

15. Matters of National Environmental Significance

15.1 Controlled Action provisions

The Proposal was initially referred under the EPBC Act on 30 July 2020, for both Refinery and Mine components. The Proposal was determined a controlled action (EPBC 2020/8743) under the EPBC Act.

On 18 March 2022, Alcoa withdrew EPBC 2020/8743 and in mid-April 2022 submitted split referrals for the Refinery and Mine components:

- Pinjarra Alumina Refinery – Development of water storage ponds and associated borrow pits (EPBC 2022/09213)
- Huntly Mine Bauxite Mine Transition (EPBC 2022/09204)

On 18 August 2022, a delegate of the Commonwealth Minister for the Environment determined that both referrals are controlled actions under the EPBC Act.

On 21 October 2024, Alcoa withdrew EPBC 2022/09213. The reason being that the proposed water storage ponds and associated borrow pits for the Pinjarra Alumina Refinery DE were no longer being assessed as part of the Proposal. This ERD therefore only assesses impacts to MNES associated with EPBC 2022/09204.

The controlling provisions for EPBC 2022/09204 are:

- Listed threatened species and communities (section 18 & 18A)
- Ramsar wetlands (s16 & 17B)
- Listed migratory species (s20 & 20A).

Based on the information available in the referral EPBC 2022/09204, the delegate considered that the Proposed Action (the Proposal) was likely to have a significant impact to Matters of National Environmental Significance (MNES), including but not limited to those presented in Table 15.1. This section presents an assessment of the MNES listed in Table 15.1 as well as other MNES relating to the controlling provisions that have modelled distributions or records within 10 km.

The assessment is for the Proposal within the Myara North DE and Holyoake DE. The Huntly Mine re-entry into the O'Neil DE has been referred separately under the EPBC Act and is, at time of writing, awaiting determination of whether it is a controlled action (EPBC 2024/10009). This section assesses potential impacts on MNES from the Myara North and Holyoake portions of the Proposal. As such, any reference in this section to the assessment area is limited to the Myara North DE and Holyoake DE, while the Mine DE refers to Myara North, Holyoake, and O'Neil DEs.

Table 15.1 MNES that may be subject to significant impacts from the Proposal (EPBC 2022/09204)

Controlling provision	MNES
Listed threatened species and communities	<p>Birds</p> <ul style="list-style-type: none"> • Baudin's Black-Cockatoo (<i>Zanda baudinii</i>) • Carnaby's Black- Cockatoo (<i>Zanda latirostris</i>) • Forest Red-tailed Black-Cockatoo (<i>Calyptorhynchus banksia naso</i>) <p>Mammals</p> <ul style="list-style-type: none"> • Woylie (<i>Bettongia penicillata ogilbyi</i>) • Chuditch (<i>Dasyurus geoffroi</i>) • Quokka (<i>Setonix brachyurus</i>) <p>Invertebrates</p> <ul style="list-style-type: none"> • Carter's Freshwater Mussel (<i>Westralunio carteri</i>) <p>Flora</p> <ul style="list-style-type: none"> • Tall Donkey Orchid (<i>Diuris drummondii</i>) • Dwarf Bee-orchid (<i>Diuris micrantha</i>) • Keighery's Eleocharis (<i>Eleocharis keigheryi</i>) • Wing-fruited Lasiopetalum (<i>Lasiopetalum pterocarpum</i>) • Purdie's Donkey-orchid (<i>Diuris purdiei</i>) • Southern Tetraria (<i>Morelotia australiensis</i>) • Shy Featherflower (<i>Verticordia fimbrialepis</i> subsp. <i>fimbrialepis</i>) • Slender Tailflower (<i>Anthocercis gracilis</i>) • Zig Zag Grevillea (<i>Grevillea flexuosa</i>) • Star Sun-orchid (<i>Thelymitra stellata</i>) • Tufted Plumed Featherflower (<i>Verticordia plumosa</i> var. <i>ananeotes</i>)
Ramsar wetlands	<ul style="list-style-type: none"> • Peel-Yalgorup Ramsar site

15.2 Relevant policy and guidance

15.2.1 Policy and guidance

- Environment Protection and Biodiversity Conservation Act 1999 *Environmental Offsets Policy* (Commonwealth of Australia 2012).
- *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (Department of Environment 2013).

15.2.2 Relevant species guidance

- *Approved Conservation Advice for Anthocercis gracilis (Slender Tailflower)* (Department of the Environment, Water, Heritage and the Arts 2008)
- *Approved Conservation Advice for Diuris drummondii (Tall Donkey Orchid)* (Department of the Environment, Water, Heritage and the Arts 2008)
- *Approved Conservation Advice for Diuris micrantha (Dwarf Bee-orchid)* (Department of the Environment, Water, Heritage and the Arts 2008)
- *Approved Conservation Advice for Eleocharis keigheryi (Keighery's Eleocharis)* (Department of the Environment, Water, Heritage and the Arts 2008)
- *Approved Conservation Advice for Grevillea flexuosa (Zig Zag Grevillea)* (Department of the Environment, Water, Heritage and the Arts 2008)
- *Conservation Advice Lasiopetalum pterocarpum (wing-fruited lasiopetalum)* (Threatened Species Scientific Committee, Department of the Environment and Energy 2017)
- *Verticordia fimbrialepis subsp. fimbrialepis Interim Recovery Plan 2010-2015*. Interim Recovery Plan No. 304 (Department of Environment and Conservation, Western Australia 2010)
- *Tufted Plumed Featherflower (Verticordia plumosa var. ananeotes) Recovery Plan*. (Department of Environment and Conservation, Western Australia 2008)
- *Wing-fruited Lasiopetalum (Lasiopetalum pterocarpum ms) Interim Recovery Plan 2003-2008*. Interim Recovery Plan No. 134. (Department of Conservation and Land Management 2003)
- *Approved Conservation Advice for Diuris purdiei (Purdie's Donkey-orchid)*. (Department of the Environment, Water, Heritage and the Arts 2008)
- *Conservation Advice Calyptorhynchus baudinii Baudin's cockatoo* (Threatened Species Scientific Committee, Department of the Environment and Energy 2018)
- *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan: Western Australian Wildlife Management Program No. 52*, (Department of Parks and Wildlife October 2013).
- *EPBC Act Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo, Baudin's cockatoo and Forest red-tailed black cockatoo* (Department of the Sustainability, Environment, Water, Population and Communities 2012)
- *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo* (DAWE 2022)
- *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan*, (Department of Environment and Conservation 2008)¹

¹ ceased to be in effect from 1/10/21

- *Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo)* (Department of the Environment, Water, Heritage and the Arts 2009)
- *Chuditch (Dasyurus geoffroi) National Recovery Plan: Wildlife Management Program No. 54* (Department of Environment and Conservation 2012)
- *National Recovery Plan for the Woylie (Bettongia penicillata ogilbyi): Wildlife Management Program No. 51* (Department of Environment and Conservation 2012)
- *Conservation Advice Bettongia penicillata woylie* (Threatened Species Scientific, Department of the Environment and Energy 2018)
- *Quokka Setonix brachyurus Recovery Plan. Wildlife Management Program No. 56* (Department of Environment and Conservation 2013)
- *Conservation Advice Westralunio carteri Carter's freshwater mussel* (Department of the Environment and Energy 2018).
- *Conservation Advice Myrmecobius fasciatus numbat* (Threatened Species Scientific Committee 2018).
- *Numbat (Myrmecobius fasciatus) Recovery Plan.* (Department of Parks and Wildlife 2017b).
- *Conservation Advice Pseudocheirus occidentalis Western ringtail possum* (Department of the Environment and Energy 2018).
- *Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan* (Department of Parks and Wildlife 2017).

15.3 Existing environmental values

15.3.1 Threatened flora

Mattiske (2024, 2025a, 2025b) assessed the potential presence of threatened flora over their respective survey areas. The assessment included a desktop review of the DBCA and WA Herbarium databases, the EPBC PMST, and the results of field surveys.

Mattiske (2025a, 2025b) identified one threatened flora species listed under the EPBC Act as having potential to occur in the Myara North survey area, with other threatened species unlikely or highly unlikely to occur in the Myara North or Holyoake survey areas. Field surveys did not record any EPBC Act listed species within the Myara North or Holyoake survey areas.

Table 15.2 presents the outcomes of the likelihood of occurrence assessment. Appendix B-1 provides details of the likelihood of occurrence assessment, including maps of each species modelled distribution and DBCA threatened species and WA Herbarium database records over ML1SA and a 10 km buffer.

As presented in Table 15.2, one threatened species has potential to occur in Myara North: *Morelotia australiensis* (Southern Tetraria), listed as Vulnerable under the EPBC Act. This species has potential suitable habitat in lower slopes (D, DA and E vegetation types), as mapped over 1,338 ha of the Myara North DE (see Figure 5-17, Table 5.24, Section 5.3.5.2).

The remaining threatened flora species reported by database searches are unlikely or highly unlikely to occur within the Myara North and Holyoake DEs, with many species found only on the Swan Coastal Plain IBRA region which is distinct from the Northern Jarrah Forest IBRA subregion.

Table 15.2 Likelihood assessment of occurrence of EPBC Act listed threatened flora

Flora species ²	Likelihood of occurrence	
	Myara North DE	Holyoake DE
Slender Tailflower (<i>Anthocercis gracilis</i>)	Highly unlikely	Highly unlikely
<i>Chamelaucium lullfitzii</i>	Highly unlikely	Highly unlikely
Dwarf hammer orchid (<i>Drakaea micrantha</i>)	Highly unlikely	Highly unlikely
Dwarf Bee-orchid (<i>Diuris micrantha</i>)	Highly unlikely	Highly unlikely
Dwellingup Synaphea (<i>Synaphea stenoloba</i>)	Highly unlikely	Highly unlikely
<i>Eucalyptus x balanites</i>	Highly unlikely	Highly unlikely
Giant Spider Orchid (<i>Caladenia huegelii</i>)	Highly unlikely	Highly unlikely
Glossy-leaved Hammer Orchid (<i>Drakaea elastica</i>)	Highly unlikely	Highly unlikely
Keighery's Eleocharis (<i>Eleocharis keigheryi</i>)	Highly unlikely	Highly unlikely
Tufted Plumed Featherflower (<i>Verticordia plumosa</i> var. <i>ananeotes</i>)	Highly unlikely	Highly unlikely
Purdie's Donkey-orchid (<i>Diuris purdiei</i>)	Highly unlikely	Highly unlikely
Shy Featherflower (<i>Verticordia fimbrialepis</i> subsp. <i>fimbrialepis</i>)	Unlikely	Unlikely
Southern Tetraria (<i>Morelotia australiensis</i>)	Potential	Unlikely
Star Sun Orchid (<i>Thelymitra stellata</i>)	Highly unlikely	Highly unlikely
Sun Orchid (<i>Thelymitra dedmaniarum</i>)	Highly unlikely	Highly unlikely
<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)	Highly unlikely	Highly unlikely
<i>Synaphea</i> sp. Pinjarra Plain (A.S. George P17P18P2)	Highly unlikely	Highly unlikely
<i>Synaphea</i> sp. Serpentine (G.R. Brand P10P3)	Highly unlikely	Highly unlikely
Tall Donkey Orchid (<i>Diuris drummondii</i>)	Highly unlikely	Highly unlikely
Wing-fruited Lasiopetalum (<i>Lasiopetalum pterocarpum</i>)	Unlikely	Unlikely

² Species in **bold** were identified in the Referral Decision letter from DAWE on 4 September 2020

Flora species ²	Likelihood of occurrence	
	Myara North DE	Holyoake DE
Zig Zag Grevillea (<i>Grevillea flexuosa</i>)	Highly unlikely	Highly unlikely

15.3.2 Threatened and migratory fauna

An assessment was undertaken of the likelihood of occurrence of EPBC Act and WA listed conservation significant fauna within each DE (see Section 6.3.3.4). The assessment was based on a desktop assessment and the findings of baseline surveys and previous studies and research (studies and research summarised in Section 6.3.1 and Section 6.3.2). The desktop assessment considered modelled distributions available for EPBC Act listed species, DBCA threatened fauna database records available over ML1SA and a 10 km buffer, Nature Map database (as available at 2020), species' biology and habitat requirements, and the quality and availability of suitable habitat.

The likelihood of occurrence assessment was undertaken for all conservation significant fauna species identified in modelled distributions and/or DBCA database records within 10 km. Section 6.3.3.4 (Table 6.11) presents the outcomes of the likelihood of occurrence assessment for non-aquatic species, with Section 6.3.4.4 presenting the outcomes for the assessment of aquatic species. Appendix B-1 provides details of the likelihood of occurrence assessment for EPBC Act listed species, including maps of each species modelled distribution and DBCA database records over ML1SA and a 10 km buffer.

A summary of the likelihood of occurrence assessment for EPBC Act listed species is presented in Table 15.3 and

Table 15.4 and indicates that:

- five listed threatened fauna species are known to occur in both the Myara North and Holyoake DE, including Black Cockatoos, Chuditch and Quokka
- one listed threatened fauna species (Woylie) is likely to occur in the Myara North and Holyoake DE
- two listed threatened fauna species (Numbat, Western Ringtail Possum) have potential to occur in the Myara North and Holyoake DEs
- one listed threatened aquatic species (Carters Freshwater Mussel) is known to occur in the Myara North DE and potential in Holyoake DE
- listed migratory species are unlikely to occur in the assessment area.

15.3.2.1 Threatened fauna

Habitats and population have been assessed for each threatened fauna species known, likely or with potential to occur in the assessment area.

Section 6.3.3.5 details habitat and population information for Black Cockatoos within the DEs and their vicinity, including mapping of suitable habitat, occurrence records, nesting trees and habitat quality, and indicative mapping of regional Black Cockatoo foraging habitat within 12 km. The suitable habitat for Black Cockatoos mapped within the DEs is considered habitat critical to the survival of these species.

Section 6.3.3.6, Section 6.3.3.7 and Section 6.3.3.8 detail habitat and population information for Woylie, Chuditch and Quokka, respectively, within the DEs and their vicinity, including mapping of suitable habitat, occurrence records and habitat quality within the Mine DE. The suitable habitat for Chuditch mapped within the assessment area is considered habitat critical to the survival of the species. The suitable habitat for Woylie mapped within the assessment area may not represent habitat critical to the survival of the species (see Section 6.3.3.6), however as a conservative assessment this ERD assumes that the assessment area contains critical habitat for the species. The dense riparian and swamp vegetation within the assessment area is considered habitat critical to the survival of Quokka, however the open upland vegetation is not critical habitat for the species.

Section 6.3.3.9 and Section 6.3.3.10 detail habitat and population information for Numbat and Western Ringtail Possum (WRP) within the Mine DE and its vicinity, including mapping of potential suitable habitat. No individuals or signs of these species were recorded within the assessment area nor have they been recently recorded within 10 km. The Numbat, if present, is expected to be below detectable densities within the assessment area. The WRP, if present, may occur in pockets of riparian forest with overlapping (closed) canopy within the assessment area. The potential suitable habitats for Numbat and WRP mapped within the assessment area are not considered habitat critical to the survival of these species, however if populations are subsequently recorded within the assessment area during targeted surveys (see Section 6.5.1) then the associated habitat for these populations would be considered critical habitat for the species (see Section 6.3.3.9 and Section 6.3.3.10).

