

Section 10

Matters of National Environmental Significance



10. Matters of National Environmental Significance

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) facilitates national environmental assessment and approvals regarding Matters of National Environmental Significance (MNES). The objectives of the EPBC Act are:

- to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance;
- to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources;
- to promote the conservation of biodiversity;
- to provide for the protection and conservation of heritage;
- to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and Indigenous peoples;
- to assist in the co-operative implementation of Australia's international environmental responsibilities;
- to recognise the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and
- to promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge.

There are nine currently MNES listed under the EPBC Act. Actions that are likely to have a significant impact on any MNES, are subject to an environmental assessment and require approval from the Australian Federal Minister for the Environment.

In June 2009 the Federal Environment Minister determined that the original Project was a 'controlled action' and required approval under the EPBC Act. Cameco advised the DoE of the change of proponent and proposed variation to the Project in November 2014. In December 2014 the DoE accepted the proposed variation to the Project under section 156B of the EPBC Act. The controlling MNES relevant to Cameco's Yeelirrie Uranium Project are:

- Nationally threatened species;
- Migratory species; and
- Nuclear actions.

The impacts of the Project on these matters are discussed in the following sections.

10.1 Listed Threatened Species, Migratory Species and Ecological Communities

This section provides an assessment of the potential impacts of the Project on threatened and migratory fauna species protected by the EPBC Act. The assessment was supported by database searches, desktop assessments, literature reviews and local and regional surveys.

10.1.1 Relevant Legislation and Policy

Fauna species of national conservation significance under the EPBC Act may be classified as:

- Critically Endangered - A taxon is Critically Endangered when it is considered to be facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered - A taxon is Endangered when it is considered to be facing a very high risk of extinction in the wild in the near future.

- Vulnerable - A taxon is Vulnerable when it is considered to be (not critically endangered or endangered) facing a high risk of extinction in the wild in the medium term future.
- Conservation Dependent - A taxon is Conservation Dependent if the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered.

Migratory species listed under international agreements are also protected under the EPBC Act. The national list of migratory species consists of those species listed under the following international agreements:

Japan-Australia Migratory Bird Agreement (JAMBA)

The agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Japan and Australia. Protection is afforded by limiting the circumstances under which migratory birds are taken or traded, protecting and conserving important habitats, exchanging information and building cooperative relationships.

Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

The agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between South Korea and Australia. Protection is afforded by limiting the circumstances under which migratory birds are taken or traded, protecting and conserving important habitats, exchanging information and building cooperative relationships.

China-Australia Migratory Bird Agreement (CAMBA) 1986

The agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between China and Australia. Protection is afforded by limiting the circumstances under which migratory birds are taken or traded, protecting and conserving important habitats, exchanging information and building cooperative relationships.

Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)

The Bonn Convention aims to improve the status of all threatened migratory species through national action and international agreements between range states of particular groups of species.

Under the EPBC Act, a proposal which is likely to have a significant impact on threatened species, populations or ecological communities or migratory species must be referred to the DoE. A significant impact is determined through application of Significant Impact Criteria (DoE, 2013) (Table 10-4).

In assessing the potential impact of a proposal on MNES under the EPBC Act, the Commonwealth Environment Minister must consider the following national and international requirements. These have been addressed by Cameco as follows:

Table 10-1: Considerations of Matters of National Environmental Significance

Requirement	Applicability to Project
Take into account the principles of ecologically sustainable development and the precautionary principle (refer to Section 12.5);	<p>Cameco has undertaken detailed assessments of the fauna species and habitats within the Project area, and investigated potential impacts of the Project on MNES.</p> <p>Cameco has considered the long-term and intergenerational impacts of the Project on groundwater (Sections 9.5.5.2 and 9.5.5.3) and landforms (Section 9.12.3) that will affect fauna habitat.</p> <p>Where there is lack of full scientific certainty, Cameco has used conservative assumptions in assessing potential impacts of the Project.</p> <p>Cameco has designed the Project to avoid impacts on matters of NES where practicable, and minimise and manage impacts that cannot be avoided through implementation of the following plans that will be developed for the Project:</p> <ul style="list-style-type: none"> • Flora and Vegetation Management Plan; • Conservation Species Management Plan (Appendix E3); • Fauna Management Plan; and • Mine Closure and Rehabilitation Plan (Appendix O1).
Not act inconsistently with Australia’s obligations under the Biodiversity Convention, the Apia Convention or CITES;	Cameco believes the proposed Project and management actions, will not be inconsistent with Australia’s obligations under these instruments.
Not act inconsistently with CAMBA, JAMBA or any other international agreement relating to migratory species;	<p>Cameco has identified migratory species that have been recorded as present in the Project area, or could potentially occur based on the presence of suitable habitat.</p> <p>Management of process water within the Project area (that may attract migratory species) is discussed in detail in Section 9.5.5, and summarised below. Deterrents will be used to discourage waterbirds from using artificial waterbodies within the Project area.</p>
Not act inconsistently with a species recovery plan or threat abatement plan;	The Project is not expected to have a significant impact on any fauna species that is the subject of a Species Recovery Plan or Threat Of Abatement Plan.
Have regard to any approved conservation advice (e.g. species listing advice); and	Cameco has referred to conservation advice (e.g. species listing advice) in the identification of fauna present within the Project area.

