Alcoa of Australia Limited

Fauna Management Plan

Huntly and Willowdale Mines

June 2024

Version	Description of Changes	Date
V0	EMMP Revision	31 August 2023
V1	Updated from Version 0 - Final	13 June 2024

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Abbreviations

Abbreviation	Definition
BAM Act	*Biosecurity and Agriculture Management Act 2007* (WA)
BC Act	*Biodiversity Conservation Act 2016* (WA)
CPC	Conservation and Parks Commission
CFM	Carter's Freshwater Mussel
DBCA	Department of Biodiversity, Conservation and Attractions
DBH	Diameter at Breast Height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
Fauna MP	Fauna Management Plan
FCA	Forest Clearing Advice
FPC	Forest Products Commission
GIS	Geographic Information System
GPS	Global Positioning System
HRZ	High rainfall zone
IBRA	Interim Biogeographic Regionalisation of Australia
IRZ	Intermediate rainfall zone
LDA	Limited Disturbance Area
LTFMP	Long-term Fauna Monitoring Program
MAZ	Mining Avoidance Zone
ML1SA	Mineral Lease 1SA
MMP	Mining and Management Program
MMPLG	Mining and Management Program Liaison Group
MNES	Matter of National Environmental Significance
MOG	Mine Operations Group
MS	Ministerial Statement
NJF	Northern Jarrah Forest (IBRA Subregion)
PEC	Priority Ecological Community
ROM	Run of Mine
SED	Strategic Exploration Drilling
SRE	Short-range Endemic
TEC	Threatened Ecological Community
WA	Western Australia
WoNS	Weeds of National Significance
WRMP	Water Resource Management Plan

Definitions

Term	Definition
Activities	Refers to mining activities, and infrastructure development and sustainment.
Clearing for mining	Refers to Alcoa's activities after harvesting – removing native vegetation from the mining area in readiness for stripping of topsoil.
Completion criteria	Completion criteria are agreed standards that indicate the success of rehabilitation and enable Alcoa to identify the standards to apply for handback / relinquishment. These are developed with, and approved by, the Mining and Management Program Liaison Group (MMPLG) on the advice of the Department of Biodiversity, Conservation and Attractions (DBCA.).
Conservation significant fauna	Environmental values which are protected by legislation or are considered to be of ecological importance, which includes: • threatened fauna under the BC Act and the EPBC Act; and • priority fauna.
Construction	Project phase that includes harvesting and clearing activities, and the construction of haul roads and infrastructure.
Declared Pest	Under the BAM Act, the Minister may declare harmful organisms that are present within an area of the State to be a Declared Pest.
Drainage controls	Controls to manage surface water runoff from the mining disturbance footprint to surrounding environment.
Environmental Impact Assessment (EIA)	An orderly and systematic process to evaluate a proposal and its effects on the environment, as well as to consider the mitigation and management of those effects (EPA, 2023).
Exploration	Exploration drilling targets areas outside of Alcoa's current mining operational envelope with a broader extent but less intense activities. As per the EP (Darling Range Bauxite Mining) Exemption Order 2023 "Exploration" is defined as: activities carried out in search of minerals, including (without limitation) (a) mapping; (b) surveying; (c) drilling; (d) the collection of and assaying of soil, rock, groundwater, and minerals samples; and (e) other activities involving the application of 1 or more of the geological sciences.
Forest Clearing Advice (FCA)	To obtain endorsement to clear within Conceptual Clearing Areas (as per the 5-year Mine Plan), approved by Mining and Management Programs (MMP). Forest Clearing Advice (FCA) are submitted to the Mine Operations Group (MOG), at an average rate of two per year. Endorsement of the FCA by the MOG is required prior to commencing vegetation clearing activities, including timber harvesting for mining, haul roads and constructing associated infrastructure.

Term	Definition
High value habitats	Comprises mapped habitat/s that are potentially suitable for denning, roosting and / or shelter (e.g. streamzone vegetation and major granite outcrops).
Indicator	A measurable or quantifiable characteristic selected for specific purposes to indicate health or condition of that part of the environment (EPA, 2024).
Infrastructure	Includes any structures that enable or support mining activities including (but not limited to): stockpiles; haul roads; conveyors; crushers; structures for water storage; and water pumps.
Landscaping	Means the moving or shaping of land, including but not limited to: (a) resloping or altering disturbed surface topography for the purpose of shaping the landform to blend with the adjacent landscape surface; and (b) movement, placement or removal of bauxite or other material; and (c) ripping for the purpose of shaping the landform to blend with the surrounding environment.
Limited Disturbance Area	Spatial area which prohibits mine pits but allows for infrastructure and haul roads (includes mapped or derived streamzone vegetation).
Management Actions	The identified actions implemented to meet the environmental objective (EPA, 2024).
Management Targets	A type of indicator that is defined to demonstrate that the objective is being met (EPA, 2024).
Matter of National Environmental Significance	Nationally significant (protected) animals, plants, habitats or places.
Mining activities	Refers to the integrated process of extracting bauxite from mineral reserves below the surface by coordinating the use of people and equipment. This refers specifically to removing topsoil and overburden, breaking caprock (blasting or ripping) to expose the viable bauxite, removal of viable bauxite, crushing and conveying bauxite to the refineries. Excludes infrastructure or rehabilitation activities.
Mining Avoidance Zone	Spatial area which prohibits mine pits and infrastructure, with the exception of monitoring and management activities which have minimal impacts (e.g. avoidance zones for known or potential Black Cockatoo nest and significant tree/s and major granite outcrops (>1ha + 50 m buffer).
Old Growth Forest	Forests that have not been subject to major disturbance by timber harvesting, grazing, mining, or introduced diseases, and that remain dominated by larger, older trees (DPaW, 2017; CPC, 2023).
Operational	Active and established activities occurring across the Project, including mine pits, infrastructure, crusher, conveyor, and haul roads.
Other operations	Adjunct activities associated with mining, infrastructure, and rehabilitation.
Protection Zone	Areas established to protect Black Cockatoo high value habitat, and considered similar to MAZ, whereby no

Term	Definition
	mining clearing activities will occur. They are determined by various factors, including presence of high-quality foraging habitat, high density of nest and / or habitat trees or permanent water sources (e.g. Yamba area at Huntly and Giles area at Willowdale).
Reference Site	A site located in a similar system, or in a location that experiences similar natural environmental conditions as an area being monitored or managed, but largely un-impacted by human influences and used as a benchmark for determining the environmental objective/s targeted in an EMP (EPA, 2024).
Rehabilitation	In relation to an area that has been disturbed, includes: (a) stabilisation of the area; and (b) restoration of the landforms of the area to a state that is as close as practicable to their original undisturbed state; and (c) the return of the native vegetation of the area to a state that is as close as practicable to its original undisturbed state.
Rehabilitation season	Rehabilitation is undertaken all year round with a focus on the drier period for some activities. Weather dependent activities are undertaken typically from October to late April in the following year.
Strategic Exploration Drilling	Includes additional drilling to be undertaken in various areas to provide early, additional information on mineralisation presence, extent, quality, and continuity.

1 Executive Summary

This Fauna Management Plan (Fauna MP) has been prepared by Alcoa of Australia Limited (Alcoa) for the Huntly and Willowdale bauxite mines (the Project) located within the Northern Jarrah Forest (NJF) Interim Biogeographic Regionalisation for Australia (IBRA) subregion and within Mineral Lease 1SA (ML1SA).

This Fauna MP provides the monitoring and management framework of conservation significant fauna (including aquatic fauna) species listed under both the State *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and specifically addresses the monitoring and management of the risks and potential impacts that may arise as a result of Alcoa's bauxite mining on these fauna species and their associated high value habitats (refer to Appendix B and Appendix C for conservation categories and definitions). This is proposed to be achieved through the continued collection of data and knowledge through surveys, the establishment and maintenance of Limited Disturbance Areas (LDA), Mining Avoidance Zones (MAZ), and Black Cockatoo Protection Zones (i.e. Yamba and Giles areas) within internal spatial database/s and includes site-specific Environmental Management Plan (EMP) objective-based and outcome-based provisions to measure and report against potential impacts.

This Fauna MP specifically addresses the following conservation significant terrestrial and aquatic fauna species known to occur within the Project area:

Class Aves

- Baudin's Black Cockatoo (*Zanda baudinii*)
- Carnaby's Black Cockatoo (*Zanda latirostris*)
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)
- Masked Owl (southwest) (*Tyto novaehollandiae novaehollandiae*)
- Peregrine Falcon (*Falco peregrinus*)

Class Bivalvia

- Carter's Freshwater Mussel (*Westralunio carteri*)

Class Gastropoda

- Minute Freshwater Snail (*Glacidorbis occidentalis*)

Class Mammalia

- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Chuditch (Western Quoll) (*Dasyurus geoffroii*)
- Quenda (Southern Brown Bandicoot) (*Isoodon obesulus fusciventer*)
- Quokka (*Setonix brachyurus*)
- Rakali (Water Rat) (*Hydromys chrysogaster*)
- Western Brush Wallaby (*Notamacropus irma*)
- Western False Pipistrelle (*Falsistrellus mackenziei*)
- Woylie (*Bettongia penicillata ogilbyi*)

Class Reptilia

- Dell's Skink (*Ctenotus delli)*
- Southern Death Adder (*Acanthophis antarcticus*)

It is predicted that all proposed monitoring and management provisions outlined within this Fauna MP will have flow-on benefits for all native terrestrial fauna species occurring within the Huntly and Willowdale mine regions. No specific provisions are proposed at this stage for Short-Range Endemics (SREs) as studies and research are currently being undertaken to identify SRE (invertebrate) fauna habitat and values. As further data and knowledge is gained through studies and research, and continued monitoring is undertaken to verify the efficacy of management controls, this Fauna MP will be updated as per the adaptive management approach, recognised by the Western Australian Environmental Protection Authority (EPA) as a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring outcomes and management actions (EPA, 2024).

This Fauna MP addresses the monitoring and management for the pre-mining and active mine cycle phases of the Western Australia (WA) mining operations within the Huntly and Willowdale mine regions (eight regions[1] and three regions[2] respectively), including:

- Exploration (components presented in section 3);
- Construction (components presented in section 4); and
- Operational (active mining, components presented in section 5).

This Fauna MP does not address the rehabilitation phase nor closure management which are addressed in separate documents.

Table 1-1 below presents a summary of the Project and the outcome-based and objective-based provisions that have been developed for the key environmental factors (Terrestrial Fauna and Inland Waters) to be met through implementation of this Fauna MP, including the environmental criteria and management targets to measure achievement of the associated environmental outcomes and objectives during the various phases of active mining.

Table 1-1: Summary of the Project and Fauna MP Purpose and Environmental Provisions

Proponent Name	Alcoa of Australia Limited (Alcoa)	
Conditions/ Commitments	Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023, SL 2023/200 (14 December 2023). Ministerial Approval conditions for the 2023 – 2027 Mining and Management Program (MMP), Appendix A (20 December 2023). Ministerial Statements: • Ministerial Statement 1157 (and previous Ministerial Statements 728, 897 and 1069) • Ministerial Statement 646	
State Agreements	State Agreements: • *Alumina Refinery (Kwinana) Agreement Act 1961* • *Alumina Refinery (Wagerup) Agreement Act and Acts Amendment Act 1978* • *Alumina Refinery (Pinjarra) Agreement Act 1969* • *Alumina Refinery Agreements (Alcoa) Amendment Act 1987*	
Purpose of this Management Plan	This Fauna MP provides for the management of conservation significant terrestrial and aquatic fauna values and their associated high value habitats with the potential to be impacted by the Project during all active phases of WA mining operations (exploration, construction and operational mining).	
Terrestrial Fauna EPA Objective: *To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.* **Inland Waters** EPA Objective: *To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.*		
Mining Phase: Exploration		
Management plan provisions	**Outcome-based**	
	Trigger criteria	1. Required exploration activities are identified to be on trajectory towards (within 30 m) of the MAZ for: • major granite outcrops (>1ha + 50 m buffer).

[1] Huntly mine regions: Del Park; Huntly 1 & 2; White; McCoy; O'Neil; Myara; Myara North; Holyoake.
[2] Willowdale mine regions: Arundel; Orion; Larego.

		2. Required exploration activities are identified to be on trajectory towards the applied MAZ[3] for known or potential Black Cockatoo nest and significant tree/s.
	Threshold criteria	1. Required exploration activities have intruded into any of the MAZ listed below (associated with exploration drilling activities): • major granite outcrops (>1ha + 50 m buffer); or • the applied MAZ for known or potential Black Cockatoo nest and significant tree/s.
	Objective-based	
	Management targets	1. Avoid or otherwise minimise fauna entrapment in exploration drill holes. 2. Avoid or otherwise minimise mortality and injury to conservation significant fauna individuals and their associated high value habitats as a result of exploration activities and vehicle movements. 3. Avoid or otherwise minimise the spread of *Phytophthora* dieback. 4. No exploration drilling is undertaken within the mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation[4]. 5. Avoid or otherwise minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.
Mining Phase: Construction		
Management plan provisions	**Outcome-based**	
	Trigger criteria	1. Required construction activities are identified to be on trajectory towards (within 30 m) of any of the MAZ listed below: • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • major granite outcrops (>1 ha + 50 m buffer); or • known Woylie population/s; or • identified active Chuditch den/s[5]. 2. Required construction activities (not including: streamzone crossings; access roads; and tracks) encroaches within 50 m buffer of the LDA of the 100 m mapped streamzone vegetation buffer. 3. Required construction activities encroaches (within 50 m) of the applied MAZ[3] for any known or potential Black Cockatoo nest and significant tree/s.
	Threshold criteria	1. Required construction activities (excluding haul roads) has intruded into any of the Protection Zone, LDA or MAZ listed below: • Yamba and Giles Protection Zones; • mapped streamzone vegetation; or • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • major granite outcrops (>1 ha + 50 m buffer); • known Woylie population/s; or • identified active Chuditch den/s[4]; or • any known or potential Black Cockatoo nest and significant tree/s.
	Objective-based	
	Management targets	1. Avoid or otherwise minimise mortality and injury to conservation significant fauna individuals and their associated high value habitats as a result of construction activities and vehicle movements. 2. Avoid or otherwise minimise the spread of *Phytophthora* dieback.

[3] Within 10 m of a Black Cockatoo nesting tree or a Huntly mine Black Cockatoo significant tree or; on or after 1 January 2027 within 50 m of a Black Cockatoo nesting tree (in accordance with the Compliance Assessment Plan prepared in accordance with Clause 9 of SL 2023/200).

[4] Excludes any requirement/s for drilling for bores or geological investigation.

[5] At the time of publication, none identified, should any be identified, this trigger and threshold criteria will be applied.

		3. All new identified new active Chuditch den/s and / or known Woylie populations and / or known or potential Black Cockatoo nest and significant tree/s have an applied MAZ[6]. 4. Avoid or otherwise minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure. 5. Avoid or otherwise minimise fragmentation of high value habitats, as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).
Mining Phase: Operational		
Management plan provisions	**Outcome-based**	
	Early response criteria	1. In-field assessment indicates trending towards potential compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation sites and / or major granite outcrop vegetation sites since baseline and compared to reference sites. 2. Weed species recorded within a monitoring area (mapped or derived streamzone vegetation sites and / or major granite outcrop vegetation sites) which has not been previously recorded during historic surveys.
	Trigger criteria	1. In-field assessment indicates statistically significant compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation sites and / or major granite outcrop vegetation sites since baseline and compared to reference sites. 2. Weed species recorded within mapped or derived streamzone vegetation sites and / or major granite outcrop vegetation sites which has not been previously recorded during historic surveys and is classified by the DBCA (2014) as having high ecological impact and low feasibility of control and exceeds 30% of total understorey cover.
	Threshold criteria	1. In-field assessments and visual observations indicate statistically significant change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation sites and / or major granite outcrop vegetation sites with no indication of recovery in native vegetation strata, abundance, cover and condition outside of natural variation since baseline and compared to reference sites and be attributable to Alcoa's operational activities.
	Objective-based	
	Management targets	1. Avoid or otherwise minimise mortality and injury to conservation significant fauna individuals and their associated high value habitats as a result of operational activities. 2. Avoid or otherwise minimise the spread of *Phytophthora* dieback. 3. All new identified new active Chuditch den/s and / or known Woylie populations and / or known or potential Black Cockatoo nest and significant tree/s have an applied MAZ[5]. 4. Avoid or otherwise minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure. 5. Maintain conservation significant aquatic fauna habitat values. 6. Avoid or otherwise minimise fragmentation of high value habitats, as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).

[6] MAZ for values will be designed with appropriate stakeholders taking into account conservation advice, feedback, condition requirements and landscape and connectivity.

2 Context, Scope and Rationale

This Fauna MP has been prepared by Alcoa for the Huntly and Willowdale bauxite mine regions located within Alcoa's ML1SA and covers all phases of active, operational mining cycles (including exploration, construction and operational mining, excluding rehabilitation and closure management). This Fauna MP has been developed to address the environmental management of conservation significant terrestrial and aquatic fauna in accordance with relevant State and Commonwealth guidelines, procedures, and guidance documents, such as the State *Environmental Factor Guideline: Terrestrial Fauna* (EPA, 2016a). Additionally, this Fauna MP has been prepared in accordance with the Western Australian Environmental Protection Authority's (EPA) Environmental Management Plan (EMP) instructions (EPA, 2024) and template (EPA, 2021a). Further, this Fauna MP has been developed with consideration and alignment of the *Forest Management Plan 2024 – 2033* (Conservation and Packs Commission [CPC], 2023), relevant threat abatement plans, recovery plans and associated documents, such as the *Threat Abatement Plan for Predation by Feral Cats* (Commonwealth of Australia, 2015b) and the *Chuditch (Dasyurus geoffroii) National Recovery Plan* (DEC, 2012). The full list of resources utilised in the development of this Fauna MP are presented in Appendix D.

This Fauna MP describes the monitoring and management actions that will be undertaken to ensure that potential impacts on conservation significant terrestrial and aquatic fauna and their associated high value habitats that may result from Project activities have been avoided, minimised and mitigated in accordance with the mitigation hierarchy. Alcoa's Biodiversity Policy (Alcoa, 2021) requires that the mitigation hierarchy (avoid, minimise, and mitigate through rehabilitation) is implemented to manage potential impacts to biodiversity values. This Fauna MP is also expected to meet current conditions and commitments (refer to Table 2-1) and is subject to approval by the State Development Minister. Approved management plans, and any revised management plans, will be published on Alcoa's website and provided to the State Development Minister in electronic form within twenty (20) business days of being implemented, or being required to be implemented (whichever is earlier).

The following are key objectives of this Fauna MP:

- identify conservation significant fauna species and their associated high value habitats that are at risk of potential impacts, both direct and indirect, from Project activities;
- apply the mitigation hierarchy to avoid, minimise and mitigate through rehabilitation, any potential impacts to conservation significant fauna species and their associated high value habitats;
- describe how potential impacts resulting from the Project will be identified, mitigated and adequately managed and monitored through the setting of both outcomes and objectives along with response actions; and
- to demonstrate Alcoa's adaptive management approach strategies relevant to conservation significant fauna and their associated high value habitats to meet best practice principles as the Project continues and there is increased understanding of fauna values.

2.1 Huntly and Willowdale Mine Regions

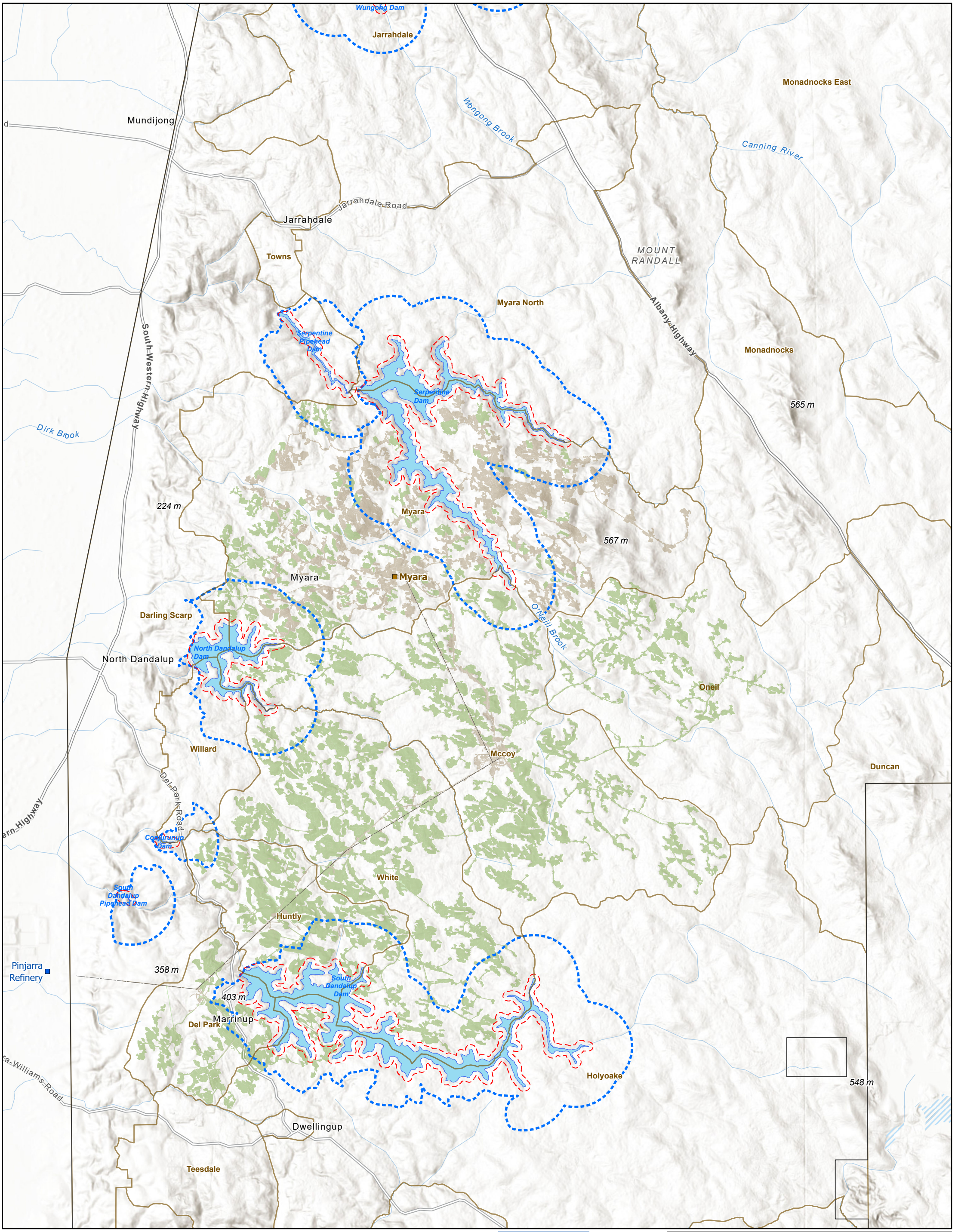
Alcoa's WA mining operation is comprised of the Huntly and Willowdale mines, located within ML1SA. To the north of the Huntly mine (Myara North Region) lies the former Jarrahdale mine, which operated from 1963 – 1998 and is now closed and rehabilitated and is not considered under this Fauna MP.

Huntly Mine

The Huntly mine (Figure 2-1) is primarily located within the Shire of Serpentine Jarrahdale and the Shire of Murray and extends from Dwellingup in the south to Jarrahdale in the north. This mine lies within Dwellingup and Jarrahdale State Forests and is broadly bordered by Serpentine National Park and the Darling Scarp to the west, the Monadnocks Conservation Park and Albany Highway to the east, Dwellingup and Pinjarra-Williams Road to the south and the former Jarrahdale Mine to the north. The mine supplies bauxite to the Kwinana and Pinjarra alumina refineries and has been in operation since 1972 over six mine regions (Del Park, Huntly 1 & 2, White, McCoy, O'Neil and Myara), with a further two regions proposed (Myara North and Holyoake).

Willowdale Mine

The Willowdale mine (Figure 2-2) is located within the Shire of Waroona and the Shire of Harvey and is broadly bordered by Lane Pool Reserve in the east and north-east, the Darling Scarp to the west and Harvey Dam and surrounding rural land to the south-east. The mine predominantly lies within Dwellingup State Forest and Lane Pool Reserve. The mine supplies bauxite to the Wagerup alumina refinery and has been in operation since 1984 and is comprised of three mine regions (Arundel, Orion and Larego).


Wungong Dam
Jarrahdale
Monadnocks East
Mundijong
Wongong Brook
Canning River
Jarrahdale Road
Jarrahdale
Towns
MOUNT RANDALL
Myara North
Albany Highway
Serpentine Pipehead Dam
Serpentine Dam
Monadnocks
South Western Highway
Dirk Brook
565 m
224 m
Myara
567 m
Myara
Myara
Darling Scarp
O'Neill Brook
North Dandalup Dam
North Dandalup
Oneil
Willard
Mccoy
Duncan
Del Park Road
Cookernup Dam
White
South Dandalup Pipehead Dam
Huntly
Pinjarra Refinery
358 m
South Dandalup Dam
403 m
Marrinup
Del Park
Holyoake
548 m
Dwellingup
Teesdale
ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer
Alcoa
N
0 2 4 6 8 10
km
Fauna Management Plan
Figure 2-1: Huntly Mine Overview
Scale: 1:150,000
Date Printed: 18/06/2024

Murray River
Nanga Road
389 m
418 m
Orion
Waroona
Lake Navarino
Waroona Dam
Drakesbrook Dam
Hamel
Samson Brook
Samson Brook Pipehead Dam
Samson Dam
Wagerup
Arundel
381 m
493 m
495 m
Bancell Brook
arloop
Laregó
Laregó
Lake Brockman
Logue Brook Dam
404 m
441 m
400 m
Falls Brook
Warawarrup
Tallanalla Road
Harvey Dam
Harvey Dam
Harvey-Quindanning Road
Stirling Dam
Cornwall
vey

ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer

Alcoa

N

0 1 2 3 4 5 km

Fauna Management Plan

Figure 2-2: Willowdale Mine Overview

Scale: 1:100,000

Date Printed: 18/06/2024

2.2 Key Environmental Factors

Environmental factors (defined in the EPA's Administrative Procedures, [EPA, 2021c]) are factors that the EPA uses as an organising principle for Environmental Impact Assessment (EIA), comprising a number of environmental values. They provide a systematic approach to organising environmental information for the purpose of EIA. Further, the EPA has identified an environmental objective for each environmental factor, and these objectives are aimed towards ensuring the objects and principles of the State *Environmental Protection Act 1986* (EP Act) are achieved (EPA, 2023).

Alcoa recognises that there are inherent links between the Terrestrial Fauna key environmental factor and other environmental factors, such as the Inland Waters environmental factor. Therefore, these two key environmental factors have been considered in conjunction with one another.

Terrestrial Fauna

The EPA (2016) defines terrestrial fauna as animals living on land or using land (including aquatic systems) for all or part of their lives and includes vertebrate and invertebrate groups.

The EPA's environmental objective for the factor "Terrestrial Fauna" is "*to protect terrestrial fauna so that biological diversity and ecological integrity are maintained*".

Key fauna values identified for this Fauna MP have been selected for a range of reasons, including:

- being a threatened or priority species;
- having restricted distributions; and / or
- a degree of historical impact from threatening processes.

These fauna values also include fauna habitats which may be significant where they provide high value habitats to the life history of the species, for example: breeding; feeding; roosting; and / or where they are unique or isolated habitats (e.g. wetlands).

Inland Waters

The EPA (2018) defines the factor Inland Waters as:

"*The occurrence, distribution, connectivity, movement, and quantity (hydrological regimes) of inland water including its chemical, physical, biological and aesthetic characteristics (quality)*."

Inland waters include groundwater (e.g. superficial and confined aquifers), and surface water (e.g. waterways, wetlands, and estuaries).

The EPA's environmental objective for the factor "Inland Waters" is "*to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*".

The Inland Waters factor is here recognised in the context of this Fauna MP as potential changes to the quality and quantity of inland waters that may affect conservation significant terrestrial and aquatic fauna and their associated high value habitats (e.g. wetlands, wild rivers, and other ecosystems that support significant fauna species or communities). Further information regarding the management of risks and potential impact of bauxite mining on key environmental values associated with the Inland Waters key environmental factor (surface water and groundwater) can be found in Alcoa's Huntly and Willowdale Mines Water Resources Management Plan (Rev 1) (Alcoa of Australia Limited, 2023b).

Potential Impacts

Over the last 200 years the magnitude and rate of change has increased within the Northern Jarrah Forest and beyond into the forest ecosystems of the south-west of Western Australia, due to: disturbance from mining, timber harvesting and water abstraction; clearing for townsites, agriculture and infrastructure; the introduction and spread of exotic diseases, weeds and pest animals; and changing bushfire events (CPC, 2023). The areas in which Alcoa operates also supports high levels of nature-based recreation and tourism, such as camping, hiking and mountain biking. These anthropogenic disturbances have resulted in changes to fauna populations (Stantec, 2023) and the cumulative effects of these disturbances have also resulted in a number of vertebrate species being listed as Endangered or Vulnerable under the EPBC Act and BC Act.

Impacts to terrestrial fauna can be direct or indirect and may be permanent or temporary.

Direct impacts include the removal, fragmentation or modification of habitat, and mortality or displacement of individuals or populations and cause direct impacts by reducing the diversity and abundance of species in an area (EPA, 2016a).

Direct impacts such as habitat removal, fragmentation or modification can also result in indirect impacts for example (EPA, 2016a):

- the introduction of weeds, introduced fauna and disease, such as *Phytophthora*; and / or
- reduced or prevention of access to feeding or roosting habitats.

Other indirect impacts may include increased light, noise, dust, fire, vehicle strike, attraction of predators or competitors and pollution or modification of water quality and changes to hydrological regimes.

Further below, Table 2-2 outlines the conservation significant fauna, knowledge of their associated high value habitats and identified potential impacts and threats to these.

2.3 Condition Requirements

The conditions and associated endorsed commitments for the Huntly and Willowdale mines that are relevant to this Fauna MP are detailed below in Table 2-1. Project avoidance areas and constraints are presented in Figure 2-3.

Table 2-1 Conditions and Commitments as Relevant for this Fauna MP

Ministerial Statement 1157[7] Conditions		Section in this Fauna MP
3	Alcoa will plan and manage its mining operations to minimise disturbance to biologically diverse fringing major rock outcrops and streamzones. Appropriate buffers will be maintained between these areas and mine pit boundaries. Stream crossings will be constructed in a manner which facilitates their removal and rehabilitation after use, unless required for ongoing forest management or other purposes agreed with the State's Mining and Management program Liaison Group (MMPLG).	Figure 2-3 Sections 3 – 6
4	Alcoa will continue its program of biological surveys and support activities contributing to the conservation of rare, endangered and priority species existing within the vicinity of its mining operations.	Section 2 Section 7 Appendix A-1
10	Alcoa is committed to an ongoing research program into all aspects of its operation that have the potential to adversely affect the environment, and into those environmental characteristics that could be adversely affected by its operations.	Table 5-5 Appendix A-1 Appendix E
Environmental Protection (Darling Range Bauxite Mining Proposals) Exemption Order 2023 (Schedule 1) Conditions		**Section in this Fauna MP**
2 (2)	Mining activities associated with the Huntly Mine – (a) must not disturb land outside the Huntly Mine disturbance footprint; and (b) must not disturb native vegetation outside the Huntly Mine native disturbance footprint.	Figure 2-3
2 (3)	Mining activities associated with the Willowdale Mine – (a) must not disturb land outside the Willowdale Mine disturbance footprint; and (b) must not disturb native vegetation.	Figure 2-3
2(4)	Exploration activities associated with the implementation of the Darling Range bauxite mining proposals must not disturb land outside the Darling Range exploration disturbance footprint.	Figure 2-3 Section 3
4(2)	In implementing the Darling Range bauxite mining proposals, Alcoa and its associates must not undertake any mining activities -	Figure 2-3 Sections 3 – 7
	(e) within 10 metres of a black cockatoo nesting tree[8] or a Huntly Mine black cockatoo significant tree[9]; or	
	(f) on or after 1 January 2027, within 50 metres of a black cockatoo nesting tree.	