Section 6.3.4 details habitat information for Carters Freshwater Mussel, including mapping of potential suitable habitat in seasonal streams and recorded occurrence. The species has been recorded at one location on 39 Mile Brook within the Myara North DE and at one location on South Dandalup River downstream of the Holyoake DE. It may occur in un-mapped permanent or semi-permanent pools in mapped streams within the assessment area, as well as downstream in permanent waters of drinking water reservoirs. The seasonal streams mapped throughout the assessment area are not considered habitat critical to the survival of the species, however if an important population (as defined in the Significant impact guidelines) is located

within a permanent to semi-permanent river pool then that pool may be considered critical habitat for the species (see Section 6.3.4).

15.3.2.2 Migratory fauna

As discussed in Section 6.3.3.4, no migratory bird species were recorded in the assessment area nor are they likely to occur due to the lack of wetland habitats favoured by the species. The Flooded Gum Woodland and Melaleuca Dampland habitats within the assessment area are seasonally waterlogged and may have areas that are seasonally inundated, however they do not contain large areas of wading habitat with mudflat, grasses, sedges, rushes or reeds. Similarly, the assessment area is unlikely to support populations of threatened birds that use such wetland habitats, such as the Australasian Bittern and Australian Painted Snipe.

There is potential for migratory birds to opportunistically use perennial waters of drinking water reservoirs downstream of the assessment area, including Serpentine Dam and South Dandalup Dam. The drinking water reservoirs comprise inundated river valleys with relatively steep sided and lateritic soil shorelines adjacent to open forest and with varying vegetation regrowth (typically shrubs) over formerly inundated areas depending on the history of reservoir inflows and outflows. These are substantially different habitats to that of the shallow, muddy wetlands with emergent or fringing vegetation that support high levels of invertebrate productivity and the abundant food resources sought by migratory birds. Accordingly, while the drinking water reservoirs downstream of the assessment area may be used opportunistically by migratory birds (e.g. resting between flights to food resources, or vagrants blown by storms) the reservoirs are not expected to comprise an important habitat for migratory birds.

Table 15.3 Likelihood assessment of occurrence of EPBC Act listed threatened fauna

Fauna species ²	Likelihood of occurrence	
	Myara North DE	Holyoake DE
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	Unlikely	Unlikely
Australian Painted Snipe (<i>Rostratula australis</i>)	Unlikely	Unlikely
Baudin's Cockatoo (<i>Calyptorhynchus baudinii</i>)	Known	Known
Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>)	Known	Known
Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>)	Known	Known
Malleefowl (<i>Leipoa ocellata</i>)	Unlikely	Unlikely
Noisy Scrub Bird (<i>Atrichornis clamosus</i>)	Unlikely	Unlikely
Grey Falcon (<i>Falco hypoleucos</i>)	Unlikely	Unlikely
Chuditch (<i>Dasyurus geoffroi</i>)	Known	Known
Woylie (<i>Bettongia penicillata ogilbyi</i>)	Likely	Likely
Numbat (<i>Myrmecobius fasciatus</i>)	Potential	Potential
Quokka (<i>Setonix brachyurus</i>)	Known	Known
Red-tailed Phascogale (<i>Phascogale calura</i>)	Unlikely	Unlikely
Western Ringtail Possum (<i>Pseudocheirus occidentalis</i>)	Potential	Potential
Carter's Freshwater Mussel (<i>Westralunio carteri</i>)	Known	Potential
Grey Falcon (<i>Falco hypoleucos</i>)	Unlikely	Unlikely

Table 15.4 Likelihood assessment of occurrence of EPBA Act listed migratory species

Migratory species ²	Likelihood of occurrence	
	Myara North DE	Holyoake DE
Common Sandpiper (<i>Actitis hypoleucos</i>)	Unlikely	Unlikely
Curlew Sandpiper (<i>Calidris ferruginea</i>)	Unlikely	Unlikely
Eastern Curlew (<i>Numenius madagascariensis</i>)	Unlikely	Unlikely
Fork-tailed Swift (<i>Apus pacificus</i>)	Unlikely	Unlikely
Grey Wagtail (<i>Motacilla cinerea</i>)	Unlikely	Unlikely
Osprey (<i>Pandion haliaetus</i>)	Unlikely	Unlikely
Pectoral Sandpiper (<i>Calidris melanotos</i>)	Unlikely	Unlikely
Red Knot (<i>Calidris canutus</i>)	Unlikely	Unlikely
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	Unlikely	Unlikely
Common greenshank (<i>Tringa nebularia</i>)	Unlikely	Unlikely

15.3.3 Threatened ecological communities

Mattiske (2024, 2025a, 2025b) assessed the likelihood of occurrence of EPBC Act listed TECs over the Mine DE, as detailed in Section 5.3.4.5. The assessment indicates that no listed TECs are known or likely to occur within or in the vicinity of the Mine DE.

The *Banksia Woodlands of the Swan Coastal Plain* TEC has a modelled distribution and records primarily over the Swan Coastal Plain IBRA region, which is distinct from the Northern Jarrah Forest IBRA subregion. The TEC may occur in valleys through the Darling Scarp on the western edge of the NJF subregion, however occurrences are not mapped over the NJF within 10 km of the Mine DE.

The assessment area lies approximately 10-20 km east of the Darling Scarp and no mapped Vegetation Types (VT) within the assessment area match the diagnostic criteria of the *Banksia Woodlands of the Swan Coastal Plain* TEC, as there are no VTs dominated by a *Banksia* species canopy of *B. attenuata*, *B. menziesii*, *B. prionotes* or *B. illicifolia*. The *Banksia* species that may occur as subdominant species within VTs mapped over the assessment area comprise *B. grandis* (Bull *Banksia*) and *B. littoralis* (Swamp *Banksia*) (see Table 5.4, Section 5.3.4.2).

15.3.4 Ramsar wetlands

The assessment area lies predominantly (17,185 ha or 93.8 per cent) within the catchment of the Peel-Inlet, a component of the Peel-Yalgorup System Ramsar site (see Section 8.4.13, Figure 8-29). The majority of the assessment area (14,649 ha or 79.9 per cent) lie within regulated catchments of drinking water dams, primarily the Serpentine Dam and South Dandalup Dam, which divert all or most of the catchment inflows for public drinking water supply.

Approximately 2,536 ha (13.8 per cent) of the assessment area lies in un-regulated catchments of Gooralong Brook, Davis Brook and Swamp Oak Brook, which are tributaries of the Serpentine and Murray rivers that discharge into the Peel Inlet. Gooralong Brook covers a small northwest portion of the Myara North DE, and Davis Brook and Swamp Oak Brook cover the southern portion of the Holyoake DE. Approximately 1,108 ha (6.0 per cent) of the assessment area DEs lie outside of the catchment of the Peel-Yalgorup System.

15.3.5 Summary of MNES occurrence and habitat within the assessment area

Table 15.5 presents a summary of the habitat and occurrence of Southern Tetraria, as the one EPBC Act listed threatened flora with potential to occur in the assessment area.

Table 15.6 presents a summary of the habitat and occurrence of EPBC Act listed Black Cockatoos known to occur in the assessment area.

Table 15.7 presents a summary of the habitat and occurrence of EPBC Act listed mammals that are known, likely or have potential to occur in the assessment area.

Table 15.8 presents a summary of the habitat and occurrence of Carters Freshwater Mussel, as the one EPBC Act listed aquatic species known to occur in the Myara North DE and has the potential to occur in the Holyoake DE.

Table 15.9 presents a summary of the Myara North and Holyoake DE catchments within the Peel-Yalgorup System.

Table 15.5 Summary of EPBC listed threatened flora species potential occurrence and habitat within the assessment area

	Southern Tetraria (<i>Morelotia australiensis</i>)
EPBC Act status	Vulnerable
Likelihood of occurrence	Potential (not recorded) – Myara North DE Unlikely – Holyoake DE
Habitat description	Grey sand over clay, winter-wet, swampy depressions, drainage lines or rises surrounding swamps, open forest or Marri (<i>Corymbia calophylla</i>) woodland (DEWHA 2008).
Total area of potential suitable habitat (see Section 5.3.5.2 for habitat mapping)	1,338 ha (D, DA and E vegetation types in Myara North DE) Potential suitable habitats mapped within the assessment area are not considered habitat critical to the survival of the species. If an important population is recorded by targeted survey (see Section 5.5.1), associated habitat is considered habitat critical to the survival of the species.
Threatening processes to species (as per species conservation advice or recovery plan)	<ul style="list-style-type: none"> • Fire: While fire is necessary to stimulate growth and flowering of the species, a fire regime that is too frequent may be detrimental as it may allow grassy weeds to out-compete. • Habitat clearing for urban development; impacts from road construction and maintenance activities, as well as recreational activities, such as horse riding and track maintenance, which can lead to the introduction of weeds and <i>Phytophthora</i> dieback.

Table 15.6 Summary of EPBC Act listed threatened fauna species occurrence and habitat within the assessment area – Black Cockatoos

Species	Baudin's Cockatoo (<i>Zanda baudinii</i>)	Carnaby's Cockatoo (<i>Zanda latirostris</i>)	Forest Red-Tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>)
EPBC Act status	Endangered	Endangered	Vulnerable
Likelihood of occurrence (see Section 6.3.3.5 for maps of occurrence records)	Known – Myara North DE Known – Holyoake DE	Known – Myara North DE Known – Holyoake DE	Known – Myara North DE Known – Holyoake DE
Habitat description (see Section 6.3.3.4 and Section 6.3.3.5 for details)	<p>Foraging</p> <p>Primarily seeds of Marri, rarely Jarrah, in woodlands and forest, and seeds of native proteaceous plants (e.g. Banksia, Dryandra and Hakea spp.). Also insects and insect larvae, Kangaroo Paw, tips of Pinus spp.</p> <p>Breeding</p> <p>Generally in woodland or forest, but may also breed in partially cleared woodland or forest, including isolated trees. Nest in hollows in live or dead trees (many eucalypt species may provide suitable hollows), particularly Marri, Jarrah, Wandoo and Bullich.</p> <p>Roosting</p> <p>Generally in or near riparian environments or other permanent water sources. Any tall trees may provide roosting habitat, but particularly Jarrah, Flooded Gum, Blackbutt, and introduced eucalypts.</p>	<p>Foraging</p> <p>Native shrubland, kwongan heathland and woodland on proteaceous plants (e.g. Banksia, Hakea and Grevillea spp.), as well as Callistemon spp. and Marri. Also seeds of Pinus spp, insects and insect larvae.</p> <p>Breeding</p> <p>Woodland or forest, but also in partially cleared woodland or forest, including isolated trees. Nest in hollows in live or dead trees (many eucalypt species may provide suitable hollows), particularly Wandoo, Jarrah, Flooded Gum, and Marri.</p> <p>Roosting</p> <p>Generally in or near riparian environments or natural and artificial permanent water sources. Any tall trees may provide roosting habitat, but particularly Wandoo, Marri, Blackbutt, introduced eucalypts and pines.</p>	<p>Foraging</p> <p>Primarily seeds of Jarrah and Marri in woodlands and forest, also Allocasuarina cones and fruits of Snottygobble. Less important foods include Blackbutt, Bullich, Sheoak, Hakea spp.</p> <p>Breeding</p> <p>Generally in woodland or forest, but may also breed in partially cleared woodland or forest, including isolated trees. Nest in hollows in live or dead trees (many eucalypt species may provide suitable hollows), particularly Marri, Wandoo, Bullich, Blackbutt, and Jarrah.</p> <p>Roosting</p> <p>Any tall trees may provide roosting habitat, but particularly tall Jarrah, Marri, Blackbutt, and introduced eucalypt trees or large trees on the edges of forests.</p>
Total area of suitable habitat mapped within the assessment area (see Section 6.3.3.5 for habitat mapping and details)	<p>Foraging habitat: 15,950 ha</p> <p>Limited foraging habitat: 2,094 ha</p> <p>Potential breeding habitat: 15,805 ha</p> <p>Potential roosting habitat: 16,704 ha</p> <p>All suitable habitats mapped within the assessment area are considered habitat critical to the survival of the species.</p>	<p>Foraging habitat: 15,950 ha</p> <p>Limited foraging habitat: 2,094 ha</p> <p>Potential breeding habitat: 16,627 ha</p> <p>Potential roosting habitat: 16,792 ha</p> <p>All suitable habitats mapped within the assessment area are considered habitat critical to the survival of the species.</p>	<p>Foraging habitat: 16,557 ha</p> <p>Limited foraging habitat: 1,242 ha</p> <p>Potential breeding habitat: 16,401 ha</p> <p>Potential roosting habitat: 16,704 ha</p> <p>All suitable habitats mapped within the assessment area are considered habitat critical to the survival of the species.</p>
Threatening processes to species (as per species conservation advice or recovery plan)	<ul style="list-style-type: none"> • Illegal shooting • Nest competition with native and introduced birds and European honey bees • Habitat loss including selective removal of Marri • Nest site shortage 	<ul style="list-style-type: none"> • Loss of breeding habitat • Nest competition with native and introduced birds and European honey bees • Loss of non-breeding foraging and night roosting habitat in the vicinity of water availability • Decline in tree health (e.g. <i>Phytophthora</i> dieback, Canker) • Mining and extraction activities • Illegal shooting and taking • Climate change, including impact to vegetation and heat stress • Collisions with motor vehicles • Disease 	<ul style="list-style-type: none"> • Illegal shooting • Nest competition with native and introduced birds and European honey bees • Habitat loss including selective removal of Marri • Nest site shortage

Table 15.7 Summary of EPBC Act listed threatened fauna species occurrence and habitat within the assessment area – mammals