10.1.2 Studies and Investigations

A search of the EPBC Protected Matters Search tool was conducted in January 2015 over an area that included a 40 km buffer around the Study Area (DoE 2015). Numerous terrestrial vertebrate and invertebrate fauna investigations have been conducted within the Study Area (e.g. BCE 2011a, 2011b, 2015a, 2015b; Ecologia 2011a, 2011b).

Targeted searches for significant fauna were conducted during all site surveys, within the Study Area and suitable adjacent habitat. Surveys focussed on Malleefowl, Mulgara, Slender-billed Thornbill, Black-flanked Rock-Wallaby and the Shield-backed Trapdoor Spider. Survey methods and effort are outlined in BCE (2011a) and Section 9.3.3.

Regional information was available from Cowan (2001, 2008), Thompson and Thompson (2006), Benshemesh *et al.* (2008), Dell *et al.* (1998), BCE (2014), KLA (2012) and Outback Ecology (2011). In addition to the database searches and regional studies, there is information on fauna of Wanjarri Nature Reserve, 50 km east of Yeelirrie (DPaW 2015).

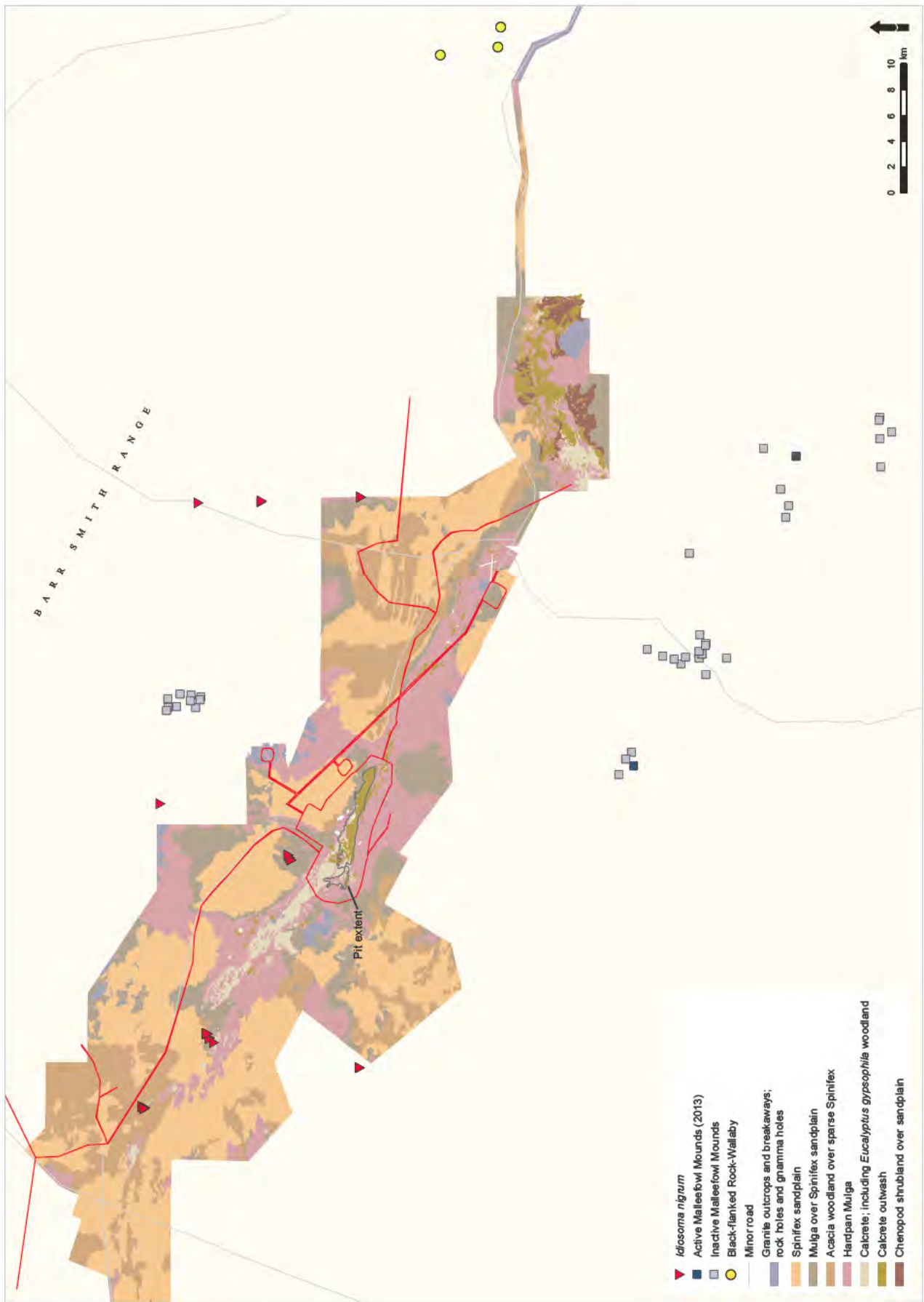


Figure 10-1: Locations of conservation significant fauna records across the Yeelirrie Project

10.1.3 Existing Environment

10.1.3.1 Fauna habitats

Background biophysical data of the region and Study Area can be found in Sections 9.1.4 (Vegetation and Flora), 9.9.4 (Soil Characteristics) and BCE (2011a).

