

8 Offsets

8.1 EPA Objective

The EPA's environmental objective for Proposal that may require Environmental Offsets is (EPA, 2014):

“To counterbalance any significant residual environmental impacts and/or uncertainty through the application of offsets”.

8.2 Policy and Guidance

The Western Australian Environmental Offset Framework includes the following documents:

- WA Environmental Offsets Policy (GoWA, 2011);
- WA Environmental Offsets Guidelines (Government of Western Australia, 2014);
- WA Environmental Offsets Template (2014) Environmental Offsets Metric (Department of Water and Environmental Regulation, 2021)
- EPA Public Advice: Considering environmental offsets at a regional scale (EPA, 2024d; EPA, 2016a)

Other policy and guidance considered in the development of the this offset include:

- Statement of environmental principles, factors, objectives and aims of EIA (EPA, 2023d)
- Environmental factor guideline – Flora and vegetation (EPA, 2016a)
- Environmental factor guideline – Terrestrial fauna (EPA, 2016c)
- Instructions on how to prepare an environmental review document (EPA, 2024c)
- Instructions on how to prepare Environmental Protection Act 1986 Part IV environmental management plans (EPA, 2024b)
- Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy [DSEWPC (2012a)]
- EPA Advice: Carnaby's cockatoo in Environmental Impact Assessment in the Perth and Peel Region (EPA, 2019)
- Forest Black Cockatoo (Baudin's Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)) Recovery Plan [DEC (2008)]
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan, (DPaW, 2013)
- Approved Conservation Advice for *Calyptorhynchus banksii naso* (Forest Red-tailed Black Cockatoo) (including listing advice) (DAWE, 2009)
- Conservation Advice for *Calyptorhynchus baudinii* – Baudin's cockatoo, Threatened Species Scientific Committee (DAWE, 2018b)
- Referral guidelines for three WA threatened Black Cockatoo species: Carnaby's cockatoo, Baudin's cockatoo and Forest red-tailed Black Cockatoo (DAWE, 2022)
- Chuditch (*Dasyurus geoffroii*) Recovery Plan. Wildlife Management Program No. 54 (DEC, 2012a)
- Quokka *Setonix brachyurus* Recovery Plan. Wildlife Management Program No. 56. (DEC, 2013)

Other guidance:

- Forest Management Plan 2024 2033 (Conservation and Parks Commission, 2023); and

- Other relevant recovery plans, conservation advice documents and/or threat abatement plans for conservation significant species that are known to occur or are likely to occur in the vicinity of the Proposal areas.

8.3 Application of Mitigation Hierarchy

Environmental offsets will only be applied where the residual impacts of a Proposal are determined to be significant, after avoidance, minimisation and rehabilitation have been pursued (EPA, 2014).

Alcoa has committed to protect (where feasible) key values and areas identified by environmental studies and/or stakeholder consultation through use of the mitigation hierarchy: avoid, mitigate or minimise, rehabilitate, offset.

Proposed management measures will avoid or minimise impacts to threatened, priority or conservation significant flora, vegetation communities and/ or fauna species. Following mining, Alcoa rehabilitates mine pits to an agreed ecological standard.

Avoidance and mitigation measures have been detailed in the relevant impact assessment chapters (Section 5.3.8). Plate 8-1 below illustrates how the mitigation hierarchy is applied to reduce the residual impact before its significance is assessed to determine whether an offset is required.

