										7							X	X			1		4	1 0	2				2		8	6	6		
Corvidae	*Corvus coronoides*	Australian Raven																						4	1					1							
	Corvus bennetti	Little Crow																	X	X																	
	Corvus orru	Torresian Crow																				4															
Estrildidae	*Taeniopygia guttata*	Zebra Finch									1				5				X													6					
Eupetidae	*Cinclosoma castanotum*	Chestnut Quail-thrush								1	3									X																	
	Cinclosoma castaneothorax	Chestnut-breasted Quail-thrush																												1							
Hirundinidae	*Hirundo neoxena*	Welcome Swallow																	X																		
	Petrochelidon nigricans	Tree Martin										2							X	X															6	1		
	Petrochelidon ariel	Fairy Martin																	X																		
Maluridae	*Malurus splendens*	Splendid Fairy-wren																	X					8								3					
	Malurus leucopterus	White-winged Fairy-wren							5											X																	
	Malurus lamberti	Variegated Fairy-wren																	X			6		4						3							
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater							3						2				X	X																	
	Lichenostomus virescens	Singing Honeyeater							2		1		1	2	1			7	X	X			1	3						2	1	6	1				
	Lichenostomus leucotis	White-eared Honeyeater								2			3	2					X	X		1								2							
	Lichenostomus flavicollis	Yellow-throated Honeyeater												6	1				X	X																	
	Lichenostomus ornatus	Yellow-plumed Honeyeater										7	1	1					X	X		2	8	8	8	6	5	6		2	1 0	4	1 0	2 0		6	
	Lichenostomus plumulus	Grey-fronted Honeyeater																	X			2					1	2								2	
	Purnella albifrons	White-fronted Honeyeater							6	6	8	1	3	2			7	10	X	X										1 0	2	2					
	Manorina flavigula	Yellow-throated Miner																				2			1	4						1		5	4		
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater							2	4		3	6	3	1	7	4	1	X	X				2						4	2	2	4	6	6		
	Anthochaera carunculata	Red Wattlebird																		X		2	2		2		1	4		2	6	6	4	2	2	4	
	Epthianura tricolor	Crimson Chat																	X																		
	Epthianura albifrons	White-fronted Chat							3										X																		
	Sugomel niger	Black Honeyeater									2								X																		

		Surveys	A																			B	C									D								
Family	Species	Common Name	Clay pan	Dam	Die Hardy Range	Olby Rock	Salmon Gum Woodland	Sand Plain	Site BM10	Site BM12	Site BM13	Site BM16	Site BM20	Site BM21	Site BM23	Site BM3	Site BM5	Site BM6	Site ME	Site MM	Bungalbin	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam
	Lichmera indistincta	Brown Honeyeater																	X	X										4		8	2		2 8		
	Melithreptus brevirostris	Brown-headed Honeyeater									2		1	2						X		6		8			1 9	8		8		1 2	3		3	8	
Monarchidae	*Grallina cyanoleuca*	Magpie-Lark																	X																		
Motacilidae	*Anthus novaeseelandiae*	Australasian Pipit														3			X	X																	
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird											1					1	X																		
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella											1						X	X																	
Pachycephalidae	*Pachycephala inornata*	Gilbert's Whistler								1																1						2	2	2			
	Pachycephala rufiventris	Rufous Whistler							2	2		1	4	4		2	1	X	X			1		1		1				2	1	2					
	Colluricincla harmonica	Grey Shrike-thrush							2	5			1			1	3	X	X						4	1	2					2	2	2	3		
	Oreoica gutturalis	Crested Bellbird							2	5			1			1	3	X	X					1		1						1	2	1	2		
Pardalotidae	*Pardalotus striatus*	Striated Pardalote									8	1						X	X			4	10		6	8	2			1 2	2	2	2	2			
Petroicidae	*Microeca leucophaea*	Jacky Winter								1		3	2						X	X		1														
	Petroica goodenovii	Red-capped Robin							4	4	2	1	2	2	5	4	3		X	X				1								2					
	Melanodryas cucullata	Hooded Robin							5			2					2		X	X																	
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler																	X					4								8					
Rhipiduridae	*Rhipidura fuliginosa*	New Zealand Fantail																						1						2	1						
	Rhipidura albiscapa	Grey Fantail									4			6	3		1	1	X	X																	
	Rhipidura leucophrys	Willie Wagtail														1	2	3	X	X								1							1	1	
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe																	X																	
Cacatuidae	*Lophochroa leadbeateri*	Major Mitchell's Cockatoo																														1					
	Eolophus roseicapillus	Galah								1	4	3	1	7	4	7			X	X										4							
	Nymphicus hollandicus	Cockatiel							1							1			X																		
Psittacidae	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet																										6				2			6	
	Polytelis anthopeplus	Regent Parrot																												1			7	2			
	Barnardius zonarius	Australian Ringneck							1		3	6			3	4	2		X	X		2	2	2	4	2	4			2			2		2		
	Psephotus varius	Mulga Parrot													4				X	X																	
	Melopsittacus undulatus	Budgerigar																	X																	
	Neopsephotus bourkii	Bourke's Parrot																	X																	
	Neophema splendida	Scarlet-chested Parrot										1																									
Strigidae	*Ninox novaeseelandiae*	Southern Boobook																	X	X																	
Tytonidae	*Tyto alba*	Barn Owl																																			
Mammals																																					
Bovidae	*Capra hircus*	Goat																	X																		
	Ovis aries	Sheep																	X																		
Camelidae	*Camelus dromedarius*	Dromedary																								1											
Canidae	*Canis lupus*	Dingo																	X	X								X								
	Vulpes vulpes	Red Fox																	X	X								X								
Felidae	*Felis catus*	House Cat																	X	X																
Emballonuridae	*Taphozous australis*	Coastal Sheathtail Bat	X	X	X	X	X					3				X			X	X																	
Molossidae	*Austronomus australis*	White-striped Freetail Bat																						X					X								X
	Mormopterus planiceps	Southern Freetail-bat	X	X	X		X	X				X				3			X	X									X								
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	X	X	X	X	X					X	1			X			X	X				X	X				X								X
	Chalinolobus morio	Chocolate Wattled Bat																						X					X								X
	Mormopterus sp.																						X	X					X								X
	Nyctophilus geoffroyi	Lesser Longeared Bat						X								X			X	X																	
	Nyctophilus major	Western Longeared Bat			X	X														X																	
	Nyctophilus sp.																																				X
	Scotorepens balstoni	Inland Broadnosed Bat	X	X			X	X				X				X			X	X																	X
	Vespadelus baverstocki	Inland Forest Bat			X											X			X	X																	X

		Surveys	A																				B	C										D								
Family	Species	Common Name	Clay pan	Dam	Die Hardy Range	Olby Rock	Salmon Gum Woodland	Sand Plain	Site BM10	Site BM12	Site BM13	Site BM16	Site BM20	Site BM21	Site BM23	Site BM3	Site BM5	Site BM6	Site ME	Site MM	Bungalbin	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam
	Vespadelus regulus	Southern Forest Bat			X	X														X				X					X								X
Dasyuridae	*Ningaui ridei*	Wongai Ningaui									5		5				2																				
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum																														1					
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo																		X																	
	Macropus robustus	Wallaroo or Euro																	X	X																	
	Macropus rufus	Red Kangaroo																	X																	1	
Leporidae	*Oryctolagus cuniculus*	European Rabbit																	X	X		X	X	X	X	X	X										
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna																	X	X																	
Muridae	*Mus musculus*	House Mouse							9	1	4	5	3	2	2	2		3		X	X																
	Notomys alexis	Spinifex Hopping Mouse							2	6	18		2	9	16		2			X	X																
	Pseudomys albocinereus	Ash-grey Mouse								12										X	X																
	Pseudomys bolami	Bolam's Mouse											1			1																					
	Pseudomys hermannsburgensis	Sandy Inland Mouse									1									X																	
Amphibians																																					
Limnodynastidae	*Neobatrachus wilsmorei*										1																										
Myobatrachidae	*Pseudophryne occidentalis*																		X																	
Reptiles																																					
Agamidae	*Ctenophorus cristatus*												1						X	X	X									1	2		2	2	1		
	Ctenophorus fordi									3			4						X	X	X																
	Ctenophorus isolepis																			X	X																
	Ctenophorus maculatus																				X																
	Ctenophorus ornatus																		X	X																	
	Ctenophorus reticulatus															5	1		X	X																	
	Ctenophorus salinarum								6										X																		
	Ctenophorus scutulatus												1	5	1		1		X	X	X																
	Moloch horridus																		X	X	X									1							
	Pogona minor								1			1			1				X	X	X									1							
Carphodactylidae	*Nephrurus milii*																			X										1	1		1	1		
	Nephrurus stellatus																				X																
	Nephrurus vertebralis														2				X																		
Diplodactylidae	*Crenadactylus ocellatus*																																				
	Diplodactylus granariensis								1												X											1	1	1			
	Diplodactylus pulcher									1						1	1		X		X									1	1	7	1	1			
	Diplodactylus vittata																			X																	
	Lucasium maini																				X											5	4	4			
	Lucasium stenodactylus																				X																
	Oedura reticulata											1																				1	1				
	Strophurus assimilis																			X	X																
	Strophurus elderi										2									X	X																
	Strophurus intermedius															1				X																	
Elapidae	*Acanthophis antarcticus*																				X																
	Brachyurophis fasciolata																				X																
	Brachyurophis semifasciata																				X									2				1			
	Demansia psammophis												1																								
	Neelaps bimaculatus																		X		X			1									5				
	Parasuta monachus														1				X		X									1			1	2	1		
	Pseudonaja mengdeni																		X																		
	Pseudonaja modesta																		X																		
	Simoselaps bertholdi																		X		X																