Eight major Vegetation and Substrate Associations (VSAs) (distinct environments that provide habitat for fauna) have been identified across the Study Area (BCE 2011a):

- Granite Outcrops and Breakaways. Supporting mixed shrubland on gravelly/sand. Some areas of chenopod shrubland on heavier soil also present;
- Hardpan Mulga. Mulga woodland with poorly-developed understorey on hard loam soils;
- Calcrete. Low calcrete rises with Eucalypt open woodland (variable) over a sparse shrubland;
- Calcrete Outwash. Clayey-loam and clay flats, subject to occasional inundation with some open claypans. Vegetation includes Acacia open shrubland, sometimes with thickets of *Melaleuca xerophila*, and chenopod shrub-heaths;
- Chenopod Shrubland over Sandplain. These shrublands occur in sandy soils on the margins of playas in the southeast of the Study Area;
- Spinifex Sandplain. Sandplains dominated by Triodia hummock grasslands and scattered shrubs with areas of open Acacia/Eucalypt woodland;
- Mulga over Spinifex Sandplain. Mulga woodland over Spinifex on sandy-loam soils; and
- Acacia woodland over sparse Spinifex. Areas of dense Acacia woodland with or without a Spinifex understorey of variable density.

10.1.3.2 Listed Threatened Species

The database search identified seven species that are listed under the EPBC Act and include the threatened species: Malleefowl, Princess Parrot, Northern Marsupial Mole, Great Desert Skink and Eastern Great Egret. A further five species (also listed under the EPBC Act) are known from the region and include: Black-flanked Rock-Wallaby, Slender-billed Thornbill, Night Parrot, Greater Bilby and Shield-backed Trapdoor Spider (Table 10-2).

Three of these (Malleefowl, Black-flanked Rock-Wallaby and Shield-backed Trapdoor Spider) were confirmed during surveys (Table 10-2 and Figure 10-1).

It should be noted that the Northern Marsupial Mole (*Notoryctes caurinus*) is listed as Endangered under the EPBC Act, but no suitable habitat for this species (i.e. sand dunes) is present in the Study Area or close to the Study Area. Searches of other databases found the species more than 400 km away (DPaW 2015). Therefore, this species has been omitted from the expected species list.

Species lists generated from database searches are generous as they include records drawn from a large region and possibly from environments not represented in the survey area. Even records made in the Study Area may not be representative of the status of the species in the area, as fauna are highly mobile. Therefore, interpretation of lists of significant species generated through the desktop review and site surveys include assigning an expected status within the Study Area to species of conservation significance. This gives an indication of the likely importance of the area to the species and this has been done in Table 10-2.

Table 10-2: Threatened species listed under the EPBC Act.

Common Name	Latin Name	EPBC Act status	Expected status in Study Area	Local records	Recorded in the Study Area	
					BCE (2011a)	BCE (2015a)
Malleefowl	<i>Leipoa ocellata</i>	Vul	Resident	Yeelirrie	X	
Princess Parrot	<i>Polytelis alexandrae</i>	Vul	Irregular visitor	Wanjarri		
Great Desert Skink	<i>Liopholis kintorei</i>	Vul	Unknown	Wanjarri		
Black-flanked Rock-Wallaby	<i>Petrogale lateralis</i>	Vul	Resident	Albion Downs	X	X
Slender-billed Thornbill	<i>Acanthiza iredalei</i>	Vul	Irregular visitor	Lake Way		
Night Parrot	<i>Pezoporus occidentalis</i>	CrE	Vagrant	None recent		
Greater Bilby	<i>Macrotis lagotis</i>	Vul	Vagrant	Wiluna		
Shield-backed Trapdoor Spider	<i>Idiosoma nigrum</i>	Vul	Resident	Yeelirrie		X

EPBC Act listed species: Vul = Vulnerable, End = Endangered, CrE = Critically Endangered.

See Section 10.1.1 for descriptions of EPBC Act conservation status levels.

A description of these species is provided in Section 9.3.4.

10.1.3.3 Listed Migratory Species

The database search identified three species that are listed as Migratory under the EPBC Act that could occur within the Study Area: the Rainbow Bee-eater, Eastern Great Egret and Oriental Plover. The Oriental Plover (*Charadrius veredus*) is a wetland species but is unlikely to occur in the Study Area, except possibly as a vagrant. A further nine migratory species listed under the EPBC Act are known from the region. Of these, the Rainbow Bee-eater and Fork-tailed Swift were recorded during recent surveys (Table 10-3).