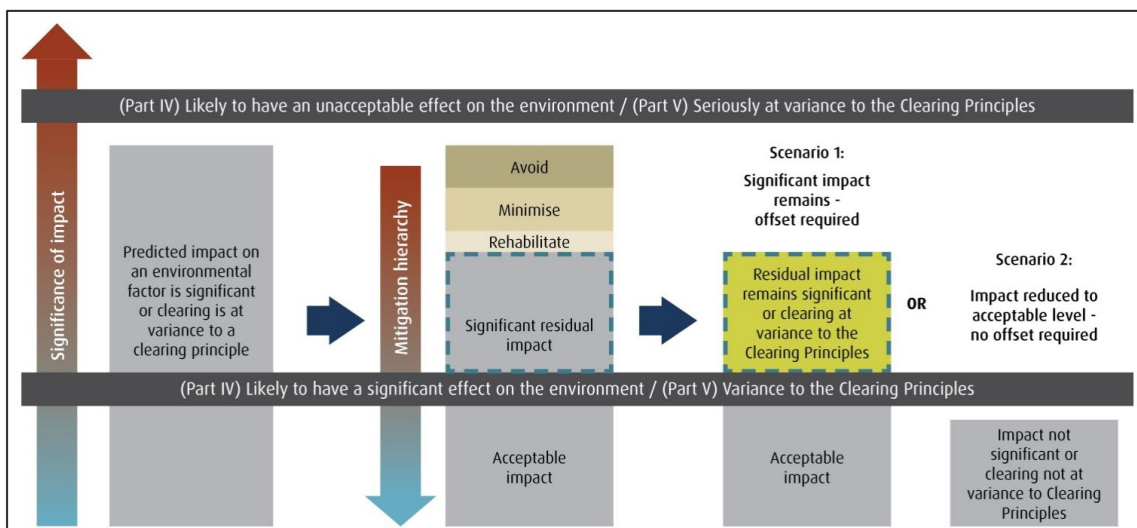


Plate 8-1: Mitigation Hierarchy (Government of Western Australia, 2014)

8.4 Significant Residual Impacts

The offset guidance (GoWA, 2014) defines significant residual impacts as:

“In general, significant residual impacts include those that affect rare and endangered plants and animals (such as declared rare flora and threatened species that are protected by statute), areas within the formal conservation reserve system, important environmental systems and species that are protected under international agreements (such as Ramsar listed wetlands) and areas that are already defined as being critically impacted in a cumulative context. Impacts may also be significant if, for example, they could cause plants or animals to become rare or endangered, or they affect vegetation which provides important ecological functions.”

This ERD identifies that the Proposal may result in a significant residual impact (SRI) on the Terrestrial Fauna (Section 5.3.9) environmental factor. The Residual Impact Significance Model (RISM), prepared as per Figure 3 in the WA Environmental Offsets Guidelines, is in Table 8-1.

The significant residual impact has been calculated following consideration of Alcoa's rehabilitation after mining, which returns foraging, roosting and ground habitat for impacted species. There is also considerable cross over of habitat in the areas to be cleared. The extent of the likely significant residual impacts is in Table 8-2.

Table 8-1: Preliminary offset triggers – Residual Impact Significance Model

This table is based on the Residual Impact Significance Model page 11 of the WA Environmental Offsets Guidelines (Government of Western Australia, 2014)

Part IV Environmental Factors	Vegetation and Flora							All factors
	Benthic Habitat and Communities				Marine Fauna Benthic Habitat and Communities			
	Terrestrial Fauna							
	Rare flora	Threatened ecological communities	Remnant vegetation	Wetlands & waterways	Conservation areas	High biological diversity	Habitat for fauna	Other
Residual impact that is environmentally unacceptable or cannot be offset	No rare flora identified	Identified threatened ecological communities (<i>Empodisma</i> peatland) are to be avoided.	Vegetation complexes have over 75 per cent of pre-European extent remaining.	No conservation significant wetlands identified	No clearing will occur in conservation reserves	None identified	Overall, the clearing will not significantly reduce the extent of any fauna habitat type.	N/A
Significant residual impacts that will require an offset – All significant residual impacts to species and ecosystems protected by statute or where the cumulative impact is already at a critical level	No rare flora identified	Identified threatened ecological communities (<i>Empodisma</i> peatland) are to be avoided.	Vegetation complexes have over 75 per cent of pre-European extent remaining.	No conservation significant wetlands identified	No clearing will occur in conservation reserves	None identified	The significant residual impacts following clearing and rehabilitation of 4,117 ha of fauna habitat can be offset. The significant residual impacts are to threatened fauna habitat, ~2,400 ha for Black Cockatoos, ~1,500 ha for Chuditch, ~40 ha for Quokka and ~2,000 ha for Woylie.	N/A
Significant residual impacts that may require an offset – Any significant residual impact to potentially threatened species and ecosystems, areas of high environmental value or where the cumulative impact may reach critical levels if not managed	No rare flora identified	Identified threatened ecological communities (<i>Empodisma</i> peatland) are to be avoided.	Vegetation complexes have over 75 per cent of pre-European extent remaining.	No conservation significant wetlands identified	No clearing will occur in conservation reserves	None identified	None identified	N/A