		Surveys	A																				B	C									D								
Family	Species	Common Name	Clay pan	Dam	Die Hardy Range	Olby Rock	Salmon Gum Woodland	Sand Plain	Site BM10	Site BM12	Site BM13	Site BM16	Site BM20	Site BM21	Site BM23	Site BM3	Site BM5	Site BM6	Site ME	Site MM	Bungalbin	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam	CR1	CR2	CR3	CR4	CR5	CR6	Opportunistic	Polaris Dam
Gekkonidae	*Gehyra purpurascens*											1		1																							
	Gehyra variegata										1			2	1	2		1	X	X										1		1	1	1	1		
	Heteronotia binoei															2	6	2	X	X																	
	Rhynchoedura ornata													1					X	X	X																
Pygopodidae	*Aprasia repens*																				X																
	Delma australis																				X																
	Delma butleri										2		1						X	X	X																
	Delma nasuta																				X																
	Lialis burtonis																			X	X																
	Pygopus lepidopodus																				X																
	Pygopus nigriceps																				X																
Scincidae	*Cryptoblepharus buchananii*												1						X	X	X																
	Ctenotus atlas									1	3		1	1						X	X																
	Ctenotus brooksi																				X																
	Ctenotus leonhardii								1										X																		
	Ctenotus mimetes																		X		X																
	Ctenotus pantherinus																				X																
	Ctenotus schomburgkii									3	4		2	3	1						X																
	Ctenotus uber																	2		X																	
	Ctenotus xenopleura																			X	X																
	Cyclodomorphus branchialis																			X	X																
	Cyclodomorphus melanops																															1		1			
	Egernia depressa																		X																		
	Egernia formosa																			X											3	1	2				
	Eremiascincus richardsonii																		X	X	X																
	Hemiergis initialis																			X																	
	Lerista macropisthopus								1										X	X	X																
	Lerista muelleri																				X																
	Lerista rhodonoides																						1													1	
	Lerista sp.									2			1	2			1		X	X																	
	Liopholis inornata													1							X																
	Menetia greyii								1	2			1		1		1			X	X									1		1		1			
	Morethia butleri														1				X	X					1						1			1	1		
	Morethia obscura																				X																
	Tiliqua occipitalis																				X																
Typhlopidae	*Ramphotyphlops australis*																													2	1	2	3				
	Ramphotyphlops bicolor																																2				
	Ramphotyphlops hamatus																			X																	
Varanidae	*Varanus caudolineatus*													1	2																						
	Varanus gouldii									1				1					X		X																
	Varanus tristis											1																									

A Burbidge A.A., Fuller, P.J. and McKenzie, N.L. (1995) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia, Part 12 Barlee-Menzies Study Area. *Records of the Western Australian Museum*, Supplement 49, 208-245.

B Bungalbin data provide by Jason Fraser to Terrestrial Ecosystems

C Ninox Wildlife Consulting (2008) *Interim Report on the FirstFfield survey of the Carina Prospect, Yilgarn Iron Ore Project*. Unpublished report for Polaris Metals NL, Perth.

D Ninox Wildlife Consulting (2009) *A Fauna Survey of the Carina Prospect; Yilgarn Iron Ore Project*. Unpublished report for Polaris Metals NL, Perth.

X = presence only

APPENDIX A(2). SUMMARY OF FAUNA SURVEY DATA IN THE VICINITY OF THE PROJECT AREA

		Surveys	A						B																											
Family	**Species**	**Common Name**	**CM1**	**CM2**	**CM3**	**CM4**	**CM5**	**CM6**	**Opportunistic**	**Site 1**	**Site 1A**	**Site 1B**	**Site 1E**	**Site 2**	**Site 2A**	**Site 2B**	**Site 2E**	**Site 3**	**Site 3A**	**Site 3B**	**Site 3E**	**Site 4**	**Site 4A**	**Site 4B**	**Site 5**	**Site 5A**	**Site 5B**	**Site 6**	**Site 6A**	**Site 6B**	**Site 7**	**Site 7A**	**Site 7B**
Birds																																				
Accipitridae	*Accipiter fasciatus*	Brown Goshawk							X																											
	Aquila audax	Wedge-tailed Eagle							X					1																						
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar							X	1																										
Podargidae	*Podargus strigoides*	Tawny Frogmouth							X																											
Casuariidae	*Dromaius novaehollandiae*	Emu				1		1																												
Columbidae	*Phaps chalcoptera*	Common Bronzewing							X																											
	Ocyphaps lophotes	Crested Pigeon						6																												
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo							X																3											
	Chalcites osculans	Black-eared Cuckoo															1																			
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar								1																										
Falconidae	*Falco berigora*	Brown Falcon		3																																
	Falco longipennis	Australian Hobby			1									2																						
	Falco peregrinus	Peregrine Falcon							X	1																										
Megapodiidae	*Leipoa ocellata*	Malleefowl		2					X																											
Acanthizidae	*Calamanthus cautus*	Shy Heathwren																																8		
	Pyrrholaemus brunneus	Redthroat												1																						
	Smicrornis brevirostris	Weebill	1 6	1 0	1 2	8	1 6	6	X					X			4	3							X						1				
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	1 0				5		X																											
	Acanthiza apicalis	Inland Thornbill	5	2			2			2							4														5				
	Aphelocephala leucopsis	Southern Whiteface																																		
	Acanthiza uropygialis	Chestnut-rumped Thornbill	4	2		4																														
Artamidae	*Artamus minor*	Little Woodswallow							X				5																							
	Cracticus torquatus	Grey Butcherbird	1				1	1		2											1															
	Cracticus nigrogularis	Pied Butcherbird			1				X								1								2											
	Strepera versicolor	Grey Currawong							X				2				3																			
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-Shrike								1																										
Climacteridae	*Climacteris rufa*	Rufous Treecreeper						3																	2											
Corvidae	*Corvus bennetti*	Little Crow							X																											
Estrildidae	*Taeniopygia guttata*	Zebra Finch							X																											
Eupetidae	*Cinclosoma castanotum*	Chestnut Quail-thrush							X																											
Maluridae	*Malurus lamberti*	Variegated Fairy-wren	4	1																																
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater	1	2	2				X					1			1																			
	Lichenostomus leucotis	White-eared Honeyeater	8	3	2			2	X					1			2								2						3				
	Lichenostomus ornatus	Yellow-plumed Honeyeater		8	6	4	4	8										2							2										
	Lichenostomus plumulus	Grey-fronted Honeyeater			2																															
	Purnella albifrons	White-fronted Honeyeater							X					2			1					1			1											
	Manorina flavigula	Yellow-throated Miner			8	2		1 3									1																			
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater							X	1				1								4			2											
	Anthochaera carunculata	Red Wattlebird	2	2	3	1	7	1 0	X	5															X											
	Lichmera indistincta	Brown Honeyeater							X	1				1							X	1			2											
	Melithreptus brevirostris	Brown-headed Honeyeater	1 2	9	9																															
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird							X																											
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella																																7		
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	1	1	1				X					2																				1		
	Colluricincla harmonica	Grey Shrike-thrush			1			1	X	7				5			1																			