[7] MS1157 supersedes MS 728, 897, 1069

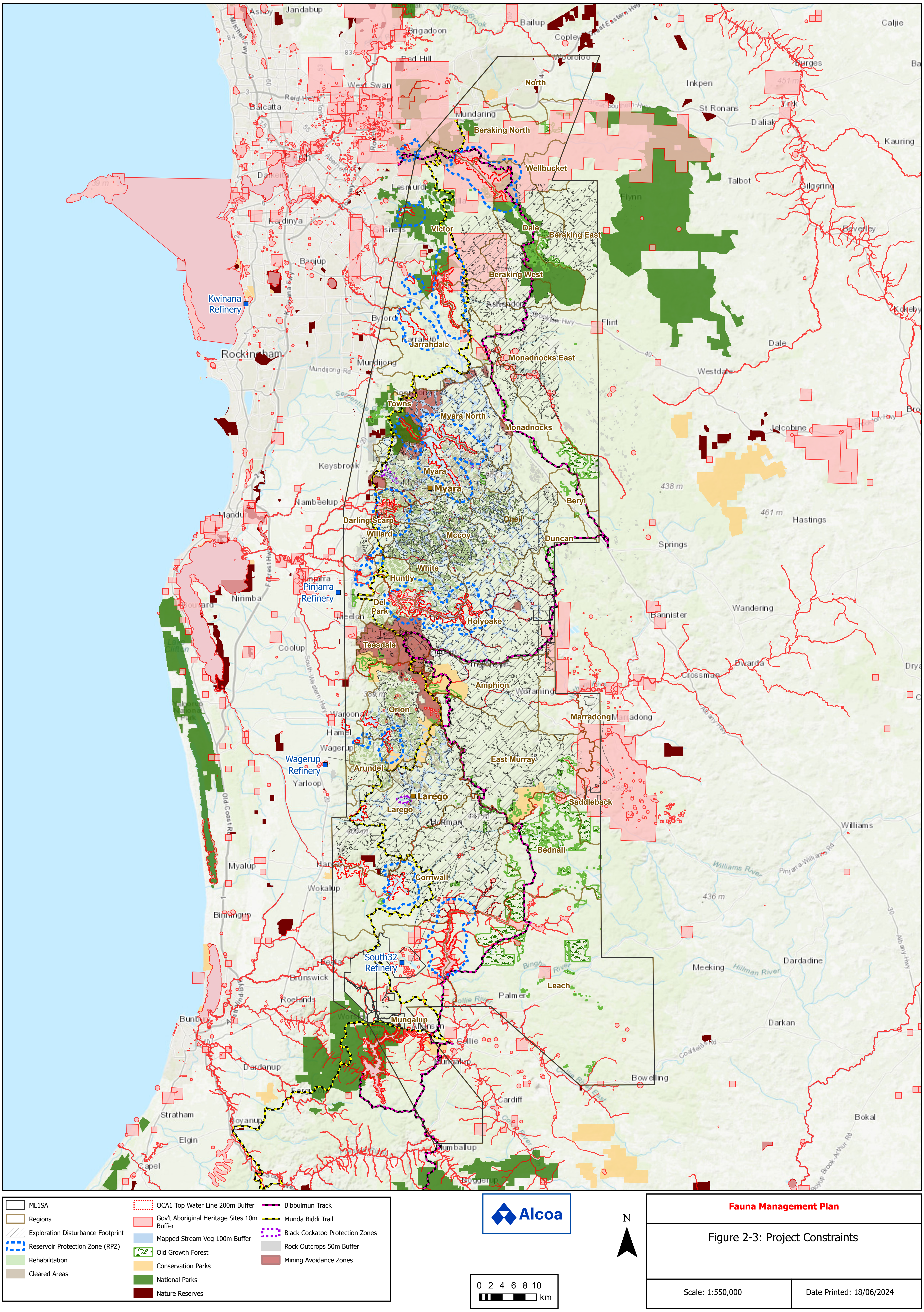
[8] As per the EP (Darling Range Bauxite Mining) Exemption Order 2023 "Black Cockatoo nesting tree" means a tree containing 1 or more hollows – (a) that appear to be, or have been, used as a Black Cockatoo breeding habitat; or (b) that have a diameter of not less than 100 mm and a depth of not less than 500 mm.

[9] As per the EP (Darling Range Bauxite Mining) Exemption Order 2023 "Huntly Mine Black Cockatoo significant tree" means – (a) a jarrah tree with a diameter of not less than 2000 mm at a height of 1300 mm above ground level; and (b) a marri tree with a diameter of not less than 1500 mm at a height of 1300 mm above ground level.

Ministerial Approval Conditions for the 2023-2027 Mining and Management Program (MMP) (Approval Letter ref: 60-076783, Dec 2023)		Section in this Fauna MP
4.	Any clearing, exploration, mining or other operations permitted by this MMP approval must be implemented by Alcoa to meet the following environmental objectives:	Figure 2-3 Sections 3 – 7
	(a) avoiding or otherwise minimising clearing within 50 metres of Black Cockatoo nesting trees; [and] -If:	Figure 2-3 Sections 3 – 7
	(c) clearing within 50 metres of Black Cockatoo nesting trees; [and/or] cannot be avoided, Alcoa must provide, to the satisfaction of the State Development Minister, a written report explaining why the relevant avoidance cannot be met prior to the clearing being undertaken.	Figure 2-3 Sections 3 – 7
5.	Alcoa must not undertake any clearing, exploration, mining or other operations:	Figure 2-3 Sections 3 – 7
	(d) within 10 metres of any Black Cockatoo nesting trees or Black Cockatoo significant trees.	
6.	Condition 5 does not apply to:	N/A
	(a) stabilisation or rehabilitation activities; or	N/A
	(b) environmental monitoring activities; or	N/A
	(c) use and maintenance of existing infrastructure; or	N/A
	(d) modification of existing road infrastructure with the written consent of the State Development Minister; or	N/A
	(e) construction of drainage control infrastructure; or	N/A
	(f) mining within 1 kilometre of the top water level of any water reservoir in Myara Central and Myara South carried out before 30 June 2024.	N/A
8.	Alcoa will not undertake any MMP-related clearing until the Mine Operations Group (MOG) has provided its endorsement of the relevant FCA.	Page 7
13.	From the date of the MMP Approval: Alcoa will implement to the extent practicable the plans referred to below until the relevant revised plan is submitted to the State Development Minister in accordance with condition 14: (a) Fauna Management Plan (Version 0) submitted to the Minister for State Development on 13 November 2023, as included in the MMP.	Section 7
14.	Alcoa will review and update the plans referred to below and submit them to the State Development Minister for approval within the timeframes outlined in condition 17, and in accordance with *Environmental Protection Authority's Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA 2021); (a) the Fauna Management Plan (Version 0), in consultation with the Department of Biodiversity, Conservation and Attractions (DBCA) and relevant stakeholders so that it: i. Satisfies the requirements of condition 18 and 19.	This document[10].
17.	Alcoa must submit the management plans to the State Development Minister within the following time periods, or such other time period should the State Development Minister determine, following a request from Alcoa (a) revised Fauna Management Plan, within 6 months of the date of the MMP approval.	This document[10].

[10] Document prepared using EPA Environmental Management Plan Template Instructions EPA, 2021a and 2024)

Ministerial Approval Conditions for the 2023-2027 Mining and Management Program (MMP) (Approval Letter ref: 60-076783, Dec 2023)		Section in this Fauna MP
18.	The management plans required under condition 17 must contain evidence to demonstrate compliance with relevant '*Operational restrictions*' and '*Clearing restrictions*' conditions, and must also include: (a) threshold criteria and trigger criteria that are relevant to the environmental impacts that the plans are mitigating and managing; (b) monitoring parameters, sites, control/reference sites, methodology, timing and frequencies, which will be used to measure threshold criteria and trigger criteria; (c) methodology for determining alternate monitoring sites as a contingency if proposed sites are not suitable in the future; (d) data collection and analysis methodologies; (e) adaptive management methodology; (f) contingency measures which will be implemented if threshold criteria or trigger criteria are not met; and (g) reporting requirements.	This document[10]. Sections 3 – 7 Appendix A-1
19.	The management plans required under condition 17 must, also contain provisions which demonstrate whether conditions 4 (a) and (b) and relevant '*Operational restrictions*' and '*Clearing restrictions*' conditions are reasonably likely to be met, and must also include: (a) management actions; (b) management targets; (c) contingency measures if the management targets are not met; and (d) reporting requirements.	This document[10]. Sections 3 – 7
20.	Upon submission of each management plan, Alcoa must to the extent practicable: (a) implement the submitted management plan(s) until receiving notice from the State Development Minister confirming that the management plan(s) satisfies the relevant requirements (i.e. is approved); and (b) following approval by the State Development Minister, implement the most recently approved version of the management plan.	Section 2
21.	Alcoa: (a) may review, revise and re-submit to the State Development Minister any management plan listed in condition 17 at any time provided it meets relevant requirements of that management plan, including any consultation that may be required when preparing the management plan; and (b) must review and revise any management plan listed in condition 17 and ensure it meets the relevant requirements of that management plan, including any consultation that may be required when preparing the management plan, as and when directed by the State Development Minister.	Sections 7 and 8
22.	Approved management plans, and any revised management plans, must be published on Alcoa's website and provided to the State Development Minister in electronic form suitable for on-line publication within twenty (20) business days of being implemented, or being required to be implemented (whichever is earlier).	Section 2



Fauna Management Plan

Figure 2-3: Project Constraints

Scale: 1:550,000

Date Printed: 18/06/2024

2.4 Rationale and Approach

This Fauna MP has been prepared in accordance with State (WA) guidelines for the development of EMPs.

This Fauna MP provides provisions for potential impacts to conservation significant terrestrial and aquatic fauna values specific to Alcoa's activities (including exploration, construction and operational phases) within the Huntly and Willowdale mine areas. However, where existing procedures provide appropriate management of potential impacts, no further measures or provisions have been developed. During the development of this Fauna MP, from the evaluation of risks from general operational activities it is also considered that the management of identified key threatening processes on conservation significant fauna will have flow-on effects for other native fauna species occurring within the Project area.

This Fauna MP refers to high value habitats for conservation significant fauna, which is defined in the context of this Fauna MP as mapped habitats that are potentially suitable for denning, roosting and / or shelter. Further, specific outcome-based provisions have been applied in regard to composition of specific vegetation types such as streamzones and major granite outcrops. Existing and proposed in-field monitoring assessments of these selected vegetation types within both impact and reference sites to monitor for changes in vegetation composition, structure and function over time as indicators of vegetation condition to protect identified high value fauna habitats is a widely used method (Lawley, V. *et al.* 2016). To enable detection of changes in fauna values as a result of Project disturbance requires baseline data and continued collection of data from impact and reference sites to enable comparison. However careful consideration is required to select appropriately comparable impact and reference sites.

2.4.1 Environmental Outcomes and Management Objectives

This Fauna MP adopts a combination of outcome-based and objective-based provisions to achieve the proposed environmental outcomes, across the three phases of active mining (exploration, construction and operational).

Outcome-based provisions are applied where a sufficient level of information exists to establish objectives and measurable criteria (EPA, 2021d). Environmental criteria are defined to assess performance against the environmental outcome, these are:

- **Early response criteria:**
    - Internal indicators selected to provide information on changes to the environment that are precursors to an environmental impact.
- **Trigger criteria:**
    - External reportable criteria where indicators are selected for monitoring to provide a warning that if exceeded the outcome may not be achieved. They are intended to forewarn of the approach of the threshold criteria and trigger response actions.
- **Threshold criteria**:
    - External reportable criteria where indicators have been selected to represent the limit of acceptable impact beyond which the environmental outcome is not being met and where there is likely to be a significant impact on the environment.

Due to the complexities of spatial and temporal variability of terrestrial fauna in addition to low level detectability in some species, objective-based provisions have been applied where a level of uncertainty or lack of appropriate knowledge exists, that prevents setting achievable and effective objectives and measurable trigger and threshold criteria.

In this case, management targets have been established to measure the success of management actions in meeting the environmental outcome.

Supplementary provisions such as research programmes and / or additional indicators (supporting both outcome-based and objective-based) have been proposed to be applied to address values where a degree of uncertainty, lack of knowledge and / or complexity exists.

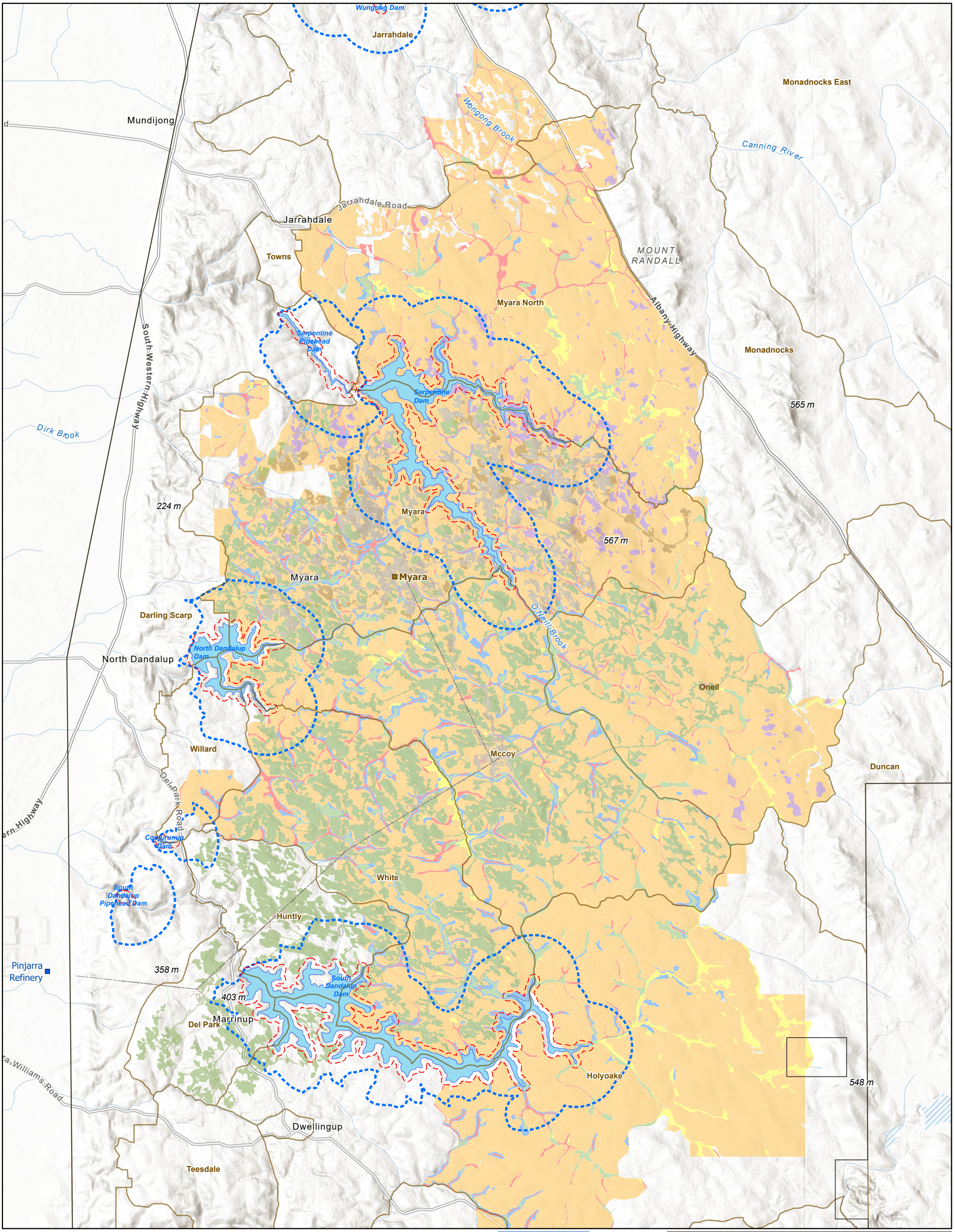
2.4.2 Current Knowledge

A wide range of flora, vegetation and fauna surveys, studies and research programmes have been undertaken across the Huntly and Willowdale mine regions over many years and includes various fauna assessment and survey methodologies, such as: opportunistic surveys; nocturnal and diurnal surveys and spotlighting; remote sensing cameras; active searches; and acoustic surveys. Streamzone monitoring in both the intermediate rainfall zone (IRZ) and high rainfall zone (HRZ) for aquatic invertebrates (and including recording physio-chemistry information) has also been undertaken at selected sites across the Project at selected years since 2004. This also includes monitoring of both impact and reference sites to attempt to differentiate effects of mining operations from stochastic fluctuations or ecological responses to climate change (WRM, 2022). Alcoa has also undertaken a long-term fauna monitoring program to evaluate fauna return to rehabilitated areas which was designed in 1991 and has been undertaken across selected years since this time. Further information on current knowledge regarding fauna values associated with the Project is provided in Appendix E.

This Fauna MP provides the monitoring and management framework of conservation significant fauna which for the purposes of this Fauna MP, have been separated into the following categories: ground-dwelling wide-ranging; ground-dwelling streamzone; birds and bats; reptiles; and aquatic fauna, and their associated high value habitats (i.e. mapped habitats that are potentially suitable for denning, roosting and / or shelter). The general description for these is provided in Table 2-2 further below, with consideration of current knowledge and understanding. Information obtained from a range of historic and contemporary fauna survey results are presented in Figures 2-4 to 2-13, however results of fauna surveys relevant to this Fauna MP that were undertaken during the preparation of this Fauna MP may not be presented within the Figures, however future iterations of the Fauna MP will ensure all relevant, contemporary information is included.

Vegetation Mapping for Indicative Fauna Habitats

A total of six broad fauna habitat types have been recorded and mapped during baseline fauna surveys across portions of the Huntly and Willowdale mine areas, based on vegetation, hydrology, soil and topography as presented in Appendix E (Table E-2). These include: Blackbutt Forest; Bullich Forest; Flooded Gum Woodland; Granite Outcrop association;, Jarrah Marri Forest; and Melaleuca Dampland. Fauna habitats have been mapped in accordance with EPA guidance for terrestrial fauna surveys (EPA, 2020). Historic assessments for terrestrial fauna have been undertaken in selected survey areas within the Huntly and Willowdale mine regions, which primarily focused on utilising Havel vegetation type mapping for the extrapolation and indication of fauna habitats based on these vegetation types (Figures 2-4 and 2-5) and monitoring to understand fauna assemblages in various rehabilitation age stages.

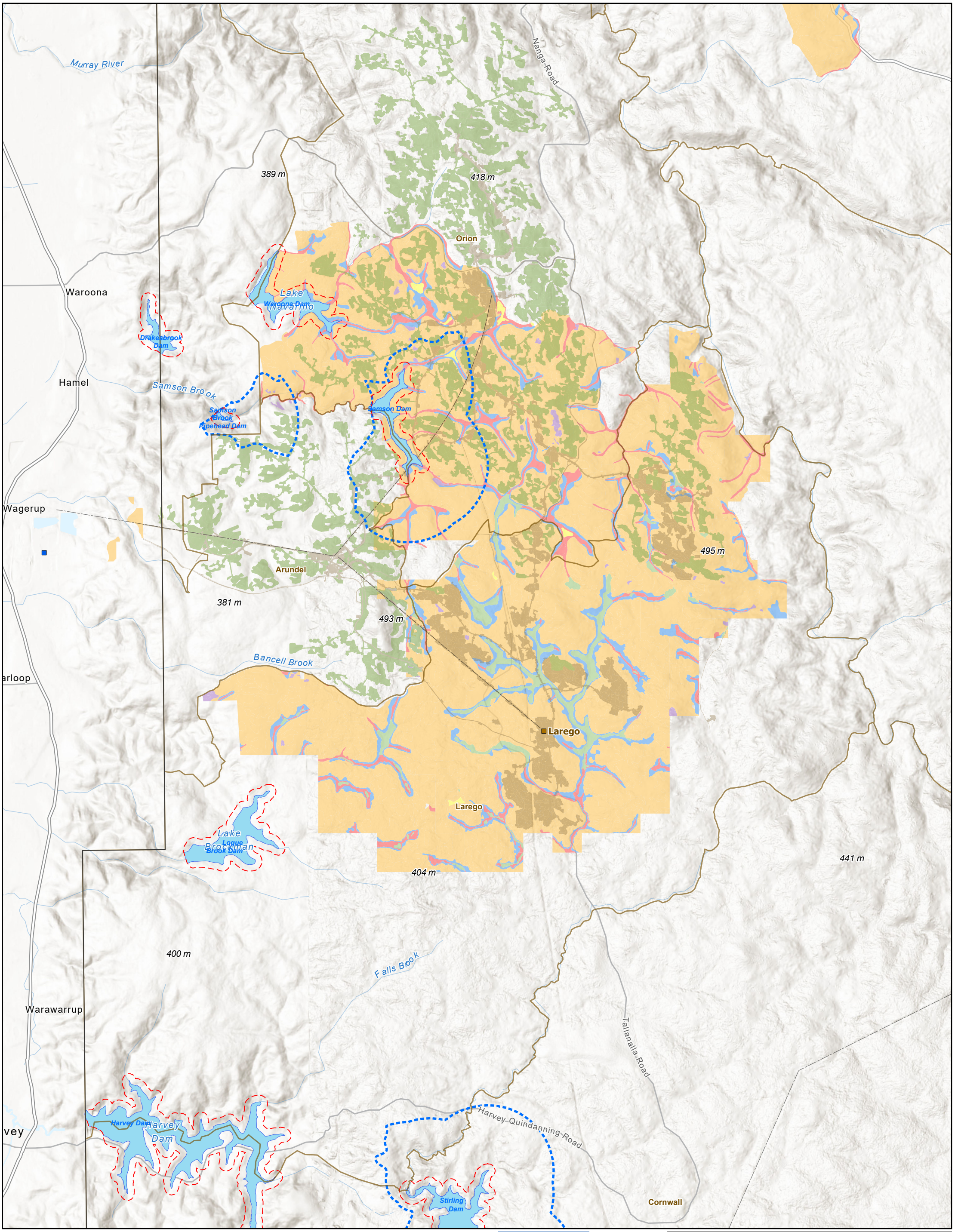


Fauna Management Plan

Figure 2-4: Huntly Mapped Vegetation Types as Indicative Fauna Habitats

Scale: 1:150,000

Date Printed: 18/06/2024


Murray River
Nanga Road
389 m
418 m
Orion
Waroona
Lake Navarino
Waroona Dam
Drakesbrook Dam
Hamel
Samson Brook
Samson Brook Pipehead Dam
Samson Dam
Wagerup
Arundel
381 m
493 m
495 m
Bancell Brook
Laregó
Laregó
Lake Logue Brook Dam
Lake Brockman
404 m
441 m
400 m
Falls Brook
Warawarrup
Tallanalla Road
Harvey Dam
Harvey Dam
Harvey-Quindanning Road
Stirling Dam
Cornwall
ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer
Vegetation Mapping
Fauna Habitat
Blackbutt Forest
Bullich Forest
Flooded Gum Woodland
Granite Outcrop Association
Jarrah Marri Forest
Melaleuca Dampland
Alcoa
N
0 1 2 3 4 5 km
Fauna Management Plan
Figure 2-5: Willowdale Mapped Vegetation Types as Indicative Fauna Habitats
Scale: 1:100,000
Date Printed: 18/06/2024

Conservation Significant Fauna

From the range of desktop assessments, on-ground surveys, and monitoring that has been undertaken across the Project, seventeen conservation significant terrestrial and aquatic fauna comprised of five classes, have been recorded across both the Huntly and Willowdale mine areas. Additionally, based on vegetation habitat assessments, other conservation significant fauna are considered to have a low likelihood of occurrence across the Project area, such as the Numbat (*Myrmecobius fasciatus*) and Malleefowl (*Leipoa ocellata*). To date however, there has been no evidence or sightings of Numbats occurring across the Project area. Whilst it is considered that there are areas of suitable habitat to support Numbats, the closest recorded population is located at Dryandra, approximately 100 km SE of the Project. Considering the levels of habitat fragmentation between the Project areas and Dryandra, in addition to the distance and impacts from feral predators such as foxes and cats, it is considered there is a low likelihood that Numbats occur within the Project area, at low abundance, and below level of detectability based on current survey efforts. However ongoing fauna surveys will continue to include consideration to identify any evidence of Numbats, or other potential conservation significant terrestrial and aquatic fauna species. If in the unlikely event that evidence and / or a sighting is recorded of a conservation significant fauna species that is not listed as per Section 1 of this Fauna MP, additional targeted surveys will be undertaken to determine the extent of occurrence and management actions will be implemented to avoid and otherwise minimise impacts to the species by following the mitigation hierarchy (avoid, minimise, mitigate through rehabilitation), and as per the management provisions of Fauna MP.

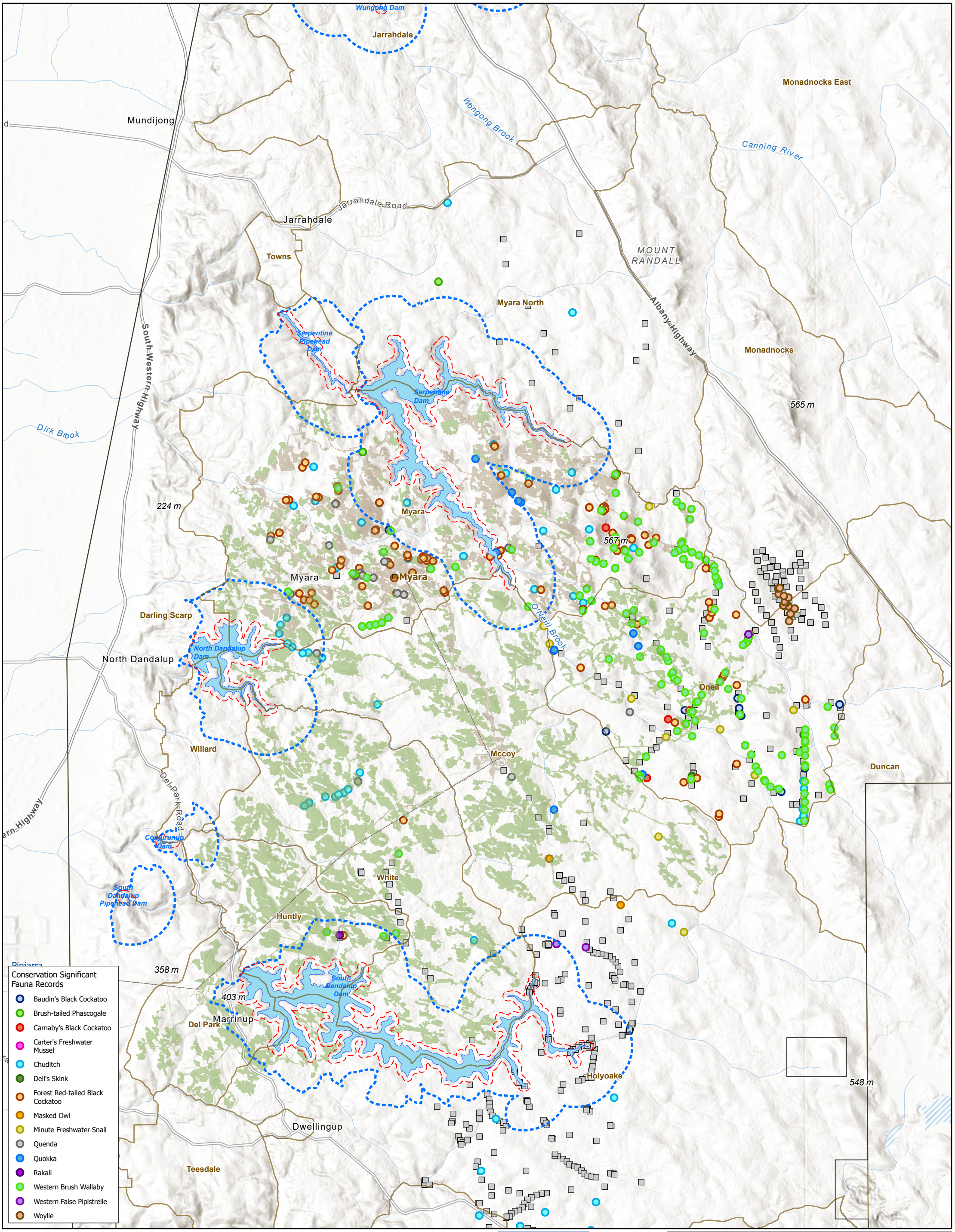
The majority of conservation significant species known to occur within the Project areas have been recorded infrequently across surveys, including: Brush-tailed Phascogale; Carter's Freshwater Mussel; Dell's Skink; Masked Owl; Minute Freshwater Snail; Peregrine Falcon; Quenda; Quokka; Rakali; Southern Death Adder; Western False Pipistrelle; and Woylie.

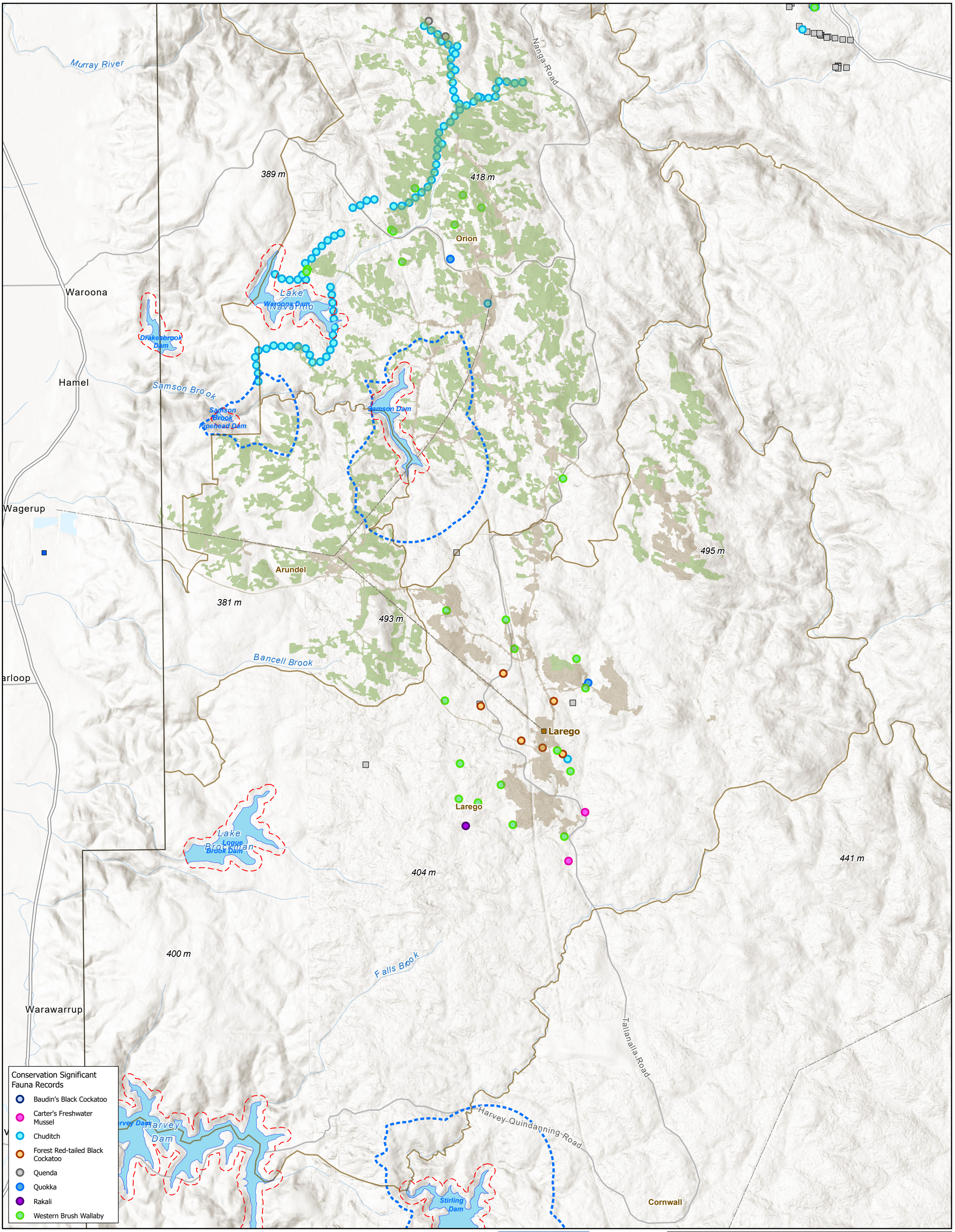
Figures 2-6 – 2-9 present the known recorded locations of conservation significant terrestrial and aquatic fauna species across the Huntly and Willowdale mines. Depending on the species, these locations were recorded through a variety of methods (e.g. camera trap records of Quokka, acoustic recording of Western False Pipistrelle etc.). Table 2-2 presents the conservation significant fauna, their associated high value habitats and potential impacts / threats associated with the Project.