Part IV Environmental Factors	Vegetation and Flora							All factors
	Benthic Habitat and Communities					Marine Fauna		
	Terrestrial Fauna					Benthic Habitat and Communities		
	Rare flora	Threatened ecological communities	Remnant vegetation	Wetlands & waterways	Conservation areas	High biological diversity	Habitat for fauna	Other
Residual impacts that are not significant	No rare flora identified	The threatened ecological community <i>Empodisma</i> peatland has been identified in proximity to the Willowdale Mine DE, with the potential to also occur in Huntly though it is not currently known. Avoidance of the TEC will occur, if identified.	Vegetation complexes mostly have over 75% of pre-European extent remaining. Reduction in current extent is between 7% and 58.1% (the outlier being Darling Scarp, DS2). All other vegetation complexes range from 7% to 24.4% Alcoa rehabilitates the cleared areas following mining operations.	No conservation significant wetlands identified. The Proposal is unlikely to cause a significant direct impact to Potential GDEs as their extent has been clearly delineated through association with VTs and the use of VT mapping.	No clearing will occur in conservation reserves	None identified	The temporary loss of habitat within the Mine DEs is not expected to cause a significant impact to State listed (i.e., under the BC Act) priority, conservation dependent or other specially protected fauna.	<p>Direct clearing of the 'Granite communities' PEC.</p> <p>The distribution and extent of this PEC within the Mine DEs has been predicted based on association of the PEC with VTs and vegetation complexes. Clearing of identified granite outcrop areas is minimised through application of LDAs. Only 5.5% of the potential area of the PEC inside the Mine DEs is proposed to be cleared.</p> <p>Direct clearing of Priority flora populations. Priority flora populations have been recorded within the Mine DEs and many more species have been identified as potentially occurring within the Mine DEs. Whilst all areas will be covered by Targeted flora surveys prior to clearing in order to identify any conservation significant flora populations present, if Priority flora species are identified impacts will be minimised to a specified outcome.</p> <p>However, future FCAs will include outcomes of Targeted flora surveys and regulatory consultation will occur to ensure no significant impacts occur.</p>

Table 8-2: Significant Residual Impact in the Mine DEs

Conservation Significant Fauna	Habitat value	Significant impact (ha)	Proposed rehabilitation (80% of significant impact)	Future quality without rehabilitation	Future quality with rehabilitation	Time until ecological benefit (years since first impact)	Confidence in rehabilitation result	Significant residual impact (ha)
Forest Red-tailed Black Cockatoo (VU)	10	3,931.8	3,145.5	0	6	10	90%	2,266.88
Baudin's Black Cockatoo (EN)	10	3,918.5	3,134.8	0	6	10	90%	2,416.06
Carnaby's Black Cockatoo (EN)	10	3,918.5	3,134.8	0	6	10	90%	2,416.06
Woylie (CR)	7	4,117.0	3,293.6	0	6	10	90%	1,960.70
Chuditch (VU)	8	4,101.2	3,281.0	0	6	8	90%	1,537.31
Quokka (VU)	8	95.6	76.50	0	6	10	90%	35.99

8.5 Environmental Offset Considerations

Environmental offsets are conservation actions which provide environmental benefits intended to counterbalance the significant residual environmental impacts associated with a Proposal (GoWA, 2014).

The environmental offsets have been developed by applying the following offset principles:

- Alcoa have only considered environmental offsets after avoidance and mitigation options has been pursued (Section 5.3.8).
- Alcoa is committed to rehabilitation of all areas cleared within the Mine DEs, with rehabilitation occurring on a rolling basis throughout the lifecycle of each mine region and following closure (Section 2.2.4).
- Environmental offsets are appropriate for this project. This is a major project that provides significant economic and social benefits for the State (Section 1.5.1).