Species	Western Ringtail Possum (<i>Pseudocheirus occidentalis</i>)	Numbat (<i>Myrmecobius fasciatus</i>)	Woylie (<i>Bettongia penicillata</i>)	Chuditch (<i>Dasyurus geoffroii</i>)	Quokka (<i>Setonix brachyurus</i>)
EPBC Act status	Critically Endangered	Endangered	Endangered	Vulnerable	Vulnerable
Likelihood of occurrence	Potential – Myara North DE Potential – Holyoake DE	Potential – Myara North DE Potential – Holyoake DE	Likely – Myara North DE Likely – Holyoake DE	Known – Myara North DE Known – Holyoake DE (see Section 6.3.3.7 for maps of occurrence records)	Known – Myara North DE Known – Holyoake DE (see Section 6.3.3.8 for maps of occurrence records)
Habitat description (see Section 6.3.3.4 for details)	Habitat is not defined for the Northern Jarrah Forest. Habitat critical to survival for WRP is not well understood, and based on occurrence records, appears to vary between key management zones in the Swan Coastal Plain, Southern Jarrah Forest and Scott Plain which are distinct IBRA regions to the Northern Jarrah Forest. The common themes are high nutrient foliage availability for food, suitable structures for protection/nesting, and canopy continuity to avoid/escape predation, and other threats. Long-term survival of the species requires linkages between suitable habitat and as such habitat critical to survival should not be limited to only the habitat described below but linkages between. Any habitat where WRP occur naturally are considered critical and worthy of protection	Original habitat ranged from mulga woodland and sand plain and sand dune areas dominated by spinifex hummock grassland in the arid zone to eucalypt woodlands and forests in southwest WA. Seeks overnight refuge in hollow logs, tree hollows and burrows. Due to the decline in range and occupied habitat types, an exhaustive description of habitat critical to the survival of the Numbat cannot be provided, however key characteristics are significant abundance of termites, presence of eucalypt species, sufficient cover near ground level, and sufficient openness in the understory for feeding activities.	Known from a variety of habitats. Current habitat includes tall eucalypt forest and woodland, dense myrtaceous shrubland, kwongan (proteaceous) or mallee heath. Thickets and other suitable habitat types such as heath, provide refuges for Woylies against predators. Woylie occupy home ranges, the size of which varies between habitats, sites and according to woylie density. Small home ranges (less than 6 ha) are generally observed at high density occurrences.	Major portion of the remaining natural populations occur in varying densities in jarrah forests and woodlands in the south-west corner of WA, and in woodlands, mallee shrublands and heaths along the south coast, east to the Ravensthorpe area. Chuditch are solitary animals for most of their life. In the absence of foxes, they occupy relatively large home ranges, males ranging over 15 km ² and females 3-4 km ² . Home ranges may overlap; however there tends to be a smaller non-overlapping 'core' area defined by den locations: 4 km ² and 0.9 km ² for males and females respectively.	Habitat use in the Northern Jarrah Forest is largely restricted to swamps and riparian habitat (Hayward et al 2005, Dundas et al 2017). Within swamps, they are habitat specialists, preferring early seral stages that have been burned within the previous 10 years. This preference derives from a combination of dietary requirements and refuge from predation. As swamps mature they become suboptimal, forcing quokkas to colonize new patches. Since the collapse of the metapopulation following the introduction of the fox, quokkas have been forced to remain at a site because predation inhibits dispersal (Hayward et al 2005). Home-range sizes are estimated at approximately 6-7 ha and core ranges approximately 1.2 ha (Hayward et al 2004). Ranges shift to the edge of swamps in winter, and toward the centre in autumn as the swamps dried.
Total area of potential suitable habitat within the assessment area (see Section 6.3.3.6 to Section 6.3.3.10 for habitat mapping and details)	Dense riparian forest: 1,484 ha Dense riparian forest may contain pockets of dense, overlapping (closed) canopy. If WRP are recorded during targeted surveys within the DEs (see Section 6.5.1) then the associated habitat would be considered habitat critical to the survival of the species.	Dense riparian vegetation: 1,791 ha Open upland vegetation: 16,166 ha If Numbat are recorded during targeted surveys within the DEs, (see Section 6.5.1) then the associated habitat would be considered habitat critical to the survival of the species.	Dense riparian vegetation: 1,791 ha Open upland vegetation: 16,166 ha As a conservative assessment, all potential suitable habitats are considered habitat critical to the survival of the species.	Dense riparian vegetation: 1,791 ha Open upland vegetation: 16,166 ha All suitable habitats are considered habitat critical to the survival of the species.	Dense riparian vegetation: 1,791 ha Open upland vegetation: 16,166 ha Dense riparian vegetation is considered habitat critical to the survival of the species. Open upland vegetation is not considered critical habitat.
Threatening processes to species (as per species conservation advice or recovery plan)	<ul style="list-style-type: none"> Climate change Groundwater depletion Altered hydrology Increasing temperature 	<ul style="list-style-type: none"> Predation by foxes and feral cats Habitat loss and fragmentation, Frequent and intense fires. 	<ul style="list-style-type: none"> Fox predation Feral cat predation Land clearing Altered fire regimes 	<ul style="list-style-type: none"> Land clearing, particularly of riparian vegetation, and the removal of suitable den logs and den sites from Chuditch habitat 	<ul style="list-style-type: none"> Predation from foxes and cats Habitat destruction from feral pigs <i>Phytophthora</i> dieback impact to forest structure, cover and food resources

Species	Western Ringtail Possum (<i>Pseudocheirus occidentalis</i>)	Numbat (<i>Myrmecobius fasciatus</i>)	Woylie (<i>Bettongia penicillata</i>)	Chuditch (<i>Dasyurus geoffroii</i>)	Quokka (<i>Setonix brachyurus</i>)
	<ul style="list-style-type: none"> • Feral predators • Fire • Tree decline and insect outbreaks, • Competition for tree hollows • Logging • Domestic dogs 		<ul style="list-style-type: none"> • <i>Phytophthora</i> dieback and climate change impacts impact to shelter and fungi foods • Native predators • Disease • Mining 	<ul style="list-style-type: none"> • Predation by, and competition from, foxes and feral cats • Deliberate and accidental mortality from poisoning, trapping, illegal shooting, and road kills 	<ul style="list-style-type: none"> • Clearing and timber harvesting • Altered fire regimes • Altered hydrological regimes and climate change • Disease

Table 15.8 Summary of EPBC listed threatened fauna species potential occurrence and habitat within the assessment area – aquatic species

	Carter's Freshwater Mussel (<i>Westralunio carteri</i>)
EPBC Act status	Vulnerable
Likelihood of occurrence	Known – Myara North DE Potential – Holyoake DE
Habitat description (see Section 6.3.4.4 for details)	<p>Perennial streams, rivers, lakes and reservoirs and occasionally swamps. The highest densities are associated with woody debris and overhanging riparian vegetation near stream banks and edges of lakes/dams. The species retreats to shallow pools or damp mud with moist leaf litter, woody debris or aquatic macrophytes or root mats, which are well-shaded during times of drought or low water levels, but survival is limited by the availability of dissolved oxygen, moisture and moderate temperatures.</p> <p>Requires freshwater conditions with mean salinity less than 1.6 g/L. Favours sediments of sand/mud/clay which are soft enough for burrowing, but stable enough for support. Dispersal through freshwater environments is via a juvenile stage (glochidia) that attached hosts including native and non-native fish. The glochidia detach to live in sediments and mature mussels may live to approximately 30-50 years and possibly longer.</p>
Total area of potential suitable habitat (see Section 5.3.5.2 for habitat mapping and details)	<p>171 km of mapped seasonal streams</p> <p>Seasonal streams are not expected to provide habitat as they dry out for several months of the year (see Section 8.3.2.2), however they may contain un-mapped permanent or semi-permanent river pools that provide habitat for the species. The species was recorded at such a river pool at Jack Rocks within the Myara North DE.</p> <p>If an important population is recorded by targeted survey (see Section 6.5.1), associated permanent or semi-permanent river pool habitat is considered habitat critical to the survival of the species.</p>
Threatening processes to species (as per species conservation advice or recovery plan)	<ul style="list-style-type: none"> • Salinity • Water extraction, dehydration and heat stress • Climate change – reduction in seasonal water availability • Habitat loss • Nutrient pollution • Loss of suitable host species (fish) • Cattle trampling • Predation by pigs

Table 15.9 Summary of Myara North and Holyoake DEs within catchments of the Peel-Yalgorup System

Catchment	Receiving waters	Assessment area total (ha)	Proportion of assessment area (%)
Regulated (dammed) catchments flowing into the Peel-Yalgorup System			
Serpentine Dam	Serpentine River, Peel Inlet	9,417	51.4
South Dandalup Dam	Murray River, Peel Inlet	4,795	26.2
North Dandalup Dam	Murray River, Peel Inlet	309	1.7
Conjurunup Pipehead Dam	Murray River, Peel Inlet	128	0.7
Regulated catchment subtotal total		14,649	79.9
Un-regulated catchments flowing into the Peel-Yalgorup System			
Gooralong Brook	Serpentine River, Peel Inlet	204	1.1
Davis Brook	Murray River, Peel Inlet	1,739	9.5
Swamp Oak Brook	Murray River, Peel Inlet	592	3.2
Un-regulated catchment subtotal		2,536	13.8
Total within Peel-Yalgorup catchment		17,185	93.8
Catchments outside of the Peel-Yalgorup System catchment			
Wungong Brook	Canning River, Swan-Canning Estuary	1,046	5.7
Canning Dam	Canning River, Swam-Canning Estuary	61	0.3
To outside Peel-Yalgorup catchment		1,108	6.0
Assessment area total		18,329	

15.4 Potential impacts

The following Proposal activities have the potential to impact EPBC Act listed flora and fauna species:

- Construction of mine access and haul roads, conveyors and facilities
- Extension of mining and operation of mining and haulage equipment

The Proposal may result in the following potential direct and indirect impacts to EPBC Act listed flora or fauna species:

- Direct impacts as a result of clearing
- Direct impacts to fauna species as a result of injury/mortality from fauna entrapment or vehicle/equipment collisions.
- Indirect impacts as a result of:
 - Introduction and/or spread of weeds
 - Introduction and/or spread of *Phytophthora* dieback
 - Attraction of feral animals
 - Light emissions from infrastructure
 - Noise emissions from construction and operational equipment
 - Spills and/or leaks from storage and handling of hazardous materials and waste
 - Waterlogging in valley floors and lower stores
 - Salinity in valley floors and lower slopes.

The following Proposal activities have the potential to impact the Peel-Yalgorup System Ramsar wetlands:

- Indirect impacts as a result of:
 - Changes to hydrological regimes that affect inflows to rivers downstream
 - Saline induced groundwater discharge that increases salinity to rivers downstream
 - Spills and/or leaks from storage and handling of hazardous materials and waste.

15.5 Assessment of impacts

The potential impacts of the Proposal on EPBC Act listed flora and fauna species have been assessed in Section 5 (Vegetation and Flora) and Section 6 (Terrestrial Fauna). The potential impacts of the Proposal on Ramsar wetlands have been assessed in Section 8 (Inland Waters).

This Section has been provided to specifically address the requirements of the EPBC Act by assessing the impact of the Myara North and Holyoake DE elements of the Proposal to relevant species against the Significant Impact Guidelines 1.1 (DotE 2013).

15.5.1 Significant impact criteria

The Significant Impact Guidelines identify criteria for Critically Endangered, Endangered, and Vulnerable species and Ramsar wetlands are presented below. The Proposal is not predicted to impact any Listed migratory species, hence relevant criteria are not considered.

Endangered or Critically Endangered species

For **Endangered** or **Critically Endangered species**, an action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population
- Reduce the area of occupancy of the species
- Fragment an existing population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of a population
- Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat
- Introduce disease that may cause the species to decline, or
- Interfere with the recovery of the species.

Habitat critical to the survival of a species is defined as areas that are necessary (DotE 2013):

- 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, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species.

Critical habitat may be defined in species Recovery Plans, including threatened fauna species and Critically Endangered or Endangered flora species.

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to (DotE 2013):

- a geographically distinct regional population, or collection of local populations, or
- a population, or collection of local populations, that occurs within a particular bioregion.

Vulnerable species

For a **Vulnerable species**, an action is likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of an important population of a species
- Reduce the area of occupancy of an important population
- Fragment an existing important population into two or more populations
- Adversely affect habitat critical to the survival of a species
- Disrupt the breeding cycle of an important population
- Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- Introduce disease that may cause the species to decline, or

- Interfere with the recovery of the species.

An 'important population' for a Vulnerable species is defined as a population that is necessary for a species' long-term survival and recovery, which may include populations identified as such in recovery plans, and/or that are (DotE 2013):

- 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.

Ramsar wetlands

For a **Ramsar wetland**, an action is likely to have a significant impact on the ecological character of the wetland if there is a real chance or possibility that it will result in:

- areas of the wetland being destroyed or substantially modified
- a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland
- the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected
- a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health
- an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

15.5.2 Assessment of significance

The 14 EPBC Act listed species, identified as likely to occur in Section 15.3.5, have been assessed against the relevant significant impact criteria. Consistent with the structure of Section 15.3.5, the significance assessment has been structured to consider:

- One Vulnerable Flora species in Myara North (Table 15.10)
- Two Endangered and one Vulnerable Black Cockatoo species (Table 15.11)
- One Critically Endangered and two Endangered mammal species (Table 15.12)
- Two Vulnerable mammal species (Table 15.13)
- One Vulnerable aquatic species (Table 15.14)
- Ramsar wetlands downstream of the assessment area (Table 15.15)

Assessment of significance of impacts to Black Cockatoo species is also made with reference to the Black Cockatoo referral guidelines (DSEWPaC 2012 and DAWE 2022).

Based on assessment against the Significant Impact Guidelines and Black Cockatoo referral guidelines, the Proposal is likely to significantly affect the following MNES:

- Baudin's Cockatoo (*Calyptorhynchus baudinii*) – Endangered
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – Endangered
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable
- Woylie (*Bettongia penicillata*) – Endangered
- Chuditch (*Dasyurus geoffroii*) – Vulnerable

- Quokka (*Setonix brachyurus*) – Vulnerable

While the Proposal may impact them, it is unlikely to significantly impact the other MNES (i.e. Southern Tetraria, Numbat, Western Ringtail Possum, Carters Freshwater Mussel, Peel-Yalgorup System) that have potential to occur within the assessment area.

Table 15.10 Significance assessment for *Morelotia australiensis* (Southern Tetraria) – Myara North DE

No.	Significance criterion	Assessment of likelihood of a significant impact
1	Lead to a long-term decrease in the size of an important population	<p>Unlikely</p> <p>No recorded individuals or populations within the assessment area. Species has a potential to occur within the Myara North DE.</p> <p>Targeted flora surveys will be undertaken for any proposed clearing within potential suitable habitat (D, DA and E vegetation types) within the Myara North DE (see Section 5.5.1). Where a population is identified in targeted surveys within proposed clearing, an avoidance area will be established over the identified population extent and a minimum 50 m buffer.</p> <p>No important populations recorded in targeted surveys will be cleared.</p> <p>Waterlogging of valleys</p> <p>Groundwater mounding from the Proposal is expected to raise groundwater levels in valleys to levels similar to those before 1970, before the decline caused by reduced rainfall (see Section 5.4.3.6). However, the hydrogeology of the assessment area is highly variable, and there is potential for the Proposal to cause in some subcatchments an increase in waterlogging within valleys that is greater than the historical range. While valley vegetation is expected to be tolerant to waterlogging, there is potential for the increased waterlogging to cause a loss of some flora species, including populations of Southern Tetraria if present.</p> <p>To prevent the potential for waterlogging impacts to suitable habitat on lower slopes, the Proposal incorporates impact avoidance measures (see Section 6.5.1) to limit the duration of waterlogging in valleys to less than six months, which is expected to be within the historical range as indicated by streamflow records within the assessment area (see Section 8.3.2.2).</p>
2	Reduce the area of occupancy of an important population	<p>Unlikely</p> <p>See criterion 1</p>
3	Fragment an existing important population into two or more populations	<p>Unlikely</p> <p>See criterion 1</p>
4	Adversely affect habitat critical to the survival of a species	<p>Unlikely</p> <p>The potential suitable habitat mapped within the Myara North DE is not considered habitat critical to the survival of the species, as the species has not been recorded within the DE and it is likely that much of the mapped area would be devoid of species occupancy.</p> <p>If targeted surveys (see criterion 1) identify an important population as being present, the associated habitat would be considered habitat critical to the survival of the species. As noted under criterion 1, any important populations will be protected from clearing with a 50 m buffer, which is expected to protect any associated critical habitat.</p> <p>Alcoa will implement impact avoidance measures to prevent extended waterlogging in valleys (see criterion 1) which are expected to prevent substantial impacts to populations and associated critical habitat, if occurring within the Myara North DE.</p>
5	Disrupt the breeding cycle of an important population	<p>Unlikely</p> <p>See criteria 1 and 4. Any important populations and their associated habitat that are present within proposed clearing areas will be protected from clearing.</p>
6	Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>See criteria 1 and 4.</p> <p>Species is vulnerable to a fire regime that is too frequent, which may allow grassy weeds to out-compete the species (DEWHA 2008). Proposal is sympathetic to the DBCA fire regime and will not increase the fire frequency from that applied over the Northern Jarrah Forest (see Section 5.4.4.6).</p> <p>Proposal will incorporate weed hygiene measures to prevent the introduction and spread of weeds (see Section 5.5.2).</p>

No.	Significance criterion	Assessment of likelihood of a significant impact
7	Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p>Unlikely</p> <p>See criteria 1 and 4.</p> <p>Species is vulnerable to weed invasion (DEWHA 2008). Potential for localised spread of weeds from existing infestations within the assessment area, which could impact potential mapped suitable habitat, which may or may not be occupied by the species.</p> <p>Proposal will not import soil materials from outside the Huntly Mine with all earthworks using cut to fill and rehabilitation using direct topsoil return. Proposal will incorporate weed management for all populations identified in targeted surveys (see Section 5.5.1) and weed hygiene measures to prevent the introduction and spread of weeds (see Section 5.5.2).</p>
8	Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>See criteria 1 and 2.</p> <p>Species may be vulnerable to <i>Phytophthora</i> dieback. Potential for localised spread of <i>Phytophthora</i> dieback from existing infestations within the assessment area, which could impact mapped potential suitable habitat, which may or may not be occupied by the species.</p> <p>Proposal will incorporate <i>Phytophthora</i> dieback management for all populations identified in targeted surveys (see Section 5.5.1) and hygiene measures to prevent the introduction and spread of <i>Phytophthora</i> dieback (see Section 5.5.2).</p>
9	Interfere with the recovery of the species	<p>Unlikely</p> <p>No Recovery Plan for the species.</p> <p>Proposal is not inconsistent with recovery actions outlined in species conservation advice. Proposal will identify and protect any important populations (high conservation priority) within proposed clearing areas, and will manage threats in habitats associated with these populations.</p>
Overall assessment		Proposal is unlikely to cause significant impacts to the species.