		Surveys	A						B																													
Family	**Species**	**Common Name**	**CM1**	**CM2**	**CM3**	**CM4**	**CM5**	**CM6**	**Opportunistic**	**Site 1**	**Site 1A**	**Site 1B**	**Site 1E**	**Site 2**	**Site 2A**	**Site 2B**	**Site 2E**	**Site 3**	**Site 3A**	**Site 3B**	**Site 3E**	**Site 4**	**Site 4A**	**Site 4B**	**Site 5**	**Site 5A**	**Site 5B**	**Site 6**	**Site 6A**	**Site 6B**	**Site 7**	**Site 7A**	**Site 7B**
	Oreoica gutturalis	Crested Bellbird	2	1					X								1	1				2			2											
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		2	2	4	2	6	X					1			2	2							2										
Petroicidae	*Microeca leucophaea*	Jacky Winter			1				X																											
	Petroica goodenovii	Red-capped Robin							X																			1								
	Melanodryas cucullata	Hooded Robin							X																											
	Eopsaltria griseogularis	Western Yellow Robin																													1					
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	8	9																																
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail							X									1																		
Psittacidae	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet							X																											
	Polytelis anthopeplus	Regent Parrot																							2											
	Barnardius zonarius	Australian Ringneck	1			2	2	2	X												1															
	Melopsittacus undulatus	Budgerigar																X							X										
Strigidae	*Ninox novaeseelandiae*	Southern Boobook							X	1																										
Mammals																																				
Camelidae	*Camelus dromedarius*	Dromedary				X		X																												
Canidae	*Canis lupus*	Dingo							X																											
Molossidae	*Austronomus australis*	White-striped Freetail Bat			X																															
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat			X																															
	Chalinolobus morio	Chocolate Wattled Bat			X																															
	Mormopterus sp.				X																															
	Vespadelus regulus	Southern Forest Bat			X																															
Dasyuridae	*Ningaui yvonneae*	Mallee Ningaui																								1										
	Sminthopsis crassicaudata	Fat-tailed Dunnart					4																													
	Sminthopsis dolichura	Little Long-tailed Dunnart		1	1						1	2											1	1					1	1						
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum									1									1				3												
Macropodidae	*Macropus robustus*	Wallaroo or Euro							X				1				3				3															
Leporidae	*Oryctolagus cuniculus*	European Rabbit							X					1																	1					
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna							X								X																			
Muridae	*Pseudomys hermannsburgensis*	Sandy Inland Mouse																	1								1			1						
Reptiles																																				
Agamidae	*Ctenophorus cristatus*								X																							1				
	Ctenophorus reticulatus											1																								
	Pogona minor									1																										
	Tympanocryptis cephalus								X		1		1																							
Carphodactylidae	*Nephrurus milii*										1																					1				
Diplodactylidae	*Diplodactylus granariensis*															1			1	3							2					1	1		
	Diplodactylus pulcher											5			1	8			2	2						2	6								
	Lucasium maini																		5	1							1								
	Strophurus assimilis																															1				
Elapidae	*Demansia psammophis*								X																											
	Parasuta monachus											1															1								
Gekkonidae	*Gehyra variegata*																									1	2		3			1			
	Heteronotia binoei								X		2													1					1		1				
Pygopodidae	*Pygopus lepidopodus*																															1				
Scincidae	*Cryptoblepharus buchananii*														3	1																				
	Cryptoblepharus ruber											2			2	1			4	6			2	1		1			3	1		5	2		
	Cyclodomorphus branchialis								X		1																			1						
	Egernia formosa																		1																	
	Eremiascincus richardsonii																		1	2																
	Menetia greyii										1				4																					
	Morethia butleri														2									1			1									
Typhlopidae	*Ramphotyphlops australis*										1													1			1									

		Surveys	A						B																												
Family	Species	Common Name	CM1	CM2	CM3	CM4	CM5	CM6	Opportunistic	Site 1	Site 1A	Site 1B	Site 1E	Site 2	Site 2A	Site 2B	Site 2E	Site 3	Site 3A	Site 3B	Site 3E	Site 4	Site 4A	Site 4B	Site 5	Site 5A	Site 5B	Site 6	Site 6A	Site 6B	Site 7	Site 7A	Site 7B
	Ramphotyphlops bituberculatus																		2							1								
	Ramphotyphlops hamatus																			1														
Varanidae	*Varanus giganteus*								X																									
	Varanus tristis											2							1											1				

A Ninox Wildlife Consulting (2008) *Interim report on the FirstFfield survey of the Chamaeleon Prospect, Yilgarn Iron Ore Project*. Unpublished report for Polaris Metals NL, Perth.

B Lyons MN and Chapman A (1997) *A Biological Survey of the Helena and Aurora Range; Eastern Goldfields Western Australia*. Unpublished report for Environment Australia, Canberra.

X = presence only

APPENDIX A(3). SUMMARY OF FAUNA SURVEY DATA IN THE VICINITY OF THE PROJECT AREA

		Surveys	A																			B													
Family	**Species**	**Common Name**	**Site 10a**	**Site 15**	**Site 15a**	**Site 15b**	**Site 18**	**Site 18a**	**Site 18b**	**Site 18c**	**Site 21**	**Site 35**	**Site 37**	**Site 39**	**Site 42a**	**Site 44**	**Site 44a**	**Site 48a**	**Site 8a**	**Site 8b**	**Opportunistic**	**Site 1**	**Site 16**	**Site 2**	**Site 22**	**Site 23**	**Site 24**	**Site 25**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**
Birds																																				
Accipitridae	*Accipiter fasciatus*	Brown Goshawk																									1							
	Aquila audax	Wedge-tailed Eagle						X		1								5														6		
	Hieraaetus morphnoides	Little Eagle										X				1		3								1								
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar						1								1		5	X	X							1							
Podargidae	*Podargus strigoides*	Tawny Frogmouth														1				1	2													
Casuariidae	*Dromaius novaehollandiae*	Emu																			1		1		1		1					X		
Turnicidae	*Turnix velox*	Little Button-quail						1		1																								
Columbidae	*Phaps chalcoptera*	Common Bronzewing				102														1						3		1						
	Ocyphaps lophotes	Crested Pigeon																										1						
Meropidae	*Merops ornatus*	Rainbow Bee-eater				2		2																		5								
Cuculidae	*Chalcites osculans*	Black-eared Cuckoo																				1										4		
	Cacomantis pallidus	Pallid Cuckoo																														1		
	Cacomantis flabelliformis	Fan-tailed Cuckoo																																3
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar				3		4										2			1													
Falconidae	*Falco cenchroides*	Nankeen Kestrel										1		X				3	X															
	Falco berigora	Brown Falcon						2								1						1												
	Falco longipennis	Australian Hobby																								1								
Falconidae	*Falco peregrinus*	Peregrine Falcon						1													2													
Megapodiidae	*Leipoa ocellata*	Malleefowl																	1	1							1							
Otididae	*Ardeotis australis*	Australian Bustard																2																
Acanthizidae	*Calamanthus cautus*	Shy Heathwren											3														1							
	Calamanthus fuliginosus	Striated Fieldwren										7		1 7																				
	Pyrrholaemus brunneus	Redthroat					2	1 0		1		2	6						2	4					3									5
	Smicrornis brevirostris	Weebill					9 1	2 9	7 6	8			2 7			133		5 0	142	155		1 0	1 5	4	4		1 0	2 0	1 2	1 1	2 0	1 7		3
	Gerygone fusca	Western Gerygone							1									X	3		1								1					
	Acanthiza robustirostris	Slaty-backed Thornbill																									5							
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill					X					1				7		3	2	4	1		5		2		3	1						
	Acanthiza apicalis	Inland Thornbill					X	3 1	9	9		2 0	5 6	3				X	1 6	X		6	6		8		1		5			7	2 1	
	Aphelocephala leucopsis	Southern Whiteface				6																			4									
	Acanthiza uropygialis	Chestnut-rumped Thornbill					1 3	4	4 9			1 1	2 4			1 5		2 0	9 9	2 1			1 2		2 3		5		3	3			7	
Acrocephalidae	*Cincloramphus mathewsi*	Rufous Songlark																6																
Artamidae	*Artamus cinereus*	Black-faced Woodswallow										1 0	1	6												1								
	Artamus cyanopterus	Dusky Woodswallow														1		2		5														
	Artamus minor	Little Woodswallow						1 6		2 8			X																					
	Cracticus torquatus	Grey Butcherbird					3	X	5	1						X		1 2	9	1 5	1	4	2	3				1	2	3	1		2	1	
	Cracticus nigrogularis	Pied Butcherbird					1 7	3	1							3 5		2 1	7	2				6		3		2	8	3	4	1 3		1
	Cracticus tibicen	Australian Magpie					6									X		X						6					4		1	5		
	Strepera versicolor	Grey Currawong							6	1						X		9	4	2			6				1	1						
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-Shrike					5	2				X	X			3 2		2 6	X	4	1	5	5		2	2	3	6	1		4	1	1	
Climacteridae	*Climacteris rufa*	Rufous Treecreeper					2									4 2		6 3								4			1	3	2			
Corvidae	*Corvus coronoides*	Australian Raven						1	X	1								X				7	4	6		1			4		1	4	1	
	Corvus bennetti	Little Crow								2								2	X	X			2					3						
	Corvus orru	Torresian Crow				5							1	X		X																		
Estrildidae	*Taeniopygia guttata*	Zebra Finch				3														2	1													
Eupetidae	*Cinclosoma castanotum*	Chestnut Quail-thrush						5	8	2			2			1				4			1												