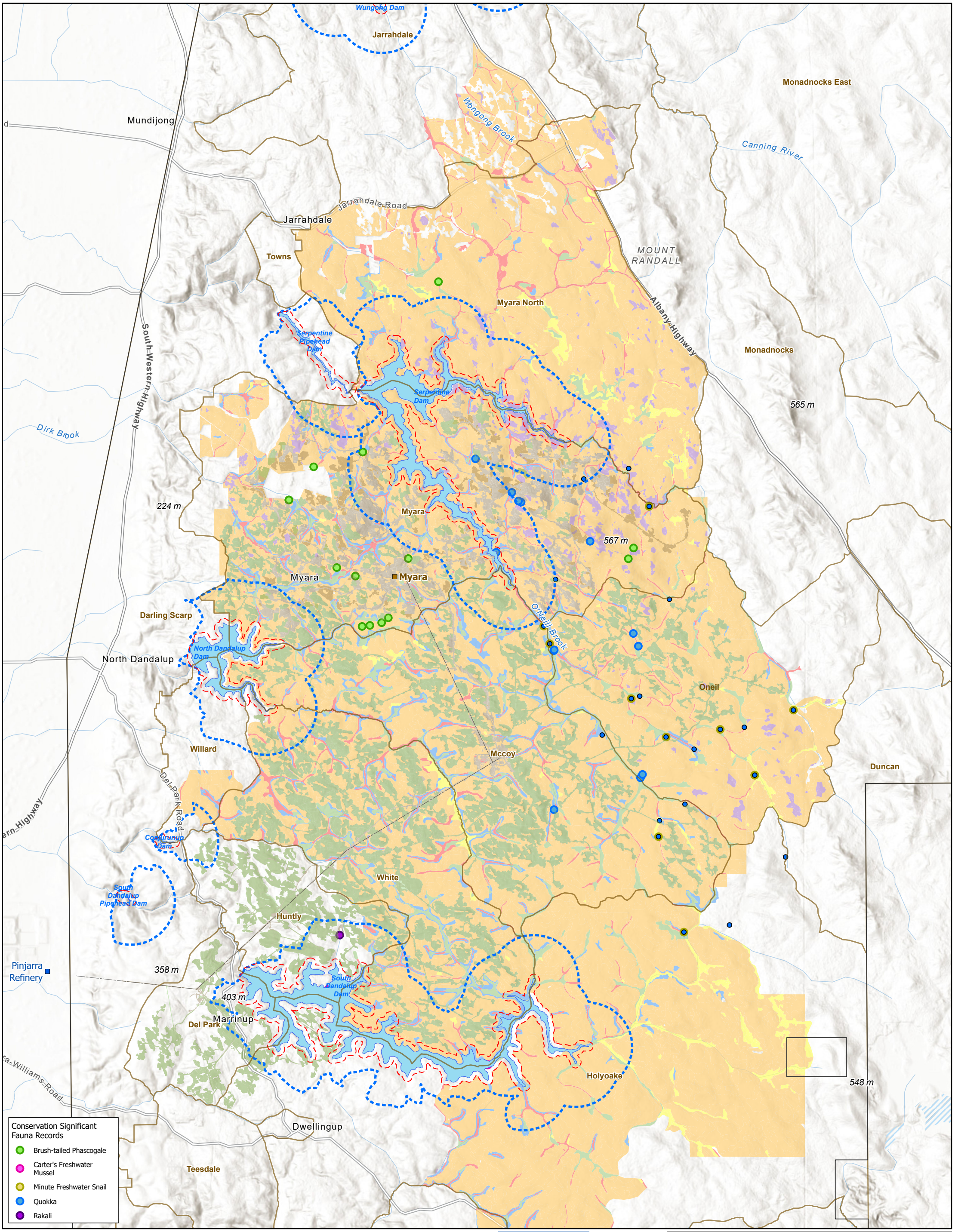
Aquatic Fauna

Carter's Freshwater Mussel[11] (CFM) is a species of native freshwater mussel that occurs at various, but restricted locations within the region to westerly flowing rivers of Southwest WA from Gingin Brook to Margret River. The greatest threats to the Carter's Freshwater Mussel are considered to be salinisation and drying of water systems, and due to their physiology, they rarely persist in non-perennial water systems (Biologic, 2024). Targeted surveys for Carter's Freshwater Mussel have been undertaken at various locations across the Huntly and Willowdale mine areas utilising a range of survey methods suitable for targeting bivalves and gastropods (e.g. using mussel rakes in stream beds and fine sieves). Historic surveys and streamzone monitoring at selected sites across the Project (Figures 2-8 and 2-9) has also recorded the presence of the conservation significant Minute Freshwater Snail, *Glacidorbis occidentalis*. This species is considered to be widespread in distribution but occurs at low abundance across its known range (WRM, 2022) and is typically restricted to forest streams with intermittent flow regimes (Bunn *et al.* 2013). Potential impacts to these species as a result of the Project are considered to be low, given the nature of the Project's activities which primarily avoids streams and water bodies to target the bauxite resource, and through the implementation of applied LDA and MAZ (excluding infrastructure and streamzone crossings etc.).

[11] *Westralunio carteri* occurring in westerly flowing rivers of SWWA from Gingin Brook to Margret River; *W. inbisi inbsi* occurring along southerly flowing rivers from Blackwood River to Waychinicup River; *W. inbisi meridiemus* restricted to Margret and Blackwood rivers.


Wungong Dam
Jarrahdale
Monadnocks East
Mundijong
Wongong Brook
Canning River
Jarrahdale Road
Jarrahdale
Towns
MOUNT RANDALL
Myara North
Albany Highway
Serpentine Pipehead Dam
Serpentine Dam
Monadnocks
South Western Highway
565 m
Dirk Brook
224 m
Myara
567 m
Myara
Myara
Darling Scarp
O'Neill Brook
North Dandalup Dam
North Dandalup
Oneil
Willard
Mccoy
Duncan
Del Park Road
Comunnup Dam
White
South Dandalup Pipehead Dam
Huntly
358 m
South Dandalup Dam
403 m
Marrinup
Del Park
Holyoake
548 m
Dwellingup
Teesdale
Conservation Significant Fauna Records
Baudin's Black Cockatoo
Brush-tailed Phascogale
Carnaby's Black Cockatoo
Carter's Freshwater Mussel
Chuditch
Dell's Skink
Forest Red-tailed Black Cockatoo
Masked Owl
Minute Freshwater Snail
Quenda
Quokka
Rakali
Western Brush Wallaby
Western False Pipistrelle
Woylie
ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer
Fauna Survey Locations
Alcoa
N
0 2 4 6 8 10
km
Fauna Management Plan
Figure 2-6 : Huntly Mine Fauna Survey Locations and Conservation Significant Fauna Records
Scale: 1:150,000
Date Printed: 18/06/2024


Murray River
Nanga Road
389 m
418 m
Orion
Waroona
Lake Navarino
Waroona Dam
Drakesbrook Dam
Hamel
Samson Brook
Samson Brook Pipehead Dam
Samson Dam
Wagerup
Arundel
381 m
493 m
495 m
Bancell Brook
Laregо
Laregо
Lake Logue Brook Dam
Lake Brockman
404 m
441 m
400 m
Falls Brook
Warawarrup
Tallanalla Road
Harvey Dam
Harvey Dam
Harvey-Quindanning Road
Stirling Dam
Cornwall
Conservation Significant Fauna Records
Baudin's Black Cockatoo
Carter's Freshwater Mussel
Chuditch
Forest Red-tailed Black Cockatoo
Quenda
Quokka
Rakali
Western Brush Wallaby
ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer
Fauna Survey Locations
Alcoa
N
0 1 2 3 4 5 km
Fauna Management Plan
Figure 2-7 : Willowdale Mine Fauna Survey Locations and Conservation Significant Fauna Records
Scale: 1:100,000
Date Printed: 18/06/2024



Alcoa

Fauna Management Plan

Figure 2-8 : Huntly Streamzone Monitoring Locations and Conservation Significant Streamzone and Aquatic Fauna Records

Scale: 1:150,000

Date Printed: 18/06/2024

Murray River
Nanga Road
389 m
418 m
Orion
Waroona
Lake Navarino
Waroona Dam
Drakesbrook Dam
Hamel
Samson Brook
Samson Brook Pipehead Dam
Samson Dam
Wagerup
Arundel
381 m
493 m
495 m
Bancell Brook
Laregо
Laregо
Lake Logue Brook Dam
Lake Brockman
404 m
441 m
400 m
Falls Brook
Warawarrup
Tallanalla Road
Harvey Quindanning Road
Harvey Dam
Harvey Dam
Stirling Dam
Cornwall

Conservation Significant Fauna Records
- Chuditch
- Quenda
- Quokka
- Rakali
- Western Brush Wallaby

- ML1SA
- Regions
- Reservoir Protection Zone (RPZ)
- Rehabilitation
- Cleared Areas
- OCA1 Top Water Line 200m Buffer
- Streamzone Monitoring Locations

Vegetation Mapping
Fauna Habitat
- Blackbutt Forest
- Bullich Forest
- Flooded Gum Woodland
- Granite Outcrop Association
- Jarrah Marri Forest
- Melaleuca Dampland

Alcoa

N

0 1 2 3 4 5 km

Fauna Management Plan

Figure 2-9 : Willowdale Streamzone Monitoring Locations and Conservation Significant Streamzone and Aquatic Fauna Records

Scale: 1:100,000

Date Printed: 18/06/2024

Black Cockatoos

Three species of Black Cockatoo are known to occur within the Project area: Baudin's Black Cockatoo (*Zanda baudinii*); Carnaby's Black Cockatoo (*Zanda latirostris*); and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*). All three species are resource dependent and able to move through the environment targeting areas as required.

A number of assessments have been undertaken and continue to be undertaken for in-field Black Cockatoo surveys and / or pole camera or drone surveys as required, recording: habitat trees; nest trees; and significant trees. Black Cockatoo foraging habitat has also been indicatively mapped as High, Medium and Low quality across the Huntly and Willowdale mine areas based on fauna habitat derived from vegetation type mapping and is presented for all three Black Cockatoo species (Figures 2-10 and 2-11). Future targeted surveys across the mine regions will verify the desktop fauna habitat mapping.

Currently, two Black Cockatoo Protection Zones have been established:

- Huntly contains an approximately 277 ha Protection Zone in the Yamba area, which contains a high density of nest trees (Figure 2-10).
- Willowdale contains an approximately 206 ha Protection Zone in the Giles area. This Protection Zone contains a high density of nest trees, particularly in comparison to the surrounding area. The Protection Zone includes a large number of trees of habitat and significant trees. High quality foraging habitat and permanent water sources are also contained within the Protection Zone (Figure 2-11).

Alcoa has established a Chance Find Procedure for Exploration Activities (Appendix F) for nest and significant tree/s to be identified, recorded and internally reported on to avoid and minimise disturbance to these trees by personnel during the exploration phase.

Refer to Appendix E for a summary of key historical research programmes and studies undertaken across the Project.

Wungong Dam
Jarrahdale
Monadnocks East
Mundijong
Wongong Brook
Canning River
Jarrahdale Road
Jarrahdale
Towns
MOUNT RANDALL
Myara North
Albany Highway
South Western Highway
Serpentine Pipehead Dam
Serpentine Dam
Monadnocks
565 m
Dirk Brook
224 m
Myara
567 m
Myara
Darling Scarp
O'Neill Brook
North Dandalup Dam
North Dandalup
Oneil
Willard
Mccoy
Duncan
Del Park Road
Canning Dam
White
South Dandalup Pipehead Dam
Huntly
Pinjarra Refinery
358 m
South Dandalup Dam
403 m
Marrinup
Del Park
Holyoake
548 m
Dwellingup
Teesdale

ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer

Black Cockatoo Protection Zones
Black Cockatoo Record
Habitat tree
Nest tree
Significant tree

Forest Red-tailed Black Cockatoo
Foraging Habitat Quality
High
Medium
Low

Alcoa

N

0 2 4 6 8 10 km

Fauna Management Plan

Figure 2-10 : Huntly Mine Black Cockatoo Records and Foraging Habitat Quality

Scale: 1:150,000

Date Printed: 18/06/2024

Murray River
Waroona
Hamel
Wagerup
arloop
vey
Warawarrup
Nanga Road
389 m
418 m
Orion
Lake Navarino
Waroona Dam
Drakesbrook Dam
Samson Brook
Samson Brook Pipehead Dam
Samson Dam
Arundel
381 m
493 m
495 m
Bancell Brook
Laregо
Laregо
Lake Logue
Brockman
Logue Brook Dam
404 m
441 m
400 m
Falls Brook
Tallanalla Road
Harvey Quindanning Road
Harvey Dam
Harvey Dam
Stirling Dam
Cornwall

ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer

Black Cockatoo Protection Zones
Black Cockatoo Record
Habitat tree
Nest tree
Significant tree

Forest Red-tailed Black Cockatoo
Foraging Habitat Quality
High
Medium
Low

Alcoa

N

0 1 2 3 4 5 km

Fauna Management Plan

Figure 2-11 : Willowdale Mine Black Cockatoo Records and Foraging Habitat Quality

Scale: 1:100,000

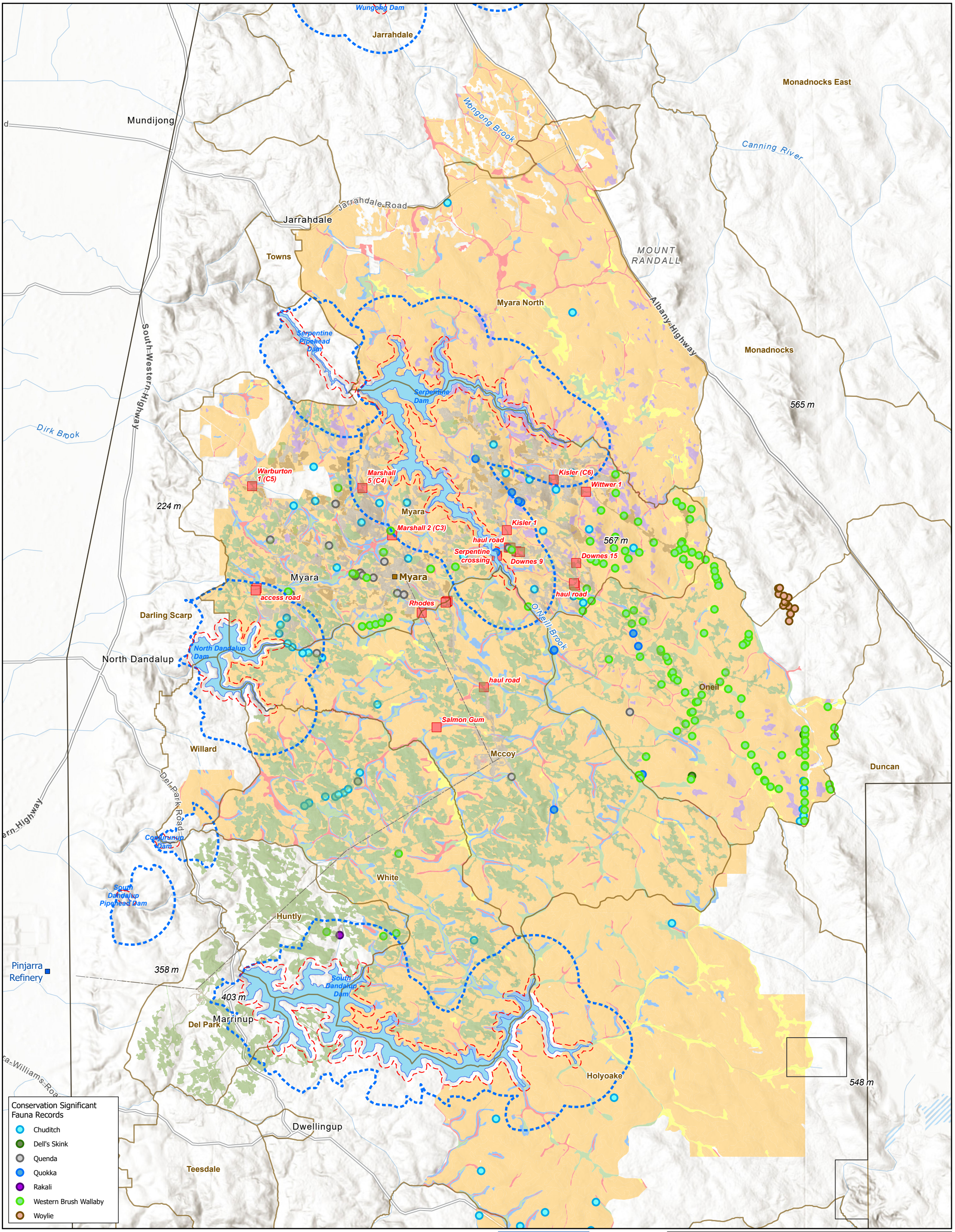
Date Printed: 18/06/2024

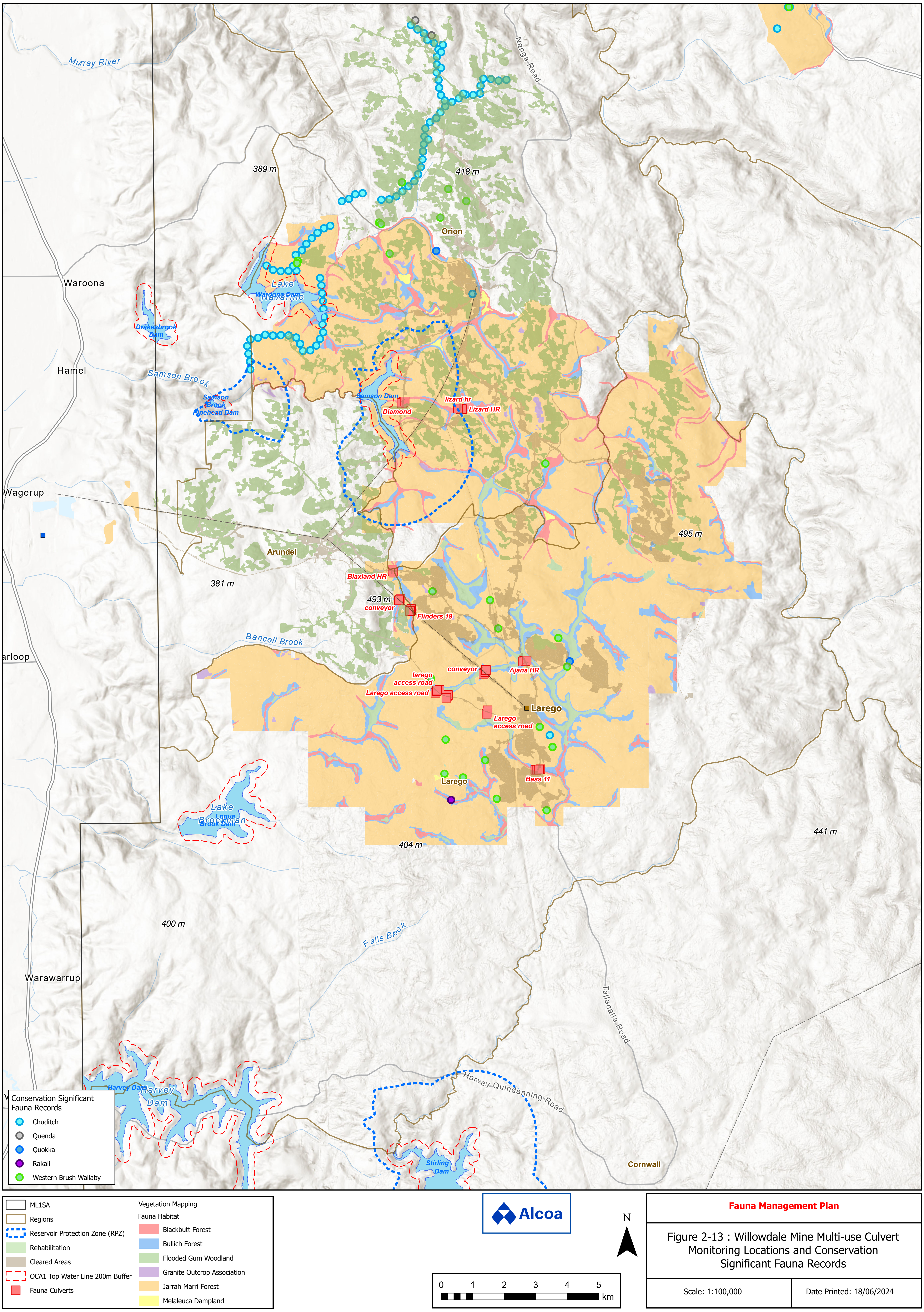
Fauna Underpasses and Multi-use Culverts

As part of construction and operational activities at the Project, streamzone access road crossings for vehicles and machinery are required to be constructed. Where these streamzone crossings are required, culverts are installed to ensure there is no or minimal impediment to surface water flows during the construction and operational phases of the Project. These culverts can also aid in the continued movements of native fauna by providing a passage for movement in areas that may otherwise be fragmented as a result of streamzone crossings and provide opportunities for resilience of fauna by maintaining a level of habitat connectivity and population viability through genetic mixing (Bamford Consulting Ecologists, 2024). Given the multiple functions of culverts, they can be considered to be 'multi-use' culverts. These culverts may also aid in reducing fauna strike mortality events along these crossings. The potential fragmentation effects of streamzone crossings is considered to be a temporary impact due to the nature of the operations which require the removal, rehabilitation and reinstatement of streamzone crossings.

The construction of purpose-specific fauna underpasses (i.e. those that are not culverts constructed primarily for water flow, and generally may be larger in diameter) across the Project requires careful consideration and a high level of baseline knowledge and understanding to ensure that any fauna underpass is appropriately placed at various positions across the landscape (e.g. streamzone vegetation and mid-slope), and within areas that are known to support high quality vegetation and high levels of faunal abundance (Main Roads, 2010) to increase the likelihood of its use and effectiveness to minimise fragmentation impacts. Additionally, in some situations, additional clearing may be required to install larger sized culverts to target a wide-range of fauna species, therefore consideration is required to the additional level of disturbance and clearing required to install the most effective multi-use culvert and requires careful planning.

Monitoring of a selection of culverts across the Huntly and Willowdale mines has been undertaken periodically since 2014 (see Figures 2-12 and 2-13) to determine the types of species (both native and feral) encountering these culverts and their effectiveness as a passageway for movements across the landscape. Results of this monitoring shows that a range of species utilise the culverts as a means of traversing the landscape, however the overall effectiveness of culverts as a consistent method in which native fauna move across the landscape is still being investigated (e.g. the likelihood of use) at the Project through research programmes. Early results however indicate that fauna underpasses tend to be successful when coupled with appropriate feral fauna management. Refer to Appendix E for further information.


Wungong Dam
Jarrahdale
Monadnocks East
Mundijong
Wungong Brook
Canning River
Jarrahdale Road
Jarrahdale
Towns
MOUNT RANDALL
Myara North
Albany Highway
Serpentine Pipehead Dam
Serpentine Dam
Monadnocks
565 m
South Western Highway
Dirk Brook
Warburton 1 (C5)
Marshall 5 (C4)
Kisler (C6)
Wittwer 1
224 m
Myara
Marshall 2 (C3)
Kisler 1
haul road
Serpentine crossing
Downes 9
Downes 15
567 m
Myara
access road
Rhodes
haul road
Darling Scarp
O'Neill Brook
North Dandalup Dam
North Dandalup
haul road
Oneil
Salmon Gum
Willard
Mccoy
Duncan
Del Park Road
Cookernup Dam
White
South Dandalup Pipehead Dam
Huntly
Pinjarra Refinery
358 m
South Dandalup Dam
403 m
Marrinup
Del Park
Holyoake
548 m
Dwellingup
Teesdale
Conservation Significant Fauna Records
Chuditch
Dell's Skink
Quenda
Quokka
Rakali
Western Brush Wallaby
Woylie
ML1SA
Regions
Reservoir Protection Zone (RPZ)
Rehabilitation
Cleared Areas
OCA1 Top Water Line 200m Buffer
Fauna Culverts
Vegetation Mapping
Fauna Habitat
Blackbutt Forest
Bullich Forest
Flooded Gum Woodland
Granite Outcrop Association
Jarrah Marri Forest
Melaleuca Dampland
Alcoa
N
0 2 4 6 8 10
km
Fauna Management Plan
Figure 2-12 : Huntly Mine Multi-use Culvert Monitoring Locations and Conservation Significant Fauna Records
Scale: 1:150,000
Date Printed: 18/06/2024



Fauna Management Plan

Figure 2-13 : Willowdale Mine Multi-use Culvert Monitoring Locations and Conservation Significant Fauna Records

Scale: 1:100,000	Date Printed: 18/06/2024

Short-range Endemics

Short-range Endemic (SRE) surveys have been undertaken across the Holyoake and Myara North regions. The surveys were undertaken across two seasons, over an area of approximately 28,000 ha, and included SRE habitat mapping using historical site vegetation type mapping. During the survey, 83 SRE taxa were recorded, comprising 19 families. Ten taxa are confirmed SREs, comprising nine millipedes and one scorpion; whilst five are considered as likely SREs, all comprised of isopod taxa. An investigation into the relationship between rehabilitation age and SRE occurrence concluded that SRE colonisation improves with age of rehabilitation.

No provisions are proposed at this stage for SREs as studies and research are currently being undertaken to identify SRE (invertebrate) fauna habitat and values within the Huntly and Willowdale mine regions. Once further knowledge is gained this Fauna MP will be updated as per the adaptive management approach.

Table 2-2 Conservation Significant Fauna and Their Associated High Value Habitats and Potential Impacts / Threats

Knowledge of Fauna Specific High Value Habitats	Potential Impacts / Threats
Ground-dwelling wide-ranging fauna and their associated high value habitats (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) References: Department of Environment and Conservation (2012); DPaW (2012); Watson (2018); Yeatman and Groom (2012); Bain (2018)	
Brush-tailed Phascogale: Occurs at low densities in the Northern Jarrah Forest in dry sclerophyll forest and open woodlands that contain hollow-bearing trees but a sparse groundcover, with home ranges varying in size from 20 to 70 ha. There are few known records of this species from across the Project area. Vegetation types as high value habitat includes: Bullich Forest; and Jarrah-Marri Forest. *Chuditch:* Given large home ranges which may overlap, Chuditch require habitats of suitable size and not excessively fragmented and adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows). To be suitable as dens logs must have a diameter >30 cm and a hollow with 7 – 20 cm in diameter and a minimum length of 1 m but preferably 3 m. Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Granite Outcrop; and Jarrah-Marri Forest. *Quenda:* Inhabit a variety of forest, woodlands, shrub and heath. The main habitat requirement is dense ground cover at ground level. For shelter the Quendas build a nest consisting of leaf litter over a shallow depression concealed next to or under logs, shrubs or piles of debris. They will also use burrows of other species. Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Flooded Gum Woodland; and Melaleuca Dampland. *Western Brush Wallaby:* Widespread and found in open forest and woodland, particularly with open seasonally wet flats, low grasses and open scrubby thickets. Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Flooded Gum Woodland; Granite Outcrop; Jarrah-Marri Forest; and Melaleuca Dampland. *Woylie:* Although habitat suitability varies across its range, where home ranges vary between male and females (pending densities), Woylies may persist where there is adequate fox and cat controls, within tall Eucalypt forest and woodland, dense Myrtaceous shrubland (or Kwongan or Mallee heath). Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; and Flooded Gum Woodland.	• Feral cats, foxes and pigs • Inappropriate fire regimes • Land clearing • Habitat fragmentation / alteration • Climate change • *Phytophthora* dieback
Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali) References: Department of Environment and Conservation (2013); Speldewinde *et al.* (2013); Bain (2018); GHD (2024)	
Quokka: Inhabits a variety of forest including: woodland; forest; coastal heath; thicket; and riparian vegetation. Low density of woody debris, complex vegetation structure (minimum of 3 layers) and habitat heterogeneity are important factors driving occupancy. Habitat requirements in the Northern Jarrah Forest is defined as complex mosaic of recently burnt areas and long unburnt areas (swamps). Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Flooded Gum Woodland; and Melaleuca Dampland. *Rakali:* Also known as the Water Rat, and is identifiably by its large size, thick otter-like fur and a thick tail. Occupies a wide variety of freshwater habitats with a diversity of structural habitats and typically live in the vicinity of permanent bodies of fresh, brackish, estuarine, or marine water, lakes and farm dams. In the south west they prefer dense riparian vegetation, with higher water quality and a degree of habitat complexity with sunken logs and roots. They sleep in a burrow in the bank of a creek with the entrance hidden under roots or in a hollow log. There are few known records of this species from across the Project area. Vegetation types as high value habitat includes: Flooded Gum Woodland; and Melaleuca Dampland	• Feral cats, foxes and pigs • Inappropriate fire regimes • Land clearing • Habitat fragmentation and alteration • *Phytophthora* dieback • Altered hydrological regimes • Climate change
Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle) References: Department of Environment and Conservation (2008); Department of Parks and Wildlife (2013); Bain (2018); GHD (2024)	
Baudin's Black Cockatoo: Mature Marri, Karri, and Jarrah in the lower southwest with large hollows, with peak breeding season occurring in October – December. Breeding occurs in tree hollows that are 2.5 – 12 m above ground and to be considered suitable, hollows need to have an entrance diameter of 30 – 40 cm with a depth of >30 cm. Trees with hollows suitable for breeding are likely to be 500 mm or greater at DBH. Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Flooded Gum Woodland; Granite Outcrop; Jarrah-Marri Forest; and Melaleuca Dampland. *Carnaby's Black Cockatoo:* Widespread distribution and display a seasonal migratory pattern linked to breeding. Breeding (July – December) occurs in inland Eucalypt woodland that provide nest hollows for breeding. Breeding activity is mainly documented to occur in the Wheatbelt region. Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Flooded Gum Woodland; Granite Outcrop; Jarrah-Marri Forest; and Melaleuca Dampland. *Forest Red-tailed Black Cockatoo*: Breed in large hollows of mature Marri and Jarrah and Karri in the lower southwest, with peak breeding season occurring in October – December. Breeding occurs in tree hollows that are 2.5 – 12 m above ground and to be considered suitable, hollows need to have an entrance diameter of 30 – 40 cm with a depth of >30 cm. Trees with hollows suitable for breeding are likely to be 500 mm or greater at DBH. Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Flooded Gum Woodland; Granite Outcrop; Jarrah-Marri Forest; and Melaleuca Dampland. *Masked Owl:* The largest owl in the south west region. Occurs in open forest (wet and dry sclerophyll, non-eucalypt dominated), open woodlands, farmlands and riparian woodlands. It requires large hollows in old growth eucalypts and often favours areas with dense understorey. Nests are usually in large hollows within trunks or near-vertical spouts of tall Eucalypt trees (18 – 30 m above ground) with an entrance diameter between 40 – 60 cm and with an approximate depth of 2.5 m and with a floor space of 50 cm. There are few known records of this species from across the Project area. Vegetation types as high value habitat includes: Bullich Forest; and Jarrah-Marri Forest. *Peregrine Falcon:* This species is a large falcon species which prefers areas with deep gorges or large cliff faces with riparian or plain habitat surrounding forests and clearings. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows. It is wide-ranging, mobile and aerial in nature and is considered likely to utilise the forest and woodland habitats, despite there being few known records of this species from across the Project area. Vegetation type as high value habitat includes: Jarrah-Marri Forest. *Western False Pipistrelle*: Small bats (average weight of 21 grams) that primarily occur in wet sclerophyll forest of Karri, Jarrah and Tuart and semi-woodland of the south west. They roost in hollows in old trees, branches and stumps, in colonies of 5 to 30 bats. An insectivore species associated with old large trees that provides the species with its preferred feeding opportunities. There are few known records of this species from across the Project area. Vegetation types as high value habitat includes: Blackbutt Forest; Bullich Forest; Jarrah-Marri Fores; and Melaleuca Dampland.	• Loss of breeding habitat • Tree health decline • Land clearing • Feral honeybees • Illegal shooting • Illegal taking • Climate change • *Phytophthora* dieback
Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder) References: Craig *et al.* (2018); Queensland Government (2022); GHD (2024)	
Dell's Skink: Inhabits Jarrah and Marri forest and woodland, with shrub-dominated understorey on lateritic, clay and sandy soils. Also inhabits dry sclerophyll forest on granite outcrops, stony hills, and ranges. It is uncommon, patchily distributed and ecologically specialised and is somewhat widespread. There are few known records of this species from across the Project area. Vegetation types as high value habitat includes: Granite Outcrop; and Jarrah-Marri Forest.	*Southern Death Adder* • Vehicle strike • Land clearing

Knowledge of Fauna Specific High Value Habitats	Potential Impacts / Threats
Southern Death Adder: Lives in a variety of well-drained habitats, including: wet sclerophyll forest; woodland; shrubland; grassland; and coastal heathlands. Prefers sites with deep fixed leaf litter. Individuals burrow into sand or leaf litter or hide under overhanging foliage. This species is highly cryptic as it awaits ambush in thick leaf litter and is often only visible when basking or active. Mating occurs in spring however females reproduce only once every second year. They produce live young, typically born in February or March, with litter size varying between two and forty-two. There are few known records of this species from across the Project area. Vegetation types as high value habitat includes: Granite Outcrop; and Jarrah-Marri Forest.	• Inappropriate / altered fire regimes • Predation by feral cats and foxes • Death by taking poisoned rodents *Dell's Skink* • Vehicle strike • Land clearing • Inappropriate fire regimes • Predation by feral cats and foxes
Aquatic fauna and their associated high value habitats (Carter's Freshwater Mussel; Minute Freshwater Snail) References: Bunn *et al.* (2013); Klunzinger and Walker (2014); Klunzinger *et al.* (2015); WRM (2022) DWER, Healthy Rivers (2024)	
Carter's Freshwater Mussel: Occurs in freshwater lakes, rivers and streams (with a mean salinity <1.6 mg/L). Greatest densities are associated with submerged tree roots (*Eucalyptus rudis*, *Melaleuca* species, and other species), woody debris and overhanging riparian vegetation near stream banks and edges of lakes / dams. There are few known records of this species from across the Project area. *Minute Freshwater Snail:* This species is typically associated with gravel riffle habitats in less disturbed, vegetated, seasonal headwater tributaries with low salinity and turbidity. It is considered to be widespread in distribution but occurs at low abundance across its known range (WRM, 2022) and is typically restricted to forest streams with intermittent flow regimes (Bunn *et al.* 2013). There are few known records of this species from across the Project area.	Primary Threats: • Salinity: Low salinity tolerance (stress response above 1.3 mg/L with mortality rates increasing rapidly to around 3.0 mg/L). • Dewatering: Dehydration resulting from reduced flow and removal of water from regulated rivers and dams. Secondary Threats: • Pollution / contamination • Increased sedimentation from runoff from surrounding cleared areas • Agriculture • Recreational activities • Invasive aquatic species • Habitat shifting and alteration • Climate change • Altered hydrological regimes

2.4.3 Key Assumptions and Uncertainties

Assumptions

It is assumed that active identification and management of conservation significant fauna and their associated high value habitats (i.e. streamzones, granite outcrops, Black Cockatoo nest and significant tree/s) will demonstrate that potential impacts resulting from Alcoa's operations are avoided and minimised. LDA and MAZ have been applied to prevent and minimise impacts to various high value habitats (e.g. LDA for streamzone vegetation and major granite outcrops) and for specific species such as the three species of Black Cockatoos and Woylie (applied MAZ). Several of the conservation significant terrestrial fauna species occurring across the Project, such as the Quokka, Rakali, Woylie, and Chuditch, are associated with water systems (i.e. streamzone vegetation). An extensive water system traverses the majority of ML1SA, and it is therefore assumed that the terrestrial fauna species that utilise high value streamzone vegetation and other riparian vegetation will continue to utilise and move through the Project area via this network of streamzone vegetation (Bamford Consulting Ecologists, 2024). These streamzone vegetation areas and networks are primarily retained and avoided throughout the Project, except in the event of crossings, and therefore are considered to provide intact ecological linkages and corridors for fauna and their movements across the landscape.