Table 15.11 Significance assessment for Black Cockatoos including assessment against referral guidance – assessment area

No.	Significance criterion	Baudin's Cockatoo (<i>Calyptorhynchus baudinii</i>) (Endangered)	Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>) (Endangered)	Forest Red-Tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) (Vulnerable)
1	Lead to a long-term decrease in the size of a population	<p>Potential</p> <p>The Proposal is expected to clear up to approximately 6,199 ha of habitat for FRTBC and Baudin's and up to approximately 6,418 ha of habitat for Carnaby's Cockatoo, which represents approximately 35 per cent of the mapped habitat for these species within the assessment area (see Section 6.4.2.2).</p> <p>The Proposal is expected to impact in the order of 81,200 potential nesting trees (range 62,100 – 114,100 at 95 per cent confidence). Alcoa commits to targeted surveys and avoidance of known and suitable nesting trees as detailed in Section 6.5.1.</p> <p>All clearing areas will be rehabilitated to a native Jarrah forest ecosystem, with Jarrah and Marri comprising the predominant canopy species, both of which are the primary foraging species of Black Cockatoos. Black Cockatoo are expected to forage on mine rehabilitation within four to seven years of rehabilitation establishment. Foraging within mine rehabilitation has been recorded at low densities compared to un-mined forest, however this reflects past rehabilitation prescriptions with a higher stem density than that of contemporary rehabilitation (see Section 6.4.4.2). Given that rehabilitation is completed within approximately 3 to 4 years from clearing, the Proposal is expected to result in the temporary loss of foraging habitat over a period of approximately seven to 11 years.</p> <p>The Mine DE lies in proximity to extensive Black Cockatoo habitat mapped over the Northern Jarrah Forest IBRA subregion (Section 6.3.3.5). The temporary loss (seven to 11 years) of 6,199 ha of FRTBC and Baudin's foraging habitat and long-term loss (> 100 years) of potential breeding and roosting habitat represents approximately 5 per cent and 3 per cent of the estimated habitat within 6 km and 12 km, respectively, of the Mine DE. The temporary loss of 6,418 ha of Carnaby's foraging habitat and long-term loss of potential breeding and roosting habitat represents approximately 5 per cent and 3 per cent of the estimated habitat within 6 km and 12 km, respectively, of the Mine DE.</p> <p>The carrying capacity of the Northern Jarrah Forest in proximity to the assessment area may be limited by the availability of food in a poor fruiting year for both Jarrah and Marri combined with proximity to perennial water sources (see Section 6.4.2.2). An estimate of carrying capacity (in terms of population that may be supported) is not possible with the available data and there is potential that the current extent of foraging habitat in the vicinity of the assessment area represents the carrying capacity for the current local populations of Black Cockatoos. Accordingly, there is the potential that the temporary loss of foraging habitat arising from the Proposal may contribute to the regional stress on Black Cockatoo populations during a poor fruiting year for Jarrah and Marri or in combination with pine plantation harvesting (in regard to Carnaby's Cockatoo or Baudin's Cockatoo), which has the potential to contribute to a measurable decline in a local population of Black Cockatoos.</p>		
2	Reduce the area of occupancy of the species	<p>Likely</p> <p>The Proposal is expected to clear up to approximately 6,199 ha of habitat for FRTBC and Baudin's and up to approximately 6,418 ha of habitat for Carnaby's Cockatoo, which represents approximately 35 per cent of the mapped habitat for these species within the assessment area (see Section 6.4.2.2). This will result in a temporary loss of occupancy until rehabilitation restores foraging resources (see criterion 1) at which point the species may recolonise the rehabilitation, potentially foraging at a lower density than that of un-mined forest.</p> <p>Local populations of Black Cockatoos within the assessment area are expected to become habituated to elevated levels of noise, dust and artificial light, as evidenced by their current occupancy in the Myara mine region (see Section 6.4.3.4). The Proposal incorporates measures to reduce potential impacts from night-time activities (see Section 6.5.1) including avoiding night-time construction as far as practicable, avoiding night-time mine development and rehabilitation, and using lighting in accordance with the National Light Pollution Guidelines for Wildlife while maintaining a safe working environment. Accordingly, elevated noise, dust and artificial lighting during construction and mining are not expected to substantially impact Black Cockatoo occupancy in the remaining forest of the assessment area or in surrounding forest.</p>		
3	Fragment an existing population into two or more populations	<p>Unlikely</p> <p>Black Cockatoos are observed to forage, roost and breed in forest adjacent to current mining operations in the Myara mine region of the Huntly Mine, including adjacent to haul roads and mine facilities. Accordingly, Black Cockatoos are expected to continue foraging, roosting and breeding in forest patches within and surrounding the assessment area during mining. Black Cockatoos can fly several kilometres between foraging areas and between roost sites, and will be able to fly across the clearing areas (typically less than a kilometre wide) caused by mining. The Proposal is therefore not expected to cause fragmentation to Black Cockatoo populations present within the assessment area.</p> <p>Clearing will be restricted to distributed mine pits (from a few to several hundred metres wide) and linear infrastructure corridors, surrounded by un-mined forest. Therefore, gaps between habitats will not be such that an existing population will be fragmented.</p> <p>Local populations of Black Cockatoos within the assessment area are expected to become habituated to elevated levels of noise, dust and artificial light (see Section 6.4.3.4). Accordingly, elevated noise, dust and artificial lighting during construction and mining are not expected to cause fragmentation of Black Cockatoo populations in the remaining forest of the assessment area or in surrounding forest.</p>		

No.	Significance criterion	Baudin's Cockatoo (<i>Calyptorhynchus baudinii</i>) (Endangered)	Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>) (Endangered)	Forest Red-Tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) (Vulnerable)
4	Adversely affect habitat critical to the survival of a species	<p>Likely</p> <p>The Proposal is expected to clear up to approximately 6,199 ha of habitat for FRTBC and Baudin's and up to approximately 6,418 ha of habitat for Carnaby's Cockatoo, which represents approximately 35 per cent of the mapped habitat for these species within the assessment area (see Section 6.4.2.2). The Proposal is expected to result in temporary loss (seven to 11 years) of foraging habitat and long term loss (> 100 years) of potential breeding and roosting habitat.</p> <p>All mapped Black Cockatoo habitat within the assessment area is considered habitat critical to the survival of Black Cockatoos (see Section 15.3.2.1).</p>		
5	Disrupt the breeding cycle of a population	<p>Likely</p> <p>The Proposal will avoid all known and suitable nesting trees within the assessment area, except where clearing for Critical Infrastructure cannot be avoided (see Section 6.5.1),. Black Cockatoos are expected to avoid nesting in the retained known nesting trees during the mine development phase, due to the disturbance of blasting, however they are expected to return to use the known nesting trees after mining is completed and rehabilitation is established around the trees. Accordingly, the Proposal may result in a temporary disruption to breeding in known nesting trees in the mined areas as well as a long-term loss (> 100 years) of nesting trees that cannot be practicably avoided.</p> <p>Black Cockatoos are observed to breed in forest adjacent to current mining operations in the Myara mine region of the Huntly Mine, including adjacent to haul roads and mine facilities. Accordingly, Black Cockatoos are expected to continue breeding in forest patches within and surrounding the assessment area during mining. The Proposal is therefore not expected to cause disruption to the breeding of Black Cockatoos in the forest surrounding mining areas.</p>		
6	Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Potential</p> <p>See criterion 1.</p> <p>There is the potential that the temporary loss of foraging habitat arising from the Proposal may contribute to the regional stress on Black Cockatoo populations during a poor fruiting year for Jarrah and Marri or in combination with pine plantation harvesting (e.g. in regard to Carnaby's Cockatoo or Baudin's Cockatoo), which has the potential to contribute to a measurable decline in a local population of Black Cockatoos.</p> <p>Streamflow generation – watering habitat</p> <p>The Proposal is expected to cause groundwater mounding and an increase in stream flows during the mine phase, which is expected to reduce gradually during the post-rehabilitation phase as rehabilitation establishes and reduces recharge (see Section 8.4.3). Groundwater mounding has potential to increase the spatial extent and/or seasonal duration of watering habitat available for Black Cockatoos within the seasonal streams mapped over the assessment area compared to a no-mining scenario, including temporarily re-connecting some streams to the groundwater table that would otherwise be disconnected and thus have a substantially reduced stream flow. The extent and duration of the increase in stream flows that will occur will strongly depend on antecedent groundwater conditions within individual subcatchments, as well as future rainfall trends (see Section 8.4.3). The continuing forecast decline in rainfall and associated decline in groundwater levels is expected to continue to cause a contraction in the extent of streams seasonally connected to groundwater, the duration and quantity of streamflow, and therefore the extent of watering habitat for Black Cockatoos within the assessment area and the surrounding Jarrah forest.</p> <p>Waterlogging of habitat in valleys</p> <p>Groundwater mounding arising from the Proposal is expected to give rise to groundwater levels within valleys that are largely within the historical range prior to the decline of groundwater levels with rainfall since the 1970s (see Section 5.4.3.6). The hydrogeology of the assessment area is highly variable, however, and there is potential for the Proposal to cause in some subcatchments an increase in waterlogging within valleys that is greater than the historical range. While valley vegetation is expected to be tolerant to waterlogging, there is potential for the increased waterlogging to cause a loss of vegetation condition and impact to the quality of Black Cockatoo habitat.</p> <p>To prevent the potential for waterlogging impacts to Black Cockatoo habitat, the Proposal incorporates impact avoidance measures (see Section 6.5.1) to limit the duration of waterlogging in valleys to less than six months, which is expected to be within the historical range as indicated by streamflow records within the assessment area (see Section 8.3.2.2).</p> <p>Salinity impacts to watering habitat and habitat in valleys</p> <p>Groundwater in the assessment area is mostly freshwater quality (< 500 mg/L TDS) although there are pockets of brackish groundwater (> 1000 mg/L TDS) (see Section 8.3.3.4). Groundwater mounding arising from the Proposal that occurs over pockets of brackish groundwater has the potential to cause brackish groundwater discharge into streams, which may increase the salinity of streamflows (see Section 5.4.3.6). Aggregated across the catchment, the total stream inflow salinity into the Serpentine Dam or South Dandalup Dam is expected to increase by around five to ten per cent over the mining phase, however reservoir salinity is expected to remain less than 300 mg/L and well within the limits of palatability for humans (600 mg/L TDS) (see Section 8.4.4).</p>		

No.	Significance criterion	Baudin's Cockatoo (<i>Calyptorhynchus baudinii</i>) (Endangered)	Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>) (Endangered)	Forest Red-Tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) (Vulnerable)
		<p>Salinity of inflows are expected to decline over the post-rehabilitation phase as groundwater mounding subsides. Accordingly, the Proposal is not expected to impact the quality of Black Cockatoo watering habitat in drinking water reservoirs.</p> <p>Due to the variability of groundwater salinity and depths across subcatchments of the assessment area, the Proposal is expected to cause a variable increase in salinity in individual streams. Where groundwater is relatively deep, groundwater mounding from the Proposal may have a very limited to no increase in groundwater discharge and therefore a limited to no salinity increase in streams. Where groundwater is relatively shallow and brackish, groundwater mounding from the Proposal may result in higher salinity levels in streams. In many cases groundwater mounding from the Proposal is expected to temporarily restore groundwater levels and stream discharge to that of historical levels occurring prior to the decline of groundwater levels with declining rainfall across the Northern Jarrah Forest. In these cases, groundwater mounding and discharge of brackish groundwater are expected to generate a stream salinity that is within a historic range and to which valley vegetation is expected to be tolerant.</p> <p>There is potential for groundwater mounding from the Proposal to result in groundwater levels and baseflow discharge to streams that exceed historic levels in some subcatchments. In these subcatchments there is potential for pockets of brackish groundwater, if occurring, to cause streamflow salinity to rise above historic levels and potentially affect the health of valley vegetation or affect the suitability of watering habitat for Black Cockatoos. Given the mostly fresh groundwater recorded within the assessment area, the extent of potential salinity impacts would be expected to be limited to a small proportion of subcatchments and streams. Given the uncertainty in groundwater salinity and depths across all subcatchments and the uncertainty in the salinity tolerance of valley vegetation, the Proposal incorporates impact avoidance measures (see Section 5.5.1) to maintain stream salinity within baseline levels.</p> <p>Contaminant impacts to watering habitat and habitat in valleys</p> <p>As presented in Section 8.4, the Proposal is unlikely to cause substantial impacts to water quality within the assessment area, including from turbidity or chemicals such as hydrocarbons or PFAS. The Proposal includes impact avoidance and mitigation commitments (see Section 8.5) to protect the high water quality standards dictated for drinking water, which are expected to protect the quality of watering habitat as well as riparian vegetation that comprise Black Cockatoo habitat.</p>		
7	Result in invasive species that are harmful to the species becoming established in species' habitat	<p>Unlikely</p> <p>Proposal is unlikely to introduce or spread feral European honeybees or introduced bird species that compete for nest hollows. Proposal is not expected to introduce any new predator species into the assessment area.</p> <p>Potential localised spread of weeds in habitat downslope / downstream of construction/mining (Section 5.4.3.1), however this is not expected to significantly impact habitat quality for foraging, breeding or roosting.</p>		
8	Introduce disease that may cause the species to decline	<p>Possible</p> <p>Potential localised spread of <i>Phytophthora</i> dieback that may affect health of foraging resources (e.g. Jarrah, proteaceous understorey, <i>Hakea</i> sp.) or Jarrah trees for breeding/roosting (Section 5.4.3.2). Proposal will include <i>Phytophthora</i> dieback hygiene during construction and operations to minimise the spread of <i>Phytophthora</i> dieback.</p> <p>Alcoa has established <i>Phytophthora</i> dieback hygiene practices which have been demonstrated to limit <i>Phytophthora</i> dieback spread to less than 1 per cent of the cleared area.</p>		
9	Interfere with the recovery of the species	<p>Likely</p> <p>Species conservation advice (TSSC 2018) states a primary conservation action for the species is to increase the number of nest hollows, mainly through limiting further loss of mature trees.</p> <p>The Proposal will clear potential breeding habitat including an estimated 81,200 potential nesting trees (range 62,100 – 114,100 at 95 per cent confidence). The potential breeding habitat may be used by a future local resident population during the breeding season.</p>	<p>Unlikely</p> <p>Species conservation advice (TSSC 2009) includes a regional priority recovery action to determine and implement ways to minimise the effects of mining on habitat loss.</p> <p>The Proposal includes impact avoidance measures (see Section 6.5.1) to minimise the effects of mining on habitat loss.</p>	<p>Likely</p> <p>Recovery plan (DPaW 2013) objective is to enhance habitat critical for survival throughout their breeding and non-breeding range, ensuring that the reproductive capacity of the species remains stable or increases.</p> <p>The Proposal will clear up to approximately 6,199 ha of habitat critical to the survival of the species, including foraging and potential roosting habitat that may be used by populations visiting during the non-breeding season, and potential breeding habitat that may be used by the local resident population during the breeding season.</p>
Overall assessment		Proposal is likely to cause significant impacts to the species.	Proposal is likely to cause significant impacts to the species.	Proposal is likely to cause significant impacts to the species.