Most of the migratory species are waterbirds expected only as vagrants or irregular visitors in small numbers. These species were not even recorded in March 2015 when wetlands were present in the Study Area and when migratory species are present in Australia. The two migratory species that were recorded, are abundant species that are not habitat-restricted.

Table 10-3: Migratory species listed under the EPBC Act.

Common Name	Latin Name	EPBC Act status	Expected status in Study Area	Local records	BCE (2011a)	BCE (2015a)
Rainbow Bee-eater	<i>Merops ornatus</i>	Mig	Regular migrant	Yeelirrie	X	X
Eastern Great Egret	<i>Ardea modesta</i>	Mig	Irregular visitor	Yeelirrie		
Oriental Plover	<i>Charadrius veredus</i>	Mig	Vagrant	None but returned from EPBC search tool		

Common Name	Latin Name	EPBC Act status	Expected status in Study Area	Local records	BCE (2011a)	BCE (2015a)
Fork-tailed Swift	<i>Apus pacificus</i>	Mig	Irregular visitor	Yeelirrie		X
Common Sandpiper	<i>Acitis hypoleucos</i>	Mig	Irregular visitor	Meekatharra		
Common Greenshank	<i>Tringa nebularia</i>	Mig	Irregular visitor	Cue		
Marsh Sandpiper	<i>Tringa stagnatalis</i>	Mig	Irregular visitor	Cue		
Wood Sandpiper	<i>Tringa glareola</i>	Mig	Irregular visitor	Cue		
Red-necked Stint	<i>Calidris ruficollis</i>	Mig	Irregular visitor	Cue		
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Mig	Irregular visitor	Yeelirrie		
Curlew Sandpiper	<i>Calidris ferruginea</i>	Mig, Crit Endg.	Irregular visitor	Lake Austin		
Black-tailed Godwit	<i>Limosa limosa</i>	Mig	Irregular visitor	Yeelirrie		

10.1.3.4 Threatened Ecological Communities

No Threatened Ecological Communities, World Heritage Properties or Wetlands of international importance (listed under the EPBC Act) were found in the search area.

10.1.4 Potential Impacts and Management

The following section summarises the status of each EPBC listed species. Possible impacts to these species are based upon the threatening processes outlined in BEC (2015a) and include: habitat loss (leading to population decline and fragmentation), habitat degradation (due to weed invasion), ongoing mortality (leading to population decline) and species interactions (feral or overabundant native species). Other potential impacts include: changes to hydroecology, altered fire regimes, disturbance from operations and bioaccumulation.

Further discussion of impacts upon listed fauna and locations of recorded species is given in Section 9.3.5. Proposed management measures to minimise impacts are also provided below.

Impact categories used include:

- Negligible: Effectively no population decline or other change in the immediate area;
- Minor: Population decline of <1% in the immediate area;
- Moderate: Permanent population decline 1-10% in the immediate area;
- Major: Permanent population decline >10% in the immediate area; and
- Critical: Taxon extinction in the immediate area.

10.1.4.1 Listed Threatened Species

Malleefowl

Suitable Malleefowl habitat is present, and one Malleefowl mound was recorded, within the Study Area by BCE during the field surveys (BCE 2011a). A recently used mound was recorded amongst closed Acacia shrubland on the northern sandplain, approximately 2 km north of the resource area.

Annual monitoring of Malleefowl mounds in the Yeelirrie area by the Malleefowl Preservation Group indicates a resident population is present. Most known Malleefowl mounds are situated away from the orebody, within stands of dense Mulga woodland. Clusters of monitored mounds are located close to the Study Area, including approximately 10 km north of the orebody and 20 km south of the orebody (Figure 10-1).

Impacts and Management

The local Malleefowl population occurs mainly outside the Study Area. Potential impacts include roadkill, loss of habitat, increase in feral predators and a change in fire regime. Impacts from the Project on this species are expected to be minor. Mitigation measures include management plans for fire and feral animals, and restrictions on speed for Project-related vehicles. Large areas of suitable habitat for this species occur outside of the Development Envelope.

Princess Parrot

The Princess Parrot is considered an irregular visitor to the Yeelirrie area and movements are largely unknown (Higgins, 1999). The species has been recorded at Wanjarri Nature Reserve (DPaW, 2015), however few other records exist for the region.

Impacts and Management

Potential impacts include loss of habitat, removal of hollow-bearing trees, changes in fire regime, dust, light, noise and vibration. However, impacts of the Project on this species are expected to be negligible. Proposed management measures are similar to those for the Malleefowl.

Great Desert Skink

The status of the Great Desert Skink is listed as Unknown, as no evidence of the species was recorded by BCE, however there is potential for the species to occur at Yeelirrie due to the extensive availability of suitable habitat and nearby records. The species typically has a clumped distribution which is influenced by fire regimes (McAlpin, 1997).