As the Project's mining activities aim to avoid and minimise, to the extent practicable, interaction with the groundwater table, and minimise impacts to surface water flows, Alcoa reasonably considers that there are no foreseen significant impacts to the aquatic freshwater population/s of Carter's Freshwater Mussel or the Minute Freshwater Snail (*Glacidorbis occidentalis*), in relation to both groundwater quality and quantity. Additionally, there is increased understanding of the known population locations of Carter's Freshwater Mussel and Minute Freshwater Snail across the Project, and these will be avoided during operations where possible. However, if disturbance to a known Carter's Freshwater Mussel and / or Minute Freshwater Snail population cannot be avoided, permanent relocation and / or translocation (species-dependent) of the population/s will be undertaken, in accordance with a Relocation Management Plan or Translocation Management Plan to be approved under the BC Act and in consultation with the DBCA. Further information relating to Alcoa's management of water resources across the Project is provided in Alcoa's Huntly and Willowdale Mines Water Resources Management Plan (Rev 1) (Alcoa of Australia Limited, 2023b).

Over the last 200 years the magnitude and rate of changes has increased within the Northern Jarrah Forest and beyond into the forest ecosystems of the south-west of Western Australia, due to: disturbance from mining, timber harvesting and water abstraction; clearing for townsites, agriculture and infrastructure; the introduction and spread of exotic diseases, weeds and pest animals; and changing bushfire events (CPC, 2023). The areas in which Alcoa operates also supports high levels of nature-based recreation and tourism, such as camping, hiking and mountain biking. These anthropogenic disturbances have resulted in changes to fauna populations (Stantec, 2023) and the cumulative effects of these disturbances have also resulted in a number of vertebrate species being listed as Endangered or Vulnerable under the EPBC Act and BC Act.

Uncertainties

There has currently been limited population-specific studies undertaken for conservation significant fauna to assist in understanding the long-term natural population viability and movements of these species within and outside the mine regions. Additionally, there is limited regional and local data to assist in understanding fauna habitat utilisation and spatial and temporal variability of these species.

There is limited data on the sensitivity of conservation significant fauna species in response to any increase in dust, noise and vibration levels. There is also limited understanding and knowledge around future population responses to cumulative impacts resulting from anthropogenic disturbances (for example nature-based recreation and tourism, such as camping, hiking and mountain biking) across the Project. The areas in which Alcoa operates is also subject to pressures from firewood harvesting.

There is limited understanding of the long-term behaviour of Black Cockatoo species in relation to their use of nesting trees and their movements between, or abandonment of nesting trees, however research programmes will be undertaken to gain greater understanding to further inform management.

There is limited knowledge on the potential impacts from climate change on fauna habitats in conjunction with mining activities (for example the impacts of a drying climate on Carter's Freshwater Mussel and Minute Freshwater Snail populations). The CPC (2023) considers that the cumulative effects of climate change are likely to have significant impacts on some vegetation communities occurring across the Northern Jarrah Forest, however there are high levels of uncertainty in regard to the magnitude of effect on climate change to the forest ecosystems.

Currently there is also limited understanding of potential for SRE invertebrates and their habitats across the mine regions, however a programme to increase Alcoa's understanding has commenced to increase knowledge of SRE invertebrates across the Project, and this Fauna MP will be revised as required in accordance with the adaptive management approach to further address SREs across the Project.

3 Exploration Phase Components

This section of the Fauna MP defines the monitoring and management components to ensure that potential impacts associated with exploration activities are avoided or otherwise minimised.

3.1 Overview of Exploration Activities

Exploration drilling provides detailed information to support Alcoa's long-term strategic decisions and planning for near term future mine development and occurs target areas outside of Alcoa's current mining operational envelope.

Alcoa undertakes two styles of drilling campaign to obtain information for mine planning purposes. Although using different drilling techniques, both types of drilling are aligned in operating practices and risk management controls to ensure minimal to no ground disturbance within ML1SA.

Exploration and development drilling is used to define the lateral and vertical extents of ore bodies, understanding the location and quality of bauxite and improve the confidence of tonnes and grade estimations. It represents the bulk of drilling activity and utilises a fleet of tractor-mounted drill rigs, which have been modified to operate in forested areas with minimal ground disturbance. While this fleet uses drilling techniques generally used in the WA mining sector, it has been customised to be compact and self-contained (no support trucks). This suits the environment and the smaller diameter shallow holes it drills.

Exploration drilling targets areas outside of Alcoa's current mining operational envelope with a broader extent but less intense activities, namely 240 m x 60 m or 120 m x 60 m drilling densities. The results from this drilling activity are used to inform longer-term strategic business decisions. The maximum number of holes drilled per year does not exceed 105,00 and being tractor mounted riggs (3 m in width) these are more suitable for drilling in a forested area, and therefore no clearing takes place, minimising impacts to the environment.

Development drilling activity enables improved resource knowledge, evaluation of future mine development options, and accurate identification of the proposed clearing boundaries. This drilling is completed in three phases of targeted drilling, namely 60 m x 60 m, 30 m x 30 m and 15 m x 15 m drilling densities.

In 2021, Alcoa completed a review of bauxite resources in previously mined areas to optimise reserves within ML1SA. This work identified the need for additional Strategic Exploration Drilling (SED) in various areas to provide early, additional information on mineralisation presence, extent, quality, and continuity.

Exploration drill holes are not undertaken within the mapped streamzone vegetation, and for areas where vegetation mapping has not been undertaken, drilling will not be undertaken within derived streamzone vegetation until mapping is undertaken[12]. Dieback mapping is carried out over a significant proportion of planned drilling areas, and where mapping has not been undertaken prior to exploration drilling, drilling is restricted to occur under dry soil conditions. Where dieback mapping has been undertaken, drill rigs and any other vehicles will be appropriately cleaned prior to entry and when moving into dieback free or uninterpretable. Preference of dieback areas for drilling during wetter periods at the start and end of the season are the main dieback control measures.

3.1.1 Supplementary Drilling

Alcoa is proposing to undertake a small volume of supplementary drilling, namely diamond drilling or triple tube aircore as part of ongoing exploration activities. This work aims to improve Alcoa's knowledge of the regolith profile, water tables, geophysical and metallurgical properties of bauxite. It will provide additional information that may be required to support mining studies with respect to approvals, mining and processing.

Alcoa plans to hire the most suitable drill rigs available that can operate without the requirement to construct tracks, pads or sumps. The drill rigs will be of a compact design utilising a method to recirculate and contain drilling fluids for off pad disposal. Drill rigs accessing uncleared forest will be mounted on metal tracks helping to minimise soil compaction. Holes will be of a diameter up to 140 mm with a maximum depth of 60 m, holes will be backfilled in accordance with Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) draft exploration and prospecting rehabilitation guidance (DEMIRS, 2022).

[12] Excludes any requirement/s for drilling for bores or geological investigation.

The environmental impacts of this activity are considered to be low as there will be less than 50 holes per annum that will be drilled. The path to the drill location will be pre-planned and marked to ensure the rig can access with minimal disturbance to the forest.

In the event that ground disturbance is visibly greater than the typical exploration and development tractor-mounted drill rigs, appropriate rehabilitation of that disturbance will be undertaken. Rehabilitation will be back to a level equivalent to the disturbance that typically results from the exploration and development tractor-mounted drill rigs traversing through the forest. Such rehabilitation can be completed through the use of manual hand tools; however, the specific methodology will be dictated by the scale and nature of the disturbance.

3.2 Potential Impacts and Mitigation Measures

Potential impacts associated with exploration drilling may include habitat loss through vegetation disturbance whilst traversing through native vegetation, injury or mortality of fauna (e.g. from vehicle strikes) and potential indirect impacts from the generation of dust, noise and vibration during exploration activities.

Table 3-1 below outlines the key environmental values, potential impacts and mitigation measures for the Project during the exploration phase.

Table 3-1 Key Fauna Values and Potential Impacts / Risk During the Exploration Phase and Associated Mitigation Measures

Fauna Value	Potential Impacts / Risk	Avoid / Minimise
Ground-dwelling wide-ranging fauna and their associated high value habitat		
Brush-tailed Phascogale Chuditch Quenda Western Brush Wallaby Woylie	**Direct Impact: Habitat Disturbance** • Habitat loss through vegetation disturbance whilst traversing native vegetation. • Potential loss of fauna individuals whilst traversing native vegetation. Exploration activities are expected to have minimal disturbance as there is no clearing of trees and minimal disturbance to native vegetation whilst traversing forest to access exploration areas.	• Land will not be disturbed outside the Darling Range exploration disturbance footprint (refer to Figure 2-3). • New exploration drill holes will be appropriately backfilled, capped or plugged immediately after drilling to prevent fauna entrapment, utilising drill spoil and / or loose materials where available. • Appropriate environmental assessment following guidelines and / or internal database review will be undertaken prior to exploration activities to understand fauna values within exploration areas where required.
Ground-dwelling streamzone fauna and their associated high value habitat		
Rakali Quokka	**Direct Impact: Habitat Disturbance** • Habitat loss through vegetation disturbance whilst traversing native vegetation. • Potential loss of fauna individuals whilst traversing native vegetation. Exploration activities are expected to have minimal disturbance as no exploration drilling is conducted within the mapped streamzone vegetation.	• Appropriate environmental assessment and / or internal database review will be undertaken prior to exploration activities to understand fauna values within exploration areas where required. • No drill holes are undertaken within mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation (excluding any requirement/s for drilling for bores or geological investigation).
Birds and bats and their associated high value habitat		
Baudin's Black Cockatoo Carnaby's Black Cockatoo Forest Red-tailed black cockatoo Masked Owl Peregrine Falcon Western False Pipistrelle	**Direct Impact: Habitat Disturbance** • Habitat loss through vegetation disturbance whilst traversing native vegetation. • Potential loss of individuals in roosts whilst traversing native vegetation. Exploration activities are expected to have minimal disturbance as there is no clearing of trees and minimal disturbance to native vegetation whilst traversing forest to access exploration areas.	• No exploration activity disturbance predicted in biologically diverse areas such as major granite outcrops (>1 ha + 50 m buffer). • Exploration activities will not be undertaken within the applied MAZ for known or potential Black Cockatoo nest and significant tree/s. • Exploration activities will not be undertaken within 50 metres of known or potential Black Cockatoo nest and significant trees on or after 1 January 2027. • Assessments for terrestrial fauna will be undertaken according to relevant guidelines to inform exploration planning.
Reptile fauna and their associated high value habitat		
Dell's Skink Southern Death Adder	**Direct Impact: Habitat Disturbance** • Habitat loss through vegetation disturbance whilst traversing native vegetation. • Potential loss of fauna individuals whilst traversing native vegetation. Exploration activities are expected to have minimal disturbance as there is no clearing of trees and minimal disturbance to native vegetation whilst traversing forest to access exploration areas.	• No exploration activity disturbance predicted in biologically diverse areas such as major granite outcrops (>1 ha + 50 m buffer). • No exploration activities undertaken within Old Growth Forest, National Parks / formal conservation reserves. • New exploration drill holes will be appropriately backfilled, capped or plugged immediately after drilling to prevent fauna entrapment, utilising drill spoil and / or loose materials where available. • Appropriate environmental assessment and / or internal database review will be undertaken prior to exploration activities to understand fauna values within exploration areas.
Aquatic fauna and their associated high value habitat		
Carter's Freshwater Mussel Minute Freshwater Snail	**Direct Impact: Habitat Disturbance** None predicted as no exploration drilling is conducted within the mapped steam zone vegetation and water bodies.	• Appropriate environmental assessment and / or internal database review will be undertaken prior to exploration activities to understand fauna values within exploration areas. • No drilling is undertaken within mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation (i.e. in the absence of vegetation mapping) streamzone vegetation (excluding any requirement/s for drilling for bores or geological investigation). • Known population/s will be avoided during exploration activities.
All conservation significant fauna and their associated high value habitat		
Ground-dwelling wide-ranging Ground-dwelling streamzone Birds and bats Reptile fauna Aquatic fauna	**Indirect Impact:** Introduction of and / or spread of *Phytophthora* dieback (and other disease such as *Armillaria*), and introduction of and / or spread of weeds.	• Where dieback mapping has not been carried out prior to exploration drilling, vehicles will be inspected to ensure external cleanliness prior to entry, and drilling will only occur under dry soil conditions. • Where dieback mapping has been undertaken prior to exploration drilling, drill rigs and any other vehicles will be appropriately cleaned prior to entry and when moving into dieback free or uninterpretable, as is the preference for start and end of seasonal wetter periods.
	Other threatening processes Indirect impacts from dust, noise and vibration during exploration activities.	• Appropriate speed limits along access tracks are established. • Forest track usage restricted at night to authorised personnel only and in the event of emergency and is limited to 40 kph at night, to reduce interactions with and minimise hazards to nocturnal fauna movements. • Regular inspection of machinery and equipment to ensure operating as expected and are not causing additional / excess noise and / or vibration.
	Introduced Feral Predators Through creation of access roads and tracks causing direct loss or injury to, individual native fauna.	• Any food brought to exploration areas will be stored in containers with secure lids and food wastes will be bagged and appropriately disposed off-site. • Fauna will not be fed or interacted with. • No domestic animals / pets are to be brought on site. • Sightings of feral animals within exploration areas to be recorded by personnel for improved feral animal movement, location and understanding and to inform additional feral animal monitoring.

3.3 Exploration Phase Provisions

Direct impacts (e.g. habitat disturbance), and indirect impacts (e.g. introduction and spread of *Phytophthora* dieback, vehicle strike, noise, vibration) on all fauna groups and their associated high value habitats during Alcoa's exploration programmes are predicted to be unlikely due to the lower impact nature of the activity.

To ensure that exploration activities do not result in greater impacts than that predicted (via avoid / minimise) both outcome-based, and objective-based provisions have been adopted for all fauna groups and their associated habitats, except for an outcome-based provision for aquatic fauna and their associated high value habitats.

- Environmental outcome:
    - Ensure no adverse direct impact (clearing) from exploration activities on conservation significant species and their associated high value habitats during the exploration phase.
- Environmental objective:
    - Ensure no adverse indirect impact from exploration activities on conservation significant species and their associated high value habitats during the exploration phase.

The protection of major granite outcrops and streamzone vegetation is measurable and reportable, therefore an outcome-based provision is adopted.

Outcome-based and objective-based provisions applied during the exploration phase are detailed in Tables 3-2 and 3-3.

The potential indirect impacts such as vehicle strike, noise, dust, vibration and risk of spread of *Phytophthora* dieback is more challenging to measure, therefore objective-based provisions have been applied.

Further, potential risks from general activities such as fire, noise, vibration, light and dust are provided in Table 6-1, as relevant during all mine phases.

Supplementary provisions regarding monitoring techniques and improvement of knowledge around conservation significant fauna and utilisation of associated high value habitats are provided in Table 5-4.

Detailed descriptions of the proposed monitoring data collection and analyses are provided in Appendix A (Table A-1). This Fauna MP will be updated as per the adaptive management approach as outlined in section 7.

Table 3-2 Outcome-based Provisions - Exploration Phase[13]

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Outcome:** Ensure no adverse direct impact (habitat disturbance) from exploration activities on conservation significant fauna and their associated high value habitats during the exploration phase. **Key impacts and risks**: Potential direct impacts (habitat disturbance) during exploration activities.			
Criteria Indicator / Fauna Value	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Ground-dwelling wide-ranging fauna and their associated high value habitat (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) **Reptile fauna and their associated high value habitat (Dell's Skink; Southern Death Adder)**			
Trigger Criteria 1 Required exploration activities are identified to be on trajectory towards (within 30 m) of the MAZ for: • major granite outcrops (>1 ha + 50 m buffer).	**Trigger level action:** • Undertake review of exploration phase plans, and final drill holes and tracks. • If applicable, conduct in-field assessment to confirm disturbance. • If avoidance can be achieved, update procedures and exploration plans accordingly. • Re-assess work practices and procedures. • Re-assess training requirements. If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to exploration activities, implement trigger level response actions in consultation with relevant stakeholders, for example: • Rehabilitation.	• In-field assessment as relevant per request (exploration plan and drill hole locations). • Annual audit of activities and review of internal protocols, where relevant. • Annual spatial database review of Protection Zones, LDA and MAZ. • Refer to Figure 2-3.	The compliance assessment report will include discussion around the assessment/s and whether revision of the trigger criterion is required.
Birds and bats and their associated high value habitat (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)			

Trigger Criteria 2
Required exploration activities are identified to be on trajectory towards the applied MAZ[14] for known or potential Black Cockatoo nest and significant tree/s.
	Trigger level action:
	• Undertake review of:
	  ○ Exploration phase plans;
	  ○ Black Cockatoo nest and significant tree/s assessments, including maps and spatial database; and
	  ○ Chance Find Procedure (refer to Appendix F).
	• If applicable, conduct in-field assessment to confirm disturbance.
	• f avoidance can be achieved, update procedures and exploration plan accordingly. If the MAZ can't be avoided, Alcoa will provide, to the satisfaction of the State Development Minister, a written report explaining why the relevant avoidance cannot be met prior to the clearing being undertaken.
	• Re-assess work practices and procedures.
	• Re-assess work practices and procedures.
	• Re-assess training requirements.
	If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to exploration activities, implement trigger level response actions in consultation with relevant stakeholders, for example:
	• Rehabilitation.
		• In-field assessment as relevant per request (exploration plan and drill hole locations).
		• Annual audit of activities and review of internal protocols, where relevant.
		• Annual spatial database review of Protection Zones, LDA and MAZ.
		• Refer to Figures 2-10 and 2-11.
			The compliance assessment report will include discussion around the assessment/s and whether revision of the trigger criterion or objective is required.

Threshold Criteria 1 Required exploration activities have intruded into any of the MAZ listed below (associated with exploration drilling activities): • major granite outcrops (> 1 ha + 50 m buffer); or • the applied MAZ[13] for known or potential Black Cockatoo nest and significant tree/s.	**Threshold contingency actions**: As above, including the addition of: If avoidance cannot be achieved, Alcoa must provide, to the satisfaction of the State Development Minister, a written report explaining why the relevant avoidance cannot be met prior to the exploration being undertaken.	• In-field assessment as relevant per request (exploration plan and drill hole locations). • Annual audit of activities and review of internal protocols, where relevant. • Annual spatial database review of Protection Zones, LDA and MAZ. • Refer to Figure 2-3, Figures 2-10 and 2-11.	In the event that monitoring, or surveys indicate exceedance of the threshold, the exceedance will be reported to the State Development Minister in writing within 21 days of the exceedance being identified. The compliance assessment report will include discussion around the assessment/s and whether revision of the management objective or criteria is required.

[13] As per the EP (Darling Range Bauxite Mining) Exemption Order 2023 "Exploration" is defined as: *activities carried out in search of minerals, including (without limitation) (a) mapping; (b) surveying; (c) drilling; (d) the collection of and assaying of soil, rock, groundwater, and minerals samples; and (e) other activities involving the application of 1 or more of the geological sciences*.

[14] Within 10 m of a Black Cockatoo nesting tree or a Huntly mine Black Cockatoo significant tree or; on or after 1 January 2027 within 50 m of a Black Cockatoo nesting tree (in accordance with the Compliance Assessment Plan prepared in accordance with Clause 9 of SL 2023/200).

Table 3-3 Objective-based Provisions - Exploration Phase[15]

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Objective:** Ensure no adverse indirect impact from exploration activities on conservation significant fauna and their associated high value habitats during the exploration phase. **Key impacts and risks**: Potential indirect impacts (vehicle movements, spread of *Phytophthora* dieback) during exploration activities.			
Management Target / Fauna Value	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Ground-dwelling wide-ranging fauna and their associated high value habitats (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) **Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali)** **Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder)** **Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)**			
Target 1 Avoid or otherwise minimise fauna entrapment in exploration drill holes.	• New exploration drill holes will be appropriately backfilled, capped or plugged immediately after drilling to prevent fauna entrapment, and where any open drill hole is observed opportunistically, these will be remediated as per above. • Where available, drill spoil and loose earth materials will be used as exploration drill hole backfill.	• Reconciliation assessment for exploration drill hole activities once specific exploration area is completed. • Exploration drill hole reconciliation assessment through relevant drilling database. • Opportunistic review of exploration disturbance. • Monitoring / audit of completed exploration drill holes.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required. Reporting to DBCA under the BC Act for threatened fauna, if required.
Target 2 Avoid or otherwise minimise mortality and injury to conservation significant fauna individuals and their associated high value habitats as a result of exploration activities and vehicle movements.	• Ensure appropriate environmental assessment undertaken prior to exploration activities, where required. • Ensure the applied MAZ[13] for known or potential Black Cockatoo nest and significant tree/s is adhered to, avoiding disturbance to these high value habitats. • Utilise custom-built exploration drill rigs suitable for forested areas to minimise disturbance (e.g. compact machinery with higher ground clearance). • The use of access tracks will be minimised with no unnecessary tracks created. • Appropriate speed limits for access tracks are established, and all personnel required to drive to conditions. • Induction training and ongoing training for exploration personnel to include fauna species risks and correct handling and reporting of injured fauna (in accordance with DBCA Standard Operating Procedures (DBCA, 2023)). • Where required for specific personnel, additional animal handling training by external service provider will be undertaken. • All litter will be removed from exploration sites and disposed of appropriately. • Fauna will not be fed or interacted with. • Maintain fauna incident register ensuring fauna deaths are recorded, including species and location. • Establish (if required) and maintain Protection Zones, LDA and MAZ, and ensure these areas are incorporated into the mine planning process and internal spatial database.	• Pre-drilling inspections where high fauna values have been identified during the assessment process. • Reconciliation of the exploration plan, access tracks and exploration drill hole tracking against the environmental assessment. • Opportunistic review of exploration disturbance. • Regular review of fauna incident register, and identification of any potential fauna strike 'hot spots'.	
Target 3 Avoid or otherwise minimise the spread of *Phytophthora* dieback.	• Boundaries of dieback mapped areas are marked in-field (e.g. flagging) and available on GIS (i.e. infested, uninfested, uninterpretable) along access tracks, and appropriate portable washdown equipment is established where practicable. • Ensure dieback management procedures are implemented during exploration activities. • All personnel will refer and adhere to internal dieback reassessment standard and process, with guidance from the DBCA *Phytophthora* Dieback Management Manual (DBCA, 2020). • Where *Phytophthora* dieback mapping has not been carried out prior to exploration drilling, drilling will only occur during dry soil conditions and all vehicles and equipment will be inspected prior to entry to drilling area. • Where *Phytophthora* dieback mapping has been undertaken prior to exploration drilling, drill rigs and any other vehicles will be appropriately cleaned prior to entry and when moving into dieback free or uninterpretable.	• Opportunistic visual observations during activities. • Dieback hygiene mapping is undertaken to provide initial interpretation to provide historical reference. Once mapping is completed, it is valid for 12 months. Subsequently dieback lines are periodically reassessed where future activities are planned. Active dieback edges are assessed for changes in addition to assessment of dieback free forest areas to determine any new spot infections.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali) **Aquatic fauna and their associated high value habitats (Carter's Freshwater Mussel; Minute Freshwater Snail)**			

[15] As per the EP (Darling Range Bauxite Mining) Exemption Order 2023 "Exploration" is defined as: *activities carried out in search of minerals, including (without limitation) (a) mapping; (b) surveying; (c) drilling; (d) the collection of and assaying of soil, rock, groundwater, and minerals samples; and (e) other activities involving the application of 1 or more of the geological sciences*.

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Objective:** Ensure no adverse indirect impact from exploration activities on conservation significant fauna and their associated high value habitats during the exploration phase. **Key impacts and risks**: Potential indirect impacts (vehicle movements, spread of *Phytophthora* dieback) during exploration activities.			
Management Target / Fauna Value	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Target 4 No exploration drilling is undertaken within the mapped or derived (i.e. in the absence of vegetation mapping) streamzone vegetation[16].	• Exploration drilling will only occur within approved areas. • Review of mapped and derived streamzone vegetation prior to conducting drilling. • Establish (if required) and maintain Protection Zones, LDA and MAZ, and ensure these areas are incorporated into the mine planning process and internal spatial database.	• Pre-drilling inspections. • Opportunistic review of exploration disturbance. • Post-exploration activity inspections. • Reconciliation of the exploration plan, access tracks and drill hole tracking against the environmental assessment. • Review of mapped and derived streamzones as required. • Annual spatial database review of Protection Zones, LDA and MAZ.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
Target 5 Avoid and otherwise minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spill) outside of containment infrastructure.	• Ensure adequate maintenance of vehicles and machinery and undertake pre-mobilisation inspections. • Induction training for exploration personnel to include spills management (including prevent, minimise, escalate and clean up, and report). • Ensuring vehicles and / or machinery carry appropriate spill clean-up kits which are regularly maintained and replaced as required. • Any contaminated soils to be collected, transported, and disposed to an appropriately licensed facility.	• Opportunistic review of exploration disturbance. • Post-exploration activity inspections. • Review of mapped and derived streamzones as required.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.

[16] Excludes any requirement/s for drilling for bores or geological investigation.

4 Construction Phase Components

4.1 Overview of Construction Activities

Prior to entering an area, the State has the right to remove from the area any merchantable timber or other forest products. Alcoa are responsible for harvesting activities in the majority of mining areas. Harvesting is a separate activity, independent of mining.

Soil is stripped in two layers including a surface layer of topsoil (~ 150 mm) and a thicker layer (average 400 mm) of overburden. The topsoil contains majority of seeds, organic material, plant nutrients and microbial activity and is an important resource for rehabilitation. The topsoil for direct return is stripped to 75 mm to avoid diluting the seed resource that is concentrated within the top 50 – 75 mm of the topsoil. This process involves stripping from an area that is about to be mined and returning the soil to an area that is being rehabilitated within three months. This avoids long term storage in a stockpile, which can cause degradation of the biological components of the topsoil. When topsoil must be stockpiled for more than three months before being used in rehabilitation, it is stripped to a depth of 150 mm. The overburden, which extends to the top of the cemented caprock layer, is stockpiled next to the mined area to be returned to the pit floor during rehabilitation.

Construction operations generate noise and light emissions which can disturb or displace fauna, causing them to potentially avoid using habitat in those areas. Construction activities are typically limited to daytime operations where practicable, unless required to be undertaken during nighttime hours for a specific construction programme. Construction areas operating at night will be illuminated by mobile towers, however permanent and / or temporary lighting is positioned to minimise the artificial light directed to adjacent native vegetation, adjacent fauna underpasses / culverts, and streamzone vegetation, whilst maintaining a safe working environment for personnel. Nighttime noise and light emissions may disturb nocturnal fauna including Chuditch, Quokka, Western False Pipistrelle and Masked Owl. The effects of noise and light emissions on fauna will be localised and temporary for the duration of construction in a given area.

4.2 Potential Impacts and Mitigation Measures

Proposed clearing areas for ore bodies and associated mine infrastructure, including haul piles and stockpile locations have the potential to impact fauna through:

- habitat loss and fragmentation through clearing of ore bodies, mine access and haul roads, conveyors and facilities;
- introduction and / or spread of weeds and *Phytophthora* dieback;
- spills and / or leaks from hydrocarbons (vehicles and machinery); and
- other threatening processes such as the generation of fire, dust, noise, light and vibration.

Table 4-1 below outlines the key environmental values, potential impacts and mitigation measures associated with the Project during the construction phase.

Table 4-1 Key Fauna Values and Potential Impacts / Risk During the Construction Phase and Associated Mitigation Measures

Factor / Value	Potential Impacts / Risk	Avoid / Minimise
Ground-dwelling wide-ranging fauna and their associated high value habitats		
Brush-tailed Phascogale Chuditch Quenda Western Brush Wallaby Woylie	**Direct Impact: Clearing** • Habitat loss through construction of mine access and haul roads, conveyors and facilities (including mine pits). • Potential injury/ mortality to fauna whilst construction of mine access and haul roads, conveyors and facilities.	• No construction activities will occur within Old Growth Forest. • No construction activities will occur within National Parks / formal conservation reserves. • No construction activities will occur in biologically diverse areas such as major granite outcrops (>1 ha + 50 m buffer). • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform mine plan development, to identify constraints, protect and manage important fauna environmental values, taking into account assessments undertaken during the construction phase as appropriate. • During construction activities, where required, a suitably qualified and experienced fauna spotter will undertake appropriate conservation significant fauna monitoring or relocations in accordance with methodologies described within authorisation/s under the BC Act and in accordance with DBCA Standard Operating Procedures.
Ground-dwelling streamzone fauna and their associated high value habitats		
Rakali Quokka	**Direct Impact: Clearing** • Habitat loss through construction of mine access and haul road within streamzones. • Potential injury/ mortality to fauna whilst construction of mine access and haul roads within streamzones.	• Disturbance will be minimised in biologically diverse areas such as mapped or derived streamzones vegetation. • Stream crossings will be constructed which facilitates their removal, rehabilitation and reinstatement of water flows after use. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform mine plan development, to identify constraints, protect and manage important fauna environmental values, taking into account assessments undertaken during the construction phase as appropriate.
Birds and bats and their associated high value habitats		
Baudin's Black Cockatoo Carnaby's Black Cockatoo Forest Red-tailed black cockatoo Masked Owl Peregrine Falcon Western False Pipistrelle	**Direct Impact: Clearing** • Habitat loss through vegetation disturbance whilst clearing during construction.	• No construction activities will occur within the applied MAZ of known or potential Black Cockatoo nest and significant tree/s. • Construction contractors and personnel inducted on avoidance of Black Cockatoo nest and significant tree/s. • Black Cockatoo breeding trees with suitable hollows within the Project areas identified from pre-clearance surveys to be retained are taped off in the field and will be clearly marked on construction drawings and documentation. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform mine plan development, to identify constraints, protect and manage important fauna environmental values, taking into account assessments undertaken during the exploration phase as appropriate.
Reptile fauna and their associated high value habitats		
Dell's Skink Southern Death Adder	**Direct Impact: Clearing** • Habitat loss through construction of mine access and haul roads, conveyors and facilities. • Potential injury/ mortality to fauna whilst construction of mine access and haul roads, conveyors and facilities.	• No construction activities will occur within Old Growth Forest. • No construction activities will occur within National Parks / formal conservation reserves. • No construction activities will occur in biologically diverse areas such as major granite outcrops (>1 ha + 50 m buffer). • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform mine plan development, to identify constraints, protect and manage important fauna environmental values, taking into account assessments undertaken during the exploration phase as appropriate.
Aquatic fauna and their associated high value habitats		
Carter's Freshwater Mussel Minute Freshwater Snail	**Direct Impact: Clearing** • Clearing to construct stream crossings may influence habitat characteristics and / or water regimes.	• Disturbance will be minimised in biologically diverse areas such as crossings in mapped and derived (i.e. in the absence of mapping) streamzone vegetation. • Clearing or construction activities required within mapped and derived (i.e. in the absence of mapping) streamzones will occur during summer or autumn months, as far as practicable. • Stream crossings will be constructed which facilitates their removal, rehabilitation and reinstatement of water flows after use. • Haul road crossings over streams / streamzones will be re-aligned where possible to avoid any known populations of Carter's Freshwater Mussel and Minute Freshwater Snail. If disturbance to known Carter's Freshwater Mussel and / or Minute Freshwater Snail population/s cannot be avoided, permanent relocation and / or translocation (species-dependent) of the population/s will be undertaken, in accordance with a Relocation Management Plan and Translocation Management Plan approved under the BC Act and in consultation with the DBCA. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform mine plan development, to identify constraints, protect and manage important fauna environmental values, taking into account assessments undertaken during the exploration phase as appropriate.
All conservation significant fauna and their associated high value habitats		
Ground-dwelling wide-ranging Ground-dwelling streamzone Birds and Bats Reptile Fauna Aquatic Fauna	**Indirect Impact: Spread of *Phytophthora* dieback (and other disease e.g. *Armillaria*)** • Movement of vehicles and machinery and clearing activities may introduce and / or spread *Phytophthora* dieback. • *Phytophthora* dieback may be introduced and / or spread via altered surface water flows as a result of construction activities.	• Maintain Alcoa's established *Phytophthora* dieback management procedures. • Boundaries of dieback mapped areas are marked in-field (e.g. flagging) and available on GIS (i.e. infested, uninfested, uninterpretable) along access tracks, and appropriate portable washdown equipment is established where practicable. • Personnel will refer and adhere to Alcoa's internal dieback reassessment standard and process, with guidance from the DBCA *Phytophthora* Dieback Management Manual (DBCA, 2020).
	Other threatening processes	• Appropriate speed limits for locations are / will be established and all personnel required to drive to conditions.