8.6 Offset Strategy

Alcoa's Environmental Offset Strategy (Appendix 13) describes at a high-level Alcoa's environmental offset program. The environment offset program is built around the implementation of conservation projects that provide positive outcomes for threatened species on a local and landscape scale.

Conservation outcomes on a local scale will address significant residual impacts specific to a local area but the net benefit will extend to and complement landscape and regional scale programs. Environmental offset projects will deliver landscape scale outcomes and enhance ecosystem function and habitat connectivity whilst aligning with the holistic management approach towards the environmental values of the Northern Jarrah Forest.

The high-level environmental objectives of the Environment Offset Program are to:

- Deliver landscape scale conservation outcomes through environmental offset projects in the Northern Jarrah Forest bioregion of Western Australia.
- Protect and enhance key or important habitat areas for threatened species.
- Support the implementation of priority actions in species management or recovery plans.
- Facilitate and/or undertake research to address knowledge gaps and improve management of habitat for and reduce threats to threatened and conservation significant species.
- Work collaboratively with all relevant stakeholders, including Traditional Owners, conservation agencies, industry, government, academia and environmental organisations, to achieve positive environmental, conservation and social outcomes for communities and Aboriginal people.

For each Proposal referred under the EP Act, Alcoa will provide an Environmental Offset Proposal. The Environmental Offset Proposal will state the significant residual impacts and the proposed offset extent. To deliver the outcomes Alcoa will:

1. Develop Environmental Offset Project Plans. These plans will demonstrate how environmental outcomes specific to the significant residual impacts will be achieved through the management actions.
2. Develop Environmental Offset Area Management Plans. These plans describe the spatial area in which Environmental Offset Projects will be implemented.

The environmental offset strategy framework is shown in Plate 8-2 below.

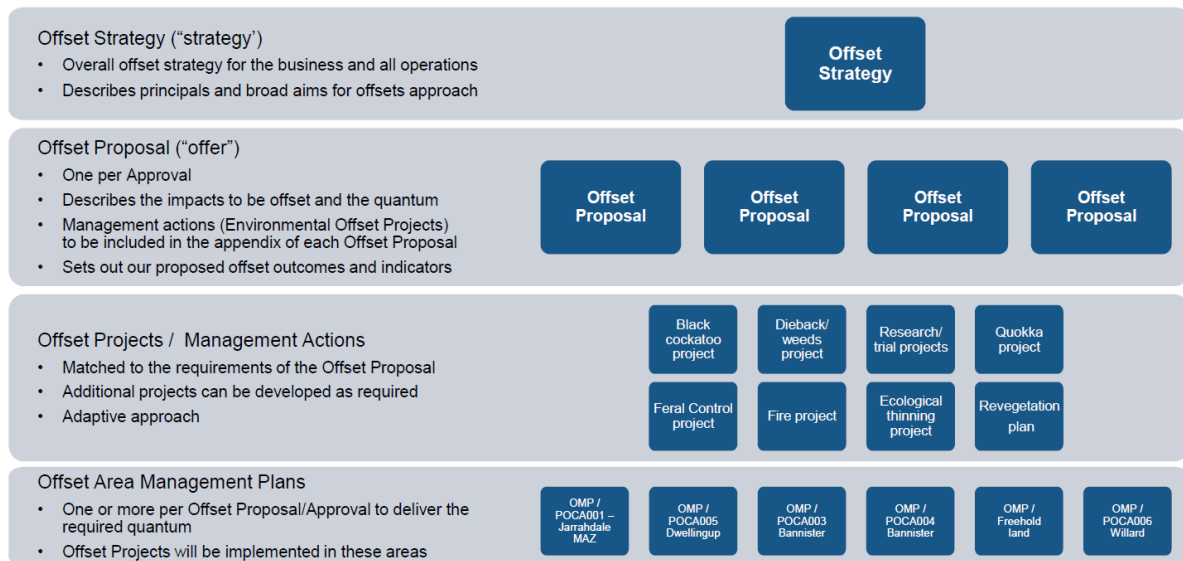


Plate 8-2: Offset Proposal Framework

8.7 Offset Proposal

Alcoa propose to offset the impacts from the Proposal through the implementation of environmental offset projects in degraded areas of State Forest to improve habitat quality, condition and functionality.