		Surveys	A																			B																
Family	Species	Common Name	Site 10a	Site 15	Site 15a	Site 15b	Site 18	Site 18a	Site 18b	Site 18c	Site 21	Site 35	Site 37	Site 39	Site 42a	Site 44	Site 44a	Site 48a	Site 8a	Site 8b	Opportunistic	Site 1	Site 16	Site 2	Site 22	Site 23	Site 24	Site 25	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow																								1 2								
	Hirundo neoxena	Welcome Swallow																			1													
	Petrochelidon nigricans	Tree Martin														2														1 8		5		
Maluridae	*Malurus splendens*	Splendid Fairy-wren				2							X								3				2								1 3	
	Malurus pulcherrimus	Blue-breasted Fairy-wren											5																					
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater				1	3	X	X	1 1		6	3	3		4		X	6	X	1	2	1		3 0			1		4	1	1	4	4
	Lichenostomus leucotis	White-eared Honeyeater						2 5	5	4		3	1			7		2	1 6	2 6		6				1	5							2
	Lichenostomus flavicollis	Yellow-throated Honeyeater						2								5 7			2 7															
	Lichenostomus ornatus	Yellow-plumed Honeyeater					2									278		188		X			1			3 7			3	5 9	7 5	2 4		
	Purnella albifrons	White-fronted Honeyeater					2					X	7	3		1 8			1 7	9					5			1				6	2
	Manorina flavigula	Yellow-throated Miner							2 4									6 8		8		2	1	2 0			1 0	1 9	2 6	2 1	1 2			1
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater				2	1	X	3	4		X	1 5	2		1 0		2 4	7	1 2	1	2	1		3 0			1		4	1	1	4	4
	Anthochaera carunculata	Red Wattlebird					4	2	X							3 4		2 5	1 8	1	1	1 1		3 8		2		2	6 3	4 6	3 8	4 5		1 1
	Epthianura tricolor	Crimson Chat						X		2																								
	Lichmera indistincta	Brown Honeyeater						X		2						2 0		2 0		2 2	1	1			1 1				2	6	2	6		2
	Melithreptus brevirostris	Brown-headed Honeyeater					4	1 0	7	6						2		4	2	3 2														
Monarchidae	*Grallina cyanoleuca*	Magpie-Lark																2						2										
Motacilidae	*Anthus novaeseelandiae*	Australasian Pipit				2																											3	
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird										X				1		X		4			1 2											
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella					2													4	1	5	8		8	5								
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler											4							3														
	Pachycephala rufiventris	Rufous Whistler					1	1	4				2			6		X	1	1 8	1	4	1			4	1							
	Colluricincla harmonica	Grey Shrike-thrush						9	3	4		1	1 1			X		8	5	1 2	1	2			5	7		3		3	4		1	3
	Oreoica gutturalis	Crested Bellbird					X	1 0	3	2		6	2	6		1 3		5	2	X		1	5	2	5	2	1	4	1	1				1
Pardalotidae	*Pardalotus striatus*	Striated Pardalote					5 0	X	6 3	3			4			138		110	6 5	3 2	1	3	4	9	9		2	2	1 4	1 4	9	3 4		
Petroicidae	*Microeca leucophaea*	Jacky Winter					9	1								4 1		X		1	4		2		1			3					
	Petroica goodenovii	Red-capped Robin				1	1 5	1 5	6	4		5	1 4	2		4		3	2 8	2 3	1	2	2		3		4	1					8	4
	Melanodryas cucullata	Hooded Robin												2									1										
	Eopsaltria griseogularis	Western Yellow Robin											3						1															
	Drymodes brunneopygia	Southern Scrub-robin								1										X														
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler						6	5	1 5									1	X	5				9									
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail							1				1							2														
	Rhipidura leucophrys	Willie Wagtail						1				X				2		7	2									5					1	
Cacatuidae	*Calyptorhynchus banksii*	Red-tailed Black-Cockatoo				6										6																		
	Calyptorhynchus banksii naso	Red-tailed Black-Cockatoo																2																
	Lophochroa leadbeateri	Major Mitchell's Cockatoo																							2 2	2 3								
	Eolophus roseicapillus	Galah				2 5												7											5		2			2
Psittacidae	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet							X							1 7		1 2			1		4 8	3 2	4	2 7			9 0	620	142	138	4 7	230
	Polytelis anthopeplus	Regent Parrot																			2								4	1			1	1
	Barnardius zonarius	Australian Ringneck				2	1 1	3	7				1	2		4 1		5 2	2 4	1 2	4	5	5	2 1	8	5		4	1 3	1 1	8	2		
	Neophema splendida	Scarlet-chested Parrot																																
Strigidae	*Ninox novaeseelandiae*	Southern Boobook				1										2		1		2			1											
Tytonidae	*Tyto alba*	Barn Owl																									1							
Mammals																																		
Canidae	*Canis lupus familiaris*	Dog																									1							
Molossidae	*Austronomus australis*	White-striped Freetail Bat														1	2	1 2				X											X	
	Mormopterus planiceps	Southern Freetail-bat																4																
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat													237	2		2 5																X
	Chalinolobus morio	Chocolate Wattled Bat													2																			
	Nyctophilus geoffroyi	Lesser Longeared Bat																2																
	Scotorepens balstoni	Inland Broadnosed Bat													1			3																
	Vespadelus regulus	Southern Forest Bat							1						1			1 0		2														