Factor / Value	Potential Impacts / Risk	Avoid / Minimise
	• Indirect impacts from dust, noise and vibration generated during construction activities. • Increased presence of weeds, noise, dust, and fauna interactions may change / influence behaviour (e.g. breeding) and use of high value habitats within and immediately adjacent to the construction area/s. • Blasting and/ or mine pit construction may cause structural damage to habitat/s and / or may change influence / behaviour.	• 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. • Forest track usage restricted at night to authorised personnel only and in the event of emergency and is limited to 40 kph at night, to reduce interactions with and minimise hazards to nocturnal fauna movements. • Regular inspection of machinery and equipment to ensure operating as expected and are not causing additional / excess noise and / or vibration. • Permanent and / or temporary lighting positioned so as to minimise the artificial light directed to adjacent native vegetation, adjacent fauna underpasses / culverts, and streamzone vegetation, whilst maintaining a safe working environment for personnel.
	Introduced Predators • Through creation of access roads and tracks causing direct loss or injury to, individual fauna.	• Any food brought to exploration areas will be stored in containers with secure lids and food wastes will be bagged and appropriately disposed off-site. • Fauna will not be fed or interacted with. • No domestic animals / pets are to be brought on site. • Sightings of feral animals within construction areas to be recorded by personnel for improved understanding and to inform additional feral animal monitoring / control.

4.3 Construction Phase Provisions

Direct impacts (e.g. clearing), and indirect impacts (e.g. introduction and spread of *Phytophthora* dieback, vehicle strikes, noise, vibration) on all fauna groups and their associated high value habitats during Alcoa's construction program will adhere to the mitigation hierarchy to avoid and / or minimise risk as a result of construction activities.

To ensure that potential impacts associated with construction activities are not greater than those predicted (via avoid / minimise) both outcome-based and objective-based provisions have been adopted for all fauna groups and their associated high value habitats.

- Environmental outcome:
    - Ensure no adverse direct impact (clearing) from construction activities on conservation significant species and their associated high value habitats during the construction phase.
- Environmental objective:
    - Ensure no adverse indirect impact from construction activities on conservation significant species and their associated high value habitats during the construction phase.

The protection of major granite outcrops and streamzone vegetation is measurable and reportable, therefore outcome-based provisions have been adopted.

The potential indirect impacts such as vehicle strikes, noise, dust, vibration and risk of spread of dieback is difficult to quantifiably measure, therefore objective-based provisions have been adopted.

Outcomes and management-based provisions during the construction phase are detailed in Table 4-2 and Table 4-3.

Further, potential risks from general activities such as fire, noise, vibration, light and dust are provided in Table 6-1, as relevant during all mine phases.

Supplementary provisions regarding monitoring techniques and improvement of knowledge around conservation significant fauna and utilisation of associated high value habitats are provided in Table 5-4.

Detailed descriptions of the proposed monitoring data collection and analyses are provided in Appendix A (Table A-1). This Fauna MP will be updated as per the adaptive management approach as outlined in section 7.

Table 4-2 Outcome-based Provisions - Construction Phase

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Outcome:** Ensure no adverse direct impact (clearing) from construction activities on conservation significant fauna and their associated high value habitats during the construction phase. **Key impacts and risks**: Potential direct impacts (clearing) during construction activities.			
Criteria Indicator / Fauna Value	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Ground-dwelling wide-ranging fauna and their associated high value habitats (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) **Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder)**			
Trigger Criterion 1 Required construction activities are identified to be on trajectory towards (within 30 m) any of the MAZ listed below: • Old Growth Forest; or; • National Parks; or • formal conservation reserves; or • major granite outcrops (>1ha + 50m buffer); • known Woylie population/s; or • identified active Chuditch den/s[17].	**Trigger level action:** • Undertake review of Mine Plan and ensure Protection Zones, LDA and MAZ are incorporated into the Mine Plan process. • Reconciliation assessments including Protection Zones, LDA and MAZ and buffers, where applicable. • Review map layers where relevant, including any updates. • If relevant, conduct in-field assessment to confirm and / or verify potential exceedance. If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to construction activities, implement trigger level response actions in consultation with relevant stakeholders, for example: • Rehabilitation.	• Reconciliation assessment against clearing activities once specific clearing area is completed. • If triggered, an in-field assessment will be undertaken against trigger criteria. • Annual spatial database review of Protection Zones, LDA and MAZ. • Refer to Figure 2-3. • Refer to Appendix A (Table A-1) for detailed monitoring provisions.	The compliance assessment report will include discussion around the assessment/s and whether revision of the trigger criterion is required.
Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali) **Aquatic fauna and their associated high value habitats (Carters' Freshwater Mussel; Minute Freshwater Snail)**			
Trigger Criterion 2 Required construction activities (not including: streamzone crossings; access roads; and tracks) encroaches within 50 m buffer of the LDA of the 100 m mapped streamzone vegetation buffer.	**Trigger level action:** • Undertake review of Mine Plan and ensure Protection Zones, LDA and MAZ are incorporated into the Mine Plan process. • Reconciliation assessments including Protection Zones, LDA and MAZ and buffers, where applicable. • Review map layers where relevant, including any updates. • If relevant, conduct in-field assessment to confirm and / or verify potential exceedance. If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to construction activities, implement trigger level response actions in consultation with relevant stakeholders, for example: • Rehabilitation.	• Reconciliation assessment against clearing activities once specific clearing area is completed. • If triggered, an in-field assessment will be undertaken against trigger criteria. • Annual spatial database review of Protection Zones, LDA and MAZ. • Review of mapped and derived streamzones as required. • Refer to Figure 2-3.	The compliance assessment report will include discussion around the assessment/s and whether revision of the trigger criterion or objective is required.
Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)			
Trigger Criterion 3 Required construction activities encroaches (within 50 m) of the applied MAZ[18] for any known or potential Black Cockatoo nest and significant tree/s and its buffer (50 m).	**Trigger level action:** • Undertake review of Mine Plan and ensure Black Cockatoo Protection Zones and MAZ are incorporated into the Mine Plan process. • Reconciliation assessments including Black Cockatoo Protection Zones and MAZ and buffers, where applicable. • Review of Black Cockatoo nest and significant tree/s assessment including map layer/s and spatial database, where relevant. • If relevant, conduct in-field assessment to confirm and / or verify potential exceedance. • If avoidance can be achieved, update procedures and plan accordingly. If the applied MAZ[17] can't be avoided, Alcoa will provide, to the satisfaction of the State Development Minister, a written report explaining why the relevant avoidance cannot be met prior to the clearing being undertaken. • **If** avoidance can be achieved update procedures and clearing plans accordingly. If investigations and on-ground assessment (if applicable) indicate that the trigger exceedance is due to construction activities, implement trigger level response actions in consultation with relevant stakeholders, for example: • Rehabilitation.	• Reconciliation assessment against clearing activities once specific clearing area is completed. • Annual spatial database review of Black Cockatoo Protection Zones and MAZ. • If triggered, an in-field assessment will be undertaken against trigger criteria.	The compliance assessment report will include discussion around the assessment/s and whether revision of the trigger criterion or objective is required.

[17] At the time of publication, none identified, should any be identified this trigger and threshold criteria will be applied.

[18] Within 10 m of a Black Cockatoo nesting tree or a Huntly mine Black Cockatoo significant tree or; on or after 1 January 2027 within 50 m of a Black Cockatoo nesting tree (in accordance with the Compliance Assessment Plan prepared in accordance with Clause 9 of SL 2023/200).

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Outcome:** Ensure no adverse direct impact (clearing) from construction activities on conservation significant fauna and their associated high value habitats during the construction phase. **Key impacts and risks**: Potential direct impacts (clearing) during construction activities.			
Criteria Indicator / Fauna Value	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Threshold Criterion 1 Required construction activities (excluding haul roads) has intruded into any of the Protection Zone, LDA or MAZ listed below: • Yamba and Giles Protection Zones; • mapped streamzone vegetation; or • Old Growth Forest; or • National Parks; or • formal conservation reserves; or • major granite outcrops (>1ha + 50m buffer); or • known Woylie population/s; or • identified active Chuditch den/s[15]; or • any known or potential Black Cockatoo nest and significant tree/s and its buffer (50m).	**Threshold contingency actions**: As above, including the addition of: If avoidance cannot be achieved, Alcoa must provide, to the satisfaction of the State Development Minister, a written report explaining why the relevant avoidance cannot be met prior to the construction activity being undertaken.	• Annual audit of activities and review of internal protocols, where relevant. • Annual spatial database review of Protection Zones, LDA and MAZ. • Review of mapped and derived streamzones as required.	In the event that monitoring, or surveys indicate exceedance of the threshold, the exceedance will be reported to the State Development Minister in writing within 21 days of the exceedance being identified. The compliance assessment report will include discussion around the assessment/s and whether revision of the management objective or criteria is required.

Table 4-3 Objective-based Provisions – Construction Phase

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Objective:** Ensure no adverse indirect impacts from construction activities on conservation significant fauna and their associated high value habitats during the construction phase. **Key impacts and risks**: Potential indirect impacts during construction activities.			
Management Target / Fauna Value	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Ground-dwelling wide-ranging fauna and their associated high value habitats (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) **Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali)** **Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)** **Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder)**			

Target 1
Avoid or otherwise minimise mortality and injury to conservation significant fauna individuals and their associated high value habitats as a result of construction activities and vehicle movements.
	• Undertake appropriate baseline and pre-clearance surveys, based on objectives, existing available data, information required and the scale and nature of the potential impacts of the construction activities.
	• Survey methodologies, if and where applicable will consider the application of:
	  ○ Primary techniques (e.g., EPA technical guidance); and
	  ○ Special purpose techniques (e.g., DCEEWW), where necessary.
	• As far as practicable, clearing will be undertaken progressively and in one direction towards native vegetation to allow fauna dispersal into adjacent habitat.
	• Construction to generally occur during daytime hours, avoiding peak nocturnal animal activity. Construction during nighttime hours will be avoided as far as practicable but may be required subject to construction program.
	• Open excavations are minimised (e.g. sumps and trenches), and where required, appropriate fauna egress options (e.g. ramps and / or nets) will be installed, and lined sumps will have fencing or egress options.
	• Appropriate speed limits for locations are / will be established, and all personnel required to drive to conditions.
	• If fauna strike 'hot spots' identified, erect fauna warning signage along roads / tracks and encourage reduced speed limits.
	• Vehicles and machinery to be on designated roads or tracks.
	• Forest track usage restricted at night to authorised personnel only and in the event of emergency and is limited to 40 kph at night, to reduce interactions with and minimise hazards to nocturnal fauna movements.
	• Induction training for construction personnel to include fauna species risks and correct handling and reporting of injured fauna (in accordance with DBCA Standard Operating Procedures (DBCA, 2023)).
	• Maintain fauna incident register ensuring fauna deaths are recorded, including species and location.
	• Use of appropriately qualified fauna spotters during harvesting and clearing activities.
	• Establish (if required) and maintain Protection Zones, LDA and MAZ, and ensure these areas are incorporated into the mine planning process and internal spatial database.
		• Opportunistic visual observations during activities.
		• Review of clearing areas required.
		• Regular review of fauna incident register and identify any possible fauna strike 'hot spots' and undertake review of implemented management actions if required.
		• As per relevant technical primary and species purpose techniques guidelines for fauna assessments.
			If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
			Reporting to DBCA under the BC Act for threatened fauna, if required.

Target 2 Avoid or otherwise minimise the spread of *Phytophthora* dieback.	• Boundaries of dieback mapped areas are marked in-field (e.g. flagging) and available on GIS (i.e. infested, uninfested, uninterpretable) along access tracks, and appropriate portable washdown equipment is established where practicable. • Clearing will only be undertaken where dieback information and mapping of proposed disturbance area is less than 12 months old (dependent on any impact from bushfire). • Ensure dieback management procedures are implemented during construction activities. • Refer and adhere to Alcoa's internal dieback reassessment standard and process, with guidance from the DBCA *Phytophthora* Dieback Management Manual (DBCA, 2020). • Cleaning of vehicles, machinery and equipment will be undertaken as required, also considering construction activities pre- and post-seasonal rains / wetter periods. • Stockpile signage in place to identify soil materials obtained from dieback infested, dieback free or dieback uninterpretable areas.	• Opportunistic visual observations during activities. • Dieback hygiene mapping is undertaken to provide initial interpretation to provide historical reference. Subsequently dieback lines are periodically reassessed where future activities are planned. Active dieback edges are assessed for changes in addition to assessment of dieback free forest areas to determine any new spot infections. Reassessments are undertaken within 12 months of previous assessment and are guided by the DBCA *Phytophthora* Dieback Management Manual (DBCA, 2020).	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Objective:** Ensure no adverse indirect impacts from construction activities on conservation significant fauna and their associated high value habitats during the construction phase. **Key impacts and risks**: Potential indirect impacts during construction activities.			
Management Target / Fauna Value	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Target 3 All new active Chuditch den/s and / or known Woylie population/s and / or known or potential Black Cockatoo nest and significant tree/s have an applied MAZ.	• Ensure establishment of appropriate MAZ[19] applied to all identified values. • Ensure MAZ has been incorporated into mine planning process and internal spatial database. • Maintain Protection Zones, LDA and MAZ.	• Annual spatial database review of Protection Zones, LDA and MAZ. • Further studies as required to build knowledge base within these areas. • Refer to Table 5-4.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali) **Aquatic fauna and their associated high value habitats (Carter's Freshwater Mussel; Minute Freshwater Snail)**			
Target 4 Avoid or otherwise minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.	• Ensure adequate maintenance of vehicles and machinery and undertake pre-mobilisation inspections. • Induction training for construction personnel to include spills management (including prevent, minimise, escalate and clean up, and report). • Ensuring vehicles and / or machinery carry appropriate spill clean-up kits which are regularly maintained and replaced as required. • Any contaminated soils to be collected, transported, and disposed to an appropriately licensed facility.	• Opportunistic review of construction disturbance. • Review of mapped and derived streamzones as required. • Post-clearing inspections.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
Target 5 Avoid or otherwise minimise fragmentation of high value habitats, as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).	• Establish (if required) and maintain Protection Zones, LDA and MAZ, and ensure these areas are incorporated into the mine planning process and internal spatial database (for example streamzone vegetation providing retained fauna corridors). • Construction of fauna underpasses via multi-use culverts where appropriate for long-term infrastructure, with consideration of appropriate placement in the landscape (e.g. streamzone vegetation and mid-slope), and preferably within areas that are known to support high quality vegetation and high levels of faunal abundance.	• Opportunistic review of construction disturbance. • Post-clearing inspections. • Regular review of Protection Zones, LDA and MAZ.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.

[19] MAZ for values will be designed with appropriate stakeholders taking into account conservation advice, feedback, condition requirements and landscape and connectivity.

5 Operational Phase Components

5.1 Overview of Operational Activities

Bauxite occurs in tabular ore pods that vary in depth from 2 – 10 m with an average depth of about 3.5 m. The ore is overlayed with gravel and soils varying in depth from 0 – 1.5 m. The upper part of the ore frequently presents as cemented caprock, ranging in thickness from 0 – 2.5 m. Beneath the caprock is a friable zone that merges into clay and uneconomic quantities of alumina.

Due to the nature of the ore pods, the mine is characterised by a constantly moving mining footprint followed by progressive rehabilitation. The mine consists of a mosaic of shallow mine pits, located within the ore pods, linked via a network of haul roads to a centrally located crusher and facilities area.

Soil is stripped in two layers including a surface layer of topsoil (~ 150 mm) and a thicker layer (average 400 mm) of overburden.

The topsoil contains the majority of seeds, organic material, plant nutrients and microbial activity and is an important resource for rehabilitation. The topsoil for direct return is stripped to 75 mm to avoid diluting the seed resource that is concentrated within the top 50 – 75 mm of the topsoil. This process involves stripping from an area that is about to be mined and returning the soil to an area that is being rehabilitated within three months. This avoids long term storage in a stockpile, which can cause degradation of the biological components of the topsoil. When topsoil has to be stockpiled for more than three months before being used in rehabilitation, it is stripped to a depth of 150 mm.

The overburden, which extends to the top of the cemented caprock layer, is stockpiled next to the mined area to be returned to the pit floor during rehabilitation.

The bauxite ore deposit that frequently presents as cemented caprock is broken either by blasting or by ripping with a large bulldozer. Blasting uses conventional Ammonium Nitrate - Fuel Oil (ANFO) explosives.

The broken cemented caprock and the underlying friable bauxite are removed by excavators and loaded on haul trucks. The mining fleet is diesel fuelled and includes excavators, loaders, trucks and earthmoving equipment. The mining fleet is diesel fuelled and includes excavators, loaders, trucks and earthmoving equipment.

The bauxite is trucked via a network of haul roads to Run of Mine (ROM) pads for primary and secondary crushing. The crushed ore is transported via a conveyor to stockpiles at the Pinjarra or Wagerup Refinery.

5.2 Potential Impacts and Mitigation Measures

The following operational activities have the potential to impact conservation significant fauna and their associated high value habitats:

- extension of mining and operation of mining and haulage equipment;
- introduction and spread of weeds / and or *Phytophthora* dieback and / or other forest disease such as *Armillaria*;
- spills and leaks from hydrocarbons (vehicles and machinery);
- the generation of dust, noise and light emissions;
- fauna encounters and fauna strike by vehicles and machinery; and
- altered hydrological regimes.

Table 5-1 below outlines the key environmental values, potential impacts and mitigation measures associated with the operational phase of the Project.

Table 5-1 Key Fauna Values and Potential Impacts / Risk During the Operational Phase and Associated Mitigation Measures

Fauna Value	Potential Impacts / Risk	Avoid / Minimise
Ground-dwelling wide-ranging fauna and their associated high value habitats		
Brush-tailed Phascogale Chuditch Quenda Western Brush Wallaby Woylie	**Direct Impact:** **Operational activities related to bauxite mining and transport.** Potential injury / mortality to fauna during operations and transport.	• Disturbance will be minimised in biologically diverse areas such as major granite outcrops (>1 ha + 50 m buffer) • No mining will occur within the MAZ of Old Growth Forest, National Parks / formal conservation reserves, major granite outcrops (>1 ha + 50 m buffer), and known or potential Black Cockatoo nest or significant tree/s. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform the operational management objective, to identify constraints, protect and manage important fauna environmental values, considering assessments undertaken during the exploration and construction phase as appropriate. • Appropriate speed limits for locations are / will be established.
Ground-dwelling streamzone fauna and their associated high value habitats		
Quokka Rakali	**Direct Impact:** **Operational activities related to bauxite mining and transport.** Potential injury / mortality to fauna during operations and transport.	• Disturbance will be minimised in biologically diverse areas such as mapped or derived streamzone vegetation. • Stream crossings will be constructed which facilitates their removal, rehabilitation and reinstatement of pre-disturbance water flows after use. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform the operational management objective, to identify constraints, protect and manage important fauna environmental values, considering assessments undertaken during the exploration and construction phase as appropriate.
Birds and bats and their associated high value habitats		
Baudin's Black Cockatoo Carnaby's Black Cockatoo Forest Red-tailed Black Cockatoo Masked Owl Peregrine Falcon Western False Pipistrelle	**Direct Impact:** **Operational activities related to bauxite mining and transport.** Potential injury / mortality to fauna during operations and transport.	• No mining will occur within the MAZ of Old Growth Forest, National Parks / formal conservation reserves, major granite outcrops (>1 ha + 50 m buffer), and known and potential Black Cockatoo nest or significant tree/s. • Mining operations contractors and personnel inducted on avoidance of known and potential Black Cockatoo nest and significant trees. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform the operational management objective, to identify constraints, protect and manage important fauna environmental values, considering assessments undertaken during the exploration and construction phase as appropriate.
Reptile fauna and their associated high value habitats		
Dell's Skink Southern Death Adder	**Direct Impact:** **Operational activities related to bauxite mining and transport.** Potential injury / mortality to fauna during operations and transport.	• Disturbance will be minimised in biologically diverse areas such as major granite outcrops (>1ha + 50 m buffer). • No mining will occur within the MAZ of Old Growth Forest, National Parks / formal conservation reserves, major granite outcrops (>1 ha + 50 m buffer), and known and potential Black Cockatoo nest or significant tree/s. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform the operational management objective, to identify constraints, protect and manage important fauna environmental values, considering assessments undertaken during the exploration and construction phase as appropriate. • Appropriate speed limits for locations are / will be established.
Aquatic fauna and their associated high value habitats		
Carter's Freshwater Mussel Minute Freshwater Snail	**Direct Impact:** **Operational activities related to bauxite mining and transport.** Potential injury / mortality to fauna during operations and transport.	• Disturbance will be minimised in biologically diverse areas such as mapped or derived streamzone vegetation. • Stream crossings will be constructed which facilitates their removal, rehabilitation and reinstatement of pre-disturbance water flows after use. • Surveys and assessments for terrestrial fauna and inland waters according to relevant guidelines will be undertaken to inform the operational management objective, to identify constraints, protect and manage important fauna environmental values, considering assessments undertaken during the exploration and construction phase as appropriate.
All conservation significant fauna and their associated high value habitats		
Ground-dwelling wide-ranging Ground Dwelling streamzone Birds and Bats Reptile Fauna Aquatic Fauna	**Indirect Impact: Spread of *Phytophthora* dieback (and other disease e.g. *Armillaria*)** • Movement of vehicles and machinery may introduce and / or spread *Phytophthora* dieback. • *Phytophthora* dieback may be introduced and / or spread via altered surface water flows as a result of operational activities.	• Maintain Alcoa's established *Phytophthora* dieback management procedures. • Boundaries of dieback mapped areas are marked in-field (e.g. flagging) and available on GIS (i.e. infested, uninfested, uninterpretable) along access tracks. • Provision of appropriate portable washdown equipment where practicable. • Regular checks of tyres and undersides of vehicles and equipment to ensure cleanliness and free of soil material (e.g. sods).
	Other Threatening Processes: Fire, vehicle and machinery movement, fauna encounters interactions, weeds (and disease), noise and vibration, dust and light which may change / influence behaviour and use of habitat/s.	• Appropriate speed limits for locations are / will be established. • Regular checks of tyres and undersides of vehicles and equipment to ensure cleanliness and free of soil material (e.g. sods) to ensure potential weed infested materials are not spread and / or introduced into new areas. • Permanent and / or temporary lighting positioned so as to minimise the artificial light directed to adjacent native vegetation, adjacent fauna underpasses / culverts, and streamzone vegetation, whilst maintaining a safe working environment for personnel.
	Introduced Feral Predators Through creation of access roads and tracks causing direct loss or injury to, individual fauna.	• Any food brought to operational areas will be stored in containers with secure lids and food wastes will be bagged and appropriately disposed off-site. • Fauna will not be fed or interacted with. • No domestic animals / pets are to be brought on site. • Sightings of feral animals within operational areas to be recorded by personnel for improved feral animal movement, location and understanding and to inform additional feral animal monitoring.

5.3 Operational Phase Provisions

Direct impacts (e.g. clearing) and indirect impacts (e.g. introduction and spread of *Phytophthora* dieback, vehicle strikes, noise, vibration) on all fauna groups and their associated high value habitats, during Alcoa's operational (active mining) phase will adhere to the mitigation hierarchy to avoid and / or minimise risks as a result of operational activities.

To ensure that potential impacts associated with the Project's operational phase are not greater than those predicted (avoid / minimise) both outcome-based and objective-based provisions have been adopted for all fauna groups and their associated high value habitats.

- Environmental outcome:
    - Ensure no adverse direct impact to associated high value fauna habitats from operational activities during the operational phase.
- Environmental objective:
    - Ensure no adverse indirect impact from operational activities on conservation significant species and their associated high value habitats during the operational phase.
    - Improve knowledge of conservation significant species and utilisation of associated high value habitats

The protection of major granite outcrops and streamzone vegetation is measurable and reportable, therefore an outcome-based provision has been adopted.

The potential indirect impacts such as vehicle strikes, noise, dust, vibration and risk of spread of *Phytophthora* dieback are difficult to quantifiably measure, therefore objective-based provisions have been adopted in relation to these potential indirect impacts.

Outcome-based and objective-based provisions during the operational phase are detailed in Tables 5-2 and 5-3.

Further, potential risks from general activities such as fire, noise, vibration, light and dust are provided in Table 6-1, as relevant during all mine phases.

Supplementary provisions regarding monitoring techniques and improvement of knowledge around conservation significant fauna and utilisation of associated high value habitats are provided in Table 5-4.

Detailed descriptions of the proposed monitoring data collection and analyses are provided in Appendix A (Table A-1). This Fauna MP will be updated as per the adaptive management approach as outlined in section 7.

Some operational monitoring aspects of Tables 5-2 and 5-3 below involves a phased process as baseline data and knowledge are still captured during earlier mine phases, exploration and construction, thus provisions for tentative schedule of operational commencement are outlined below.

The operational monitoring provisions in Tables 5-2 and 5-3 (and also within Appendix A Table A-1 – operational provisions) refers to the period following handover from the construction phase through operations until commencement of the rehabilitation phase and aligning with long-term mine planning.

Table 5-2 Outcome-based Provisions - Operational Phase[20]

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Outcome:** Ensure no adverse direct impacts from operational activities on conservation significant fauna and their associated high value habitats during the operational phase. **Key impacts and risks**: Potential direct impacts during operational activities.			
Criteria Indicator / Fauna Value	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Ground-dwelling wide-ranging fauna and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle) **Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali)** **Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)** **Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder)**			

Early Response Criterion 1
In-field assessment indicates trending towards potential compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation sites and / or major granite outcrop vegetation sites since baseline and compared to reference sites.
	Early response actions:
	• Investigate potential exceedance by:
	  ○ Review degree of infrastructure (access roads) disturbance;
	  ○ Review reference data to ascertain if changes have also occurred at reference sites; and
	  ○ Review site and tree condition to determine if other factors may have caused the change (e.g. fire, storm, insect activity, etc).
		• Annual in-field assessment (for changes in strata outside of normal seasonal variation) of selected sites (refer to Appendix A, Table A-1).
		• Refer to Figure 2-3.
		• Monitoring provisions for vegetation critical strata levels (i.e. streamzone and major granite outcrops) and weed species will commence Q3 2025.
			If the criterion was exceeded during the reporting period, the compliance assessment report will include supporting monitoring results, if relevant to the exceedance.

Early Response criterion 2 Weed species recorded within a monitoring area (mapped or derived streamzone vegetation sites and / or granite outcrop vegetation sites) which has not been previously recorded during historic surveys.	**Early response actions:** • Where any new weed incursions are found, they will be appropriately treated, removed and managed as soon as is reasonably practicable. • Review recorded weed species against current Western Australian Organism List (DPIRD, 2024), Weeds of National Significance (WoNS; Invasive Plants and Animals Committee, 2016) and DBCA (2014) weed species' ecological impact and invasiveness rankings for the south west and update internal database where required. • Review vehicle and machinery hygiene practices. • If required, undertake targeted weed mapping / assessment.	• Opportunistic visual observations and annual in-field assessments in high-risk areas such as drainage lines / streamzones and areas of high importance to terrestrial fauna. • If available, periodic review of existing targeted weed mapping / assessments. • Refer to Figure 2-3. • Monitoring provisions for vegetation critical strata levels (i.e. streamzone and major granite outcrops) and weed species will commence Q3 2025.	If the criterion was exceeded during the reporting period, the compliance assessment report will include supporting monitoring results, if relevant to the exceedance. If required, reporting under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) for any recorded Declared Pest weed species.
Ground-dwelling wide-ranging fauna and their associated high value habitats (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) **Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali)** **Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)** **Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder)**			
Trigger Criterion 1 In-field assessment indicates statistically significant compositional change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation sites and / or major granite outcrop sites since baseline and compared to reference sites.	**Trigger level actions:** **Investigate potential cause of exceedance by review of:** • Mine Plan; • Internal incident report/s relating to operational activities; • Site-specific observations; operation works extent and predictions; and • Relevant Operational plan/s. **If warranted (investigations and in-field assessments indicate that trigger exceedance is attributable to Alcoa's operational activities), implement trigger level actions which may include:** • Update any relevant operational procedures; • Re-assess work practices and training requirements; • Update relevant operational plan/s; • Investigate potential for rehabilitation; and • Other measures as agreed by relevant stakeholder/s. If assessments indicate that threshold criteria are likely to be exceeded and attributable to Alcoa's operational activities then consult with DBCA and the MMPLG to investigate further contingency actions.	• Annual in-field assessment (for changes in strata outside of normal seasonal variation) of selected sites. • Refer to Figure 2-3. • Monitoring provisions for vegetation critical strata levels (i.e. streamzone and major granite outcrops) and weed species will commence Q3 2025.	The compliance assessment report will include discussion around the assessment/s and whether revision of the trigger criterion or objective is required.

[20] As per the EP (Darling Range Bauxite Mining) Exemption Order 2023 "Mining activities" mean (a) extraction and processing of bauxite from mineral reserves below the surface of the earth, including but not limited to (i) the removal of topsoil and overburden, (ii) blasting, ripping or otherwise breaking caprock to expose bauxite, (iii) removal of bauxite, (iv) crushing of bauxite, (v) transport of bauxite to a refinery and (b) activities that are preparatory to, incidental to or consequential upon extraction and processing of bauxite, including but not limited to (i)exploration, (ii) land clearing, (iii) the construction or maintenance of mining infrastructure, and (iv) rehabilitation

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Outcome:** Ensure no adverse direct impacts from operational activities on conservation significant fauna and their associated high value habitats during the operational phase. **Key impacts and risks**: Potential direct impacts during operational activities.			
Criteria Indicator / Fauna Value	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Trigger Criterion 2 Weed species recorded within mapped or derived streamzone vegetation sites and / or granite outcrop vegetation sites which has not previously been recorded during historic surveys and is classified by DBCA (2014) as having high ecological impact and low feasibility of control and exceeds 30% of total understorey cover.	**Trigger contingency actions:** **Investigate potential cause of exceedance by review of:** • Mine Plan; • Reference site data; • Causal environmental factors; • Review recorded weed species against current Western Australian Organism List (DPIRD, 2024), Weeds of National Significance (WoNS; Invasive Plants and Animals Committee, 2016) and DBCA (2014) weed species' ecological impact and invasiveness rankings for the south west and update internal database where required. If warranted (investigations and in-field assessments indicate that trigger exceedance is Attributable to Alcoa's operational activities): • Appropriately treat, remove and manage as soon as is reasonably practicable. • Undertake targeted weed mapping / assessment.	• Opportunistic visual observations, where any new weed incursions are found they will be treated and managed appropriately. • Annual in-field assessment (for changes in strata outside of normal seasonal variation) of selected sites (as above) to also record any weeds. • Weed monitoring program to identify weed species (and priority) weed control methods, incorporated into GIS system. • If available, periodic review of existing targeted weed mapping / assessments. • Refer to Figure 2-3. • Monitoring provisions for vegetation critical strata levels (i.e. streamzone vegetation sites and major granite outcrop vegetation sites) and weeds will commence Q3 2025.	If the trigger criterion was exceeded during the reporting period, the compliance assessment report will discuss potential contributing factors for trigger level exceedance including a description of their effectiveness. If required, reporting under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) for any recorded Declared Pest weed species.
Ground-dwelling wide-ranging fauna and their associated high value habitats (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) **Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali)** **Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)** **Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder)**			
Threshold criterion 1 In-field assessments and visual observations indicate statistically significant change/s in critical strata levels (e.g. understorey indicator species such as *Gahnia trifida*) of mapped or derived streamzone vegetation sites and / or major granite outcrop vegetation sites with no indication of recovery in native vegetation strata, abundance, cover and condition outside of natural variation since baseline and compared to reference sites and be attributable to Alcoa operational activities.	**Threshold contingency actions**: As above, including the addition of: **If exceedance of the threshold criteria is considered likely to be attributable to Alcoa's operational activities, implement action/s as agreed during prior consultation with relevant stakeholders, for example:** • Rehabilitation; • Other mitigation action/s as agreed with relevant stakeholder/s; • Implement, as appropriate recovery actions such additional remediation works. • Continue to implement recovery actions until confirmed that the impact is below criteria level.	• Annual in-field assessment (for changes in strata outside of normal seasonal variation) of selected sites. • Refer to Figure 2-3. • Monitoring provisions for vegetation critical strata levels (i.e. streamzone vegetation sites and major granite outcrop vegetation sites) and weeds will commence Q3 2025.	In the event that monitoring, or surveys indicate exceedance of the threshold, the exceedance will be reported to the State Development Minister in writing within 21 days of the exceedance being identified. The compliance assessment report will include discussion around the assessment/s and whether revision of the management objective or criteria is required.