Table 15.12 Significance assessment for listed Critically Endangered and Endangered mammal species – Myara North and Holyoake DEs

No.	Significance criterion – Endangered	Western Ringtail Possum (<i>Pseudocheirus occidentalis</i>) – Critically Endangered	Numbat (<i>Myrmecobius fasciatus</i>) – Endangered	Woylie (<i>Bettongia penicillate</i>) – Endangered
1	Lead to a long-term decrease in the size of a population	<p>Unlikely</p> <p>No evidence of WRP occupation was recorded during baseline surveys (GHD 2025a, 2025b), including nocturnal searches of the tree canopy at 47 locations, which targeted arboreal species including possums, and diurnal searches at 75 locations across the assessment area which included search for mammal scats, including possums. The surveys recorded evidence of common Brushtail Possum in very low densities, however no WRP were identified. The surveys noted a generally open canopy in the vegetation, potentially due to historical timber harvesting and fire frequency.</p> <p>The assessment area lies more than 10 km from the three key management zones and identified populations for the species. There are very few species records in the Northern Jarrah Forest IBRA subregion north of Harvey and no recent records (i.e. within the past 10-20 years) within 10 km.</p> <p>No recent records of the species within 10 km and very few historic records within the Northern Jarrah Forest in the vicinity of the Huntly Mine. Species has potential to be present in pockets of dense, overlapping canopy within riparian areas.</p> <p>Proposal has potential to clear 305 ha of riparian forest, which represents approximately 21 per cent of riparian forest mapped within the assessment area.</p>	<p>Unlikely</p> <p>No evidence of Numbat occupation was recorded during baseline surveys comprising remote cameras at 172 locations and diurnal surveys at 75 locations across the assessment area (GHD 2025a, 2025b). No individuals or signs (e.g. digs, scats) were identified during the baseline surveys, however the species is cryptic and difficult to record when at low densities.</p> <p>The assessment area lies over 50 km from known subpopulations at Boyaging and Dryandra and approximately 15 km from recent records at George Block. The modelled distribution in the vicinity of Jarrahdale and the Myara North DE is based on historic records and expected to represent a former distribution that no longer occurs.</p> <p>The species, if present within the assessment area, is considered to be below detectable densities.</p> <p>Proposal has potential to clear up to 6,217 ha of potential suitable habitat, which represents approximately 35 per cent of potential suitable habitat mapped within the assessment area.</p> <p>Targeted surveys undertaken for proposed clearing areas for other threatened fauna species will include provision to record opportunistic sightings of Numbat occurrence, in accordance with Alcoa's Fauna Environmental Management Plan (FEMP).</p> <p>Where opportunistic sightings of Numbat occurrence are recorded by targeted surveys for other fauna, Numbat specific targeted surveys and avoidance measures will be designed and implemented as per Alcoa's adaptive management principles as outlined in the FEMP (see Section 6.5.1).</p> <p>All cleared areas will be rehabilitated to a native jarrah forest ecosystem, which will restore eucalypt species and has been demonstrated to restore termite populations, which are expected to restore habitat values for Numbat if occurring at present or in the future.</p>	<p>Unlikely</p> <p>No evidence of Woylie occupation was recorded during baseline surveys comprising remote cameras at 99 locations, diurnal surveys at 75 locations, and cage traps with universal bait at 173 locations across the assessment area (GHD 2025a, 2025b). The species has a patchy modelled distribution and estimated sparse population within the Northern Jarrah Forest. The species, if present within the assessment area, is expected to be at below detectable densities.</p> <p>Proposal has potential to clear up to 6,396 ha of potential suitable habitat, which represents approximately 36 per cent of potential suitable habitat mapped within the assessment area.</p> <p>Targeted surveys will be undertaken in accordance with the FEMP for all proposed clearing areas to determine the occupancy of Woylie.</p> <p>Where Woylie are recorded by targeted surveys, avoidance measures will be designed and implemented as per Alcoa's adaptive management principles as outlined in the FEMP (see Section 6.5.1).</p> <p>All cleared areas will be rehabilitated to a native jarrah forest ecosystem, which has been demonstrated to restore ectomycorrhizal fungi and therefore have potential to restore habitat values for Woylie if a population is occurring at present or in the future.</p>

No.	Significance criterion – Endangered	Western Ringtail Possum (<i>Pseudocheirus occidentalis</i>) – Critically Endangered	Numbat (<i>Myrmecobius fasciatus</i>) – Endangered	Woylie (<i>Bettongia penicillate</i>) – Endangered
2	Reduce the area of occupancy of the species	Unlikely See criterion 1.	Unlikely See criterion 1.	Potential Proposal will generate noise and night lighting emissions which may potentially disturb or displace ground mammals within the assessment area, causing them to avoid using habitat in impacted areas (see Section 6.4.3.4). Depending on the sensitivity of Woylie to noise and night lighting, this may cause a localised and temporary loss of occupancy in the vicinity of mining areas, should Woylie be present within the assessment area. The timeframe for loss of occupancy is expected to be several years for mine pits and up to ten years for the vicinity of mine facilities and primary haul roads that will operate over longer timeframes.
3	Fragment an existing population into two or more populations	Unlikely See criterion 1.	Unlikely See criterion 1.	Possible Mining will cause progressive fragmentation of habitat as mine pits and infrastructure are developed and then decline as rehabilitation establishes (Section 6.4.1.3). The total duration of fragmentation impacts is expected to be about 15 to 20 years for each mine region, being the cumulative timeframe for mining, rehabilitation, and fauna recolonisation.
4	Adversely affect habitat critical to the survival of a species	Unlikely The mapped potential suitable habitat within the assessment area is not considered habitat critical to the survival of the species, as most or all of the potential habitat is expected to be unoccupied by the species. If a population is recorded during targeted surveys within the assessment area (see criterion 1) then the associated habitat would be considered habitat critical to the survival of the species. Impact avoidance measures for identified critical habitat will be designed and implemented as per Alcoa's adaptive management principles as outlined in the FEMP (see Section 6.5.1).	Unlikely The mapped potential suitable habitat within the assessment area is not considered habitat critical to the survival of the species, as most or all of the potential habitat is expected to be unoccupied by the species. If a population is recorded during targeted surveys within the assessment area (see criterion 1) then the associated habitat would be considered habitat critical to the survival of the species. Impact avoidance measures for identified critical habitat will be designed and implemented as per Alcoa's adaptive management principles as outlined in the FEMP (see Section 6.5.1).	Likely The suitable habitat for Woylie mapped within the assessment area DEs may not represent habitat critical to the survival of the species (see Section 6.3.3.6), however as a conservative assessment this ERD assumes that the assessment area contains critical habitat for the species. Proposal has potential to clear up to 6,396 ha of potential suitable which is assumed to be habitat critical to the survival of the species. All cleared areas will be rehabilitated to a native jarrah forest ecosystem, which has been demonstrated to restore ectomycorrhizal fungi and therefore have potential to restore critical habitat for Woylie if a population is occurring at present or in the future.
5	Disrupt the breeding cycle of a population	Unlikely See criterion 1.	Unlikely See criterion 1.	Possible Fragmentation may potentially disrupt breeding, though the species is expected to occur occasionally and occupies small home ranges. See criterion 3.

No.	Significance criterion – Endangered	Western Ringtail Possum (<i>Pseudocheirus occidentalis</i>) – Critically Endangered	Numbat (<i>Myrmecobius fasciatus</i>) – Endangered	Woylie (<i>Bettongia penicillate</i>) – Endangered
6	Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>See criterion 4.</p> <p>Groundwater mounding arising from the Proposal has potential to impact valley vegetation of some subcatchments within the assessment area through waterlogging or salinity (see Section 5.4.3.6). This may potentially impact pockets of habitat if occurring in riparian forest within valleys.</p> <p>The Proposal incorporates impact avoidance measures (see Section 6.5.1) to prevent waterlogging or salinity impacts in valleys.</p> <p>The Proposal incorporates weed hygiene measures (see Section 5.5.2) to prevent a loss of vegetation condition within the assessment area, which are expected to protect habitat values for the species.</p>	<p>Unlikely</p> <p>See criterion 4.</p> <p>Groundwater mounding arising from the Proposal has potential to impact valley vegetation of some subcatchments within the assessment area through waterlogging or salinity (see Section 5.4.3.6). This may potentially impact habitat if populations occur in valleys.</p> <p>The Proposal incorporates impact avoidance measures (see Section 6.5.1) to prevent waterlogging or salinity impacts in valleys.</p> <p>The Proposal incorporates weed hygiene measures (see Section 5.5.2) to prevent a loss of vegetation condition within the assessment area, which are expected to protect habitat values for the species.</p>	<p>Unlikely</p> <p>See criterion 4.</p> <p>Groundwater mounding arising from the Proposal has potential to impact valley vegetation of some subcatchments within the assessment area through waterlogging or salinity (see Section 5.4.3.6). This may potentially impact habitat if populations occur in valleys.</p> <p>The Proposal incorporates impact avoidance measures (see Section 6.5.1) to prevent waterlogging or salinity impacts in valleys.</p> <p>The Proposal incorporates weed hygiene measures (see Section 5.5.2) to prevent a loss of vegetation condition within the assessment area, which are expected to protect habitat values for the species.</p>
7	Result in invasive species that are harmful to a species becoming established in the species' habitat	<p>Unlikely</p> <p>Construction and mining can potentially lead to an increased presence of feral animals through increased availability of food and water supplies (see Section 6.4.3.3). Proposal incorporates mitigation measures (see Section 6.5.2) to reduce the attraction of feral animals.</p>	<p>Unlikely</p> <p>Construction and mining can potentially lead to an increased presence of feral animals through increased availability of food and water supplies (see Section 6.4.3.3). Proposal incorporates mitigation measures (see Section 6.5.2) to reduce the attraction of feral animals.</p>	<p>Unlikely</p> <p>Construction and mining can potentially lead to an increased presence of feral animals through increased availability of food and water supplies (see Section 6.4.3.3). Proposal incorporates mitigation measures (see Section 6.5.2) to reduce the attraction of feral animals.</p>
8	Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>Potential localised spread of <i>Phytophthora</i> dieback that may affect health of vegetation (Section 5.4.3.2). This may potentially impact pockets of habitat if occurring in riparian forest within valleys.</p> <p>Proposal will include <i>Phytophthora</i> dieback hygiene during construction and operations to minimise the spread of <i>Phytophthora</i> dieback (see Section 5.5.2). Alcoa has established <i>Phytophthora</i> dieback hygiene practices which have been demonstrated to limit <i>Phytophthora</i> dieback spread to less than one per cent of the cleared area.</p>	<p>Unlikely</p> <p>Potential localised spread of <i>Phytophthora</i> dieback that may affect health of vegetation (Section 5.4.3.2).</p> <p>Proposal will include <i>Phytophthora</i> dieback hygiene during construction and operations to minimise the spread of <i>Phytophthora</i> dieback (see Section 5.5.2). Alcoa has established <i>Phytophthora</i> dieback hygiene practices which have been demonstrated to limit <i>Phytophthora</i> dieback spread to less than one per cent of the cleared area.</p>	<p>Unlikely</p> <p>Potential localised spread of <i>Phytophthora</i> dieback that may affect the health of vegetation (Section 5.4.3.2) and potentially ectomycorrhizal habitat.</p> <p>Proposal will include <i>Phytophthora</i> dieback hygiene during construction and operations to minimise the spread of <i>Phytophthora</i> dieback (see Section 5.5.2). Alcoa has established <i>Phytophthora</i> dieback hygiene practices which have been demonstrated to limit <i>Phytophthora</i> dieback spread to less than one per cent of the cleared area.</p>

No.	Significance criterion – Endangered	Western Ringtail Possum (<i>Pseudocheirus occidentalis</i>) – Critically Endangered	Numbat (<i>Myrmecobius fasciatus</i>) – Endangered	Woylie (<i>Bettongia penicillate</i>) – Endangered
9	Interfere with the recovery of the species	<p>Unlikely</p> <p>Recovery plan (DPaW 2017) ten year goal is to slow the decline in population size, extent and area of occupancy through managing major threatening processes affecting the subpopulations and their habitats in identified key management zones: Swan Coastal Plain, southern forests and south coast.</p> <p>Proposal will not impact the subpopulations in the key management zones.</p> <p>Proposal is unlikely to cause a decline in population size or occupancy (see criterion 1).</p> <p>Conservation advice (TSSC 2017) primary objective is to reduce the direct and indirect threat to WRP from developments by retaining and protecting habitat (particularly older growth peppermint trees).</p> <p>Proposal will protect habitat where a WRP population is identified to occur (see criterion 4).</p> <p>Proposal is not inconsistent with the recovery plan goal or conservation advice objective.</p>	<p>Unlikely</p> <p>Recovery plan (DPaW 2017) long term goal is to improve its conservation status by increasing the number of subpopulations and the size of subpopulations.</p> <p>The Proposal will not exacerbate feral foxes or cats, or cause an inappropriate fire regime, which are the two key threatening processes that would prevent introduction of a population to the area or decrease the size of a population if present.</p> <p>Rehabilitation is expected to restore habitat values for Numbat if a population is occurring within the assessment area at present or in the future.</p>	<p>Unlikely</p> <p>Recovery plan (DEC 2012) long term objectives are to maintain current distribution and abundance across its current range, and increase abundance and range by reducing the impacts of processes that are causing species decline and establishing new wild populations in suitable habitat within the species former range.</p> <p>Proposal will protect Woylie populations, if occurring within the assessment area (see criterion 1), thereby maintaining the current distribution and abundance.</p> <p>Proposal will protect the quality of potential suitable habitat within the assessment area (see criteria 6 and 8) and mitigate the attraction of feral animals (see criterion 7).</p>
Overall assessment		Proposal is unlikely to cause significant impacts to the species.	Proposal is unlikely to cause significant impacts to the species.	Proposal is likely to cause significant impacts to the species.