		Surveys	A																			B															
Family	Species	Common Name	Site 10a	Site 15	Site 15a	Site 15b	Site 18	Site 18a	Site 18b	Site 18c	Site 21	Site 35	Site 37	Site 39	Site 42a	Site 44	Site 44a	Site 48a	Site 8a	Site 8b	Opportunistic	Site 1	Site 16	Site 2	Site 22	Site 23	Site 24	Site 25	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Dasyuridae	*Ningaui ridei*	Wongai Ningaui										3		4																						
	Ningaui yvonneae	Mallee Ningaui										1		1																						
	Sminthopsis crassicaudata	Fat-tailed Dunnart																1																		
	Sminthopsis dolichura	Little Long-tailed Dunnart	8				2		2			2	2	2		3	1	2	3											1					1
	Sminthopsis hirtipes	Hairy-footed Dunnart										1		1																					
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum											1			1		1	2				1						1	2		1	2		
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	X				X					X						X										2						
	Macropus robustus	Wallaroo or Euro						X										X		X														
Leporidae	*Oryctolagus cuniculus*	European Rabbit												X			X	X	X		2	X	1											
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna																															X	X
Muridae	*Mus musculus*	House Mouse					3		5					2		6	6	5	2	7 7			1	2	4	1	2	7			2	7	1 0	
	Notomys alexis	Spinifex Hopping Mouse											1	1																				
	Notomys mitchellii	Mitchell's Hopping Mouse	1										1																					
	Pseudomys albocinereus	Ash-grey Mouse										5		2 1		1									1									
	Pseudomys hermannsburgensis	Sandy Inland Mouse	1						1			2	2			1										2								
Amphibians																																		
Limnodynastidae	*Neobatrachus kunapalari*																				1 0	3							3	1		2	1	
	Neobatrachus sutor				6		1												1															
Myobatrachidae	*Pseudophryne occidentalis*			1														2			1 5								1	4				
Reptiles																																		
Agamidae	*Ctenophorus cristatus*						1								1	2		1	1							1								
	Ctenophorus fordi											1																						
	Ctenophorus isolepis citrinus											8		1 3																				
	Ctenophorus reticulatus			1	2				3		1	1			1		1			8			1		1			1						
	Ctenophorus scutulatus		4	1					4							1	2		1	3														
	Moloch horridus		1										1																					
	Pogona minor		1				1	1				3	1	3			1										1							
	Tympanocryptis cephalus						2													4														
Boidae	*Antaresia stimsoni*																1			1														
Carphodactylidae	*Nephrurus milii*										4					4		4 1		1									1					
	Nephrurus stellatus											2		2																				
	Nephrurus vertebralis		1																															
Diplodactylidae	*Crenadactylus ocellatus*															3			1															
	Diplodactylus granariensis		2		8		2		4		3				1	3	7	1 2	1															
	Diplodactylus pulcher		1		6		4		4			2			1	2	3	3	1	2		2	1	2	4	3	1		2					
	Lucasium maini				1 0		1	2							5	9										1	2			1				
	Lucasium stenodactylus											2		1																				
	Oedura reticulata			1			1									2		6	6	1			1			2								
	Strophurus elderi													1																				
	Strophurus intermedius				2		1								5	9			1 0															
Elapidae	*Parasuta monachus*																1																	1
	Pseudechis australis																			2					1			1						
	Pseudonaja affinis																								1									
	Simoselaps bertholdi			1	1													1		1														
	Simoselaps semifasciata																		2															
	Suta fasciata																	1			1													
Gekkonidae	*Gehyra variegata*		7		1 1		3	1	3		4		1		3	1 1	1	1 9	2	4														
	Heteronotia binoei		3		4			3	3		1 2				1		3	2		2							2		3	1	1	2		3
	Rhynchoedura ornata		1		5								2		2		1		1	1			1											
Pygopodidae	*Delma australis*			1												8		2	3															
	Delma butleri																						1				2							
	Delma nasuta													1	1																			

TERRESTRIAL ECOSYSTEMS

		Surveys	A																			B																
Family	Species	Common Name	Site 10a	Site 15	Site 15a	Site 15b	Site 18	Site 18a	Site 18b	Site 18c	Site 21	Site 35	Site 37	Site 39	Site 42a	Site 44	Site 44a	Site 48a	Site 8a	Site 8b	Opportunistic	Site 1	Site 16	Site 2	Site 22	Site 23	Site 24	Site 25	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
	Lialis burtonis														1																					
	Pygopus lepidopodus																													1					
	Pygopus nigriceps																			1															
Scincidae	*Cryptoblepharus buchananii*				1			2								3	1	1		2							1								
	Ctenotus atlas											4		3	5												2	1							
	Ctenotus leonhardii				1																														
	Ctenotus mimetes														1																				
	Ctenotus schomburgkii	3						5			2	7		3				2																	
	Ctenotus uber					2	1	6									6			4			1					2				2		
	Ctenotus xenopleura										1 1	1	1 7																					
	Cyclodomorphus branchialis						4	1		3				1						1															
	Cyclodomorphus melanops																						1					1							
	Egernia depressa							1																											
	Eremiascincus richardsonii																								1	2		2							
	Hemiergis initialis					2	1 3	2		5						2	1 5	3		4															
	Lerista gerrardii													1																			1		
	Lerista macropisthopus		1	4						1	1				1		4																		
	Lerista sp.	3		2		3	2							2	4	1 1	8	2	5			1			1	2		1			1				
	Liopholis inornata													1				1							2										
	Menetia greyii		1	1							2	1		1	3	1	1	3																	
	Morethia butleri													2	6	2	1	2	4									1							
	Tiliqua occipitalis											1																							
	Tiliqua rugosa																									1									
Typhlopidae	*Ramphotyphlops australis*					1									1								1												
	Ramphotyphlops hamatus														1																				
Varanidae	*Varanus giganteus*						1			1																									
	Varanus gouldii	1										1													1	3	1								
	Varanus tristis																			1															

A Dell J and How RA (1985) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia Part 3; Jackson - Kalgoorlie. *Records of the Western Australian Museum*; Supplement No 23, 39-66.

B Ecologia Environmental (2003) *Koolyanobbing Expansion Project - Transport Corridor Fauna Assessment Survey*. Unpublished report for Portman Iron Ore Limited, Perth.

X = presence only

APPENDIX A(4). SUMMARY OF FAUNA SURVEY DATA IN THE VICINITY OF THE PROJECT AREA

		Survey	A																																	
Family	**Species**	**Common Name**	**Opportunistic**	**Site 1**	**Site 10**	**Site 11**	**Site 12**	**Site 13**	**Site 14**	**Site 15**	**Site 16**	**Site 17**	**Site 18**	**Site 19**	**Site 2**	**Site 20**	**Site 21**	**Site 22**	**Site 23**	**Site 24**	**Site 25**	**Site 26**	**Site 27**	**Site 28**	**Site 29**	**Site 3**	**Site 30**	**Site 31**	**Site 32**	**Site 33**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**
Birds																																				
Accipitridae	*Lophoictinia isura*	Square-tailed Kite	1											1																						
	Accipiter fasciatus	Brown Goshawk		1																	1															
	Accipiter cirrocephalus	Collared Sparrowhawk			1																															
	Aquila audax	Wedge-tailed Eagle			1								2								1												1		2	
	Hieraaetus morphnoides	Little Eagle																	1																	
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar		1																1																
Podargidae	*Podargus strigoides*	Tawny Frogmouth														1																				
Casuariidae	*Dromaius novaehollandiae*	Emu									1			X		X		1	X		1							X								
Turnicidae	*Turnix velox*	Little Button-quail							1	1																										
Columbidae	*Phaps chalcoptera*	Common Bronzewing						1							2				3														1		1	
Alcedinidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher			1														5			1													2	
Meropidae	*Merops ornatus*	Rainbow Bee-eater			1			1				2			1					5						24					3	1	3			
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar										1	1																				2			
Falconidae	*Falco cenchroides*	Nankeen Kestrel			1									3											1											
	Falco cenchroides cenchroides	Nankeen Kestrel																																		
	Falco berigora	Brown Falcon		1			1	2														1										1				
	Falco longipennis	Australian Hobby										1							1																	
	Falco peregrinus	Peregrine Falcon								2																										
Megapodiidae	*Leipoa ocellata*	Malleefowl	1																	1																
Otididae	*Ardeotis australis*	Australian Bustard	1																																	
Acanthizidae	*Calamanthus cautus*	Shy Heathwren																		2														1		
	Calamanthus fuliginosus	Striated Fieldwren				1																														
	Pyrrholaemus brunneus	Redthroat				3	7	4							5			3					2		6		1	1	2		2	1	2	1		
	Smicrornis brevirostris	Weebill			21	6		30	1		15			1			19	4		10	20	50	9	16	23	19	16	18	41	7	27	7		10	6	1
	Acanthiza robustirostris	Slaty-backed Thornbill				3														1																
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill			17	2					5							2		3	1	3				1					14	13				
	Acanthiza apicalis	Inland Thornbill		12	3	14	17	16		1	6				8		4	8		1		10	13		12	2	28	37			14	1	7	13	9	
	Aphelocephala leucopsis	Southern Whiteface			1	12												4																		
	Acanthiza uropygialis	Chestnut-rumped Thornbill		6	26	27	13	22	1		12		1		9		26	23		5		50	36		13	3	18	23			38		15	32	26	
Artamidae	*Artamus cinereus*	Black-faced Woodswallow										12							1																	
	Artamus cyanopterus	Dusky Woodswallow																						1												
	Artamus minor	Little Woodswallow		3			6	2	1	9			8		18		2													3		15	10			
	Cracticus torquatus	Grey Butcherbird			4	3	1	4	1		2	2									1			2	2	1	1				2	1		1	3	
	Cracticus nigrogularis	Pied Butcherbird			7		2	3						9					3		2		1			7										
	Cracticus tibicen	Australian Magpie			3						1	2												3											2	
	Strepera versicolor	Grey Currawong			7		1	2			6			1			6			1	1		1			4	3	6			3	1			1	
Campephagidae	*Coracina maxima*	Ground Cuckoo-Shrike																						10												
	Coracina novaehollandiae	Black-faced Cuckoo-Shrike		1	5	3					5	8	8	7	5			2	2	3	6		2	6	4	3			3	2		2		2	1	
Climacteridae	*Climacteris affinis*	White-browed Treecreeper				1																													2	
	Climacteris rufa	Rufous Treecreeper			8									8					4					12												
Corvidae	*Corvus coronoides*	Australian Raven									4			5					1																2	
	Corvus bennetti	Little Crow									2					5					3															
Eupetidae	*Cinclosoma castanotum*	Chestnut Quail-thrush		2			8	2			1								5			1		1				4			2	3		6	4	
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow										2							12														1			
	Hirundo neoxena	Welcome Swallow																							2								3			