Table 5-3: Objective-based Provisions – Operational Phase

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Objective:** Ensure no adverse indirect impacts from operational activities on conservation significant fauna and their associated high value habitats during the operational phase. **Key impacts and risks**: Potential indirect impacts during operational activities.			
Management Target / Fauna Value	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Ground-dwelling wide-ranging fauna and their associated high value habitats (Brush-tailed Phascogale; Chuditch; Quenda; Western Brush Wallaby; Woylie) **Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali)** **Birds and bats and their associated high value habitats (Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Masked Owl; Peregrine Falcon; Western False Pipistrelle)** **Reptile fauna and their associated high value habitats (Dell's Skink; Southern Death Adder)**			
Target 1 Avoid or otherwise minimise mortality and injury to conservation significant fauna individuals and their associated high value habitats as a result of operational activities.	• Appropriate speed limits for locations are / will be established, and all personnel required to drive to conditions. • Vehicles and machinery to be on designated roads or tracks. • Forest track usage restricted at night to authorised personnel only and at 40 kph and in the event of an emergency, to reduce interactions with and minimise hazards to nocturnal fauna movements. • Open excavations are minimised (e.g. sumps and trenches), and where required, appropriate fauna egress options (e.g. ramps) will be installed, and lined sumps will have fencing or egress options. • Maintain fauna incident register ensuring that in the event of a fauna death, these are recorded, including species and location. • If fauna strike 'hot spots' identified, erect fauna warning signage along roads / tracks and undertake review of speed limits and reduce if required. • Establish (if required) and maintain Protection Zones, LDA and MAZ, and ensure these areas are incorporated into the mine planning process. • Installation of appropriate constructed fauna habitats (e.g. rock and log piles) within rehabilitated areas (discussed further in separate rehabilitation document/s). • Construction of fauna underpasses via multi-use culverts where appropriate for long-term infrastructure, with consideration of appropriate placement in the landscape (e.g. streamzone vegetation and mid-slope), and within areas that are known to support high quality vegetation and high levels of faunal abundance.	• Opportunistic visual observations during activities. • Regular review of fauna incident register, and identification of any potential fauna strike 'hot spots'. • Refer to supplementary provisions for research programmes (Table 5-4, and Appendix A Table A-1). • Refer to Figures 2-12 and 2-13.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required. Reporting to DBCA under the BC Act for threatened fauna, if required.
Target 2 Avoid or otherwise minimise the spread of *Phytophthora* dieback.	• Boundaries of dieback mapped areas is mapped throughout the mine region areas (including within mine pits) and are signposted along access tracks and available on GIS (i.e. infested, uninfested, uninterpretable). • Provision of appropriate portable washdown equipment where practicable. • Clearing will only be undertaken where dieback information and mapping of proposed disturbance area is less than 12 months old (dependent on any impact from bushfire). • Ensure dieback management procedures are implemented during operational activities. • Refer and adhere to internal dieback reassessment standard and process, with guidance from the DBCA *Phytophthora* Dieback Management Manual (DBCA, 2020). • Cleaning of machinery and equipment will be undertaken as required. • Stockpile signage in place to identify soil materials obtained from dieback infested, dieback free or dieback uninterpretable areas.	• Opportunistic visual observations during activities. • Dieback hygiene mapping is undertaken to provide initial interpretation to provide historical reference. Subsequently dieback lines are periodically reassessed where future activities are planned. Active dieback edges are assessed for changes in addition to assessment of dieback free forest areas to determine any new spot infections. Reassessments (excluding of known dieback mapped areas) are undertaken within 12 months of previous assessment and in accordance with the *Phytophthora* Dieback Management Manual (DBCA, 2020).	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
Target 3 All new identified active Chuditch den/s and / or known Woylie populations and / or known or potential Black Cockatoo nest and significant tree/s have an applied MAZ.	• Ensure establishment of appropriate Protection Zones and MAZ applied to all identified values. • Ensure Protection Zones and MAZ has been incorporated into internal spatial database. • Maintain Protection Zones MAZ.	• Annual spatial database review of Protection Zones and MAZ. • Further studies as required build knowledge base within these areas. • Refer to Table 5-4 for supporting parameters.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Objective:** Ensure no adverse indirect impacts from operational activities on conservation significant fauna and their associated high value habitats during the operational phase. **Key impacts and risks**: Potential indirect impacts during operational activities.			
Management Target / Fauna Value	**Management Actions**	**Monitoring: Frequency and Location**	**Reporting**
Ground-dwelling streamzone fauna and their associated high value habitats (Quokka; Rakali) **Aquatic fauna and their associated high value habitats (Carter's Freshwater Mussel; Minute Freshwater Snail)**			
Target 4 Avoid or otherwise minimise impact to vegetation (e.g. streamzone vegetation) resulting from any discharge of environmentally hazardous material (e.g. hydrocarbon leaks or spills) outside of containment infrastructure.	• Ensure adequate maintenance of vehicles and machinery, and pre-mobilisation inspections are undertaken. • Induction training for operational personnel to include spills management (including prevent, minimise, escalate and clean up, and report). • Ensuring vehicles and / or machinery carry appropriate spill clean-up kits which are regularly maintained and replaced as required. • Any contaminated soils to be collected, transported, and disposed to an appropriately licensed facility.	• Opportunistic review of disturbance. • Review of mapped and derived streamzone vegetation as required. • Post-clearing inspections.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
Target 5 Maintain conservation significant aquatic fauna habitat values.	• Ensure adequate maintenance of vehicles and machinery, and pre-mobilisation inspections are undertaken. • Induction training for operational personnel to include spills management (including prevent, minimise, escalate and clean up, and report). • Ensuring vehicles and / or machinery carry appropriate spill clean-up kits which are regularly maintained and replaced as required. • Any contaminated soils to be collected, transported, and disposed to an appropriately licensed facility.	• Biennial aquatic fauna assessment (in the intermediate rainfall zone (IRZ) and the high rainfall zone (HRZ)). • Opportunistic review of disturbance. • Review of mapped and derived streamzone vegetation as required. • Refer to Figures 2-8 and 2-9.	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.
All terrestrial and aquatic fauna and their associated high value habitats			
Target 6 Avoid or otherwise minimise fragmentation of high value habitats, as far as reasonably practicable, by retaining ecological corridors / linkages (i.e. streamzone vegetation).	• Establish (fi required) and maintain Protection Zones, LDA and MAZ, and ensure these areas are incorporated into the mine planning process. • Retain vegetation corridors (ecological linkages, e.g. along streamzone vegetation) to facilitate fauna movement across the landscape. • Construction of fauna underpasses via multi-use culverts where appropriate for long-term infrastructure, with consideration of appropriate placement in the landscape (e.g. streamzone vegetation and mid-slope), and preferably within areas that are known to support high quality vegetation and high levels of faunal abundance.	• Opportunistic review of disturbance and mine planning. • Post-clearing inspections. • Regular review of Protection Zones, LDA and MAZ. • Refer to supplementary provisions for research programmes (Table 5-4, and Appendix A Table A-1). •	If the management action was conducted during the reporting period, the compliance assessment report will include discussion around the assessment/s and whether revision of the management action or target is required.

Table 5-4: Supplementary Provisions – Operational Phase

Supporting parameters / indicators for the trigger and threshold criteria			
Aspect	**Response Actions**	**Monitoring: Frequency and Location**	**Reporting**
Remote sensing of selected mapped or derived streamzone vegetation sites' overstorey canopy condition and cover. Remote sensing of selected major granite outcrop vegetation sites. Remote sensing of open forest habitat.	Supporting indicator, review will inform the trigger and threshold criteria.	Remotely sensed imagery of relevant vegetation condition and cover of selected sites (e.g. through the use of LiDAR) to monitor changes in vegetation strata outside of typical seasonal variation. The programme to commence Q3 2025.	If the trigger and/or threshold criterion was exceeded during the reporting period, the compliance assessment report will include supporting monitoring results, if relevant to the exceedance.
Research programmes to improve the knowledge of the ecology and biology of selected native fauna			
Research	**Objectives**	**Timing**	
Improve knowledge of Black Cockatoo species' usage of retained nesting trees.	The aim / objective with this research programme is to understand how Black Cockatoos utilise nest trees that are retained within the mining landscape. For more information refer to Appendix E.	The programme commenced in Q1 2021 and will undergo a review of assessment end of 2024.	
Improve knowledge of Black Cockatoo species' usage of artificial nest hollows.	The aim / objective with this research programme is to understand how Forest Red-tailed Black Cockatoos, Baudin's Black Cockatoos and Carnaby's Black Cockatoos utilise artificial nest hollows within the mine regions and surrounds. For more information refer to Appendix E.	The programme commenced in Q2 2024, results will be interpreted after one year and duration of monitoring will be reassessed.	
Improve knowledge of and identify locations of remnant mainland Quokka populations within the Alcoa's ML1SA.	The aim / objective with this research programme is to locate the remnant mainland Quokka population/s within Alcoa's mine lease. Should populations be identified, the extent of habitat use will be determined, considering disturbance history. For more information refer to Appendix E.	The programme commenced in Q3 2023, concluding Q4 2024, results to be published by Q4 2025.	
Improve knowledge of Chuditch ecology and use of a disturbed landscape within the Northern Jarrah Forest.	The aim / objective with this research programme is to improve knowledge of the temporal and spatial use of the Northern Jarrah Forest, including home range, den preferences, constructed habitat use and use of rehabilitation. For more information refer to Appendix E.	The programme commenced in mid-2024 and will run for 3 years.	
Improve knowledge of efficacy of feral species control to support threatened species conservation.	The aim / objective with this research programme is to improve knowledge around feral species movement through the mine landscape, utilising infrastructure corridors, and determine the most effective method of control. For more information refer to Appendix E.	The programme commenced in early 2024 and will undergo a review and assessment early / mid 2026.	
Improve knowledge and understanding of the use of fauna underpasses and / or multi-use culverts.	For more information refer to Appendix E.	The programme commenced in 2014 and has been undertaken periodically since that time, and will continue to be investigated as part of research programmes.	

6 Other Potential Impacts / Threats

This section of the Fauna MP details the general provisions from potential risks from general activities such as fire, noise, vibration, light and dust, as relevant during all mine phases, that have not already been considered in previous sections, including:

- fire;
- feral animals;
- noise and vibration; and
- dust and light.

The objective-based provisions for these threatening processes relevant to the Project are summarised in Table 6-1.

Table 6-1 Objective-based Provisions – General Provisions for potenial risks from general activities, subject during All Active Mine Phases

EPA Objectives To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected. **Objective:** Ensure no indirect impacts (from general activities) from exploration, construction and operational activities on conservation significant fauna during active mine phases. **Key impacts and risks**: Potential indirect impacts (fire, dust, noise, light) during Project activities.			
Management Target: **Fire** as a potential threatening process / indirect impact	**Management Actions:**	**Monitoring: Frequency and Location**	**Reporting**
Firefighting response procedures are in place including the provision and maintenance of firefighting equipment in accordance with the relevant fire safety standards.	• Appropriate equipment is to be available to control localised outbreaks of fire. • Ensure procedures are implemented to control fires. • Emergency response team are appropriately trained in fire response.	• Regular inspection and maintenance of equipment to ensure compliance with fire safety standards. • Inspection of hazard / incident records.	If the management action was not achieved during the reporting period, the annual report will include a description and analysis of event/s.
Management Target: **Feral animals** as a potential threatening process / indirect impact	**Management Actions:**	**Monitoring: Frequency and Location**	**Reporting**
Avoid or otherwise minimise the introduction and / or spread of feral animals by ensuring that feral animal control is regular, targeted and actions are implemented. No increase in feral animal abundance attributable to Alcoa's operations. Training material to contain information relevant to feral animals. Discourage presence of feral animals.	• Continued contribution to the Western Shield program in managing feral (foxes and cats) animals in the Northern Jarrah Forest. • The control program will engage with relevant stakeholders (e.g. DBCA) to assist in the development to ensure a robust approach in managing feral animals. • All personnel will be informed during training to report potential feral animal species in the fauna sighting register, and appropriate waste disposal for food scraps and other wastes to be disposed off-site. • No domestic animals / pets to be brought to site. • Feral fauna will not be fed or interacted with. • Future research programme will investigate appropriate targeted feral animal control if camera monitoring or the fauna register indicates an increase in feral predator movements.	• Regular inspections of training materials and fauna sighting records. • As part of research programme, where camera monitoring at selected fauna underpasses is undertaken, to understand feral fauna movements, where available.	If the management action was not achieved during the reporting period, the annual report will include a description and analysis of event/s.
Management Target: **Noise and vibrations** as a potential threatening process / indirect impact	**Management Actions:**	**Monitoring: Frequency and Location**	**Reporting**
Minimise the generation of noise and vibration as far as reasonably practicable during operational activities.	• Construction to generally occur during daytime hours, avoiding peak nocturnal animal activity. Construction during nighttime hours will be avoided as far as practicable but may be required subject to construction program. • Forest track usage restricted at night to authorised personnel only and at 40 kph and in the event of an emergency, to reduce interactions with and minimise hazards to nocturnal fauna movements.	• Regular inspections of activities, records and incidents. • Regular inspection of machinery and equipment to ensure operating as expected and are not causing additional / excess noise and / or vibration.	If the management action was not achieved during the reporting period, the annual report will include a description and analysis of event/s.
Management Target: **Dust and light** as a potential threatening process / indirect impact	**Management Actions:**	**Monitoring: Frequency and Location**	**Reporting**
Minimise dust deposition as far as reasonably practicable. Minimise effect of operational lighting as far as reasonably practicable.	• Dust suppression activities carried out (e.g. via water carts) during high level usage of haul roads. • Permanent and / or temporary lighting positioned so as to minimise the artificial light directed to adjacent native vegetation, adjacent fauna underpasses / culverts, and streamzone vegetation, whilst maintaining a safe working environment for personnel.	• Regular inspections of records and incidents. • Regular inspections of installed operational lighting, and planning procedures.	If the management action was not achieved during the reporting period, the annual report will include a description and analysis of event/s.

7 Adaptive Management and Review of the Fauna MP

The EPA defines adaptive management as a systematic approach to improving environment results and management practices during project implementation through the application of learning from monitoring of outcomes and management actions (Figure 7-1, EPA [2024]).

Alcoa is committed to undertaking this adaptive management approach for the Project which includes:

- identifying and defining fauna values and appropriate outcomes and objectives that are risk-based, specific, measurable, adequate and realistic;
- the ongoing collection and analysis of baseline and monitoring data and compare to baseline, historic, reference, local and regional data on a regular basis to determine potential impacts;
- evaluation of the effectiveness and relevance of management actions against the outcomes and objectives, and undertake reviews on an annual basis to determine if any changes to actions, targets or monitoring are required;
- evaluate existing methodologies and adopt new or additional monitoring methodologies where suitable;
- review and amend applicable protection and / or buffer zones with regard to data collection and analyses;
- undertake a range of research programmes relating to fauna and their habitats across the Project and applying knowledge gained to address any knowledge gaps; and
- undertake regular review of and respond to legislative requirements.

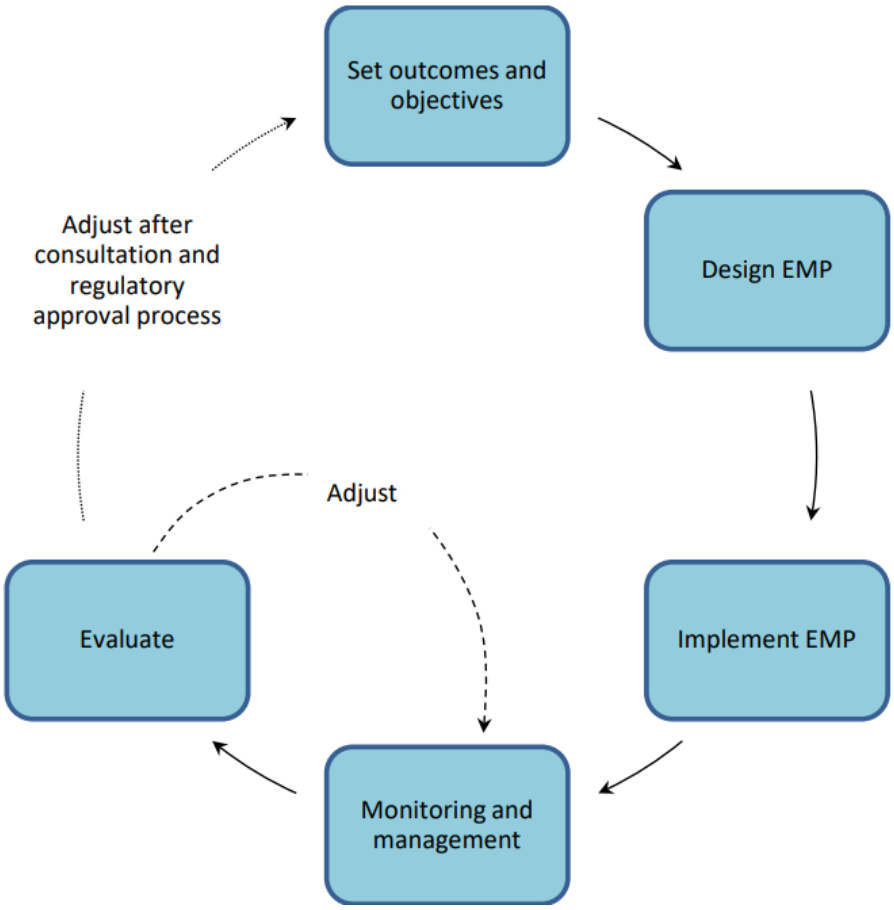


Figure 7-1: Adaptive Management Approach (EPA, 2024)

Changes to the Fauna MP

Alcoa will continually review this Fauna MP throughout the Project implementation and will update the Plan as required to include new data and information obtained with ongoing survey and monitoring activities and research programmes, in accordance with the adaptive management approach described above. If and when, substantial changes are made to the Plan, Alcoa will consult with all relevant stakeholders regarding the changes.

Based on results of the review and revision process of the Plan, Alcoa updated and adjusted the measures and strategies in consultation with relevant stakeholders from the previous Fauna Management Plan v0 (Alcoa of Australia Limited, 2023a) as summarised in Table 7-1 below.

Table 7-1 Summary of Changes Between Fauna MP Versions[21]

Complexity of Changes: Moderate Revisions				
Number of Key Environmental Factors: Two – Three				
Item No.	**EMP Section No.**	**EMP Page No(s).**	**Summary of Change(s)**	**Reason(s) for Change**
1.	1. Executive Summary	Pages 9 – 12	1. Additional conservation signification fauna species included. 2. Table S-1 updated. 3. Rehabilitation phase removed.	1. Minute Freshwater Snail (*Glacidorbis occidentalis*) recorded during streamzone monitoring assessment. 2. Table S-1 updated to include both outcome-based and objective-based provisions for all active mining phases (exploration, construction, and operational) of the Project, and to align with the EPA EMP template (EPA, 2021a) and instructions (EPA, 2024). 3. Rehabilitation and Schedule Management Plan required as a separate standalone document as per MMP 2023 – 2027 Ministerial approval condition 15 (a).
2.	2. Context, Scope and Rationale	Page 13	1. Key objectives of the Fauna MP included.	1. To clearly describe the purpose of the Fauna MP in relation to the Project.
3.	2.1 Huntly and Willowdale Mine Regions	Pages 13 - 15	1. Provided Huntly and Willowdale mines overview Figures.	1. Provision of Figures to provide a current visual overview of the Huntly and Willowdale mines, including their mine regions, ML1SA boundary, rehabilitation and cleared areas, streams, conveyors and reservoir protection zones.
4.	2.2 Key Environmental Factors	Pages 16 – 17	1. The EPA's Inland Waters key environmental factor included.	1. The EPA's Inland Waters key environmental factor included as it is recognised that there are inherent links between the Terrestrial Fauna key environmental factor and the Inland Waters key environmental factor, and that potential changes to the quality and quantity of inland waters may affect conservation significant terrestrial and aquatic fauna and their associated high value habitats.
5.	2.3 Condition Requirements	Pages 18 – 20	1. Additional condition requirements included where relevant. 2. Figure included showing Project constraints.	1. Condition requirements (Table 2-1) revised to ensure all relevant conditions presented, and where they are addressed within the Fauna MP. 2. Project constraints Figure included to visually present aspects of conditions requirements (e.g. disturbance footprints, Protection Zones, LDA and MAZ).
6.	2.4 Rationale and Approach	Page 22	1. Section revised to describe outcome-based and objective-based provisions in the context of this	1. To align with the EPA (2024), information on the development of adopting both outcome-based and objective-based provisions under

[21] Summary of changes between Fauna MP v0 and this document, Fauna MP v1.

Complexity of Changes: Moderate Revisions				
Number of Key Environmental Factors: Two – Three				
Item No.	**EMP Section No.**	**EMP Page No(s).**	**Summary of Change(s)**	**Reason(s) for Change**
			Fauna MP.	this Fauna MP for conservation significant terrestrial and aquatic fauna and their high-value habitats.
7.	2.4.2 Current Knowledge	Pages 23 – 38	1. Summary table of surveys and study findings now presented in Appendix E. 2. Fauna habitats summary table now presented in Appendix E. 3. Summary of research into mine rehabilitation now presented in Appendix E. 4. Information on relevant aquatic fauna provided. 5. Streamzone monitoring information included. 6. Information on fauna underpass / multi-use culverts included. 7. Summary of conservation significant fauna and their associated high value habitats and potential impacts / threats included.	1. Moved to be presented as an Appendix as supporting information. 2. Moved to be presented as an Appendix as supporting information. 3. Moved to be presented as an Appendix as supporting information. 4. Carter's Freshwater Mussel and Minute Freshwater Snail now included based on recent survey findings within the Project area, both of which are conservation significant species. 5. This Fauna MP now includes the Inland Waters key environmental factor, additionally two conservation significant aquatic fauna species have been recorded across the Project. Streamzone monitoring has been undertaken at the Project across a number of years and provides valuable information relating to addressing the Inland Waters key environmental factor and allows for the potential recording of Carter's Freshwater Mussel and Minute Freshwater Snail. 6. Fauna underpasses / multi-use culverts have been used across the Project and may provide a means of mitigating impact to fauna, particularly in relation to streamzones. Information provided to describe Alcoa's current understanding of these and research programmes to further understand the potential effectiveness of these across the Project. 7. Knowledge of conservation significant fauna and their high value habitats and associated mapped vegetation types and associated potential impacts / threats included to describe Alcoa's current understanding of these fauna values in the context of this Fauna MP.
8.	2.4.3 Key Assumptions and Uncertainties	Page 39	1. Assumptions now included and additional information on uncertainties provided.	1. A number of assumptions have now been provided. Additional uncertainties included such as limited fauna population-specific studies have been undertaken, and limited understanding of potential impacts from climate change.
9.	3. Exploration Phase Components	Pages 40 – 46	1. This Fauna MP has now been developed to provide specific information on the three active mining phases (exploration, construction, operational), due to differing levels of impact and	1. To align with the EPA EMP template (2021a). This Fauna MP adopts a combination of Project-specific outcome-based and objective-based provisions to achieve the proposed environmental outcomes, with consideration of current knowledge and understanding in

Complexity of Changes: Moderate Revisions				
Number of Key Environmental Factors: Two – Three				
Item No.	**EMP Section No.**	**EMP Page No(s).**	**Summary of Change(s)**	**Reason(s) for Change**
			management requirements. Both outcome-based and objective-based provisions have been developed for the exploration phase. Given exploration phase is expected to be low impact, these differ to other phases.	relation to fauna values.
10.	4. Construction Phase Components	Pages 47 – 54	1. This Fauna MP has now been developed to provide specific information on the three active mining phases (exploration, construction, operational), due to differing levels of impact and management requirements. Both outcome-based and objective-based provisions have been developed for the construction phase.	1. To align with the EPA EMP template (2021a). This Fauna MP adopts a combination of Project-specific outcome-based and objective-based provisions to achieve the proposed environmental outcomes, with consideration of current knowledge and understanding in relation to fauna values.
11.	5. Operational Phase Components	Pages 55 – 62	1. This Fauna MP has now been developed to provide specific information on the three active mining phases (exploration, construction, operational), due to differing levels of impact and management requirements. Both outcome-based and objective-based provisions have been developed for the operational phase.	1. To align with the EPA EMP template (2021a). This Fauna MP adopts a combination of Project-specific outcome-based and objective-based provisions to achieve the proposed environmental outcomes, with consideration of current knowledge and understanding in relation to fauna values.
12.	6. Other Potential Threats / Impacts	Pages 63 – 65	1. This Fauna MP now includes consideration of threatening processes associated with conservation significant terrestrial and aquatic fauna and their associated high value habitats. Relevant threatening processes as listed by DCCEEW (2021) have been identified.	1. Objective-based provisions have been developed for threatening processes for all mine phases (exploration, construction, and operational).
13.	7. Adaptive Management and Review of the Fauna MP	Page 66	1. This section provides Alcoa's commitments to undertaking the adaptive management approach for the Project. 2. Changes to the Fauna MP are described in this Table.	1. To align with the EPA (2024). 2. To summarise the changes made between the previous Fauna MP v0 and this Fauna MP v1, and to align with the EPA EMP template (2021a).

8 Stakeholder Consultation

To date, consultation has been undertaken with internal and external stakeholders for the preparation of the Fauna MP v1.

External comments relating to this Fauna MP, and other comments as relevant are captured in Table 8-1 below, including Alcoa's response actions and how these have been addressed in this Fauna MP.

Table 8-1: Summary of External Stakeholder Consultation in Relation to this Fauna MP

Date	Stakeholder	Consultation	Stakeholder Response	Alcoa Action
27/02/2024	DBCA	Initial meeting between DBCA and Alcoa to discuss progress of revising the Fauna MP Rev 0 to Fauna MP v1.	Ensure document is aligned with contempoary guidelines. Provide further baseline information and S.M.A.R.T outcomes where possible.	Revised the Fauna MP v1 to ensure alignment with contemporary guidelines and standards. Included additional baseline information and outcome-based and objective-based provisions for the three active Project phases.
15/03/2024	DBCA	Alcoa provided DBCA with key excerpts and information (i.e. extracted tables) from the draft Fauna MP v1 to allow for DBCA to undertake a targeted review and comment as agreed at the initial meeting on 27/02/2024.	DBCA review not undertaken, and noted that the Department will only review the full draft Fauna MP v1. Some minor comments provided.	Continued to develop the Fauna MP v1.
30/04/2024	DBCA	Alcoa provided DBCA with the full draft Fauna MP v1 for review and comment.	DBCA provided an expedited review of the draft Fauna MP v1 and provided overview comments.	Alcoa acknowledged comments from DBCA. The draft Fauna MP v1 was further revised to address comments where appropriate.

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10 APPENDICES

APPENDIX A: Monitoring Provisions

Table A-1: Monitoring and Methodology Provisions for Relevant Species / Aspects of the Project

Monitoring Action	Alcoa Responsible Team / Department	Relevant Species / Aspect	Location	Timing	Methodology	Rationale
Targeted survey (pre-clearance surveys)	Pre-mining	Baudin's Black Cockatoo Carnaby's Black Cockatoo Forest Red-tailed Black Cockatoo	Conceptual clearing areas with potential habitat (native vegetation including rehabilitation).	In advance of clearing, one phase of seasonal surveys.	Suitably qualified / experienced personnel will inform on the presence of breeding habitat and foraging habitat for Black Cockatoo trees. Targeted surveys will be in accordance with (as far as reasonably practicable): • Referral guideline for three Black Cockatoo species (DAWE 2022); • Survey guidelines for Australia's threatened birds (DEWHA 2010); and • EPA Technical Guidance – Terrestrial Fauna Surveys (EPA 2020).	Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP.
Targeted survey (pre-clearance surveys)	Pre-mining	Carter's Freshwater Mussel (CFM) Minute Freshwater Snail	Conceptual clearing areas – haul road crossings over streams.	In advance of clearing and construction of haul road crossings that intersect streams / streamzones. Minute Freshwater Snail surveys to commence in Q3 2025.	Suitably qualified / experienced personnel will undertake surveys which may include: foraging with mussel rakes; hand searching; quadrats; and sieving of sediments to locate juveniles. As there is no current technical guidance for CFM and the Minute Freshwater Snail surveys, targeted surveys will be in accordance with (as far as reasonably practicable): • EPA Technical Guidance – Sampling of Short Range Endemic Invertebrate Fauna (EPA 2016); and • EPA Technical Guidance – Terrestrial Fauna Surveys (EPA 2020). • Best practice, following similar targeted CFM surveys undertaken in the South West (Klunzinger *et al.* 2012)	If disturbance to known CFM population and / or Minute Freshwater Snail cannot be avoided (noting that the Minute Freshwater Snail is considered to be widespread in distribution, but at low abundance), permanent relocation and / or translocation of the population/s will be undertaken (species-dependent), in accordance with a Relocation or Translocation Management Plan to be developed in consultation with the DBCA and approved under the BC Act.
Targeted survey (pre-clearance surveys)	Pre-mining	Chuditch Quokka Woylie (Other conservation significant fauna, non-conservation significant and feral fauna will also be recorded during surveys)	Conceptual clearing areas with potential habitat (native vegetation including rehabilitation).	In advance of clearing, as required.	Suitably qualified / experienced personnel will undertake surveys that include: baited camera traps using appropriate baits (and in selected vegetation to target Quokka) using universal baits (peanut butter, oats, and sardines or tuna) or chicken and may include landscape-scale trapping transects. Targeted surveys will be in accordance with (as far as reasonably practicable): • EPA Technical Guidance – Terrestrial Fauna Surveys (EPA 2020). • Survey guidelines for Australia's threatened mammals (DSEWPC 2011)	Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP.
Pre-harvesting and clearing monitoring and relocation	Pre-mining	Chuditch	Within final clearing areas if suitable habitat identified; before harvesting or before clearing in unharvested areas.	Within four months of harvesting/clearing for targeted searches for habitat features.	A suitably qualified and experienced fauna spotter will be on site during active harvesting and clearing. Snipping and mulching are not active harvesting or clearing. Final clearing areas will be searched prior to harvesting or clearing in unharvested areas by a suitably qualified and experienced fauna spotter for potential habitat features (logs, burrows, trees with low hollows) which will be recorded by GPS and assessed as low-risk (able to be checked the morning prior to clearing) or high-risk (monitoring or initial avoidance needed). Signs of activity including tracks and scats will also be recorded, and camera traps will monitor use of deep dens and hollows.	Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP. * Relocation using cage traps for Chuditch may be undertaken as a trial and run in conjunction with research, with the animals collared prior to release (with appropriate licensing in place), to determine the suitability and effectiveness of this method (given Chuditch may re-home to areas where they were captured and released).

Monitoring Action	Alcoa Responsible Team / Department	Relevant Species / Aspect	Location	Timing	Methodology	Rationale
					Habitat destruction (blocking/filling unused/vacant dens, breaking apart logs) will be utilised in advance of clearing to minimise risk. Active relocation using cage traps* in the 7 nights immediately preceding harvesting or clearing may occur in areas with active den sites or high quality habitat. Captured Chuditch will be released within adjacent suitable habitat in accordance with methodologies described within authorisation/s under the BC Act and in accordance with DBCA Standard Operating Procedures. Once relocated, the Chuditch's associated den can be destructed or cleared that day. <u>During Chuditch denning season (August to November):</u> During Chuditch denning season (August to November) cage trapping is not recommended as females are susceptible to stress and can be separated from denning young. Where a nursery den is located in a clearing area (where camera traps indicated daily use of den for >5 days), an exclusion zone of 100 m radius will be employed. Clearing will not commence in this area until the camera traps confirm the den has been abandoned (>5 days without use). Note: A research project in 2024 will trap and collar Chuditch in operational areas across Myara which will provide data on Chuditch home ranges, den sites and use of habitats, which will further inform fauna spotting methodology.	
Pre-clearing and pre-harvesting monitoring and relocation	Pre-mining	Quokka	Within final clearing areas if suitable habitat identified; before harvesting or before clearing in unharvested areas	Within four weeks of clearing.	A suitably qualified and experienced fauna spotter will be on site during active harvesting and clearing. Snipping and mulching are not active harvesting or clearing. Final clearing areas will be searched by a suitably qualified and experienced fauna spotter for signs of quokka use (runnels, scats) in the four weeks prior to harvesting or clearing. In areas of suitable habitat, camera traps may be deployed up to four weeks in advance of harvesting or clearing. If quokka are recorded on cameras active relocation using soft traps in the seven nights immediately preceding harvesting or clearing may occur. Captured Quokka will be released within adjacent suitable habitat in accordance with methodologies described within authorisation/s under the BC Act and in accordance with DBCA Standard Operating Procedures.	Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP. If Quokka require relocation, it will be conducted in accordance with a Relocation Management Plan to be developed in consultation with the DBCA and approved under the BC Act.
Pre-clearing and pre-harvesting monitoring and relocation	Pre-mining	Woylie	Within final clearing areas if suitable habitat identified; before harvesting or before clearing in unharvested areas	Within four weeks of clearing.	A suitably qualified and experienced fauna spotter will be on site during active harvesting and clearing. Mulching is not active harvesting or clearing. Final clearing areas will be searched by a suitably qualified and experienced fauna spotter for signs of Woylie use (nest building, scats) in the four weeks prior to harvesting or clearing. In areas of suitable habitat, camera traps may be deployed up to four weeks in advance of harvesting or clearing. If Woylie are recorded on cameras active relocation must be approved by DBCA.	Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP. If Woylie require relocation, it will be conducted in accordance with a Relocation Management Plan to be developed in consultation with the DBCA and approved under the BC Act.
Pre-clearing and pre-harvesting monitoring and relocation	Pre-mining	Chuditch Quokka Woylie (Other conservation significant fauna will also be recorded (e.g. Numbat and Malleefowl).	Within final clearing areas if suitable habitat identified and if harvested >3 months before clearing.	At least one week of recording (i.e. seven nights) prior to clearing. Recording to occur a maximum of four weeks in advance of clearing.	A suitably qualified and experienced fauna spotter will be on site during active harvesting and clearing. Snipping and mulching are not active harvesting or clearing. Baited cameras traps using universal bait (such as	This methodology will be trialed for six months at Huntly to assess the number of occurrences and inform future management actions.