Impacts and Management

Potential impacts include increased mortality, loss of habitat, increase in feral predators and changes in fire regime. However, impacts of the Project on this species are expected to be minor. Management measures include management plans for fire and feral animals (including stray stock).

Black-flanked Rock-Wallaby

The Black-flanked Rock-Wallaby was known to occur in the region and genetic analysis of old scats collected from a cave in the Barr Smith Range during the 2015 assessment confirmed the species identification as the Black-flanked Rock-Wallaby (*Petrogale lateralis*). The assumed status of the species in the area is Resident.

While much of the rocky habitat along the Barr Smith Range appears marginal, the presence of scattered waterholes in association with caves and rock crevices may allow the species to persist. While not expected to occur within habitats associated with the orebody, the species may persist in the extensive rocky habitats to the north and south (BCE, 2015a).

Impacts and Management

The Project will result in the clearing of approximately 15 ha of suitable habitat for the proposed quarry. The Project could also result in an increase in feral predators that may affect what is an isolated and relict population. Implementation of a feral animal management plan would reduce this impact. A small population may also be particularly vulnerable to roadkill as the Yeelirrie–Meekatharra Road is situated alongside suitable habitat and as such restrictions on speed for project-related vehicles would be imposed. Overall, impacts from the Project on this species are expected to be minor.

Slender-billed Thornbill

The Slender-billed Thornbill has not been recorded at Yeelirrie despite a number of bird surveys conducted in the area by BCE (2011a, 2015a) and historical surveys conducted by previous land managers. As a result a resident population appears unlikely but if a population persist nearby, individuals might disperse though the area. While habitat potentially suitable for the species occurs at Yeelirrie (dense tall chenopod shrubland), such habitat appears marginal and lacks the samphire elements of chenopod shrublands known to support the species in the region (e.g. Lake Way and Lake Annean). A site, a salt lake near Sir Samuel, where the species was recorded in 1978 was visited in March 2015 and was found to support a quite different chenopod shrubland from that found at Yeelirrie. This site had extensive low, dense samphire shrubland with occasional taller patches, whereas the chenopod shrubland at Yeelirrie was very patchy with tall clumps but extensive open areas (BCE, 2015a).

Impacts and Management

If present in the fauna Study Area, the species could be sensitive to habitat loss and fragmentation. Therefore, as a precaution, impacts on chenopod shrublands will be minimised where practical. However, impacts of the Project on this species are expected to be negligible.

Night Parrot

The Night Parrot is included as potentially occurring due to the presence of suitable habitat and historical records. However an extant population has not been confirmed for the region.

Impacts and Management

If the species is present, there may be some loss of habitat and the possibility of increased mortality on roadsides. Proposed management measures are similar to those for the Malleefowl.

Greater Bilby

There are anecdotal records of the Greater Bilby further north of the Study Area (BCE, 2014), and the species is thriving at the DPaW managed Lorna Glen approximately 180 km north-west of the fauna Study Area. While no sign of Bilbies were recorded by BCE during field surveys, suitable habitat (spinifex sandplains) is extensive at Yeelirrie and it is feasible that individuals may move through the area currently, or in the future.

Impacts and Management

Extensive habitat is available in the Study Area and thus it is feasible for individuals to move through the area. Potential impacts, if the species is present, would include increased mortality, loss of habitat, increase in feral predators and changes in fire regime. However, impacts are expected to be minor. Management measures include management plans for fire and feral animals and restrictions on speed for project-related vehicles.

Shield-backed Trapdoor Spider

The Shield-backed Trapdoor Spider was recorded from 17 locations at Yeelirrie by BCE (2015b) and favours Acacia shrublands with a sandy substrate to a depth of at least 30 cm. It appears to be absent from the grey loamy-clay soils around some calcrete areas and in the Development Envelope. Spiders also appear absent from shallow, rocky soils of the Barr-Smith Range.

The Shield-backed Trapdoor Spider occurs at Yeelirrie in apparently much lower densities than those observed elsewhere, with typically only one or two spiders recorded across a number of hectares. At Yeelirrie, the spider does not appear to form matriarchal clusters, which is perhaps an artefact of low recruitment rates (BCE, 2015b).

Impacts and Management

Potential impacts to this species relate to dust generation from nearby activities. Standard management practices, such as watering access roads to control dust, would be sufficient to avoid impacts. It is noted however that this species appears to exist in very low numbers, and therefore Cameco will focus on minimising impacts on areas where they are known to occur.

10.1.4.2 Listed Migratory Species

Rainbow Bee-eater and Fork-tailed Swift

The Rainbow Bee-eater was recorded throughout the fauna Study Area in 2009, 2010 and 2015 (BCE 2011a, 2015a). While of high conservation significance because of its listing as a migratory species, it is widespread across Australia and frequently uses disturbed environments. The Fork-tailed Swift is likely to be an irregular visitor to the Study Area and was recorded at Yeelirrie during the 2015 survey, with two sightings of several (and possibly the same) birds (BCE 2015a). It is a highly aerial species and largely independent of terrestrial environments.