The current Offset Proposal is included in the Pinjarra Alumina Refinery Revised Proposal (Assessment 2253) ERD.

8.7.1 Objectives

The high-level objectives of this Offset Proposal are to:

- Identify areas of important habitat within the Northern Jarrah Forest for threatened species and
 - enhance foraging, roosting and breeding habitat for Black Cockatoos
 - reduce the abundance and/or distribution of feral foxes, cats and pigs in important habitat areas and
 - sustain or improve abundance and/or distribution and ongoing viability of threatened species within the Northern Jarrah Forest.
- Contribute to ongoing research, knowledge and understanding of threatened species habitat and movement in the Northern Jarrah Forest.
- Provide information on the appropriateness, suitability and effectiveness of recovery, threat abatement and conservation or management actions.
- Provide beneficial conservation outcomes for other species that could use the habitat including but not limited to numbats, woylie, western ring tailed possums, quenda, brush-tailed phascogale, western brush wallaby and rakali.
- Help resolve key knowledge gaps, identified in consultation with DBCA, that will lead landscape scale and multi-organisation co-operations to maintain the ongoing ecological integrity of the Northern Jarrah Forest.

8.7.2 Proposed Outcomes

The delivery of this Offset Proposal is expected to provide the following outcomes for threatened fauna that may be impacted by the Proposal:

Maintain and enhance no less than 8,609 hectares of remnant vegetation in State Forest that contains:

1. At least 8,609 hectares of habitat for Black Cockatoos
2. At least 5,062 hectares of habitat for Chuditch
3. At least 119 hectares of habitat for Quokka.
4. At least 8,512 hectares of habitat for Woylie

The outcomes will be delivered by improving habitat functionality for threatened fauna species by:

- Improving Black Cockatoo habitat through provision of permanent drinking water sources, fire protection mechanisms, preserving and maintaining Black Cockatoo known, suitable and potential nesting trees;
- Improving Chuditch and Woylie habitat through a reduction in feral foxes and cats; and
- Improving quokka habitat through reduction in feral pigs and enhancement of riparian vegetation.

The proposed environmental outcomes in this draft Offset Proposal are achievable, scientifically robust and reasonable. The proposed outcomes have been developed with regards to *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2024b).

8.7.3 Proposed Offset Extent

Alcoa has used the WA environmental offsets metric (calculator and guidance) (DWER, 2021) to calculate the proposed offset extent. The WA environmental offsets metric calculator is a tool that can be used by proponents to help determine the minimum offset required to address significant residual impacts. Alcoa has also taken into consideration the draft additional guidance on metric inputs released for public consultation from 12 May to 8 July 2022 (DWER, 2022).

The significant impacts and offsets have been calculated using area. Alcoa uses fauna spotters and other management measures to avoid direct mortality or injury to fauna. The impacts to fauna are from the loss or degradation of their habitat. Therefore, the impacts and offsets are calculated based on loss of habitat.

A summary of the proposed offset quantum is in Table 8-3. The values and justification used in the application of the calculator are in Table 8-4. The offset assessment guides are provided in Appendix 71 to Appendix 75 inclusive, and the WA Environmental Offsets Template is provided in Appendix 77.

Table 8-3: Summary of proposed offset quantum

Species	BC Act Status	Raw Impact (ha, rounded)	Significant Residual Impact (ha, rounded)	Proposed Offset Extent (ha, rounded)
Forest Red-tailed Black Cockatoo	VU	3,932	2,267	7,518
Baudin's Black Cockatoo	EN	3,919	2,416	8,609
Carnaby's Black Cockatoo	EN	3,919	2,416	8,609
Woylie	CR	4,117	1,961	8,512
Chuditch	VU	4,101	1,537	5,062
Quokka	VU	96	36	119