Monitoring Action	Alcoa Responsible Team / Department	Relevant Species / Aspect	Location	Timing	Methodology	Rationale
					rolled oats, peanut butter, and sardines) and chopped apples, and chicken if targeting Chuditch, will be installed to identify fauna occurrences. Where Chuditch, Quokka or Woylie are identified from camera traps, targeted searches of the clearing areas will occur to identify active dens and evidence of current nesting activities. Active relocations as per species-specific methodologies above. *Note: A pilot thermal imaging project will be undertaken in 2024 to explore the ability to detect fauna use in harvested areas where access and safety concerns limit on-ground work.	
Pre-clearing monitoring	Pre-mining	Baseline flora and vegetation mapping (including weeds)	Selected sites to be confirmed according to the mine plan.	During appropriate seasons.	In-field assessments / surveys.	To collect and analyse baseline data and to allow comparison with ongoing monitoring data. Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP.
Monitoring / audit	Exploration	Exploration drill holes	Selected exploration sites and opportunistic.	As soon as reasonably practicable post drill hole completion and rehabilitation, within 12 months.	Visual observation and where applicable, photographic records and GPS locations, of drill hole disturbance to ensure they are appropriately backfilled and/or capped.	Inadequate rehabilitation of drill holes presents an additional risk to fauna through entrapment, and ponding of water can increase the potential for subsidence of drill holes. Drill spoil is an appropriate backfill material. Monitoring and auditing of newly completed drill holes to ensure they are adequately closed, and where any open holes are identified they can be appropriately remediated.
Monitoring / audit	Exploration	Exploration tracks	Selected exploration sites and opportunistic.	As soon as reasonably practicable post exploration completion and rehabilitation, within 12 months.	Visual observation, photographic records and GPS locations of selected exploration access tracks.	Photographic records to ensure minimal disturbance and clearing and avoidance of Protection Zones.
Monitoring	Operations[22]	Vegetation composition and condition (including weeds, for critical strata levels)	Selected permanent monitoring sites to be confirmed* across high value fauna habitats (e.g. streamzone vegetation, open forest areas and major granite outcrop vegetation). These will include both impact and reference sites. *Some sites are already established.	Annually or bi-annually, during appropriate seasons. Programme to commence Q3 2025.	In-field assessments of permanent monitoring plots (e.g. 20 x 20 m plots with 2 x 2 m quadrats) across high value habitats (selected from various vegetation types) at both impact and reference sites and will include supporting remote sensing, for example, LiDAR for density of vegetation structure (e.g. strata levels by height bands) and will be guided by a range of resources, including McFarlane, D. J. and Wallace, J. F. (2019). In-field vegetation assessments to also include records of any visual observations of high-level disturbance from feral fauna (e.g. European fox dens, feral pig and European rabbit activity). Vegetation condition scales for the South West and Interzone Botanical Province may be used in assessing condition (EPA, 2016c).	To determine and monitor any impacts to vegetation (i.e. high value fauna habitat) as a result of the Project in comparison to selected baseline / control plots. To determine, monitor and manage any impacts to vegetation (i.e. high value fauna habitat) as a result of new weed incursions or spread of existing weeds as a result of the Project, and in comparison to baseline / control plots.
Monitoring	Operations[23]	Weeds	Selected permanent monitoring sites to be confirmed* across high value fauna habitats (e.g. streamzone vegetation, open forest areas, and major granite outcrop vegetation), and at other selected high-traffic locations such as adjacent to haul roads and long-term infrastructure. These will include both impact and reference sites. *Some sites are already established.	Annually or bi-annually, during appropriate seasons. Programme to commence Q3 2025.	In-field assessments of permanent monitoring plots (e.g. 20 x 20 m plots with 2 x 2 m quadrats) and / or appropriate transect assessments. If required, targeted weed assessments including weed identification, population and distribution mapping will be undertaken.	Univariate and / or multivariate statistics to determine, monitor and manage any impacts to vegetation (i.e. high value fauna habitat) as a result of new weed incursions or spread of existing weeds as a result of the Project, and in comparison to baseline / control plots. Identified weed populations mapped to monitor extent and potential spread. Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP.

[22] Refers to the period following handover from the construction phase through operations until commencement of the rehabilitation phase and aligning with long-term mine planning.

[23] Refers to the period following handover from the construction phase through operations until commencement of the rehabilitation phase and aligning with long-term mine planning.

Monitoring Action	Alcoa Responsible Team / Department	Relevant Species / Aspect	Location	Timing	Methodology	Rationale
Monitoring	Operations[22]	Streamzones (aquatic invertebrates and physico-chemistry)	Existing monitoring sites at various streamzone locations in both the intermediate rainfall zone (IRZ) and the high rainfall zone (HRF), includes both impact and reference sites (refer to Figures 2-8 and 2-9).	Biennial, during appropriate season. Existing programme and will re-commence Q3 2025.	Sampling at selected impact and reference sites, within both the IRZ and HRZ. <u>Aquatic invertebrate sampling:</u> Sampling methods include 250 µm mesh sampling net, at all habitats present at each site, e.g. faster flowing gravel riffle runs, slow water channel pools, littoral margins, draped vegetation, and / or emergent and submerged macrophytes. Samples sieved through appropriately sized sieve to separate fine sediment, leaf litter, and aquatic fauna. Aquatic fauna identified under microscope. <u>Physico-chemistry sampling:</u> Field methods include spot sampling of dissolved oxygen, temperature and pH using relevant meters. Water samples collected for laboratory analysis of electrical conductivity, total nitrogen, and total phosphorus.	Univariate and multivariate statistics employed to test for any changes in macroinvertebrate community structure in response to mining. Data collected from both impact and reference sites are included to compare how sites change over time relative to their historic condition. Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP.
Research	Research	Feral fauna control	Various locations, however targeting streamzone vegetation and culverts in addition to 'hot spots' from fauna sighting register.	Programme commenced in Q1 2024, completion anticipated Q2 2026.	Monitoring at selected locations using camera traps to gain baseline data before control methods are implemented, then again after control methods are implemented. Control methodology yet to be determined, but may include ground baiting, grooming traps, trapping and shooting.	Feral species are a key threatening process to native species. Camera traps to monitor potential movement of feral fauna (including feral predators) to determine if fauna underpasses are preferentially used by feral predators. These underpasses may then be used as lures for feral species control. Camera traps will also be used at select forest locations to determine feral species presence and efficacy of control. Compounding impacts on native fauna from feral animal predation, disturbance to habitat (e.g. feral pig and European rabbit). In addition to Western Shield Program. Results will be used to determine feral animal control effectiveness via monitoring. Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP.
Research	Research	Fauna underpasses	Selected multi-use culverts / fauna underpass monitoring locations.	Research programme commenced Q1 2024, fieldwork due to be completed by end of 2024, and report finalization by Q1 2025.	Periodic camera trap monitoring at selected multi-use culverts / fauna underpasses.	Potential isolation of conservation significant fauna individuals / populations by construction of streamzone crossings (e.g. haul roads). Camera traps to monitor potential movement of conservation significant fauna. Potential for multi-use culverts at appropriate locations. Results from surveys will be used to inform further works. Further information to be provided in future iterations of the Fauna MP.

APPENDIX B: Conservation Significant Fauna Relevant to the Project

Table B-1: State and Commonwealth Listings of Conservation Significant Fauna[24]

Class	Common Name	Species	Listing	
			State (BC Act)	Commonwealth (EPBC Act)
Aves	Baudin's Black Cockatoo	*Zanda baudinii*	Endangered	Endangered
	Carnaby's Black Cockatoo	*Zanda latirostris*	Endangered	Endangered
	Forest Red-tailed Black Cockatoo	*Calyptorhynchus banksii naso*	Vulnerable	Vulnerable
	Masked Owl (southwest)	*Tyto novaehollandiae novaehollandiae*	Priority 3	N/A
	Peregrine Falcon	*Falco peregrinus*	Other Specially Protected	N/A
Bivalvia	Carter's Freshwater Mussel	*Westralunio carteri*	Vulnerable	Vulnerable
Gastropoda	Minute Freshwater Snail	*Glacidorbis occidentalis*	Priority 3	N/A
Mammalia	Brush-tailed Phascogale	*Phascogale tapoatafa*	Conservation Dependent	N/A
	Chuditch	*Dasyurus geoffroii*	Vulnerable	Vulnerable
	Quenda	*Isoodon obesulus fusciventer*	Priority 4	N/A
	Quokka	*Setonix brachyurus*	Vulnerable	Vulnerable
	Rakali	*Hydromys chrysogaster*	Priority 4	N/A
	Western Brush Wallaby	*Notamacropus irma*	Priority 4	N/A
	Western False Pipistrelle	*Falsistrellus mackenziei*	Priority 4	N/A
	Woylie	*Bettongia penicillata ogilbyi*	Critically Endangered	Endangered
Reptilia	Dell's Skink	*Ctenotus delli*	Priority 4	N/A
	Southern Death Adder	*Acanthophis antarcticus*	Priority 3	N/A

[24] Information current at time of publication.

APPENDIX C: State and Commonwealth Conservation Category Codes and Descriptions

Biodiversity Conservation Act 2016 (State)

Category	Definition
T *Threatened*	Fauna species that are listed as critically endangered, endangered or vulnerable threatened species.
CR *Critically Endangered*	Threatened fauna species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
EN *Endangered*	Threatened fauna species considered to be facing a very high risk of extinction in the wild in the near future.
VU *Vulnerable*	Threatened fauna species considered to be facing a high risk of extinction in the wild in the medium-term future.
EX *Extinct*	Species where there is no reasonable doubt that the last member of the species has died.
SP *Specially Protected*	Meeting one or more of the following categories: species of special conservation interest; migratory species; species subject to international agreement; or species otherwise in need of special protection.
MI *Migratory species*	Fauna that periodically or occasionally visit Australia or the species is subject of an international agreement that relates to the protection of migratory species.
CD *Conservation Dependent*	Species of special conservation need that are dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
OS *Other specially protected*	Species otherwise in need of special protection to ensure their conservation.

Department of Biodiversity, Conservation and Attractions (DBCA) Priority Species Listing

Category	Definition
Priority 1	Poorly known species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation.
Priority 2	Poorly known species, that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, for example, national parks, conservation parks, nature reserves and other lands being managed for conservation.
Priority 3	Poorly known species that are known from several locations and the species does not appear to be under imminent threat or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under threat.
Priority 4	Rare, Near Threatened and other species in need of monitoring. Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. Near Threatened: Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as conservation dependent specially protected species.

***Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)**

Category	Definition
EX *Extinct*	Taxa not definitely located in the wild during the past 50 years.
EW *Extinct in the Wild*	Taxa known to survive only in captivity.
CE *Critically Endangered*	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
EN *Endangered*	Taxa facing a high risk of extinction in the wild in the near future.
VU *Vulnerable*	Taxa facing a high risk of extinction in the wild in the medium-term future.
MG *Migratory*	Consists of species listed under the following International Conventions: Japan-Australia Migratory Bird Agreement (JAMBA) China-Australia Migratory Bird Agreement (CAMBA) Convention on the Conservation of Migratory Species of Wild animals (Bonn Convention)

APPENDIX D: Resources Utilised in Fauna MP Development

STATE AND COMMONWEALTH DEPARTMENT / AUTHOR	DOCUMENT TITLE
State and Commonwealth Guidelines, Guidance and Instructions	
Environmental Protection Authority (EPA) 2016a.	*Environmental Factor Guideline: Terrestrial Fauna*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2018.	*Environmental Factor Guideline: Inland Waters*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2020.	*Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2021a.	*Templates – Environmental Management Plans.*
Environmental Protection Authority (EPA) 2021b.	*Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2021c.	*Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2021.*
Environmental Protection Authority (EPA) 2021d.	*Interim Guidance – Environmental outcomes and outcomes-based conditions*, EPA, Western Australia.
Environmental Protection Authority (EPA) 2023.	*Statement of Environmental Principles, Factors, Objectives and Aims of EIA*, EPA, Western Australia.
Department of Climate Change, Energy, the Environment, and Water (DCCEW) 2024.	*Environmental Management Plan Guidelines*, DCCEW, Canberra, March. CC BY 4.0.
Environmental Protection Authority (EPA) 2024.	*Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*, EPA, Western Australia.
State Forest Management Plan	
Conservation and Parks Commission (CPC) 2023.	*Forest Management Plan 2024-2033.* Conservation and Parks Commission. Perth, Western Australia.
Recovery Plans	
Department of Environment and Conservation (DEC) 2008.	Approved conservation advice for *Calyptorhynchus banksii naso* (Forest Red-tailed black cockatoo (2009). Approved conservation advice for *Calyptorhynchus baudinii* (Baudin's cockatoo) (2009).
Department of Environment and Conservation (DEC) 2012.	Chuditch (*Dasyurus geoffroii*) National Recovery Plan.
Yeatman and Groom (2012).	National Recovery Plan for the Woylie *Bettongia penicillata ogilbyi.*
Department of Environment and Conservation (DEC) 2013.	Quokka (*Setonix brachyurus*) Recovery Plan.
Department of Parks and Wildlife (DPaW) 2013.	Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan.
Threat Abatement Plans and Associated Documents	
Department of the Environment, Water, Heritage and the Arts (DEWHAa) 2008a.	*Background for the threat abatement plan for predation by the European red fox.* DEWHA, Canberra.
Department of the Environment, Water, Heritage and the Arts (DEWHAb) 2008b.	*Threat abatement plan for predation by the European red fox.* DEWHA, Canberra.
Commonwealth of Australia (2015a).	*Background document for the Threat abatement plan for predation by feral cats.*
Commonwealth of Australia (2015b).	*Threat abatement plan for predation by feral cats.*
Commonwealth of Australia (2016a).	*Background document to the Threat abatement plan for competition and land degradation by rabbits.*
Commonwealth of Australia (2016b).	*Threat abatement plan for competition and land degradation by rabbits.*

Commonwealth of Australia (2017a).	*Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) – Background Document.*
Commonwealth of Australia (2017b).	*Threat Abatement Plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa).*
Commonwealth of Australia (2018a).	*Background document: Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi.*
Commonwealth of Australia (2018a).	*Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi.*
Forest Agreement and Associated Document	
Commonwealth of Australia (1999).	*Regional Forest Agreement for the South-West Forest Region of Western Australia.*
Department of Biodiversity, Conservation and Attractions (DBCA) 2019.	*Assessment of Matters Pertaining to Renewal of the Regional Forest Agreement for the South-West Forest Regional of Western Australia.*

APPENDIX E: Project Knowledge – Surveys, Study Findings and Research

Table E-1: Terrestrial and Aquatic Fauna Studies and Research

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
1992, 1995, 1998, 2001, 2003, 2006, 2007	Environmental Management and Research Consultants (EMRC)	Long-term fauna monitoring program (LTFMP) - Jarrahdale, Huntly, Karnet	The Alcoa LTFMP was designed in 1991. The program is designed to monitor fauna approximately every three years at twenty plots located in rehabilitation and nearby forest at Jarrahdale, Huntly and Karnet (remote from mining). A variety of different survey methods were used including: trapping (five successive trap nights in July, August and September); avifauna (quantitative and inventory surveys in summer and winter); reptile survey (trapping over five consecutive nights in Summer with toenail clippings to indicate recapture); opportunistic survey; nocturnal surveys; and active searches. The LTFMP recorded: • Huntly site: 18 mammal, 49 bird and 16 reptile species; six conservation significant species • Jarrahdale site: 15 mammal, 56 bird and 21 reptile species; five conservation significant species • Karnet site: total of 9 mammal, 44 bird and 14 reptile species; three conservation significant species • Frog and ant species
1997 – 2021	WRM	IRZ Streamzone monitoring	Macroinvertebrates and fish were surveyed in the Camerons Intermediate Rainfall Zone (IRZ) area between 1995 and 2007 as part of streamzone monitoring for the Huntly Mine. Further monitoring for macroinvertebrates was conducted in the Camerons, Jayrup and O'Neill areas in 2009, 2011, 2014, 2019 and 2021. Long term aquatic biomonitoring during and post-mining aimed to track changes physical and biological attributes in response to mining, particularly in response to secondary salinisation (Croton & Dalton 2010). No detrimental impact on macroinvertebrate communities in response to mining was found, however communities did respond to consistent downward trends in rainfall over the study period. Baseline surveys of control sites, and sites affected by mining have been conducted. Monitoring of control sites is conducted in conjunction with monitoring of potential exposed sites, in order to differentiate effects of mining operations from stochastic fluctuations or ecological responses to climate change.
1999, 2004, 2011, 2015	EMRC Stokes / EMRC	Orion (Willowdale Mine) related studies: A fauna survey of planned mining areas at Alcoa's Orion Mining region Long Term Fauna Monitoring Program (LTFMP) - Orion	Fauna survey conducted between February and November 1999. The habitats monitored were surveyed in current mining areas, extensive dieback affected areas, small dieback free areas and on sites where mining operations are planned. A total of 46 bird species, nine mammals (6 native, 3 introduced) and 13 reptiles, and frog species were recorded. These included three rare species (the Chuditch, Baudin's Black Cockatoo and possibly the Quokka) and one Specially Protected species (the Carpet Python). As well as these, the Noisy Scrub-bird was recorded in the area and the uncommon Brush-tailed Phascogale was recorded, albeit in low densities. The fauna of the Orion area was largely comparable to that of existing Willowdale mining areas. Results emphasise the need for ongoing fox control. Rehabilitation using Jarrah and other indigenous species offers the best prospects of successfully recreating suitable habitat for the species. The LTMFP was reviewed in 2003 which included a recommendation for a similar program to be established at Orion so that any differences in faunal successional processes taking place at Willowdale could be detected. Similar techniques to those used at Jarrahdale, Huntly and McCoy. Mammals, birds, reptiles and frogs were surveyed during both summer (March) and winter (July), and ground dwelling invertebrates were sampled in summer only. Survey

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
			methods were similar to those used in the original LTFMP. A single large trapping transect designed to specifically target Chuditch was used in the later studies. The LTFMP recorded: 15 mammals; 54 birds; 19 reptile species; including five conservation significant species.
2000	EMRC	A survey of the impact of burning on mammals and birds in Alcoa's rehabilitated Bauxite mines at Jarrahdale	To ascertain the impact of burning on birds and mammals, pre burning monitoring took place 1997, and post burn monitoring commenced in 1998 in both burnt and unburnt, rehabilitated and unmined forest sites. Low numbers of mammals were caught making it difficult to conclude with certainty whether burning had an effect on most species. New epicormic growth may have attracted possums into one rehabilitated area, while mice invaded the dense rehabilitated site after the burn. There was a large decline in the numbers of birds and bird species following the burn in the dense rehabilitation. Burning sparse rehabilitation only resulted in a small decline in numbers of birds and bird species while fire had little effect on bird populations of unmined forest. The survey was conducted three years after burning in 1997, and it was concluded that more time was needed to define the longer-term effects of burning on mammals and birds.
2000, 2007	EMRC	A Vertebrate Fauna Survey of Rehabilitated Areas at Alcoa's Huntly Minesite	Overview of the vertebrate fauna surveys of Alcoa's rehabilitated bauxite mines at Huntly undertaken in 1994, 2000 and 2007. Mammals, birds and reptiles were surveyed in six rehabilitated pits ranging in age from 8 to 16 years. A total of sixteen mammal species (eleven indigenous, five introduced), 34 birds and eight reptiles were recorded. Rare or specially protected species either recorded in the present survey or recently sighted or trapped in rehabilitation at Huntly include the Brush-tailed Phascogale, Chuditch, Quokka, Baudin's Black Cockatoo, Forest Red-tailed Black Cockatoo and Carpet Python.
2003, 2007, 2013	EMRC	Long-term Fauna Monitoring Program (LTFMP) - McCoy	The monitoring program involved survey of terrestrial vertebrates (including mammals, birds and reptiles) and ground invertebrates. Mammals, birds, reptiles, and frogs were surveyed in both winter (July – August) and summer (December – January). Mammal and reptile trapping were undertaken. Birds were surveyed using quantitative methods (transects) and inventory methods (opportunistic recordings). In the 2013 survey, additional methods were implemented including a single large trapping transect to sample highly mobile species, remote sensor cameras and all invertebrates collected in pitfall traps were identified to taxonomic order. The LTFMP recorded: 16 mammals; 51 birds; and 10 reptile species, including four conservation significant species. Frog and ant species were also recorded.
2011-2022	Alcoa; Tony Kirkby	Pre-clearance black cockatoo hollow surveys - Willowdale and Huntly mines	Black cockatoo surveys undertaken by Black Cockatoo Specialist as engaged by Alcoa. Surveys undertaken within all areas planned for clearing of potential Black Cockatoo breeding trees.
2012	Stokes	Vertebrate fauna survey of planned mining areas at Alcoa's Keats Mining Region 2011/12	Fauna were surveyed between November 2011 and February 2012 using a range of techniques, including: trapping (Elliot); remote sensor cameras; tracking tunnels; observational surveys; and spotlighting across a diversity of forest types. Five areas were trapped: two dieback free Jarrah forest areas and three streamzones. Pitfall traps were not used due to time constraints. Black Cockatoo habitat, feeding and occurrence was surveyed during January 2012 covering approximately 840 ha. Recorded conservation significant fauna comprised:

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
			• Forest Red-tailed Black Cockatoo - foraging evidence, flock of 11 sighted • Baudin's Black Cockatoo - foraging evidence, two individuals sighted • Chuditch - one young male trapped • Western Brush Wallaby - opportunistic sighting and recorded on cameras • Carpet Python (delisted) - (sighting).
2013, 2014	Alcoa McGregor et al. 2014	Chuditch related studies: Chuditch survey raw data Myara. Does forest restoration in fragmented landscapes provide habitat for a wide-ranging carnivore?	Trapping transects undertaken in 'Myara west' and 'Myara east'. Trapping recorded eight Chuditch captures at 'Myara west' and one Chuditch at 'Myara east' between 18-22 March 2013. Total number comprises five males and four females. Fourteen Chuditch trapping sessions (13 at Huntly, one at Willowdale) across 9 trapping transects (8 at Huntly, one at Willowdale) undertaken between June 2009 and December 2010. The study identified 138 den sites from 11 tracked animals: 75 in unmined forest and 63 in restored forest ranging from 2 – 32 years old. In unmined forest, dens were mostly in hollow logs and ground burrows beneath tree stumps, but these substrates were never used in restored forest where dens were mostly ground burrows, usually associated with rock piles at the surface.
2014; 2016; 2022	Alcoa	Culvert Camera Trap Monitoring - Willowdale and Huntly	Monitoring of fauna and creek crossing culverts has been undertaken since 2014 across both the Huntly and Willowdale mines. The monitoring recorded twelve native species used the underpasses, including regular activity by Quenda and Echidna, and intermittent use by Grey Kangaroo, Western Brush Wallaby, Chuditch, Brush Tailed Phascogale and a single Quokka record. This suggests the potential for fauna underpasses to at least partially mitigate the fragmentation effects of haul roads on Quokka and other fauna using streamzones as corridors. Monitoring also recorded feral animals including Feral Pig, Feral Cat and European Fox. Accordingly, targeted feral animal control may be required at underpasses to prevent habitat damage or increased predation of Quokka and other native fauna.
2015	Alcoa Stokes, V.	Report on Fauna Use of the Fauna Underpass at Ironbark Haul Road, Huntly Mine	Ironbark haul road stream crossing at Huntly mine was identified as a location for a fauna underpass based on its suitability both from an engineering and ecological perspective. The streamzone it is located in was selected due to suitable habitat and good potential for localised fauna movement based on: condition; signs of animal activity; and fauna sightings. Findings: Twelve native species and four feral species were recorded on sand plots and / or cameras in the fauna underpass. Most of these species travelled through the tunnel, indicating the underpass is facilitating movement of animals.
2015, 2017	Burgar et al. 2017	Bat related studies: The importance of mature forest as bat roosting habitat within the production landscape Habitat features act as unidirectional and dynamic	Surveys undertaken in forest surrounding Huntly mine site, both unmined and different stages of vegetation succession. *Nyctophilus gouldii* and *Vespadelus regulus* were trapped and tracked during maternity and mating seasons using harp traps and position-sensitive radio transmitters. Few bats were captured in restored forest so traps were relocated to water sources. Study aimed at identifying roost habitat within restored forest versus unmined forest. Findings indicate that habitat restoration in production forest landscapes is unlikely to play a significant role in conserving species that rely on slow developing microhabitats such as tree hollows for decades or centuries and that retaining and managing forest remnants would be a more effective strategy to conserve populations of these species.

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
		filters to bat use of production landscapes	Ultrasonic detectors (Anabat Titley Electronics) were set at 64 sites four times per year between October and March 2010/2011 and 2011/2012 for a total of 512 survey nights. *Vespadelus regulus* was detected most frequently and *Falsistrellus mackenziei* (P4, BC Act) least frequently.
2016, 2019	Doherty et al. 2016 Mastrantonis et al. Craig et al. 2021	Black Cockatoo related studies: Successional changes in feeding activity by threatened cockatoos in revegetated mine sites. Climate change indirectly reduces breeding frequency of a mobile species through changes in food availability	Plots (232) were surveyed in revegetated forest and 480 plots were surveyed in unmined forest to determine whether there were successional patterns in cockatoo feeding activity in revegetation aged between 4 and 23 years. The study concludes that Black Cockatoos feed in vegetation at all three mine sites, despite variations in vegetation age, structure and floristics. Black Cockatoos began feeding on proteaceous and myrtaceous food plants within 4 and 7 years following revegetation, indicating that some food sources are restored quickly after mining disturbance of the Jarrah forest. The results highlight the importance of monitoring fauna recolonization over appropriate time scales to understand how successional processes in revegetation influence fauna persistence in production landscapes. Using a dataset of annual breeding frequency spanning 19 years, in combination with hydrological, climatological, and remotely sensed data, the effects of environmental variation on the annual breeding frequency of Forest Red-tailed Black Cockatoo's were modelled. Results found several significant relationships between annual breeding frequency of Forest Red-tailed Black Cockatoos and environmental variation. While the model, which included a proxy for the availability of the cockatoo's primary food source and the previous season's rain, explained 49 per cent of annual breeding frequency, Forest Red-tailed Black Cockatoo breeding was found to appear to be linked to the spatiotemporal availability of its primary food sources, the fruit from the tree species, Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata*). However, due to climate change experienced and predicted to be experienced in the future in Western Australia it is expected that the food resources during the breeding season for cockatoos will become increasingly limited in time and space, thus threatening their persistence. Nest selection of Forest Red-tailed Black Cockatoos was examined to identify factors influencing nest hollow selection at multiple spatial scales including interactions between functional resources. It was found that nest selection occurred primarily at the hollow scale, with deeper, higher hollows selected, and at the landscape scale, with hollows closer to ephemeral and permanent drink sites selected. The preference for specific types of hollows indicated that suitable hollows are likely to be scarce in the landscape and that management prescriptions need to be developed to maintain the supply of suitable hollows. Maintenance of drink sites in an area experiencing significant declines in rainfall will require more novel management prescriptions, which could potentially include the provision of artificial drink sites.
2019-2020	Tony Kirkby	Myara North black cockatoo surveys	Black Cockatoo surveys undertaken by Black Cockatoo Specialist as engaged by Alcoa. Surveys undertaken along tracks throughout Myara North and reviewing the trees present 30 m either side of the track. Eighty-two nest trees were recorded.
2021a	WRM	Aquatic Fauna Desktop Assessment Myara North and Holyoake Regions	Recent records of Carter's Freshwater Mussel (EPBC Vulnerable, WA BC Vulnerable) have been collected on Wungong Brook downstream and north of Myara North and in Serpentine Reservoir and on Serpentine River downstream and west of Myara North This species has potential to occur within Myara North and Holyoake and is known to occur in Serpentine Reservoir. Recent records of minute freshwater snail *Glacidorbis occidentalis* (P3) have been collected on Big Brook and Serpentine River upstream and south of Myara North, and on Wungong Brook downstream and north of Myara North. Species is considered likely to occur in Myara North.

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
			Hyporheic zone affords seasonal feeding habitat for stygal amphipods (*Uroctena* sp., *Wesniphargus nichollsi*) that are potential short-range endemic (SRE) fauna. Rakali (P4) potentially occur in both regions, and pouched lamprey (P1) potentially occur in Murray River tributaries in Holyoake. No conservation significant fish or crayfish species recorded in the Huntly Mine to date, including Myara North and Holyoake regions. Distributions of native fish, crayfish and many endemic macroinvertebrate species are known to overlap the regions. Potential for populations of macroinvertebrates to occur in streams and headwater swamps, including species of conservation interest, notably stygal amphipods and isopods, and candidate priority dragonflies and damselflies. Holyoake region (southern portion) drains to the Murray River, which is one of the last remaining unregulated (un-dammed) rivers in the NJF subregion, and may provide seasonal connectivity of headwaters for reproductive migration of native fish and habitat for native freshwater crayfish.
2021b	WRM	Streamzone Monitoring 2021 Cameron Corridor and O'Neil Project Areas	This survey is the seventh streamzone monitoring survey to be conducted following commencement of the programme in 2004. Surveys were conducted in spring. Monitoring of control (reference) sites is conducted in conjunction with monitoring of potential exposed sites (impact) in order to differentiate effects of mining operations from stochastic fluctuations or ecological responses to climate change. Sixteen sites sampled for water quality (physico-chemistry parameters) and aquatic macroinvertebrates. A number of sites were dry and unable to be sampled. A total of 106 macroinvertebrate taxa were collected. One species of conservation significance, the Minute Freshwater Snail (*Glacidorbis occidentalis*) was recorded, at five potential exposed (impact) sites, and one individual recorded at a reference site.
2021a	GHD	Myara North – Terrestrial Fauna Survey and Black Cockatoo Assessment	Desktop assessment and two season detailed and targeted (Forest Red-tailed Black Cockatoo, Carnaby's Black Cockatoo, Baudin's Black Cockatoo, Chuditch, Quokka, and other priority species) vertebrate fauna survey. Six broad fauna habitat types identified: Jarrah-Marri forest, Bullich forest, Granite outcrop, Blackbutt forest, Flooded Gum woodland, Melaleuca dampland, Mine rehabilitation, and pine plantation. Jarrah-Marri forest predominated at 83 per cent of the survey area. A small portion of the survey area comprises rural cleared land. The survey recorded 132 vertebrate fauna species utilising the Survey Area, including: 23 mammals; 76 birds; 26 reptiles; and 7 amphibians. Of these, eight introduced species (mammals and birds) were identified. Thirteen conservation significant fauna species were recorded. All species identified are likely to have populations and habitat present within the Survey Area based on fauna habitat mapping. The Survey Area lacks open water such as shallow shorelines or tidal zones for migratory bird foraging habitat. The creek lines and vegetated dampland areas within the Survey Area are not suitable for migratory shorebirds. All three EPBC Act listed Black Cockatoo species were recorded primarily throughout the Marri-Jarrah forest. All habitat types will be utilised for foraging by either one or all of the species. Melaleuca damplands and riparian areas comprising Bullich forest, Blackbutt forest and Marri-Jarrah forest support a Quokka (EPBC and BC Act Vulnerable) population with records scattered throughout the survey area. Chuditch (EPBC and BC Act Vulnerable) are wide-ranging and expected to use all habitat types at a relatively low density.