Impacts and Management

The Rainbow Bee-eater is a widespread species and versatile in natural and altered habitats. Potential impacts include increased mortality and loss of habitat. Mitigation measures include management plans for fire and feral animals, and protecting nest sites during earthworks and road maintenance. The Fork-tailed Swift is largely independent of terrestrial environments. Impacts to these two migratory species are expected to be negligible.

Migratory waterbirds

Ten waterbirds listed as migratory may periodically utilise the Study Area during migration (Table 10-3). Of these, the Eastern Great Egret, Sharp-tailed Sandpiper and Black-tailed Godwit have been recorded in the Yeelirrie area, although the Black-tailed Godwit is largely a species of marine coastal environments and therefore the record was probably of a vagrant bird or birds. All of the migratory waterbirds are expected only as occasional visitors in small numbers. Some seasonal wetlands were identified in March 2015, as a result of recent rains, but no migratory waterbird species were observed (BCE 2015a).

Impacts and Management

Potential impacts to migratory waterbirds include loss of habitat, changes to hydroecology and the introduction of new water bodies (e.g. an evaporation pond). These impacts are discussed in detail in Section 9.3.5.

An assessment of the potential impacts from the 50 ha evaporation pond on waterbird species was conducted by BCE (2015a). The evaporation pond has the potential to attract wildlife although the water quality of the pond (alkaline with salinity similar to or greater than seawater) is expected to make the water unpalatable. However, there may be occasions where stratification of the pond may occur, or following heavy rainfall where a fresh water lens may form, where the water in the evaporation pond may be more palatable.

The Uranium concentration of the evaporation pond water is expected to be less than 60 mg/L. The Uranium No Observable Adverse Impact Level (NOAEL) benchmark for drinking water for birds is 68.8 mg/L (Sample *et al.* 1996). Therefore for migratory birds, uranium concentrations are expected to be below NOAEL benchmarks at least initially, although how concentrations change will require to be monitored.

The presence of a water body in an arid landscape will attract passing waterbirds at least occasionally, even if the water is unpalatable. This includes weak birds that would be unlikely to survive under normal circumstances. It is possible therefore that dead birds may be recorded in and

around the evaporation pond, and that these have not died as a direct result of contact with the evaporation pond.

Several deterrents will be used to discourage waterbirds from using artificial waterbodies and these will be outlined in a Fauna Management Plan to be developed for the Project. Bird deterrents are used at the Olympic Dam mine site, South Australia, where acidic liquid is stored. A rotating beacon with an intermittent beam directed at a shallow angle across the water surface (in combination with gas guns) effectively discourages most waterbirds (Read 1999).

Further mitigation measures to protect migratory birds may include:

- conducting an ecological risk assessment of the evaporation ponds;
- implementing a water quality monitoring program and adapting fauna management strategies (e.g. bird deterrents) based on the outcomes of the ecological risk assessment; and
- monitoring bird visitation of the evaporation ponds and reporting fauna deaths.

The impacts on migratory water birds from the evaporation pond are expected to be minor due to the implementation of mitigation measures.

10.1.4.3 Significant Impact Guidelines

The EPBC Act Policy Statement 1.1, 'Significant Impact Guidelines Matters of National Environmental Significance' (DotE, 2013) is used to assess project impacts on MNES. Given the studies and investigations undertaken for the Project (Section 10.1.2), potential impacting processes and the mitigation measures proposed (Section 10.1.4), an assessment of the listed species of MNES against the EPBC significant impact criteria was conducted (Table 10-4).

It is not expected that any EPBC significance criteria will be exceeded for the majority of species occurring within the Development Envelope. However, individual species of concern include the Shield-back Trapdoor Spider and Malleefowl (Table 10-4).

The proportional impact upon habitat is generally low due to the extent of habitat outside of the development envelope and proposed mitigation strategies outlined above. After mitigation, residual impacts include a loss of up to 2,421 ha of habitat.