Table 8-4: Application of the WA environmental offsets metric calculator

Environmental value	Forest Red-tailed Black Cockatoo	Baudin's Black Cockatoo	Carnaby's Black Cockatoo	Woylie	Chuditch	Quokka	Rationale
Step 1: Conservation Significance							
Type of environmental value	Species (fauna)	Species (fauna)	Species (fauna)	Species (fauna)	Species (fauna)	Species (fauna)	Loss of habitat for fauna species
Conservation Significance	VU	EN	EN	CR	VU	VU	As per DBCA Threatened and Priority Fauna List – October 2024 (DBCA, 2024b)
Step 2: Significant Residual Impact							
Significant impact (ha)	3,932	3,919	3,919	4,117	4,101	96	Black Cockatoos, Woylie & Chuditch – clearing of predominantly Jarrah-Marri Forest habitat type Quokka & Woylie – clearing of drainage lines (Blackbutt and Bullich forest) and Melaleuca damplands vegetation
Quality (scale)	10	10	10	7	8	8	Due to gaps in vegetation condition data, and survey information all the habitat values for Black Cockatoos, Woylie, Chuditch and Quokka have been rated as high.
Proposed rehabilitation (ha)	3,145	3,135	3,135	3,293	3,281	76	80% of the Mine area that will be cleared will be rehabilitated (see Section 2.2.4). The remaining 20% will not be rehabilitated within a similar timeframe.
Current quality of rehabilitation site (scale)	0	0	0	0	0	0	Following clearing and mining, the area is assumed to have no to little habitat value for Black Cockatoos, Woylie, Chuditch or Quokka.
Future quality without rehabilitation (scale)	0	0	0	0	0	0	Without active rehabilitation, the area is assumed to remain as having little habitat value for Black Cockatoos, Woylie, Chuditch or Quokka.
Future quality with rehabilitation (scale)	6	6	6	6	6	6	Although Alcoa's rehabilitation returns habitat for fauna, a conservative approach has been taken when attributing a value to future quality of habitat. A value of six has been given consistently for future quality following rehabilitation efforts.

Environmental value	Forest Red-tailed Black Cockatoo	Baudin's Black Cockatoo	Carnaby's Black Cockatoo	Woylie	Chuditch	Quokka	Rationale
Time until ecological benefit (years)	10	10	10	10	8	10	Chuditch is considered opportunistic and adaptable and is able to rapidly recolonise the rehabilitated environment. It has been assumed that five years of rehabilitation would provide ecological benefit to the Chuditch. Quokka thrive in dense riparian habitats. Rehabilitation has an ecological benefit when it can provide dense, leafy coverage along protective corridors. A period of seven years is considered a suitable timeframe for riparian vegetation to be beneficial to the Quokka.
Confidence in result (%)	90	90	90	90	90	90	Confidence in rehabilitation is high based on the successful large-scale rehabilitation across Alcoa's operations, particularly over the past 20 years, therefore the confidence in result of this rehabilitation is therefore given a value of 90%. The 10% uncertainty is allocated to the small proportion of rehabilitation not meeting the criteria within the timeframe.
Total quantum of impact (ha)	3,932	3,919	3,919	2,882	3,281	76	Calculated.
Rehabilitation credit (ha)	1,665	1,502	1,502	921	1,744	40	Calculated.
Significant residual impact (ha)	2,267	2,416	2,416	1,961	1,537	36	Calculated.
Step 3: Offsets							
Proposed offset (ha)	7,518	8,609	8,609	8,512	5,062	119	Calculated using the "What-if" function.
Current quality of offset site (scale)	8	8	8	7	8	8	Alcoa assumes that the proposed offset conservation area will have habitat quality similar to the impact area, of 8 (noting 10 was applied to the impacts due to gaps in vegetation condition and survey data).

Environmental value	Forest Red-tailed Black Cockatoo	Baudin's Black Cockatoo	Carnaby's Black Cockatoo	Woylie	Chuditch	Quokka	Rationale
Future quality without offset (scale)	6	6	6	5	6	6	Without additional management existing threats and increasing impacts from climate change could lead to degradation of the habitat within a proposed offset conservation area.
Future quality with offset (scale)	9	9	9	8	9	9	With intensive management Alcoa consider the habitat quality and functionality can be improved from baseline.
Time until ecological benefit (years)	10	10	10	5	5	5	The habitat quality for Black Cockatoos can take time provide benefits. Even though installing permanent drinking water sources for Black Cockatoos, it may take time for the cockatoos to use the water on an annual or regular basis. The habitat functionality for woylie, chuditch and quokka will improve in a shorter time frame with a reduction in feral foxes, cats and pigs.
Confidence in result (%)	80	80	80	80	80	80	Data from recent climate and assessments have demonstrated impacts to habitat is rising. Similar projects have demonstrated that if recovery actions and threat abatement is undertaken, habitat for species improves.
Duration of offset implementation	20	20	20	20	20	20	Alcoa will fund the implementation of the offset for at least 20 years.
Time until offset site secured (years)	1	1	1	1	1	1	Alcoa are consulting with the State Government and agencies with regards to proposed offset conservation areas.