TERRESTRIAL ECOSYSTEMS

		Survey	A																																	
Family	**Species**	**Common Name**	**Opportunistic**	**Site 1**	**Site 10**	**Site 11**	**Site 12**	**Site 13**	**Site 14**	**Site 15**	**Site 16**	**Site 17**	**Site 18**	**Site 19**	**Site 2**	**Site 20**	**Site 21**	**Site 22**	**Site 23**	**Site 24**	**Site 25**	**Site 26**	**Site 27**	**Site 28**	**Site 29**	**Site 3**	**Site 30**	**Site 31**	**Site 32**	**Site 33**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**
	Petrochelidon nigricans	Tree Martin			8							10											4	4		2						4	2		2	
	Petrochelidon ariel	Fairy Martin					2																													
Maluridae	*Malurus splendens*	Splendid Fairy-wren	1			17												2				7														
	Malurus leucopterus	White-winged Fairy-wren	1																																	
	Malurus pulcherrimus	Blue-breasted Fairy-wren																										8								
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater		16	1		6	14	4	6	1	2	28		23		16	30			1	3	3	2	1		9	7	58	42	3	19	17	8	14	1
	Lichenostomus leucotis	White-eared Honeyeater				1	1			2					1				1	5						2		1	2							
	Lichenostomus ornatus	Yellow-plumed Honeyeater			19						1			53		4			37					60	3						37		3		2	
	Lichenostomus plumulus	Grey-fronted Honeyeater																								2										
	Purnella albifrons	White-fronted Honeyeater																5			1														2	
	Manorina flavigula	Yellow-throated Miner			3		8				1		2	12		1				10	19				4							2	3		6	
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater			10	7	3	2				3		9	1			37	4	7	13	2		5	1	4					7			21	15	
	Anthochaera carunculata	Red Wattlebird		3	10									28	3	3			2		2	3		1	8	12				2					1	
	Epthianura tricolor	Crimson Chat										10																								
	Lichmera indistincta	Brown Honeyeater		3									8		5				11							1			2	3		1				
	Melithreptus brevirostris	Brown-headed Honeyeater		2		3		3		3					4		11					2				1	10		7	5	27			7	4	
Motacilidae	*Anthus novaeseelandiae*	Australasian Pipit										2																								
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird		3				1		1	12		2		3		4						3	3	11	2	1		6	8	1	9		1	1	3
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella									8							8																		
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler		4	2	18	13	10	3	4	1				7				4	1			1		3		1	2			7	4	12	4	5	3
	Colluricincla harmonica	Grey Shrike-thrush		4			4	11	4	3			4		13		2	5	7		3		2	4		8	1		5	6	5	12		4	2	2
	Oreoica gutturalis	Crested Bellbird		5	3	9	2	4	2		5	3	1	4	4		10	5	2	1	4	2	2	7	4	6	2	1	1	1	5	4	7	5	7	
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote			5																															
	Pardalotus striatus	Striated Pardalote		2	19			5		1	4	2	5			2	2	9		2	2	6	9	6	15	17		1	9	6	16	2		1	10	
Petroicidae	*Microeca leucophaea*	Jacky Winter				5					2				2			1			3	1	1		1	4									3	
	Petroica goodenovii	Red-capped Robin		3	4	12	2	7		1	2				1			3		4	1	6			1	4	1	2			14	1	1	7	10	2
	Melanodryas cucullata	Hooded Robin									1		1																1				4	1	4	
	Eopsaltria griseogularis	Western Yellow Robin																									2	3		3						
	Drymodes brunneopygia	Southern Scrub-robin																										2								
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler					6	11		6					12			9				11										4		3		
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	1			3	2	3							1																3					1
	Rhipidura leucophrys	Willie Wagtail					3		2	2		3	5				2				5									2					1	
Cacatuidae	*Calyptorhynchus banksii*	Red-tailed Black-Cockatoo	1																																	
	Lophochroa leadbeateri	Major Mitchell's Cockatoo	1															12	23																	
	Eolophus roseicapillus	Galah			5																					2									4	
Psittacidae	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet			19						48	1	14	85		4	4	4	27			5	6	2	35	8			37	8						
	Polytelis anthopeplus	Regent Parrot	1		1																															
	Barnardius zonarius	Australian Ringneck			23	2	3		5		5			15			3	8	5		4	2	3	8	11	9					3	2		4	10	
Strigidae	*Ninox novaeseelandiae*	Southern Boobook									1			1																						
Tytonidae	*Tyto alba*	Barn Owl	1																	1																
Mammals																																		
Bovidae	*Bos taurus*	Cow			1																															
	Capra hircus hircus	Goat													1			1												2		1	4	1		
Canidae	*Canis lupus familiaris*	Dog	1																	1										1				1		
	Vulpes vulpes	Red Fox																													1					
Felidae	*Felis catus*	House Cat	2																																	
Molossidae	*Austronomus australis*	White-striped Freetail Bat	1																																	
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Longeared Bat	1																																	
	Vespadelus baverstocki	Inland Forest Bat				1																														
	Vespadelus regulus	Southern Forest Bat	1																																	
Dasyuridae	*Ningaui yvonneae*	Mallee Ningaui																						1			2									
	Pseudantechinus woolleyae	Woolley's False Antechinus											1		1															1		1				