Table 10-4: Assessment against EPBC significant impact guidelines

EPBC Criteria (DoE 2013)	Likelihood and rationale
Listed Threatened Species	
Lead to a long term decrease in the size of a population ¹ (or an important population ²)	<p>Unlikely to occur. Species of MNES that may occur within the Development Envelope largely rely on environments that are regionally widespread with only small proportional direct impacts from the project. Rehabilitation of cleared habitat will reduce effects of habitat loss. Some threats related to processes such as fire and feral species, but these are existing and amendable to management. Migratory waterbirds occur only as vagrants and irregular visitors in small numbers so any change in wetland availability would have a negligible impact.</p> <p>Species of concern: The Shield-backed Trapdoor Spider occurs in very low numbers on the spinifex sandplain VSA across the Study Area. Less than 2% (821 ha) of this VSA within the Study Area will be impacted, and it is extensive outside the development envelope.</p> <p>Malleefowl are sensitive to ongoing mortality and increased predation from feral species but can be managed with onsite management procedures.</p>
Reduce the area of occupancy of the species (or an important population).	<p>Unlikely to occur. It is unlikely that the Project will reduce the area of occupancy of listed species, as species of MNES that may occur within the Project Area largely rely on environments that are regionally widespread with only small proportional direct impacts from the project. There are also rehabilitation commitments to further minimise impacts.</p> <p>Species of concern: There will be an approximately 2% loss of occupied habitat of the Shield-backed Trapdoor Spider within the Study Area, but there is extensive suitable habitat outside this area.</p>
Fragment an existing population (or important population) into two or more populations.	<p>Unlikely to occur. No barrier to movement of listed species is expected. Retention of chenopod shrublands around impact areas will enable Slender-billed Thornbills to move through the area if this species persists anywhere in the region.</p>
Adversely affect habitat critical to the survival of a species ³ .	<p>Unlikely to occur. Habitat loss for species of MNES that may occur within the Project Area is low on a local scale. Extensive habitat is available adjacent to and outside the development envelope.</p>
Disrupt the breeding cycle of a population (or important population).	<p>Unlikely to occur. Not likely to disrupt breeding cycle of listed species.</p> <p>Species of concern: Loss of one Malleefowl mound recorded in the development envelope; this mound has not been used for at least several years. 40 mounds are currently being monitored on an annual basis outside of the Project Area (MPG, 2014). Some minor disturbance during the operational phase is expected. If management measures are implemented then unlikely to be significant in the long term.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	<p>Unlikely to occur. Although up to 2,421 ha of vegetation will be impacted as a result of the Project, the proportional loss of vegetation types upon which species on MNES that may occur within the Project Area are reliant is low. Rehabilitation of the site and the provision of offsets will minimise long term impacts associated with vegetation clearing.</p>
Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.	<p>Unlikely to occur. Feral and native competitors are present in the region, but can be effectively controlled with onsite management procedures.</p>

EPBC Criteria (DoE 2013)	Likelihood and rationale
Introduce disease that may cause the species to decline.	Unlikely to occur. Hygiene management measures will be implemented.
Interfere or substantially interfere with the recovery of the species.	Unlikely to occur. Highly localised impacts. Broad-scale threatening processes are of greatest concern for these species (e.g. fire and feral species impacting upon the Greater Bilby). No active, direct recovery measures are currently undertaken in the Study Area although de-stocking of the station has probably been of some benefit. At a regional scale, the removal of 2,421 ha of habitat is unlikely to interfere with regional recovery programs. There are several opportunities to contribute to conservation efforts in the area (e.g. Black-flanked Rock-Wallaby).
Listed Migratory Species	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat ⁴ for a migratory species.	Unlikely to occur. Some minor loss of seasonal wetlands in the mining area, but this environment is extensive in the region. The Rainbow Bee-eater is a habitat generalist so not threatened by habitat loss, while the Fork-tailed Swift is largely aerial in Australia.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	Unlikely to occur. Feral and native competitors are present in the region but can be effectively controlled with onsite management measures. Furthermore, the risk they pose to migratory species is low. Even the ground-nesting Rainbow Bee-eater breeds successfully in locations where feral predators such as foxes and cats are present.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion ⁵ of the population of a migratory species ⁶ .	Unlikely to occur. Not likely to disrupt the lifecycle of listed migratory species. Of these species, only the Rainbow Bee-eater is likely to breed in the Study Area and measures to reduce impacts on breeding birds are proposed. These may include identifying and avoiding roadside nest sites.

- 1 A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area (includes a geographically distinct regional population, or collection of local populations, or a population, or collection of local populations, that occurs within a particular bioregion). Pertains to critically endangered, endangered and vulnerable species.
- 2 An 'important population' is a population that is necessary for a species long term survival and recovery (includes populations identified as such in recovery plans, and/or key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species range). Pertains to vulnerable species.
- 3 'Habitat critical to the survival of a species' refers to areas that are necessary: for activities such as foraging, breeding, roosting, or dispersal; for the long term maintenance of the species (including the maintenance of species essential to the survival of the species); to maintain genetic diversity and long term evolutionary development; or for the reintroduction of populations or recovery of the species. Pertains to critically endangered, endangered and vulnerable species
- 4 An area of 'important habitat' for a migratory species is:
 - a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
 - b. habitat that is of critical importance to the species at particular life-cycle stages, and/or
 - c. habitat utilised by a migratory species which is at the limit of the species range, and/or
 - d. habitat within an area where the species is declining.
- 5 Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).
- 6 'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

Summary of Management Measures

Cameco will implement the following management measures to minimise impacts on species listed under the EPBC Act:

- The evaporation pond will be inspected daily for fauna and bird access. Should fauna visitations to the facilities be considered significant, measures will be taken to deter fauna.
- Training on the identification and reporting of conservation-significant fauna species will be included in the Cameco site induction.
- The ground disturbance protocol will ensure that areas to be cleared are first inspected by qualified environmental personnel to determine if there are any significant habitats or signs of significant fauna activity. Training on vegetation clearing procedures will be included in the environmental induction.
- Dust suppression will be undertaken in accordance with the Dust Management Plan.
- Work with DPaW and local indigenous groups to assist in the implementation of a landscape scale fire management program.