Table 15.13 Significance assessment for listed Vulnerable mammal species – Myara North and Holyoake DEs

No.	Significance criterion – Endangered	Chuditch (<i>Dasyurus geoffroi</i>)	Quokka (<i>Setonix brachyurus</i>)
1	Lead to a long-term decrease in the size of a population	<p>Unlikely</p> <p>The Proposal has potential to result in a short-term decrease in the Chuditch population in the assessment area during the life of each mine due to vehicle strike and the temporary loss and fragmentation of habitat until mine rehabilitation establishes.</p> <p>Proposal has potential to clear up to 6,396 ha of suitable habitat, which represents approximately 36 per cent of suitable habitat mapped within the assessment area.</p> <p>All cleared areas will be rehabilitated to a native jarrah forest ecosystem. Chuditch are rapid colonisers of mine rehabilitation, being recorded within two years of rehabilitation completion (see Section 6.4.4.2). Research suggests that rehabilitation provides a permeable matrix for Chuditch that is rapidly recolonised and used for denning, however it is uncertain whether the relative sparsity of microhabitats affects breeding success and long-term survival (see Section 6.4.4.2).</p> <p>Fragmentation may cause localised disruption of breeding by Chuditch as it may break up the overlapping ranges of males and females, and obstruct dispersal of juveniles in this short-lived species. Chuditch occupy core home ranges of about 90-400 ha and there is potential for smaller fragments to have insufficient foraging resources for individuals. Accordingly, there is the potential for loss of individuals in un-mined forest fragments within the assessment area, where these are disconnected from ecological corridors.</p> <p>Survey within the existing Myara mine region of the Huntly Mine (SLR 2024) recorded Chuditch at 18 locations and spot analysis identified a minimum of 14 individuals. The persistence of a local population within a region mined for ten years suggests that the species is resilient to the effects of mining including noise, night lighting and fragmentation.</p> <p>Proposal will implement fauna crossing structures to maintain ecological corridors and provide connectivity for Chuditch habitat within the assessment area (see Section 6.5.2.1).</p> <p>The Proposal may also result in vehicle strike, particularly along sealed mine access roads during dawn and dusk peak traffic periods (see Section 6.4.2.7).</p> <p>Chuditch have a short life span and relatively high fecundity. As habitat and connectivity is restored with mine rehabilitation, and operational traffic ceases, local populations are expected to recover and recolonise impacted areas of the assessment area. The Proposal is therefore not expected to cause a long-term decrease in local populations of Chuditch.</p>	<p>Unlikely</p> <p>Proposal will clear up to 341 ha of Quokka critical habitat (riparian and swamp vegetation), which represents 19 per cent of the Quokka critical habitat mapped within the DE. This is a conservative estimate assuming all Quokka critical habitat within the Low Disturbance Areas is cleared, as the remaining 82 per cent of Quokka critical habitat within the assessment area is covered by the Avoidance Zone.</p> <p>All cleared areas will be rehabilitated to a native jarrah forest ecosystem. Quokka have been recorded in mine rehabilitation and appear to favour the dense understorey of the rehabilitation in proximity to riparian habitat (see Section 6.4.4.2). There is potential for rehabilitation to restore the habitat values for Quokka in riparian habitats.</p> <p>Targeted surveys will be undertaken in accordance with the FEMP for all proposed clearing areas within 100 m of riparian and swamp vegetation to determine the occupancy of Quokka. Clearing will be avoided within a 50 m buffer of a mapped Quokka population extent, unless this is not viable due to clearing for Critical Infrastructure (see Section 6.5.1).</p> <p>Where clearing cannot viably avoid the 50 m buffer of a mapped Quokka population extent, a pre-clearance fauna spotter will be engaged to corral the animals into suitable habitat in the riparian corridor adjacent to the clearing.</p> <p>Proposal may fragment Quokka critical habitat due to infrastructure crossings of riparian corridors, which may prevent Quokka dispersal if this is occurring within the assessment area. Research indicates that Quokka populations in the Northern Jarrah Forest may not be dispersing due to predator pressure (see criterion 3).</p> <p>Proposal will implement fauna crossing structures to maintain ecological corridors and provide connectivity for Quokka critical habitat within the assessment area (see Section 6.5.2.1). Fauna crossing structures will incorporate key elements to maximise use by Quokka and be provided with targeted predator control (see Section 6.5.2.1).</p> <p>Survey within the existing Myara mine region of the Huntly Mine (SLR 2024) recorded Quokka at six locations. The persistence of a local population within a region mined for ten years suggests that the species is resilient to the effects of mining including noise, night lighting and fragmentation.</p> <p>Due to the substantial avoidance of Quokka critical habitat and use of targeted surveys and avoidance, the Proposal is not expected to cause a long-term decrease in local populations of Quokka.</p>
2	Reduce the area of occupancy of the species	<p>Likely</p> <p>See criterion 1.</p> <p>The Proposal will result in a temporary reduction in occupancy of up to 6,396 ha over a period of approximately 15 to 20 years in the assessment area, until rehabilitation establishes and Chuditch recolonise.</p> <p>Proposal will generate noise and night lighting emissions which may potentially disturb or displace ground mammals within the assessment area, causing them to avoid using habitat in impacted areas (see Section 6.4.3.4). Depending on the sensitivity of Chuditch to noise</p>	<p>Possible</p> <p>See criterion 1.</p> <p>Proposal will clear up to 341 ha of Quokka critical habitat within Low Disturbance Areas, which represents 19 per cent of the Quokka critical habitat mapped within the DE. Where clearing is for Critical Infrastructure, Quokka may be corralled into adjacent riparian habitat (see criterion 1) and therefore there would be a loss of occupancy over the cleared area.</p>

No.	Significance criterion – Endangered	Chuditch (<i>Dasyurus geoffroi</i>)	Quokka (<i>Setonix brachyurus</i>)
		<p>and night lighting, this may cause a localised and temporary loss of occupancy in the vicinity of mining areas. The timeframe for loss of occupancy is expected to be several years for mine pits and up to ten years for the vicinity of mine facilities and primary haul roads that will operate over longer timeframes.</p> <p>The persistence of a local population within the Myara region which has mined for ten years (see criterion 1) suggests that the species is resilient to the effects of mining noise and night lighting.</p>	<p>Proposal may prevent Quokka dispersal due to infrastructure crossings of riparian corridors, if Quokka dispersal is occurring within the assessment area (see criterion 3). The reduced dispersal may potentially result in reduced occupancy through the assessment area.</p> <p>Proposal will implement fauna crossing structures to maintain ecological corridors and provide connectivity for Quokka critical habitat within the assessment area (see Section 6.5.2.1). Fauna crossing structures will incorporate key elements to maximise use by Quokka and be provided with targeted predator control (see Section 6.5.2.1).</p> <p>Proposal will generate noise and night lighting emissions which may potentially disturb or displace ground mammals within the assessment area, causing them to avoid using habitat in impacted areas (see Section 6.4.3.4). Depending on the sensitivity of Quokka to noise and night lighting, this may cause a localised and temporary loss of occupancy in the vicinity of mining areas. The timeframe for loss of occupancy is expected to be several years for mine pits and up to ten years for the vicinity of mine facilities and primary haul roads that will operate over longer timeframes.</p> <p>The persistence of a local population within the Myara region which has mined for ten years (see criterion 1) suggests that the species is resilient to the effects of mining noise and night lighting.</p>
3	Fragment an existing population into two or more populations	<p>Likely</p> <p>The Proposal will cause temporary fragmentation of Chuditch habitat within the assessment area, with the species expected to rapidly recolonise mine rehabilitation.</p> <p>Fragmentation will spread progressively through the assessment area as mine pits and infrastructure are developed and then decline as rehabilitation establishes. The total duration of fragmentation impacts is expected to be about 15 to 20 years in each mine region, being the cumulative timeframe for mining, rehabilitation, and Chuditch recolonisation.</p> <p>Proposal will implement fauna crossing structures to maintain ecological corridors and provide connectivity for Chuditch habitat within the assessment area (see Section 6.5.2.1).</p>	<p>Possible</p> <p>Quokka are unlikely to be affected by fragmentation of upland Jarrah forest within the Development Zone as they are mostly confined the swamp and riparian habitats. Quokka may be fragmented by infrastructure crossings of riparian and swamp habitats within the Low Disturbance Areas, if Quokka dispersal is occurring in the assessment area. Hayward et al (2005) observed that dispersal was not occurring in populations monitored in the Northern Jarrah Forest, which was thought to be due to feral predator pressure suppressing population growth that could drive dispersal.</p> <p>Mining will cause progressive fragmentation as infrastructure crossings are developed and then decline as rehabilitation establishes (Section 6.4.4.2). The total duration of fragmentation impacts is expected to be about 15 to 20 years for each mine region, being the cumulative timeframe for mining, rehabilitation, and fauna recolonisation.</p> <p>Proposal will implement fauna crossing structures to maintain ecological corridors and provide connectivity for Quokka populations within the assessment area (see Section 6.5.2.1). Fauna crossing structures will incorporate key elements to maximise use by Quokka and be provided with targeted predator control (see Section 6.5.2.1).</p>
4	Adversely affect habitat critical to the survival of a species	<p>Likely</p> <p>The Proposal will clear up to 6,396 ha of suitable habitat for Chuditch, which is expected to comprise habitat critical to the survival of the species. The loss of habitat will be temporary over a period of approximately 15 to 20 years within the assessment area.</p> <p>It is uncertain whether the relative sparsity of microhabitats (e.g. logs, tree stumps) in rehabilitation affects breeding success and long-term survival of Chuditch (see Section 6.4.4.2). Loss of microhabitats may be long term, with coarse woody debris such as logs expected to take over a century to form, therefore there is potential for a long-term loss of habitat quality for Chuditch in mined areas.</p>	<p>Likely</p> <p>Proposal will clear up to 341 ha of Quokka critical habitat within Low Disturbance Areas, which represents 19 per cent of the Quokka critical habitat mapped within the assessment area. This is a conservative estimate assuming all critical habitat within the Low Disturbance Areas is cleared, as the remaining 81 per cent of critical habitat within the assessment area is covered by the Avoidance Zone.</p> <p>All cleared areas will be rehabilitated to a native jarrah forest ecosystem. Quokka have been recorded in mine rehabilitation and appear to favour the dense understorey of the rehabilitation in proximity to riparian habitat (see Section 6.4.4.2). There is potential for rehabilitation to restore the habitat values for Quokka in riparian habitats.</p>

No.	Significance criterion – Endangered	Chuditch (<i>Dasyurus geoffroii</i>)	Quokka (<i>Setonix brachyurus</i>)
		<p>Groundwater mounding arising from the Proposal has potential to impact valley vegetation of some subcatchments within the Mine DE through waterlogging or salinity (see Section 5.4.3.6). This may potentially impact habitat for Chuditch, which may favour riparian and swamp habitats due to increased density of prey. The Proposal incorporates impact avoidance measures (see Section 6.5.1) to prevent waterlogging or salinity impacts in valleys.</p>	<p>The Proposal may fragment Quokka critical habitat due to infrastructure crossings of riparian corridors, which may prevent Quokka dispersal if this is occurring in the assessment area (see criterion 3). Proposal will implement fauna crossing structures to maintain ecological corridors and provide connectivity for Quokka critical habitat within the assessment area (see Section 6.5.2.1).</p> <p>Groundwater mounding arising from the Proposal has potential to impact valley vegetation of some subcatchments within the assessment area through waterlogging or salinity (see Section 5.4.3.6). This may potentially impact riparian and swamp vegetation that represent critical habitat for Quokka. The Proposal incorporates impact avoidance measures (see Section 6.5.1) to prevent waterlogging or salinity impacts in valleys.</p>
5	Disrupt the breeding cycle of a population	<p>Likely</p> <p>The Proposal will cause temporary fragmentation of Chuditch habitat within the assessment area, with the species expected to rapidly recolonise mine rehabilitation. Fragmentation may cause localised disruption of breeding by Chuditch as it may break up the overlapping ranges of males and females, and obstruct dispersal of juveniles in this short-lived species.</p> <p>The persistence of a local population within the existing Myara region (see criterion 1), which has been mined for ten years, suggests that the species is resilient to the effects of fragmentation.</p> <p>The total duration of fragmentation impacts to breeding is expected to be about 15 to 20 years in each mine region, being the cumulative timeframe for mining, rehabilitation, and recolonisation.</p>	<p>Possible</p> <p>Proposal may fragment Quokka critical habitat due to infrastructure crossings of riparian corridors, which may prevent Quokka dispersal if this is occurring in the assessment area (see criterion 3).</p> <p>Proposal will implement fauna crossing structures to maintain ecological corridors and provide connectivity for Quokka critical habitat within the assessment area (see Section 6.5.2.1).</p>
6	Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Possible</p> <p>See criterion 1.</p> <p>The Proposal has potential to result in a short-term decrease in the Chuditch population in the assessment area, due to the temporary loss and fragmentation of habitat until mine rehabilitation establishes.</p> <p>The Proposal incorporates impact avoidance measures (see Section 6.5.1) to prevent waterlogging or salinity impacts in valleys that could reduce the quality of riparian or swamp vegetation.</p> <p>The Proposal incorporates weed hygiene measures (see Section 5.5.2) to prevent a loss of vegetation condition within the assessment area, which are expected to protect habitat values for the species.</p> <p>Proposal is sympathetic to the DBCA fire regime and is not expected to increase the fire frequency or intensity from that applied over the Northern Jarrah Forest (see Section 5.4.4.5).</p> <p>The persistence of a local population within the Myara region which has mined for ten years (see criterion 1) suggests that the species is resilient to the effects of mining including noise, night lighting and fragmentation.</p>	<p>Possible</p> <p>See criterion 1.</p> <p>Groundwater mounding arising from the Proposal has potential to impact valley vegetation of some subcatchments within the assessment area through waterlogging or salinity (see Section 5.4.3.6). This may potentially impact riparian and swamp vegetation that is critical habitat for Quokka.</p> <p>The Proposal incorporates impact avoidance measures (see Section 6.5.1) to prevent waterlogging or salinity impacts in valleys that could reduce the quality of riparian or swamp vegetation.</p> <p>The Proposal incorporates weed hygiene measures (see Section 5.5.2) to prevent a loss of vegetation condition within the assessment area, which are expected to protect habitat values for the species.</p> <p>Proposal is sympathetic to the DBCA fire regime and is not expected to the fire frequency or intensity from that applied over the Northern Jarrah Forest (see Section 5.4.4.5).</p> <p>The persistence of a local population within the Myara region which has mined for ten years (see criterion 1) suggests that the species is resilient to the effects of mining including noise, night lighting and fragmentation.</p>

No.	Significance criterion – Endangered	Chuditch (<i>Dasyurus geoffroii</i>)	Quokka (<i>Setonix brachyurus</i>)
7	Result in invasive species that are harmful to a species becoming established in the species' habitat	<p>Possible</p> <p>The Proposal may spread feral predators through attraction to food wastes and feral animals using culverts and fauna crossing structures. The Proposal incorporates mitigation measures (see Section 6.5.2) to reduce the attraction of feral animals and will incorporate feral animal prevention measures, including monitoring and targeted feral predator control at fauna crossing structures (see Section 6.5.2.1).</p> <p>The Proposal may cause localised spread of weeds in habitat downslope / downstream of construction/mining, which may affect vegetation condition and the food web upon which Chuditch relies. The Proposal incorporates weed hygiene measures to prevent the introduction and spread of weeds within the assessment area (see Section 5.5.2).</p>	<p>Possible</p> <p>The Proposal may spread feral predators through attraction to food wastes and feral animals using culverts and fauna crossing structures. The Proposal incorporates mitigation measures (see Section 6.5.2) to reduce the attraction of feral animals and will incorporate feral animal prevention measures, including monitoring and targeted feral predator control at fauna crossing structures (see Section 6.5.2.1).</p> <p>The Proposal may cause localised spread of weeds in habitat downslope / downstream of construction/mining, which may affect riparian and swamp vegetation which is critical habitat for Quokka. The Proposal incorporates weed hygiene measures to prevent the introduction and spread of weeds within the assessment area (see Section 5.5.2).</p>
8	Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>Potential localised spread of <i>Phytophthora</i> dieback that may affect vegetation structure (Section 5.4.4.2) and potentially the species habitat.</p> <p>Proposal will include <i>Phytophthora</i> dieback hygiene during construction and operations to minimise the spread of <i>Phytophthora</i> dieback. Alcoa has established <i>Phytophthora</i> dieback hygiene practices which have been demonstrated to limit <i>Phytophthora</i> dieback spread to less than 1 per cent of the cleared area.</p>	<p>Unlikely</p> <p>Potential localised spread of <i>Phytophthora</i> dieback that may affect vegetation structure and floristic diversity (Section 5.4.4.2), which may potentially impact the species habitat through loss of shelter from predators and/or loss of foraging resources.</p> <p>Proposal will include <i>Phytophthora</i> dieback hygiene during construction and operations to minimise the spread of <i>Phytophthora</i> dieback. Alcoa has established <i>Phytophthora</i> dieback hygiene practices which have been demonstrated to limit <i>Phytophthora</i> dieback spread to less than 1 per cent of the cleared area.</p>
9	Interfere with the recovery of the species	<p>Possible</p> <p>The Proposal includes avoidance and mitigation measures aligned with the recovery plan objective to reduce threats to the Chuditch and increase population densities to ensure long-term survival through retaining and improving habitat critical for survival of the species. However, the Proposal will result in temporary loss of habitat over a period of 15 to 20 years in each mine region of the assessment area, and a potential long-term loss (> 100 years) of microhabitats that may affect habitat quality for Chuditch.</p>	<p>Unlikely</p> <p>The Proposal includes avoidance and mitigation measures aligned with the recovery plan (DEC 2013) long-term objective to at least maintain Quokka current distribution and abundance, though protection and management of key populations and habitats.</p>
Overall assessment		Proposal is likely to cause significant impacts to the species.	Proposal is likely to cause significant impacts to the species.