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
			Carter's Freshwater Mussel (EPBC and BC Act Vulnerable) was targeted during the survey but no presence was recorded. Large areas of the survey area had been burnt within the last 2 to 3 years and observed to cause substantial impact to fauna habitats.
2021b	GHD	Holyoake – Terrestrial Fauna Survey and Black Cockatoo Assessment	Desktop assessment and two season detailed and targeted (Forest Red-tailed Black Cockatoo, Carnaby's Black Cockatoo, Baudin's Black Cockatoo, Chuditch, Quokka, and other priority species) vertebrate fauna survey. Five broad fauna habitat types identified: Jarrah-Marri forest, Bullich forest, Granite outcrop, Blackbutt forest, Flooded Gum woodland. Jarrah-Marri forest predominated at 88 per cent of the survey area. A small portion of the survey area comprises highly disturbed land, including pine plantation, mine-rehabilitation area, and rural/clearing. The survey recorded 129 vertebrate fauna species utilising the Survey Area, including 22 mammals, 77 birds, 23 reptiles and 7 amphibians. Of these, 8 introduced species (mammals and birds) were identified. Ten conservation significant fauna species were recorded. All species identified are likely to have significant populations and habitat present within the Survey Area. The Survey Area lacks open water such as shallow shorelines or tidal zones for migratory bird foraging habitat. The creek lines and vegetated dampland areas within the Survey Area are not suitable for migratory shorebirds All three EPBC Act listed Black Cockatoo species were recorded primarily throughout the Marri-Jarrah forest. All habitat types will be utilised for foraging by either one or all of the species. Flooded Gum woodland and riparian areas comprising Bullich forest, Blackbutt forest and Marri-Jarrah forest support a Quokka (EPBC and BC Act Vulnerable) population with records scattered throughout the Survey Area. Chuditch (EPBC and BC Act Vulnerable) are wide-ranging and expected to use all habitat types at a relatively low density. The Survey Area is unlikely to support a population of Carter's Fresh Water Mussel (EPBC and BC Act Vulnerable) due to the lack of permanent surface water.
2021a	Phoenix	Short-range endemic invertebrate fauna survey for the Huntly Mine Extension	Desktop assessment and two season short-range endemic (SRE) invertebrate fauna survey of Myara North, Holyoake and Huntly Mine rehabilitation sites. SRE habitat mapping was undertaken based on vegetation mapping prepared for the Proposal (Mattiske 2021) and taking into account habitat attributes relevant to SRE invertebrates. Each habitat was rated for its potential to support SREs (potential habitat rating; PHR) as High, Low or None. Ten habitats were present within the Myara North Study Areas and seven SRE habitats were present in the Holyoake Study Area (further details are supplied in Appendix D Section 6.4.1). A total of 113 taxa from groups known to include SREs were collected in the field surveys and of these, 83 taxa (73 per cent) from 19 families were classified as SREs. A total of 24 of the SRE taxa, from three SRE groups, are currently known only from sites in the baseline study area, mainly the Myara North Study Area. Twenty-eight taxa from nine groups known to include SREs were collected from the Rehabilitation Study Area during the surveys. This indicates that SRE taxa can re-colonise rehabilitated areas but, as expected, the diversity is overall considerably lower than that of remnant native vegetation. As the numbers of SREs showed a moderate positive correlation with rehabilitation age, it may be concluded that SRE colonisation improves with age of rehabilitation.

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
			Some overlap of SRE species was identified between the Myara North and Holyoake Study Areas, and between these study areas and records from a nearby large-scale SRE survey or other desktop sources, indicating wider distributions than the baseline study area. However, the survey results suggest at least some SRE invertebrates have narrow habitat preferences and potentially highly restricted distributions. Overall, Myara North is of higher value for SREs than Holyoake, with greater diversity and abundance of SRE habitat features. Myara North is more likely to harbour SREs with highly restricted distributions than Holyoake.
2021 – 2023	Alcoa	LTFMP – Orion and Myara	A revised LTFMP was conducted within the Orion region over four consecutive nights (five days), in winter of 2021 (June/July) and summer of 2022 (January/February). Two transects were established at each of the four sites, which included rehabilitation of five, ten and 15 year age as well as unmined forest. One streamzone site was also monitored, consisting of targeted monitoring of quokkas and short-range endemics and did not follow the standard transect design. An additional eight transects across four sites, and one streamzone site, were established prior to summer 2021/2022. Two landscape trapping transects were also established; one inside the current mine perimeter and close to operations, and one outside the current mine perimeter largely surrounded by unmined forest. Across all sites during the 2021/22 monitoring program at Orion, a total of 13 mammal species were recorded, of which 11 were native, along with two species of frog, seven species of bird and eight species of reptile. This included 4 conservation significant mammals: Chuditch, Quokka, Western Brush Wallaby and Quenda. Several mygalomorph spiders were recorded, comprising at least eight species, with additional undescribed species likely. Several isopods and scorpions, one opilione and one pseudoscorpion were also collected, with identification ongoing.
2023	Biologic	Alcoa Willowdale (Larego Region) Targeted Carter's Freshwater Mussel Survey	Biologic conducted a targeted survey for CFM in the Larego region in November 2023. Seven sites including haul road sites and turbidity monitoring sites were sampled. Survey methods included foraging with mussel rakes, hand searching, intensive searching within quadrats, and sieving of sediments to locate juveniles. Substrate assessments were also undertaken, along with water quality measurements to evaluate suitability of in-stream habitat for CFM. A total of nine deceased and one live CFM were recorded during the survey. Water quality and habitat data found conditions were suitable for CFM at the time of the survey, and therefore did not provide any insight into possible causes of CFM mortality.
2023	GHD	O'Neil East Targeted Woylie Assessment	GHD conducted a targeted Woylie survey via remote camera traps in June 2023. A total of 71 remote cameras were deployed and remained in situ up to 41 nights. Cameras were baited with liquified peanut butter and sardines. Woylies were recorded at abundance during the remote camera trapping period within mixed shrub dampland and fringing Jarrah-Marri forest.
2023	GHD	Terrestrial Fauna Assessment O'Neil Mine Development	GHD conducted a desktop assessment and literature review of the O'Neil region, in addition to a basic fauna survey, and a targeted fauna survey. The survey area covered approximately 12,719.25 ha. Seven survey events were undertaken by GHD between June 2023 and January 2024. Targeted survey methods included: fauna habitat assessments; pitfall and tunnel traps; Elliott box traps; remote cameras; acoustic bat and bird call recorders; diurnal and nocturnal searches; opportunistic observations; and comprehensive assessment of Black Cockatoo habitat quality and quantity. The combined fauna surveys (reconnaissance to camera collection) recorded a total of 121 vertebrate fauna species, including 19 mammals (four introduced), 68 birds, 27 reptiles and seven frogs. Twelve conservation significant fauna species were recorded within the survey area: Baudin's Black Cockatoo; Forest Red-tailed Black Cockatoo;

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
			Carnaby's Black Cockatoo; Chuditch; Quokka; Carter's Freshwater Mussel; Rakali; Western Brush Wallaby; Dell's Skink; Quenda; Masked Owl; and Western False Pipistrelle.
2023	SLR Consulting Australia	Alcoa Myara – Carter's Freshwater Mussel Targeted Survey	A targeted survey for CFM at Myara was undertaken by SLR in October 2023. Six sites were targeted within the survey area, however only three sites were successfully sampled with the remaining three sites being dry. Monitoring was conducted along the length and width of inundated channel areas at the sites, employing visual observations for shells, manual hand sorting through benthic sediments, and gentle use of mussel rakes and wire baskets where water depth allowed. The survey methods for CFM followed that of Klunzinger *et al.* (2012) and EPA technical guidance for terrestrial vertebrate fauna surveys. No CFM were recorded in the survey locations during the targeted field survey, this includes live specimens, and the absence of shells or deceased individuals. Habitat observations of each site identified the substrate composition to be unsuitable for mussels to be present.
2023	SLR Consulting Australia	Black Cockatoo Habitat Assessment Huntly Mine – Myara Region	SLR conducted a fauna desktop assessment and Black Cockatoo habitat assessment between July to December 2023 for the Myara region. All three Black Cockatoo species were recorded during the survey, and given the large number of records from both the field and desktop assessment, all three species appear to regularly occur and use habitats within the survey area and surrounds. A total of 10,039 Black Cockatoo nesting or potential nesting trees were recorded, of which nine were categorised as known nesting trees due to the presence of hollows with chew marks indicating previous use. A total of 1,494 trees were categorised as suitable nesting trees due to the presence of suitably sized hollows, and the remaining 8,536 trees were categorised as potential nesting trees as they did not yet have suitable hollows, but may develop them in the future. A total of 501.6 ha of very high quality Black Cockatoo night roosting habitat and foraging habitat was identified within the survey area. Eleven Black Cockatoo roosting sites were recorded, of which six were confirmed to be FRBT roosting sites, and five undetermined. No direct evidence of breeding was observed during the assessment.
2023	SLR Consulting Australia	Targeted Chuditch, Quokka, and Woylie Survey Huntly Mine – Myara Region	SLR conducted a fauna desktop assessment and a targeted Chuditch, Quokka and Woylie survey for the Myara region between August and September 2023. The survey area covered 928.6 ha and used a total of 80 motion sensitive camera traps. The targeted fauna survey used a variety of detection methods including camera trapping, spotlighting, active searches and opportunistic observations. Fauna habitat mapping was based on a combination of field observations, vegetation mapping, fauna habitat assessment data and aerial imagery. Two targeted fauna species were recorded during the survey: the Chuditch was recorded 52 times with spot analysis indicating a minimum of 14 individuals occurring within the survey area; and the Quokka was recorded 18 times. The Woylie was not detected. An additional six conservation significant fauna species were also recorded: Baudin's Black Cockatoo; Carnaby's Black Cockatoo; Forest Red-tailed Black Cockatoo; Brush-tailed Phascogale; Quenda; and Western Brush Wallaby. A basic terrestrial fauna survey also recorded: 13 mammal taxa; 3 amphibian taxa; 35 bird taxa; and 10 reptile taxa. Five introduced fauna species were also recorded: Laughing Kookaburra; Red Fox; Rabbit; Black Rat; and Pig.
2023	SLR Consulting Australia	Targeted Chuditch, Quokka, and Woylie Survey Willowdale Mine – Larego Region	SLR conducted a fauna desktop assessment and a targeted Chuditch, Quokka and Woylie survey for the Larego region between October and November 2023. The survey area covered 451.8 ha and used a total of 45 motion sensitive camera traps. The targeted fauna survey used a variety of detection methods including camera trapping, spotlighting, active searches and opportunistic observations. Fauna habitat mapping was based on a combination of field observations, vegetation mapping, fauna habitat assessment data and aerial imagery. Five significant fauna taxa were

Year/s	Author	Project / Study Region	Summary of Project / Study and Findings
			recorded within the survey area: Baudin's Black Cockatoo; Forest Red-tailed Black Cockatoo; Chuditch; Rakali; and Western Brush Wallaby. A basic terrestrial fauna survey also recorded: 10 mammal taxa; 3 amphibian taxa; 12 bird taxa; and 5 reptile taxa. Three introduced fauna species were also recorded: Cat; Black Rat; and Pig.
2024	Bamford Consulting Ecologists	Myara North Mine Fauna Underpass Review.	Consultant engaged to prepare a report which included: site visits; review of survey data to identify conservation significant species likely to be present in the Project area; describe target species and their habitat; conduct literature review of underpass designs, including likelihood of use by target species; desktop assessment of each proposed culvert location to determine best culvert design for each location; and provide recommendations to mitigate impacts of proposed Myara North road system.
2024	GHD	Myara Pre-clearance Targeted Fauna Assessment	A targeted pre-clearance survey was undertaken during March – May 2024 within the Myara region, including a targeted Black Cockatoo assessment and a targeted fauna survey of EPBC Act listed fauna. Twenty five targeted remote cameras were deployed within the survey area, at a minimum of 400 m apart (dependent on habitat availability). Cameras were baited with a combination of sardines, tuna and peanut better and deployed to target Chuditch, Quokka and Woylies, however all significant and non-significant terrestrial fauna species were recorded. A Black Cockatoo habitat assessment for all three species was undertaken across the survey area to assess the presence, quality and extent of foraging and breeding habitat and assess roosting habitat. The assessment involved visual and aural assessment. Extensive foraging habitat was present, no known or potential roosting trees were recorded, and suitable nest trees were recorded. A basic fauna assessment was also undertaken during the survey, via traverses on foot and by vehicle and opportunistic fauna were recorded. The most extensive habitat identified was Jarrah-Marri forest, the survey area represents a large continuous tract of forest and woodland with good connectivity. Thirty four terrestrial fauna vertebrates were identified comprising nine mammals (two introduced), twenty one birds and four reptiles. Five conservation significant fauna were recorded: Chuditch; FRBT; Western Brush Wallaby; Brush-tailed Phascogale; and Quenda.
Various	Various	Introduced fauna threats to conservation significant fauna – Huntly and Willowdale.	The Feral Pig, Feral Cat, European Fox and European Rabbit are considered key threatening processes under the EPBC Act as they are threats to fauna species listed under the EPBC Act. These species are key threats to the EPBC Act listed species recorded or likely to occur in the Huntly and Willowdale mines: three Black Cockatoo species, Chuditch, and Quokka. Habitat disturbance from the Feral Pig (Sus scrofa) was notable in fauna habitat types that support conservation significant fauna species during the Myara North and Holyoake terrestrial surveys (GHD 2021a; 2021b), and throughout other regions noted during LTFMP and other environmental activities. Feral Cat is a known threat to the Quokka and Woylie, Numbat and Malleefowl (DEE 2013). Feral cats have been recorded across both Huntly and Willowdale during culvert monitoring and the LTFMP. The fox is a known threat to the Malleefowl, Numbat, Quokka, Woylie and Chuditch (DEE 2013). While no records confirming their presence within the Huntly or Willowdale sites have been collected, foxes are presumed to occur as indicated by their known range. The European Rabbit is a known threat to the Chuditch (DEE 2016). The European Rabbit has been recorded across both Huntly and Willowdale during the LTFMP.

Fauna Habitats

A total of six broad fauna habitat types have been recorded and mapped across portions of the Huntly and Willowdale mine areas based on vegetation, hydrology, soil and topography, during baseline fauna surveys, as outlined in Table F-2. Fauna habitat have been mapped in accordance with EPA guidance for terrestrial fauna surveys (EPA 2020) within the Myara North and Holyoake mine regions. Preliminary fauna habitat mapping has been undertaken in areas of the Huntly and Willowdale mines where baseline fauna surveys have not been undertaken, and extrapolation of habitats was made using available historical site vegetation type mapping, undertaken by Mattiske Consulting. These areas have not been subject to ground truthing in accordance with EPA guidance for terrestrial fauna surveys (EPA 2020).

Based on the surveyed and preliminary fauna habitat mapping, approximately 35 per cent of the Huntly and Willowdale Mine areas comprises Jarrah-Marri forest, which is associated with uplands and slopes, and is widespread across the NJF subregion. A further 17 per cent comprise mine site rehabilitation, which is predominantly a restoration of the Jarrah-Marri forest habitat type.

Approximately eight per cent of the mapped Huntly and Willowdale Mine areas comprises Blackbutt and Bullich Forest, associated with the lower slopes and creek lines, and less widespread across the NJF subregion. These habitat types may also be associated with potential seasonal aquatic fauna habitat along creek lines.

Approximately three per cent of the mapped Huntly and Willowdale Mine areas comprises Flooded Gum Woodland and Melaleuca Dampland, associated with swamps and drainage floors, which is relatively restricted in distribution in the NJF subregion. These habitat types may also be associated with seasonal aquatic fauna habitat.

Approximately one per cent of the mapped Huntly and Willowdale Mine areas comprises Granite Outcrops, which is relatively restricted in distribution in the NJF subregion.

Approximately 4.6 per cent of the mapped Huntly and Willowdale Mine areas comprises cleared land while 0.1 per cent comprises pine plantations.

To date, 81,382 ha (85.3%) of the Huntly Mine and 28,139 ha (47.4%) of the Willowdale Mine has been mapped for fauna habitat types and site vegetation types as identified within Table E-2.

Table E-2: Mapped Vegetation Types and Extents Across the Huntly and Willowdale Mine Areas

Habitat Type	Vegetation Description	Mapped Extent [25](ha)	Huntly Mine Area		Willowdale Mine Area	
			Area (ha)	Proportion of mine area (%)	Area (ha)	Proportion of mine area (%)
Blackbutt Forest Habitat limited to localised patches often associated with creeks and drainage lines.	Blackbutt open forest with occasional Bullich, and Marri over sparse *Banksia littoralis* over *Trymalium, Macrozamia, Xanthorrhoea preissii,* over *Lepidosperma tetraquetrum, Astartea scoparia* and areas of dense Swamp Peppermint (*Taxandria linearifolia*).	3,959.0	2,790.6	2.8%	923.6	1.6%
Bullich Forest Habitat associated with seasonal creeks and drainage areas.	Valleys and drainage areas dominated by Bullich (*Eucalyptus megacarpa*) and with some Blackbutt (*E. patens*), occasional Marri (*Corymbia calophylla*), over Sheoak (*Allocasuarina fraseriana*), *Banksia littoralis* over grass trees (*Xanthorrhoea preissii*), Bracken Fern (*Pteridium esculentum*), patches of dense *Gahnia trifida* shrubland over *Lasiopetalum floribundum,* sedges and herbs	4,642.7	3,317.2	3.4%	1,249.7	2.2%
Flooded Gum Woodland Habitat associated with poorly drained broad valleys forming seasonal swamps and occasionally tall open forest along drainage lines.	Flooded Gum (*E. rudis*) open woodland with occasional Blackbutt (*E. patens*), over open to open to sparse *Banksia littoralis* over Prickly Moses (*Acacia pulchella*), Myrtaceous species such as Swamp Peppermint (*Taxandria linearifolia*), *Astartea scoparia, Trymalium odoratissimum*, low shrub / sedgeland. Substrate varies from dark grey to grey-brown sandy clays.	3,624.7	2,969.9	3.0%	446.3	0.8%
Granite Outcrop Localised habitat patches associated with seasonal watercourses and seasonally damp areas.	Granite outcrops with associated lithic vegetation complexes and adjacent associated fringing open Jarrah (*E. marginata*) and Marri (*C. calophylla*) areas with scattered Sheoak (*A. fraseriana*), Melaleuca, *Banksia ilicifolia* over occasional grass trees over mixed open heath communities of Myrtaceous and Proteaceous low shrubs. Soils are pale grey to yellowish fine sand or sandy clay	1,615.9	1,513.5	1.5%	87.0	0.2%
Jarrah- Marri Forest Habitat comprise a number of vegetation types dominated by Jarrah on upper, mid and low slopes and broad valleys.	Jarrah (*E. marginata*) and Marri (*C. calophylla*) open forest over grass trees (*X. preissii*), *Lasiopetalum floribundum*, Macrozamia mid shrubland. Patches have dominance of understory *Allocasuarina fraseriana* and *Banksia grandis*. Often with complex mosaic of low shrubs such as Fabaceae, *Hibbertia*, *Leucopogon*, *Adenanthos*, and *Pteridium.*	68,268.3	52,974.1	53.6%	11,926.0	20.9%

[25] Unsurveyed areas encompass 15.6% (15,400 ha) and 62.4% (35,597.6 ha) of the Huntly and Willowdale mine regions respectively.

Habitat Type	Vegetation Description	Mapped Extent [25](ha)	Huntly Mine Area		Willowdale Mine Area	
			Area (ha)	Proportion of mine area (%)	Area (ha)	Proportion of mine area (%)
Melaleuca Dampland Habitat generally associated with limited areas of poor drainage and subject to winter inundation such as broad valleys and swamps.	Paperbark (*Melaleuca preissiana*) over sparse isolated *Banksia littoralis* over open *Hakea*, occasional Woody Pear (*Xylomelum*), Grass trees and over mixed shrub layer of Cyperaceae, Restionaceae, *Babingtonia*, *Jacksonia* and *Acacia*, over low shrubs, sedges and herbs. There are areas of sparse to occasional stunted Jarrah and Marri however these are limited to lowland transitional zones adjacent to slightly higher elevation and drainage open forest areas.	976.9	931.8	0.9%	36.1	0.1%

Research into Mine Rehabilitation

Alcoa's rehabilitation and its effectiveness in restoring terrestrial fauna habitats and assemblages demonstrates:

- Alcoa's mine rehabilitation restores most terrestrial vertebrate fauna biodiversity in the short to medium term (within about 10 years), as it restores foraging habitat through establishment of a native vegetation understorey then overstorey. Current rehabilitation prescriptions are expected to improve foraging habitat values for Black Cockatoos.
- The relatively dense vegetation of past rehabilitation prescriptions, that aligned with past completion criteria affected the restoration of reptile biodiversity; however, the current rehabilitation prescription aligned with current (2016) completion criteria, aims to restore a lower density of trees which may increase the restoration of reptile biodiversity.
- Rehabilitation restores minor densities of coarse woody debris (CWD) and does not immediately restore potential hollow bearing trees, both will take over a century to accumulate to levels comparable to un-mined forest. CWD and trees hollows provide shelter, breeding habitat and invertebrate microhabitats and are key elements of fauna habitat quality and ecological integrity.
- Whilst rehabilitation will take over a century to get to an age where the trees will start to develop hollows, all trees with current hollows suitable for use by Black Cockatoos are retained, so large mature trees are interspersed throughout the rehabilitation, providing habitat to birds and arboreal mammals immediately.

A summary of the research is provided in Table E-3.

Table E-3: Summary of Alcoa Research into Mine Rehabilitation

Class / Species	Research Findings
Mammalia	Nichols and Grant (2007) reviewed mammal recolonisation of mine rehabilitation based on a range of studies commencing as early as 1978. It was noted that monitoring of native mammals was problematic until fox baiting in the 1990s, following which there was increased trapping success. The studies collectively indicated all mammal species recolonize rehabilitation within 10 years of completion, however the timeframe for recolonisation varies between species. Rapid colonizers (e.g. Chuditch, Quenda) were recorded within 2 years of completion. Other species (e.g. Brush Wallaby) recolonize within 4-5 years while Echidna, Brush-tailed Phascogale and Common Brushtail Possum recolonized in 8-10 years. Nichols and Grant (2007) note this is partly due to foraging requirements, with rapid colonizers grazing on newly established plants or invertebrates while arboreal species require trees of a certain age for foraging. Studies collectively indicated that for most species females were recorded carrying young in rehabilitated areas, however breeding records varied between species (Nichols and Grant 2007). Kangaroos and Western Pygmy Possum were recorded breeding in rehabilitation; however no breeding had been recorded for Chuditch or Quenda, and Brushtail Possums require hollows for nesting so will rely on older trees in un-mined forest or those retained within rehabilitation. Nichols and Grant (2007) concluded that studies indicate that all mammal species use Alcoa's rehabilitation, though in differing rates and extent which appears to be due to differing foraging and shelter requirements and possibly abundance in the surrounding forest. Craig et al. (2012) investigated successional patterns of six small mammal species in Alcoa's rehabilitation at ages of 4 to 17 years and concluded that mammal communities converged to that of un-mined forest as rehabilitation matured. All species surveyed recolonized rapidly, indicating that there were no habitat features that acted as 'filters' to slow or prevent small mammal recolonisation.
Woylie	Recolonisation of Woylie into mine rehabilitation has not been recorded to date nor have specific studies been conducted on the species, however Woylie are not expected to occur within rehabilitated areas due to absence in surrounding forest. The species primarily feeds on fruiting bodies of ectomycorrhizal fungi, however they also consume a broad diet including invertebrates, seeds and other plant material (Zosky et al 2018). Glen et al (2008) found that Alcoa's mine rehabilitation contained a species richness of ectomycorrhizal fungi similar to that un-mined forest within a period of 15 years, with species composition tracking towards that of un-mined forest as the rehabilitation increased in age, suggesting the gradual restoration of ectomycorrhizal communities. The findings by Glen et al (2008), the restoration of floristic diversity (>80 per cent) and recolonisation by invertebrates suggest that mine rehabilitation has potential to support Woylie foraging as rehabilitation matures, provided that ongoing integrated predator control is maintained.
Chuditch	McGregor et al (2014) studied macro and micro habitat use by Chuditch within the mosaic of mine rehabilitation and un-mined forest at the Huntly and Willowdale Mines. The study indicated that Chuditch used rehabilitation of varying ages for denning and were adaptable in use of den substrates, selecting burrows associated with surface rocks in rehabilitation where preferred substrates used in unmined forest (hollow logs and stumps) were less available. Logs were an important microhabitat used by Chuditch to traverse un-mined forest and were relatively sparse in rehabilitation, at three per cent of the density of un-mined forest. McGregor et al (2014) suggested that rehabilitation provides a permeable matrix for Chuditch that is rapidly recolonized and utilized for denning, however the relative sparsity of microhabitats in rehabilitation required further study to determine whether this affected breeding success and long-term survival.
Quokka	Craig et al (2017) studied occupation of Quokka in mine rehabilitation aged 16-21 years to identify whether the vegetation structure provides suitable habitat. Quokka prefers riparian and swamp habitats with dense understorey vegetation that provides shelter from predators. Mining does not occur within riparian and swamp areas and accordingly rehabilitation predominantly restores the structure of upland Jarrah forest that is not the species preferred habitat. Craig et al (2017) recorded Quokka in riparian forest and mine rehabilitation but not in un-mined mid-slope Jarrah forest, with findings indicating that Quokka favoured mine rehabilitation with dense understory in proximity to riparian habitat. It is noted that the rehabilitation surveyed by Craig et al (2017) developed under prescriptions of the 1990s. Contemporary rehabilitation prescriptions are expected to reduce the density of understorey, which may potentially reduce the shelter from predators and so habitat value for Quokka.

Class / Species	Research Findings
Birds	Nichols and Grant (2007) reviewed bird recolonisation of Alcoa's mine rehabilitation based on a range of studies commencing as early as the mid-1970s. The studies collectively indicated that birds rapidly recolonized rehabilitation, recording 95 per cent of 70 bird species that inhabit upland Jarrah forest. Analysis of Alcoa's LTFMP data indicated that contemporary rehabilitation had similar community structure to that of un-mined forest at about 10 years from establishment, including comparable numbers of species, diversity (i.e. relative abundance) and composition (Nichols and Grant 2007). The most notable species not yet present was the Rufous Treecreeper (*Climacteris rufa*), which forages for insects on the trunks of tall eucalypts and among log piles. The remainder were uncommon species that may have returned but have not yet been observed. Nichols and Grant (2007) noted that while species that built nests in a variety of sites bred successfully in rehabilitation, those that nest in hollows will not breed for an extended period until hollows reform, but will use rehabilitation for foraging.
Black Cockatoos	Doherty et al (2016) studied foraging by Black Cockatoos in Huntly Mine rehabilitation over ages 4 to 20 years. The study indicated that Black Cockatoos commenced foraging on proteaceous and myrtaceous food plants within 4 and 7 years of rehabilitation establishment, respectively. Foraging transitioned from proteaceous plants to myrtaceous plants as the vegetation structure transitioned from a dominant understorey to a closed overstorey. Foraging densities in rehabilitation were relatively low, being recorded in ten per cent of rehabilitation plots, with zero per cent foraging of Jarrah, ten per cent foraging of Marri and 50 per cent of some Hakea species (where present). By comparison, un-mined forest plots recorded foraging in 25 per cent of Jarrah, 65 per cent of Marri and 25 per cent of Persoonia and Sheoak. Logistic regression analysis indicated a lower likelihood of foraging with rehabilitation age. Survey undertaken in 2020 of Jarrahdale and Huntly Mine rehabilitation at 20 and 30 years indicated predominantly low foraging by Black Cockatoos compared to higher foraging in adjacent un-mined forest (T. Kirkby, pers. comm., 2020). Doherty et al (2016) speculated that the lower foraging in rehabilitation may be due to the younger tree age; a higher stem density affecting growth, flowering and fruiting; or a higher stem density impeding access for canopy feeding. It is noted that the rehabilitation studied by Doherty et al (2016) and surveyed by Kirkby (2020) reflects prescriptions in the 1990s with an average tree establishment of 3000 stems/ha, whereas contemporary prescriptions from 2016 onwards target 1000 stems/ha. Contemporary rehabilitation is therefore expected to have a substantially lower overstorey density, which may improve foraging habitat quality from that indicated by Doherty et al (2016) and Kirkby (2020).
Reptilia	Nichols and Grant (2007) reviewed reptile recolonisation of Alcoa's mine rehabilitation based on a range of studies commencing as early as the mid-1970s. The combined studies have indicated recolonisation by 87 per cent of 24 reptile species that inhabit upland Jarrah forest. These include species from all upland reptile families, indicating that to some extent rehabilitation caters for a wide range of reptile habitat requirements. Reptile recolonisation appears to follow a pattern of succession, with rapid return of general foragers and active predators that feed on feral mice that are temporary, early disturbance colonisers. These are followed by small, mobile insectivores. Late colonists include those species that require particular habitats such as exfoliating bark and deep leaf litter that may take more than 10 years to develop (Nichols and Grant 2007). Three species not yet recorded feed on small vertebrates and so may be affected by low densities of small reptiles and potentially scarcity of shelter such as coarse woody debris (CWD e.g., logs, stumps). However, it is also noted that the three species are rarely recorded in un-mined forest and so may be present but not noticed in rehabilitation. The studies indicate that abundance of reptiles is lower in rehabilitation than in un-mined forest, which is likely to be due to the scarcity of shelter rather than food availability. Craig et al (2012) investigated successional patterns of 20 reptile species in Alcoa's rehabilitation at ages of 4 to 17 years and concluded that reptile communities did not converge to that of un-mined forest, indicating that there were 'filters' that slowed or prevented recolonisation. Craig et al (2012) identified lower CWD volumes and higher overstorey stem densities as likely filters, with CWD a filter that will decrease gradually over the long term (possibly centuries) as CWD naturally deposits, while overstorey density is dynamic and fluctuates in intensity over shorter timeframes. Craig et al (2018) further reported overstorey fluctuation over a period of two to seven years in response to thinning and fire treatments, with the recovery of overstorey density precluding persistence of some reptile species. It is important to note that the rehabilitation studied by Craig et al (2012, 2018) comprised distinct cohorts with a substantial variation in prescriptions. Contemporary rehabilitation from 2016 onwards comprises a lower overstorey seeding (1000 stems/ha) than that of the 2000s (1400 stems/ha) or 1990s (3000

Class / Species	Research Findings
	stems/ha), a lower legume seeding and a lower fertilizer application (20 kg P/ha) than in the 2000s (40 kg P/ha) or 1990s (80 kg P/ha). The combined effect of the contemporary prescription is a reduced density of overstorey and understorey, a reduced dominance of leguminous (e.g. Acacia) shrubs and increased floristic diversity. Accordingly, contemporary rehabilitation is expected to reduce the effect of the dynamic filter and improve reptile recolonisation to that documented by Craig et al (2012). Coarse woody debris habitat value for reptiles The importance of CWD as habitat for some reptiles was further studied by Christie et al (2012, 2013) with respect to Napoleon's skink (Egernia napoleonis). This species relies on logs for habitat and is largely absent from rehabilitation. Christie et al (2012) concluded that CWD fauna habitats were required at densities of 60 per hectare to enable the species to recolonize. Given that such habitat construction is unfeasible, Christie et al (2012) recommended targeted CWD placement in large piles or corridors near un-mined forest. Christie et al (2013) trialled CWD placement within rehabilitation close to un-mined forest, reporting initial success in recolonisation by Napoleon's skink. Triska et al (2016) assessed the relative influence of landscape and site factors on reptile recolonization of rehabilitation at the Huntly Mine. The study indicated that most reptiles that were commonly found in rehabilitation were present by 3-4 years from completion, however assemblages did not converge to that of un-mined forest. Species composition and abundance was primarily influenced by site factors such as canopy height, litter cover and CWD volume and not by landscape factors (e.g. availability of source populations). Triska et al (2016) recommended continued focus on restoring microhabitats and vegetation structure to that of un-mined forest to promote recolonisation by reptiles. The studies have demonstrated that mine rehabilitation provides suitable habitat for recolonisation by some reptile species however the lower density of CWD and higher overstorey stem density may prevent recolonisation and persistence of some reptile species over the long term. This suggests a partial loss of biodiversity and ecological integrity until CWD habitat and overstorey density matures over the long term and approaches that of un-mined forest.

APPENDIX F: Black Cockatoos – Alcoa's Chance Find Procedure for Exploration Phase Activities

The Northern Jarrah Forest, where Alcoa operates, supports habitat for three listed threatened species of Black Cockatoo species: Forest Red-tailed Black Cockatoo; Baudin's Black Cockatoo; and Carnaby's Black Cockatoo. Under the State BC Act and Commonwealth EPBC Act, the Forest Red-tailed Black Cockatoo is listed as Vulnerable, and Carnaby's and Baudin's Black Cockatoos are listed as Endangered.

Significant Trees

Significant trees provide roosting and foraging habitat for Black Cockatoos and are protected by Alcoa (where reasonably practicable, and otherwise disturbed under authorisation).

Jarrah – *Eucalyptus marginata*

- A healthy tree with a Diameter at Breast Height (DBH) ≥ 2000 mm; and
- Has a circumference ≥ 6,283 mm.

A healthy Marri (*Corymbia calophylla*) tree with a DBH of ≥ 1500 mm.

Marri – *Corymbia calophylla*

- A healthy tree with a DBH a DBH of ≥ 1500 mm; and
- Has a circumference ≥ 4,712 mm.

Procedure for Encountering a Potential Significant Tree During Exploration Activities

- Measure the circumference of the tree if safe and possible to do so.
- Record the location of potential significant tree via GPS and take a photograph.
- Do not conduct any activities (i.e. drilling or other) within 10 m of the potential significant tree.
- Send the GPS location and photograph to the environment team as soon as practical.
- The potential significant tree/s will be checked by a suitable consultant to confirm the status.

Nest Trees

A tree (live or dead but still standing) containing one or more hollows suitable as Black Cockatoo breeding habitat. A suitable hollow is based on hollow size, shape, and entry angle, irrespective of signs of use for breeding, however signs of use such as chew marks may be visible around the outside of the hollow.

Hollows suitable for Black Cockatoos must have suitable:

- entrance size: > 100 mm
- depth: > 500 mm
- orientation: side, top or double entry
- height from ground: > 6 m

Procedure for Encountering a Potential Nest Tree During Exploration Activities

- GPS recording of the potential nest tree/s and take a photograph.
- Do not drill or undertake other activities within 10 m of the potential nest tree/s. If tree is confirmed as a nest tree, no drilling or activities will be undertaken within 50 m of the tree/s.
- Send the GPS location and photograph to the environment team as soon as practical.
- The potential nest tree/s will be checked by a consultant to confirm breeding habitat.