TERRESTRIAL ECOSYSTEMS

		Survey	A																																	
Family	**Species**	**Common Name**	**Opportunistic**	**Site 1**	**Site 10**	**Site 11**	**Site 12**	**Site 13**	**Site 14**	**Site 15**	**Site 16**	**Site 17**	**Site 18**	**Site 19**	**Site 2**	**Site 20**	**Site 21**	**Site 22**	**Site 23**	**Site 24**	**Site 25**	**Site 26**	**Site 27**	**Site 28**	**Site 29**	**Site 3**	**Site 30**	**Site 31**	**Site 32**	**Site 33**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**
	Sminthopsis crassicaudata	Fat-tailed Dunnart																																		
	Sminthopsis dolichura	Little Long-tailed Dunnart		2										3			2					1		2				2					1	2		
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum			2						1										1				1	2			2		1					
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	1														1	1											1	1						
	Macropus robustus	Wallaroo or Euro	1				3	2																												
	Macropus rufus	Red Kangaroo	1																																	
Leporidae	*Oryctolagus cuniculus*	European Rabbit			1		1				1		1													1	1	1	1	2			1			
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna		3				1																		2					1					
Muridae	*Mus musculus*	House Mouse		6	1	2		3	1	1	1	1	1	2	6	1	10	4	1	2	7	1	6	14	3	8	3	2	5	5	5	9	1	9	1	1
	Notomys sp.	Great Hopping Mouse																									1									
	Pseudomys hermannsburgensis	Sandy Inland Mouse		2															1					1												
Reptiles																																		
Agamidae	*Ctenophorus cristatus*										1								1			3	1												1	
	Ctenophorus reticulatus					3												1			1	1						1								
	Moloch horridus											1																								
	Pogona minor			2					1			1			1					1								1								
	Tympanocryptis cephalus																										1									
Carphodactylidae	*Nephrurus milii*						2							2		1	1															6	1			
Diplodactylidae	*Crenadactylus ocellatus*												1	5		1																				
	Diplodactylus granariensis		1		1			1										1						1		1	1	1	1		2		1			
	Diplodactylus pulcher		1			2					1											4		2	1	1	1		1	3		1			2	
	Diplodactylus vittata																																			
	Lucasium maini															1			1	2	1															
	Oedura reticulata		1								1			5		1			2							1									1	
	Strophurus assimilis																										2									
Elapidae	*Furina ornata*																										1									
	Parasuta monachus																																	1		
	Pseudechis australis																	1			1															
	Pseudonaja affinis																	1																		
	Simoselaps bertholdi																					1			1											
Gekkonidae	*Gehyra variegata*		1	2	3		1	5			1	1		3	5			4	3	1	1	6		1	1	1	5	3		1			7	3	4	
	Heteronotia binoei		1	3	8	5	9	8				1	3		16		1		1	2			6							1		9				
	Rhynchoedura ornata		1								1													1	1											
Pygopodidae	*Delma australis*			1	1						1				1							1														
	Delma butleri																			2																
	Pygopus lepidopodus									1															1											
Scincidae	*Cryptoblepharus buchananii*			2	2									3	2					1							1		1			1	3	1	6	1
	Ctenotus atlas																			2	1															
	Ctenotus mimetes		1																																	
	Ctenotus uber		1		1	1					1										2	1	1	3	1	1	6	3	2	1					2	
	Cyclodomorphus melanops										1		3				1				1									1						
	Egernia depressa				1	2		2																	1		1									
	Egernia formosa													4																						
	Eremiascincus richardsonii																	1	2		2	1				1										
	Hemiergis initialis			1				5					1		1								1							1	6	1		1		
	Lerista gerrardii															1																				
	Lerista macropisthopus			1	3			2							5											4					3			1		
	Lerista sp.			1	7	1							1		2			1	2		1		3		2	3	1			2	11			1	3	
	Liopholis inornata											1						2																		
	Menetia greyii				1	1		1									1							3					1	4	1		1			
	Morethia butleri				4			2													1		1		1	1	1				5				1	
	Tiliqua rugosa																	1	1																	

		Survey	A																																		
Family	**Species**	**Common Name**	**Opportunistic**	**Site 1**	**Site 10**	**Site 11**	**Site 12**	**Site 13**	**Site 14**	**Site 15**	**Site 16**	**Site 17**	**Site 18**	**Site 19**	**Site 2**	**Site 20**	**Site 21**	**Site 22**	**Site 23**	**Site 24**	**Site 25**	**Site 26**	**Site 27**	**Site 28**	**Site 29**	**Site 3**	**Site 30**	**Site 31**	**Site 32**	**Site 33**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**
Typhlopidae	*Ramphotyphlops australis*							1			1				1																					
	Ramphotyphlops bituberculatus																						1					1								
Varanidae	*Varanus caudolineatus*					1																														
	Varanus giganteus		1				1								1										1							1	3			
	Varanus gouldii		1									1						1	3	1																
	Varanus tristis													1															1		1					

A Ecologia Environmental Consultants (2001) *Koolyanobbing Expansion Project - Fauna Assessment Survey*. Unpublished report for Portman Iron Ore Limited.

X = presence only

APPENDIX A(5). SUMMARY OF FAUNA SURVEY DATA IN THE VICINITY OF THE PROJECT AREA

		Surveys	A	B			C			D			E		
Family	Species	Common Name	Mt Walton	MJ1	MJ2	WD1	MJ1	MJ2	WD1	MJ1	MJ2	WD1	MJ1	MJ2	WD1
Birds															
Accipitridae	*Lophoictinia isura*	Square-tailed Kite						1							
Podargidae	*Podargus strigoides*	Tawny Frogmouth					3								
Meropidae	*Merops ornatus*	Rainbow Bee-eater			X			1			2				
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar				1									
Falconidae	*Falco peregrinus*	Peregrine Falcon		1											
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat				X	1					3			
	Smicrornis brevirostris	Weebill		X	1 5		2	1 3			6				
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill						3							
	Acanthiza apicalis	Inland Thornbill		2	8	2	6			3		7			
	Aphelocephala leucopsis	Southern Whiteface													
	Acanthiza uropygialis	Chestnut-rumped Thornbill		8	8	1 0	6	6	8						
Artamidae	*Cracticus torquatus*	Grey Butcherbird			X	1					1				
	Cracticus nigrogularis	Pied Butcherbird			X	X									
	Strepera versicolor	Grey Currawong		X	X	X									
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-Shrike				X					4				
Eupetidae	*Cinclosoma castanotum*	Chestnut Quail-thrush		5	2										
Hirundinidae	*Petrochelidon nigricans*	Tree Martin								3					
Maluridae	*Malurus splendens*	Splendid Fairy-wren		2	2		7					5			
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater		X					1			1			
	Lichenostomus leucotis	White-eared Honeyeater			1		6	2	1						
	Lichenostomus ornatus	Yellow-plumed Honeyeater									1				
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater							2		1	2			
	Anthochaera carunculata	Red Wattlebird									2				
	Lichmera indistincta	Brown Honeyeater		X			5								
	Melithreptus brevirostris	Brown-headed Honeyeater					3								
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird		X	1			2							
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella									5				
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler		2	X		2								
	Pachycephala rufiventris	Rufous Whistler		X	X	X			2	1	1	1			
	Colluricincla harmonica	Grey Shrike-thrush		X	X	X	2	9	1	3	2				
	Oreoica gutturalis	Crested Bellbird		X	X	X									
Pardalotidae	*Pardalotus striatus*	Striated Pardalote			1			4			2				
Petroicidae	*Microeca leucophaea*	Jacky Winter						1			1				
	Petroica goodenovii	Red-capped Robin				1	1	1	1			1			
	Eopsaltria griseogularis	Western Yellow Robin					2								
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler		5		X									
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail							2						
	Rhipidura leucophrys	Willie Wagtail									2				
Cacatuidae	*Eolophus roseicapillus*	Galah						1							
Psittacidae	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet			1	X					6				
	Polytelis anthopeplus	Regent Parrot									1				
	Barnardius zonarius	Australian Ringneck			1			1			9	3			
Mammals															
Felidae	*Felis catus*	House Cat	1												
Dasyuridae	*Sminthopsis dolichura*	Little Long-tailed Dunnart	1 7	2		2	1	1	5	6	4	1	3	1	
	Sminthopsis hirtipes	Hairy-footed Dunnart	1												

		Surveys	A	B			C			D			E		
Family	**Species**	**Common Name**	**Mt Walton**	**MJ1**	**MJ2**	**WD1**	**MJ1**	**MJ2**	**WD1**	**MJ1**	**MJ2**	**WD1**	**MJ1**	**MJ2**	**WD1**
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum								1		1			
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	3												
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	1												
Muridae	*Mus musculus*	House Mouse	2			2	1	2	5		2	1			
	Pseudomys albocinereus	Ash-grey Mouse	9												
Reptiles															
Agamidae	*Ctenophorus cristatus*		1												
	Ctenophorus fordi		9												
	Ctenophorus reticulatus		2		3	3					1	2		3	
	Ctenophorus scutulatus		3	2	2		1				1		3		
	Moloch horridus		1												
	Pogona minor		2		5		2	1	2	5	1		1	1	
Carphodactylidae	*Nephrurus milii*			3			1								
	Nephrurus stellatus		2 6												
Diplodactylidae	*Diplodactylus granariensis*		1	3	5		1	4						2	
	Diplodactylus pulcher			3	6	1 0	2	3	4		1	1			1
	Lucasium maini		1								2			1	
	Lucasium stenodactylus				4			1							
	Oedura reticulata				1										
	Strophurus assimilis		1												
Elapidae	*Brachyurophis semifasciata*											1			
	Pseudonaja mengdeni		1												
	Pseudonaja modesta													1	
	Simoselaps bertholdi				1										
Gekkonidae	*Gehyra variegata*			4	6	5	1 0	6	3		1				
	Heteronotia binoei			1		1		1	2				1		
Pygopodidae	*Delma australis*						1								
	Delma fraseri			1											
	Pygopus lepidopodus							1							
Scincidae	*Cryptoblepharus buchananii*				4										
	Ctenotus mimetes					6			1						
	Ctenotus schomburgkii		1 3	2			2	1		2			2		
	Ctenotus uber			5	8	8	2	2	2		2		1		4
	Egernia depressa					2			2						1
	Eremiascincus richardsonii											1			
	Lerista macropisthopus		1	1	3	2			1				1		
	Lerista muelleri				2			4				1	1	1	
	Liopholis inornata		3										1		
	Menetia greyii		3		1				1		2				
	Morethia butleri				2			1							
	Morethia obscura		1												
	Tiliqua occipitalis		2												
Typhlopidae	*Ramphotyphlops australis*		1	1				1							
Varanidae	*Varanus caudolineatus*					5			3						
	Varanus gouldii		2		1										
	Varanus tristis		1												

A Dickman, C.R., Henry-Hall, N.J., Lloyd, H. and Romanow, K.A. (1991) A survey of the terrestrial vertebrate fauna of Mount Walton, western goldfields, Western Australia. *Western Australian Naturalist*, 18, 200-206.