Table 15.14 Significance assessment for *Westralunio carteri* (Carter's Freshwater Mussel) – Myara North and Holyoake DEs

No.	Significance criterion	Assessment of likelihood of a significant impact
1	Lead to a long-term decrease in the size of an important population	<p>Unlikely</p> <p>The species has been recorded at one location at Jack Rocks on 39 Mile Brook in the Myara North DE. This location lies within the Avoidance Zone (see Section 6.3.4.4) and will not be subject to direct impacts.</p> <p>Targeted surveys will be undertaken where proposed infrastructure intersects mapped streams, to determine the species occupancy. Where a population is recorded by targeted surveys, clearing will be avoided within a 100 m buffer of the mapped population extent, unless this is not viable due to clearing for Critical Infrastructure. Where infrastructure alignments cannot viably avoid a 100 m buffer around the mapped population extent, the population will be permanently translocated to a suitable location (see Section 6.5.1).</p> <p>Alcoa will implement impact avoidance measures to maintain stream salinity to within baseline levels (see Section 8.5.1) which are expected to prevent impacts to the population at Jack Rocks, downstream in drinking water reservoirs, and other populations if occurring within the assessment area.</p> <p>As presented in Section 8.4.9, the Proposal is unlikely to cause substantial impacts to water quality in drinking water reservoirs, including from turbidity or chemicals such as hydrocarbons or PFAS. As presented in Section 8.4.3 and Section 8.4.4, the Proposal is expected to cause variation in inflow yield and salinity to drinking water reservoirs by approximately five to ten per cent, with reservoirs remaining freshwater quality and salinity remaining well below the species tolerance of 1600 mg/L (see Section 6.3.4.4). Inflows to the reservoirs are expected to be predominantly affected by a forecast decline in rainfall, groundwater levels and streamflow connection across their catchments. Accordingly, the Proposal is not expected to cause a decline in any important populations of the species present in the drinking water reservoirs.</p>
2	Reduce the area of occupancy of an important population	<p>Unlikely</p> <p>See criterion 1.</p>
3	Fragment an existing important population into two or more populations	<p>Unlikely</p> <p>See criterion 1</p>
4	Adversely affect habitat critical to the survival of a species	<p>Unlikely</p> <p>The seasonal streams mapped within the Myara North DE are not considered habitat critical to the survival of the species, as the species has not been recorded in streams within the assessment area and it is likely that much of the mapped streams would be devoid of permanent or semi-permanent pools that could support species occupancy.</p> <p>If targeted surveys (see criterion 1) identify an important population as being present, the associated habitat may be considered habitat critical to the survival of the species. As noted under criterion 1, any important populations will be protected from clearing of habitat, if this is not viable due to clearing for Critical Infrastructure the populations will be permanently translocated to a suitable location. While the original habitat will be adversely impacted by the Critical Infrastructure development, the translocation is expected to maintain the viability of the important population in the new habitat.</p> <p>Alcoa will implement impact avoidance measures to maintain stream salinity to within baseline levels (see Section 8.5.1) which are expected to prevent impacts to potential critical habitat at Jack Rocks, downstream in drinking water reservoirs, and at other locations if occurring within the assessment area.</p> <p>As discussed in criterion 1, the Proposal is unlikely to cause substantial impacts to water quality in drinking water reservoirs, including from turbidity or chemicals such as hydrocarbons or PFAS. The Proposal is expected to cause variation in inflow yield and salinity to drinking water reservoirs by approximately five to ten per cent, with salinity of reservoirs remaining well within the species tolerance. Accordingly, the Proposal is not expected to cause an adverse impact to critical habitat within the drinking water reservoirs.</p>
5	Disrupt the breeding cycle of an important population	<p>Unlikely</p> <p>See criteria 1 and 4.</p>
6	Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>See criteria 1 and 4.</p>

No.	Significance criterion	Assessment of likelihood of a significant impact
7	Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely The Proposal will not involve any importation, storage or handling of an aquatic species (e.g exotic fish or crayfish) that could be potentially harmful to Carters Freshwater Mussel.
8	Introduce disease that may cause the species to decline	Unlikely See criteria 1 and 2. Species may be vulnerable to <i>Phytophthora</i> dieback. Potential for localised spread of <i>Phytophthora</i> dieback from existing infestations within the assessment area, which could impact potential suitable habitat mapped within the assessment area, which may or may not be occupied by the species. Proposal will incorporate <i>Phytophthora</i> dieback management for all populations identified in targeted surveys (see Section 5.5.1) and hygiene measures to prevent the introduction and spread of <i>Phytophthora</i> dieback (see Section 5.5.2).
9	Interfere with the recovery of the species	Unlikely There is no Recovery Plan for the species. The species conservation advice (TSS 2017) recommends ongoing management of waterways including habitat protection to benefit the conservation of the species. Proposal is not inconsistent with the recommended actions in the species conservation advice. Proposal will protect approximately 78 per cent of mapped streams within the assessment area through an Avoidance Zone and will implement impact avoidance measures (see Section 8.5.1) to maintain stream salinity within baseline levels and prevent a loss of containment from mine drainage.
Overall assessment		Proposal is unlikely to cause significant impacts to the species.

Table 15.15 Significance assessment for Peel Yalgorup System Ramsar wetlands

No.	Significance criterion	Assessment of likelihood of a significant impact
1	Areas of the wetland being destroyed or substantially modified	Unlikely The assessment area lies at least 28 km east of the Peel-Yalgorup System. The Proposal will not involve any direct impact to the Peel-Yalgorup System.
2	A substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland	Unlikely The majority of the assessment area (14,649 ha or 79.9 per cent) lies within regulated catchments of drinking water dams, primarily the Serpentine Dam and South Dandalup Dam, which divert all or most of the catchment inflows for public drinking water supply (see Section 8.4.8.2). The total flow downstream to the Serpentine and Murray rivers from the pre-dominantly regulated catchments covering the Mine DE is expected to average a total of approximately 2.86 GL/yr. This total downstream flow represents approximately 0.75 per cent of the average total inflow into the Peel-Harvey Estuary, however only a fraction of the downstream flow is expected to reach the Peel-Harvey Estuary, due to water abstraction by downstream users, evaporative losses, and potential losses to groundwater along the Serpentine, Dandalup and Murray rivers (see Section 8.4.13.2). A conservative estimate of the total downstream flow reduction possible due to the Proposal (during the post-rehabilitation phase) is 0.26 GL/yr. This represents approximately 0.07 per cent of the average total inflow into the Peel-Harvey Estuary. In a low inflow year, the Peel-Harvey Estuary may receive an inflow of 230 GL/yr (lower standard deviation). In this case, a 0.26 GL/yr reduction in inflow due to the Proposal would represent a reduction in 0.11 per cent of the total inflow into the Estuary. Only a fraction of the downstream flow is expected to reach the Peel-Harvey Estuary as noted above, thus the reduction to inflow at the Peel-Harvey Estuary would be less. The reduced streamflow is a conservative estimate and does not account for the increase in total downstream flow that may occur due to the Proposal increasing catchment stream flows during the mining stage prior to establishment of rehabilitation (see Section 8.4.13.3). The conservative estimate of a reduction of approximately 0.07 per cent of inflow into the Peel-Harvey Estuary is not expected to cause a substantial and measurable change in the hydrological regime of the Peel-Harvey Estuary, which are highly variable from year to year and are expected to be dominated by future rainfall trends over un-regulated catchments as opposed to regulated catchments (e.g. Serpentine Dam and South Dandalup Dam) that divert all or most of the catchment inflows for public drinking water supply.

No.	Significance criterion	Assessment of likelihood of a significant impact
3	The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected	<p>Unlikely</p> <p>The assessment area lies at least 28 km east of the Peel-Yalgorup System. The Proposal will not involve any direct impact to the Peel-Yalgorup System that could affect the habitat or lifecycle of native species using the wetlands.</p> <p>The assessment area is not considered to contain habitat for listed migratory wetland birds (see Section 15.3.2.2) and accordingly the Proposal is unlikely to impact the habitat or lifecycle of migratory birds dependent on the Peel-Yalgorup System.</p> <p>The assessment area has seasonal streams that are expected to provide seasonal freshwater habitat for aquatic fauna that disperse upstream from permanent aquatic habitats in the Serpentine Dam and South Dandalup Dam. Source populations of aquatic fauna within the Serpentine Dam and South Dandalup Dam are not expected to be able to migrate or disperse downstream past the large dam structures and accordingly are expected to be isolated from the aquatic fauna populations of the lower Serpentine, Dandalup and Murray rivers downstream of the dams that may potentially be dependent on the Peel-Harvey Estuary.</p> <p>The Peel-Harvey Estuary supports a range of fish, the majority of which are marine stragglers which spawn at sea and typically enter estuaries in low numbers staying in areas where salinity doesn't drop below 35 parts per thousand (about 35,000 mg/L TDS) (PHCC 2019). These species are not expected to disperse upstream into unregulated freshwater streams within the Mine DE.</p> <p>The Peel-Harvey Estuary supports a single species that is wholly catadromous, the Pouched Lamprey (<i>Geotria australis</i>) (PHCC 2019). This species has been recorded in the Serpentine and Murray rivers downstream of the assessment area (see Section 6.3.4.4). Approximately 2,536 ha (13.8 per cent) of the assessment area lies in unregulated catchments of the Serpentine and Murray rivers, which could potentially be subject to migrations of the species for breeding of adults and dispersal of juveniles during seasonal stream flow. Approximately 78 per cent of the mapped streams within the assessment area are covered by an Avoidance Zone, with the Proposal estimated to impact up to 18 per cent of the length of mapped streams within the assessment area (see Section 6.4.2.6). The length of streams that may be directly impacted is a very small proportion of streams in unregulated catchments in the vicinity of the assessment area, therefore direct impacts to stream habitats are not expected to significantly impact Pouched Lamprey. As presented in Section 8.4.2, Section 8.4.3 and Section 8.4.4, the Proposal is unlikely to cause substantial impacts to water quality within assessment area, including from turbidity or chemicals such as hydrocarbons or PFAS. The Proposal includes impact avoidance and mitigation commitments (see Section 8.5) to protect the high water quality standards dictated for drinking water. Accordingly, the Proposal is highly unlikely to impact the lifecycle of migrating Pouched Lamprey or other aquatic fauna in the lower Serpentine and Murray rivers that are dependent on the Peel-Harvey Estuary.</p>
4	A substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health	<p>Unlikely</p> <p>Assuming a conservative scenario that the Proposal causes increase salinity of flows to the downstream rivers to rise by up to ten per cent, flows would remain fresh (i.e. less than 500 mg/L total dissolved salts or TDS) and the slightly elevated salinity of flows arising from the Mine DE would not be expected to cause a measurable change in salinity at the Peel-Harvey Estuary, which has a salinity ranging from 17,000 to 35,000 mg/L TDS (close to seawater) due to the opening of the Dawesville Channel (Peel-Harvey Catchment Council 2019).</p> <p>As presented in Section 8.4.2, Section 8.4.3 and Section 8.4.4, the Proposal is unlikely to cause substantial impacts to water quality in drinking water reservoirs, including from turbidity or chemicals such as hydrocarbons or PFAS. Given that the majority of the assessment area (86 per cent) lies within the catchments of drinking water reservoirs, the high water quality standards dictated for drinking water and the associated impact avoidance and mitigation commitments (see Section 8.5) to protect drinking water catchments, and the small proportion of water releases from drinking water dams to downstream rivers, the Proposal is highly unlikely to generate sufficient contaminant discharges to the Serpentine and Murray rivers downstream of the dams such that there would be a measurable impact to water quality in the Peel-Harvey Estuary.</p> <p>Accordingly, the Proposal is not expected to cause a substantial and measurable change in the water quality of the Peel-Yalgorup System.</p>

No.	Significance criterion	Assessment of likelihood of a significant impact
5	An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.	<p>Unlikely</p> <p>The Proposal is not expected to introduce any invasive organism that could flow from the assessment area downstream into the Peel-Yalgorup System. The Proposal will not involve any importation, storage or handling of marine organisms, being located over 28 km inland from the coast. The Proposal will not involve any activities over the Peel-Yalgorup System that could spread existing weeds in the wetlands. The Proposal incorporates weed hygiene measures to prevent the introduction and spread of weeds within the assessment area (see Section 5.5.2). Any localised spread of weeds within the assessment area is highly unlikely to result in sufficient discharge of weed seeds that bypass drinking water reservoirs, overflow into downstream rivers and are transported tens of kilometres downstream to flow into the Peel-Harvey Estuary and cause the establishment of a new weed infestation in the estuary. It is noted that the assessment area lies in forested catchments with relatively intact riparian foreshores, which are expected to have much lower levels of weed infestation and loading of weed seeds to streams compared to the extensive cleared agricultural catchments of the Peel-Harvey Estuary and associated degraded foreshore conditions along the lower Serpentine and Murray rivers (PHCC 2014, Urbaqua 2020).</p>
Overall assessment		Proposal is unlikely to cause significant impacts to the Peel-Yalgorup System.

15.6 Mitigation

Table 15.16 presents a summary of the avoidance, minimisation and rehabilitation for impacts to MNES that are known or likely to occur in the assessment area. Details of mitigation are presented in Section 5.5 for threatened flora, in Section 6.5 for threatened fauna and in Section 8.5 for Ramsar wetlands.