10.1.5 Commitments

Cameco will implement a Fauna Management Plan.

10.1.6 Outcomes

Development of the Yeelirrie Project will not have a significant impact to listed Threatened or Migratory Fauna.

10.2 Nuclear Actions

The EPBC Act recognises the protection of the environment from nuclear actions as a matter of national environmental significance. Nuclear actions include mining or milling of uranium ores, and decommissioning or rehabilitating a facility or area where this has occurred. The Yeelirrie Uranium Project is therefore a nuclear action.

For projects that are considered to be a nuclear action, the proponent must describe the nature and extent of likely impacts (both direct and indirect) on the whole environment. This PER document (specifically Sections 7 – 11) describes the:

- environmental context of the Project;
- potential impacts of the Project on the whole environment; and
- proposed impact avoidance, mitigation and management measures.

10.2.1 Studies and Investigations

The following specific investigations in relation to radiation have been undertaken by Cameco (Table 10-5). These are presented in Appendix J.

Table 10-5: Radiological studies undertaken for the Project by Cameco

Study	Section of PER
Radiation assessment (ERICA modelling) for non-human biota	9.1.5.5 (Flora and vegetation) 9.3.5.4 (Fauna)
Radiological baseline assessment including radon concentration monitoring	9.6
Modelling of radiation exposure pathways, exposure estimates for workforce and critical groups	9.6
Assessment of risks to human health from bush tucker consumption	9.6
Investigate radon emanation potential and design project to minimise resultant impacts on surface water, groundwater and bush tucker.	9.6
Input into the engineering design of the TSF, waste rock dumps and open pits to minimise human radiation exposure to ALARA	6 9.6

10.2.2 Potential Impacts and Management of the Project

The assessment of impacts of a nuclear action should refer to the Significant Impact Guidelines 1.2 (Commonwealth of Australia, 2013). The impacts and proposed management of the Project on all environmental factors are discussed in Sections 9 – 11.

Radiological impacts are discussed in Section 9.6 and a summary provided in Table 10-6.

Table 10-6: Summary of radiological impacts

Aspect	Estimated Dose	Guideline Dose Limit
Radiation exposure of mine workers	Estimated maximum average annual dose of 10.5 mSv/year.	20 mSv/year
Radiation exposure of process plant workers	Estimated maximum average annual dose of 6.4 mSv/year concentrator ore handling workers	20 mSv/year
Radiation exposure of administration workers	Estimated average annual dose < 1 mSv/year	20 mSv/year

Aspect	Estimated Dose	Guideline Dose Limit
Radiation exposure of camp workers	Estimated average annual dose 1 mSv/year	20 mSv/year
Radiation exposure of construction workers	Negligible	20 mSv/year
Radiation exposure of transport workers	Estimated average annual dose 0.5 mSv/year	20 mSv/year
Radiation exposure to public (inhalation of radionuclides in dust and radon decay products)	Estimated average annual dose 0.2 mSv/year (at Yeelirrie Pool)	Background plus 1 mSv/year
Radiation exposure to public (ingestion of bush tucker)	Estimated average annual dose 0.04 mSv/year (at Yeelirrie Pool)	Background plus 1 mSv/year
Radiation exposure of non-human biota	<10 µGy/hr	Trigger value of 10 µGy/hr

Note. The dose estimates have been calculated from first principles and the assumptions used in the modelling are very conservative for the reasons outlined in Section 9.6 and Sections 9.1.5.5 and 9.3.5.4. Therefore the impacts outlined in this table represent worst-case predictions, and in some cases are more than double the actual doses measured at operating mines and expected for this project.

Radiation management measures are discussed in Section 9.6.6. As part of the approval and authorisation process, a draft Radiation Management Plan (RMP) will be developed for the Project and provided to the Radiological Council for approval prior to construction. The RMP would include details of radiation protection and radioactive waste management specific to the plant and would address the requirements of the Western Australian NORM Guidelines (DMP 2010) and the ARPANSA Mining Code (ARPANSA 2005).

A Transport Radiation Management Plan (TRMP) which includes an Emergency Response Assistance Plan (ERAP) will also be prepared for approval prior to the commencement of mining. The transport carrier will be required to develop a plan consistent with Cameco's ERAP.

Section 9.6 of this PER outlines the principles that will be applied in managing radiation exposure and radioactive waste, and outlines the way these principles will be applied to the Project, including an outline of the radiation control methods and an overview of the proposed monitoring.

10.2.3 Commitments

Cameco will:

- Develop and Implement a Radiation Management Plan
- Develop and implement a Transport Radiation Management Plan.

10.2.4 Outcomes

No significant radiological impacts on human health or the environment.