B Bamford Consulting Ecologists and Metcalf, B. (2005) *Portman Iron Ore Windarling/Mt Jackson Project: Fauna Studies*. Unpublished report for Portman Iron Ore Ltd, Perth.

C Bamford Consulting Ecologists (2006) *Portman Iron Ore Windarling/Mt Jackson Project Report on the 2004/2005 Fauna Surveys*. Unpublished reports for Portman Iron Ore Ltd, Perth.

D Metcalf, B .and Bamford Consulting Ecologists (2007) *Portman Iron Ore Windarling/Mt Jackson Project Fauna Monitoring 2004 / 2006*. Unpublished report for Portman Iron Ore Ltd, Perth.

E Metcalf, B. and Bamford Consulting Ecologists (2008) *Portman Iron Ore Windarling/Mt Jackson Project Fauna Monitoring 2004 - 2007*. Unpublished report for Portman Iron Ore Ltd, Perth.
X = Presence only

Appendix B
Definitions of Significant Fauna under the WA *Wildlife Conservation Act 1950*

Vertebrate Fauna Assessment – Marda Project

APPENDIX B
DEFINITIONS OF SIGNIFICANT FAUNA UNDER THE WESTERN AUSTRALIAN *WILDLIFE CONSERVATION ACT 1950*

In Western Australia, all native fauna species are protected under the Western Australian *Wildlife Conservation Act 1950-1979*. Fauna species that are considered rare, threatened with extinction or have a high conservation value are specially protected under the Act. In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan and Australian Migratory Bird Agreement (JAMBA) and the China and Australian Migratory Bird Agreement (CAMBA).

Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 2010* recognises four schedules of taxa. These are:

Schedule 1 – fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;

Schedule 2 – fauna which are presumed to be extinct and are declared to be fauna in need of special protection;

Schedule 3 – birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction which are declared to be fauna in need of special protection; and

Schedule 4 – fauna that are in need of special protection, for reasons other than mentioned in Schedules 1, 2 or 3.

In addition to the above classifications, DEC also classifies fauna under five different Priority codes:

Priority one – ***Taxa with few, poorly known populations on threatened lands*.** Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority two – *Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.* Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat from habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority three – *Taxa with several, poorly known populations, some on conservation lands*. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

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

Priority five – *Taxa in need of monitoring.* Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Appendix C
Results of the *EPBC Act* Protected Matters Search

Vertebrate Fauna Assessment – Marda Project

EPBC Act Protected Matters Report: Coordinates

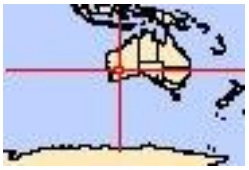
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

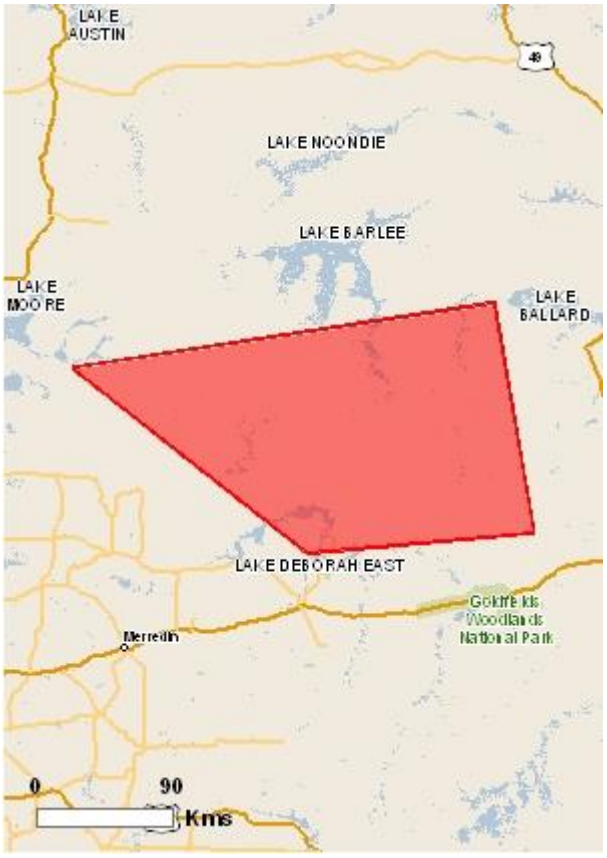
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 28/12/10 18:02:36





Coordinates
Buffer: 1Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communitites:	None
Threatened Species:	18
Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	4

Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	3
State and Territory Reserves:	5
Regional Forest Agreements:	None
Invasive Species:	6
Nationally Important Wetlands:	1

Details

Matters of National Environmental Significance

Threatened Species **[Resource Information]**

Name	Status	Type of Presence
BIRDS		
Acanthiza iredalei iredalei Slender-billed Thornbill (western) [25967]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
MAMMALS		
Myrmecobius fasciatus Numbat [294]	Vulnerable	Species or species habitat likely to occur within area
PLANTS		
Acacia denticulosa Sandpaper Wattle [20600]	Vulnerable	Species or species habitat likely to occur within area
Acacia lobulata Chiddarcooping Wattle [55567]	Endangered	Species or species habitat likely to occur within area
Boronia adamsiana Barbalin Boronia [16935]	Vulnerable	Species or species habitat likely to occur within area
Eremophila virens Campion Eremophila, Green-flowered Emu bush [21433]	Endangered	Species or species habitat may occur within area
Eremophila viscida Varnish Bush [2394]	Endangered	Species or species habitat may occur within area
Gastrolobium graniticum Granite Poison [14872]	Endangered	Species or species habitat likely to occur within area

Gyrostemon reticulatus Net-veined Gyrostemon [8491]	Critically Endangered	Species or species habitat may occur within area
Leucopogon spectabilis Ironstone Beard-heath [83012]	Critically Endangered	Species or species habitat known to occur within area
Myriophyllum lapidicola Chiddarcooping myriophyllum [55940]	Endangered	Species or species habitat known to occur within area
Pityrodia axillaris Native Foxglove, Woolly Foxglove [17376]	Critically Endangered	Species or species habitat may occur within area
Ricinocarpos brevis [82879]	Endangered	Species or species habitat known to occur within area
Roycea pycnophylloides Saltmat [21161]	Endangered	Species or species habitat may occur within area
Tetratheca aphylla Bungalbin Tetratheca [2915]	Vulnerable	Species or species habitat likely to occur within area
Tetratheca harperi Jackson Tetratheca [6251]	Vulnerable	Species or species habitat likely to occur within area
Tetratheca paynterae Paynter's Tetratheca [66451]	Endangered	Species or species habitat known to occur within area

Migratory Species **[Resource Information]**

Name	Status	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land -

Listed Marine Species [Resource Information]

Name	Status	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
Lake Barlee WA	Indicative Place
Lake Moore Area WA	Registered
Mount Manning Nature Reserve WA	Registered

State and Territory Reserves [Resource Information]

Unnamed WA36918, WA
Wallaroo Rock, WA
Unnamed WA48470, WA
Mount Manning Range, WA
Karroun Hill, WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Capra hircus		
Goat [2]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area

Vulpes vulpes Red Fox, Fox [18]	Species or species habitat likely to occur within area

Plants

Carrichtera annua Ward's Weed [9511]	Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]	Species or species habitat may occur within area

Nationally Important Wetlands **[Resource Information]**

Lake Barlee, WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

117.97056
-29.80833,120.47583
-29.41972,120.70944
-30.78639,119.36806
-30.90944,117.97056 -29.80833

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111 ABN