Table 15.16 Avoidance and minimisation of potential impacts to MNES

Potential Impact	Mitigation measures – threatened flora	Mitigation measures – threatened fauna	Mitigation measures – Ramsar wetlands
Direct impacts as a result of clearing	<p>Avoid</p> <ul style="list-style-type: none"> Avoidance Zone covers approximately 85 per cent of the potential suitable <i>Morelotia australiensis</i> habitat within the Myara North DE. Targeted flora surveys undertaken for any proposed clearing within potential suitable habitat for <i>Morelotia australiensis</i> (D, DA and E vegetation types) within the Myara North DE. Surveys undertaken in accordance with EPA (2016) survey guidance and at least six months prior to clearing to enable sufficient time for impact avoidance in design. Surveys timed to maximise detectability, considering flowering seasons. All threatened flora recorded reported to DBCA. Where a population of threatened flora is identified by targeted surveys within a proposed clearing footprint, an avoidance area will be established over the identified population extent with a minimum 50 m buffer. Critical Infrastructure within the assessment area re-aligned to avoid threatened flora species recorded in pre-clearance surveys, as far as practicable. <p>Minimise</p> <ul style="list-style-type: none"> Critical Infrastructure proposed in the assessment area designed to minimise the area of disturbance to mapped stream zone vegetation communities where practicable. Where avoidance of recorded threatened flora species is not practicable within the assessment area, management measures, which may include translocation, will be implemented in accordance with Alcoa’s Flora and Vegetation Environmental Management Plan (FVEMP). Any clearing of threatened flora in accordance with an authorisation under the Biodiversity Conservation Act 2016. No important populations of threatened flora will be cleared, except where clearing is required for Critical Infrastructure. <ul style="list-style-type: none"> Management of identified threatened flora populations (including buffer) during construction and operation in accordance with the FVEMP. <p>Rehabilitate</p> <ul style="list-style-type: none"> All native vegetation cleared within assessment area to be rehabilitated as presented in Section 5.5.3. 	<ul style="list-style-type: none"> Avoid The DEs were amended post-referral to avoid clusters of known breeding trees, large amounts of foraging and potential breeding habitat, mature age forest, and old growth forest. The Avoidance Zone covers approximately 82 per cent of the mapped riparian and swamp vegetation, 78 per cent of mapped seasonal streams, and 89 percent of mapped granite outcrops within the assessment area. Pre-clearance surveys for all proposed clearing areas that are mapped as potential breeding or roosting habitat for Black Cockatoos, to identify all known and suitable nesting trees, and all nighttime roosting trees. All known and suitable nesting trees and all confirmed roosting sites identified within clearing areas will be avoided with a suitable buffer (minimum 30 m radius), unless clearing is Critical Infrastructure, whereby a justification will be provided and agreed with the CEO and subsequently a 10 m radius will be implemented, unless clearing the tree(s) cannot be avoided. Targeted surveys will be undertaken in accordance with Alcoa’s Fauna Environmental Management Plan (FEMP) for all proposed clearing areas to determine the occupancy of Woylie. Where Woylie population/s has been determined by surveys, they will be avoided and contained within a 6 ha AZ of contiguous suitable habitat for the species for each recorded population. Targeted surveys will be undertaken in accordance with the FEMP for all proposed clearing areas to determine the occupancy of Chuditch. Where active Chuditch nursery den/s are recorded by targeted surveys, they will be avoided in accordance with the FEMP. There will be no clearing of active Chuditch nursery dens. Targeted surveys will be undertaken in accordance with the FEMP for all proposed clearing areas within 100 m of riparian and swamp vegetation to determine the occupancy of Quokka. Clearing will be avoided within a 50 m buffer of a mapped Quokka population extent, unless this is not viable due to clearing for Critical Infrastructure. Where clearing cannot viably avoid the 50 m buffer of a mapped Quokka population extent, a justification will be provided and agreed with the CEO, and a pre-clearance fauna spotter will be engaged to corral the animals into suitable habitat in the riparian corridor adjacent to the clearing. A suitably qualified fauna spotter will be present at the clearing front throughout clearing within the 50 m buffer of a mapped Quokka population, to ensure that animals are corralled away at the time of clearing and prevent animals from re-entering clearing areas. Targeted surveys will be undertaken in accordance with the FEMP for all proposed clearing areas within 100 m of riparian forest to determine the occupancy by Western Ringtail Possum. Where sightings of WRP 	<p>Avoid</p> <ul style="list-style-type: none"> The DEs were amended post-referral to avoid the Serpentine Pipehead Dam and the majority of the Gooralong Brook and Swamp Oak Brook catchments. The Avoidance Zone covers approximately 82 per cent of mapped riparian and swamp vegetation within the assessment area, and approximately 78 per cent of the mapped streams within the assessment area. Open areas limited to no more than 30 per cent of a subcatchment. Clearing for mine pits limited to areas with an average slope less than or equal to 16 per cent prior to mining. <p>Rehabilitate</p> <ul style="list-style-type: none"> All native vegetation cleared within assessment area to be rehabilitated as presented in Section 5.5.3.

Potential Impact	Mitigation measures – threatened flora	Mitigation measures – threatened fauna	Mitigation measures – Ramsar wetlands
		<p>occurrence are recorded, WRP specific targeted surveys will be designed and implemented as per Alcoa's adaptive management principles as outlined in the FEMP.</p> <ul style="list-style-type: none"> • Where WRP population/s has been determined by surveys, they will be avoided and contained within a 2.7 ha AZ of contiguous suitable habitat for the species for each recorded population. • Targeted surveys undertaken for proposed clearing areas for other threatened fauna species will include provision to record opportunistic sightings of Numbat occurrence, in accordance with the FEMP. Where opportunistic sightings of Numbat occurrence are recorded, Numbat specific targeted surveys will be designed and implemented as per Alcoa's adaptive management principles as outlined in the FEMP. • Where Numbat population/s has been determined by surveys, they will be avoided and contained within a 50 ha AZ of contiguous suitable habitat for the species for each recorded population. • Targeted surveys will be undertaken where LDAs intersect mapped streams, to determine the occupancy of Carter's Freshwater Mussel. Where a current population is recorded by targeted surveys, clearing will be avoided within a 100 m buffer of the mapped population extent, unless this is not viable due to clearing for Critical Infrastructure. Where infrastructure alignments cannot viably avoid a 100 m buffer around the mapped population extent, a justification will be provided and agreed with the CEO. • Minimise • Critical Infrastructure is planned to minimise the area of disturbance within stream zone fauna habitats within the assessment area, as far as practicable. • If disturbance to a recorded Carter's Freshwater Mussel population/s cannot be avoided, undertake permanent translocation of population/s, in accordance with a Translocation Management Plan approved under the Biodiversity Conservation Act 2016. • Rehabilitate • All native vegetation cleared within assessment area to be rehabilitated as presented in Section 5.5.3. 	
Direct impacts as a result of injury/mortality from fauna entrapment or vehicle/equipment collisions	Not applicable	<p>Avoid</p> <ul style="list-style-type: none"> • Construction to generally occur during daytime hours, avoiding peak nocturnal animal activity and reducing the likelihood of fauna strikes during construction. Construction during night-time hours will be avoided as far as practicable but may be required subject to the construction program. <p>Minimise</p> <ul style="list-style-type: none"> • Clearing conducted in a progressive manner to allow fauna to relocate, as far as practicable. • Construction and operational vehicle and equipment movements limited to designated roads, access tracks and cleared areas, as far as practicable. 	Not applicable

Potential Impact	Mitigation measures – threatened flora	Mitigation measures – threatened fauna	Mitigation measures – Ramsar wetlands
		<ul style="list-style-type: none"> Procedures in place to ensure the humane treatment and care of trapped or injured vertebrate fauna. 	
Introduction and/or spread of weeds	<p>Minimise</p> <ul style="list-style-type: none"> Pre-construction weed surveys to be conducted, over areas at high risk such as creeks and swamps, existing tracks, roads, plantations and other disturbed areas within the assessment area. All identified Declared Pests treated in accordance with their Control Codes and advice from Department of Primary Industries and Regional Development (DPIRD), with the aim of eradication where possible but as a minimum prevent offsite movement. All identified Weeds of National Significance (WoNS), declared pests and environmental weeds treated according to the weed control management outlined by Weeds Australia with the aim of controlling off-site movement. Each identified threatened flora population (including buffer) monitored and managed to prevent the introduction or spread of weeds. 	<ul style="list-style-type: none"> The introduction or spread of weeds will be monitored and managed in accordance with the FVEMP. 	Not applicable
Introduction and/or spread of <i>Phytophthora</i> dieback and forest diseases	<p>Minimise</p> <ul style="list-style-type: none"> Each identified threatened flora population (including buffer) monitored and managed to prevent the introduction or spread of <i>Phytophthora</i> dieback. Dieback management as per section 5.5.2. 	<ul style="list-style-type: none"> The introduction or spread of <i>Phytophthora</i> dieback will be monitored and managed in accordance with the FVEMP. 	<ul style="list-style-type: none"> Not applicable
Attraction of feral animals	Not applicable	<p>Minimise</p> <ul style="list-style-type: none"> Food and domestic waste management as presented in Table 7.6 (Section 7.5) Prohibition on construction or operational workforce feeding feral or native animals or bringing domestic animals to site (e.g. dogs and cats) 	Not applicable
Noise and light emissions from construction and operational equipment	Not applicable	<p>Minimise</p> <ul style="list-style-type: none"> Construction to generally occur during daytime hours, avoiding peak nocturnal animal activity. Construction during night-time hours will be avoided as far as practicable but may be required subject to the construction program. Permanent and temporary lighting positioned to minimise the artificial light directed to adjacent native vegetation, adjacent fauna underpasses, stream zone and swamp habitats, while maintaining a safe working environment for employees. 	Not applicable
Spills and/or leaks from storage and handling of hazardous materials and wastes	<p>Minimise</p> <ul style="list-style-type: none"> Hazardous material and waste management as presented in Section 7.5 	<ul style="list-style-type: none"> As per threatened flora. 	<ul style="list-style-type: none"> As per threatened flora.

Potential Impact	Mitigation measures – threatened flora	Mitigation measures – threatened fauna	Mitigation measures – Ramsar wetlands
Habitat fragmentation	<p>Avoid</p> <ul style="list-style-type: none"> Avoidance zone covers approximately 85 per cent of suitable habitat for <i>Morelotia australiensis</i> within the Myara North DE. Clearing within potential habitat for <i>Morelotia australiensis</i> (E, D, and DA SVTs) will be limited to haul road and conveyor crossings, approximately 50-70 m wide. <p>Minimise</p> <ul style="list-style-type: none"> Weeds and dieback will be managed as presented in Section 5.5.2. <p>Rehabilitate</p> <p>All native vegetation cleared within assessment area to be rehabilitated as presented in Section 5.5.3.</p>	<p>Avoid</p> <ul style="list-style-type: none"> Critical Infrastructure within the assessment area planned to limit crossing of mapped swamp and stream zone fauna habitats to the minimum required for safe mining. If disturbance to mapped swamp and stream zone fauna habitats cannot be avoided, minimize disturbance within swamp and stream zone fauna habitats, as far as practicable. Fauna crossing structures provided for conveyors and primary haul routes within the assessment area along swamp and stream zone crossings to maintain linkages. <p>Rehabilitate</p> <p>All native vegetation cleared within assessment area to be rehabilitated as presented in Section 5.5.3.</p>	Not applicable
Waterlogging in valley floors and lower slopes	<p>Avoid</p> <ul style="list-style-type: none"> Groundwater investigation undertaken in each subcatchment (at a first order stream scale) where mining is proposed, at least 24 months prior to clearing of mine pits in that catchment, to identify the depth of groundwater. Predictive modelling undertaken of groundwater rise and potential waterlogging (i.e. groundwater within one metre of the surface) for more than six months a year during mining in the subcatchment. Mine pits designed to maintain groundwater levels to avoid waterlogging for more than six months per year to any mapped site vegetation types that are known to contain threatened flora within the subcatchment. Should groundwater investigation and mine pit design for a subcatchment indicate that mining within that subcatchment cannot maintain waterlogging to six months or less per year, then mining avoided in that subcatchment unless empirical data is available that demonstrates the affected threatened flora are tolerant to the predicted duration of waterlogging. 	<p>Not applicable</p> <ul style="list-style-type: none"> Groundwater investigation undertaken in each subcatchment (at a first order stream scale) where mining is proposed, at least 24 months prior to clearing of mine pits in that catchment, to identify the depth of groundwater. Predictive modelling undertaken of groundwater rise and potential waterlogging (i.e. groundwater within one metre of the surface) for more than six months a year during mining in the subcatchment. Mine pits designed to maintain groundwater levels to avoid waterlogging for more than six months per year to any mapped site vegetation types that are known to contain threatened flora within the subcatchment. Should groundwater investigation and mine pit design for a subcatchment indicate that mining within that subcatchment cannot maintain waterlogging to six months or less per year, then mining avoided in that subcatchment unless empirical data is available that demonstrates the affected vegetation types are tolerant to the predicted duration of waterlogging. 	Not applicable
Salinity in valley floors and lower slopes	<p>Avoid</p> <ul style="list-style-type: none"> Groundwater investigation undertaken in each subcatchment (at a first order stream scale) where mining is proposed, at least 24 months prior to clearing of mine pits in that catchment, to identify the depth and salinity of groundwater. Where groundwater salinity is recorded at greater than 500 mg/L TDS, further investigation will be undertaken including collection of at least 18 months of baseline groundwater level data and at least six months of baseline stream salinity data, and predictive modelling of groundwater rise and discharge into streams. Mine pits will 	<ul style="list-style-type: none"> Groundwater investigated in each subcatchment where mining is proposed, at least 24 months prior to the clearing of mine pits in that subcatchment, to identify the depth and salinity of groundwater. Where groundwater salinity is recorded at greater than 500 mg/L TDS, further investigation will be undertaken. Mine pits will be designed to maintain the predicted stream salinity within the range of the baseline salinity recorded. Should groundwater investigation and mine pit design for a subcatchment with a recorded groundwater salinity greater than 500 mg/L TDS indicate that mining within that subcatchment cannot maintain salinity within the baseline range, mining will be avoided in that subcatchment. 	Not applicable

Potential Impact	Mitigation measures – threatened flora	Mitigation measures – threatened fauna	Mitigation measures – Ramsar wetlands
	<p>be designed to maintain the predicted stream salinity to within the range of the baseline salinity recorded in the subcatchment stream.</p> <ul style="list-style-type: none"> Should the groundwater investigation and mine pit design for a subcatchment with a recorded groundwater salinity greater than 500 mg/L TDS indicate that mining within that subcatchment cannot maintain stream salinity within the baseline range, then mining will be avoided in that subcatchment. Unless empirical data is available that demonstrates the affected threatened flora are tolerant to the predicted duration elevated salinity. 	<ul style="list-style-type: none"> Should groundwater investigation and mine pit design for a subcatchment with a recorded groundwater salinity greater than 500 mg/L TDS indicate that mining within that subcatchment cannot maintain salinity within the baseline range, mining will be avoided in that subcatchment. 	

15.7 Offsets

Following application of the mitigation hierarchy, including rehabilitation, the Proposal is likely to cause a residual significant impact (RSI) to MNES. The calculated RSI to MNES is summarised in Table 15.17 with details provided in the Offset Strategy (Appendix E1).

Alcoa propose an offset strategy as outlined in Section 14 and presented in detail in Appendix E1. The offset strategy is proposed to counterbalance the RSI of the Proposal including to MNES and is consistent with the principles of the EPBC Act Environmental Offsets Policy (DSEWPaC 2012).

Table 15.17 Calculated Significant Residual Impact to MNES in Myara North and Holyoake

Species	Significant Impact (ha)	Average habitat quality score	Quantum of impact
Forest Red-tailed Black Cockatoo (VU)	6,396	8.8	5,639
Baudin's Black Cockatoo (EN)	6,418	8.8	5,641
Carnaby's Black Cockatoo (EN)	6,413	7.8	4,997
Woylie (EN)	6,293	5.2	3,258
Chuditch (VU)	6,334	7.0	4,448
Quokka (VU)	674	6.7	448