Environmental value	Forest Red-tailed Black Cockatoo	Baudin's Black Cockatoo	Carnaby's Black Cockatoo	Woylie	Chuditch	Quokka	Rationale
Risk of future loss without offset (%)	10	10	10	10	10	10	<p>Offset conservation areas are proposed to be in State Forest. This is Crown land, classified as State Forest (not a protected area under IUCN tenure), and under management by DBCA. Native logging has been banned.</p> <p>Alcoa hold a mineral lease over a large portion of the NJF with the right to access Bauxite (pending appropriate approvals are attained).</p> <p>There is a potential the area may also contain additional resources, specifically critical minerals, and is at risk from future mining or other developments.</p> <p>A value of 10% (low risk of future loss) has been assigned.</p>
Risk of future loss with offset (%)	0	0	0	0	0	0	<p>Offset conservation areas are proposed to be in State Forest. This is Crown land, classified as State Forest (not a protected area under IUCN tenure), and under management by DBCA. Native logging has been banned. A low risk of future loss without the offset was applied.</p> <p>Alcoa will commit to not mining or disturbing offset conservation areas.</p> <p>Alcoa will work with the State to secure the offset conservation area from future disturbance.</p>

8.7.4 Description of Actions to be Undertaken

Alcoa propose to deliver management actions through Environmental Offset Projects. Environmental Offset Project Plans are under development, but examples of the types of conservation actions proposed are as follows:

- The Black Cockatoo Environmental Offset Project plans to outline proposed conservation actions that aim to enhance Black Cockatoo habitat within proposed offset conservation areas. Conservation actions include reducing the risk of habitat loss; map, survey, monitor and maintain Black Cockatoo known or suitable nest trees; and locate, install and maintain suitable permanent fresh water drinking sources for Black Cockatoos.
- The Feral Fox and Cat Control Environmental Offset Project plans to implement targeted feral fox and cat control in important habitat areas for Chuditch, Woylie and Quokka within proposed offset conservation areas.
- Additional plans under development include weed and *Phytophthora* dieback hygiene controls and early fire detection technologies.

The Environmental Offset Project Plans contain specific and measurable success criteria, timelines and milestones, the monitoring program, reporting details and timing, financial arrangements, risks and contingency measures and governance arrangements including responsibilities and legal obligations.

Environmental Offset Project Plans are being developed in consultation with relevant stakeholders and on the advice of fauna ecologists and specialists.

8.7.5 Description of Offset Areas

Alcoa propose to implement environmental offset projects in proposed offset conservation areas. Given the Proposal will impact on fauna habitat in State Forest, Alcoa are looking to implement the environmental offsets within State Forest, as near to the impacts as possible.

Alcoa are consulting with the State Government and agencies with regards to proposed offset conservation areas. Once a proposed offset conservation area is agreed, Alcoa will develop an Environmental Offset Area Management Plan.

8.7.6 Alignment with the Six Principles Outlined in the WA Environmental Offsets Policy and WA Environmental Offset Guideline

Table 8-5 demonstrates how the Environmental Offset Program is consistent with the six principles identified in the WA Environmental Offset Policy (GoWA, 2011) and Table 8-6 shows how the program is consistent with the principled in the WA Environmental Offset Guidelines (GoWA, 2014).

Table 8-5: Application of the principles in the WA Environmental Offset Policy

Principle	Consideration
<p>Environmental offsets will only be considered after avoidance and mitigation options have been pursued.</p>	<p>Alcoa apply rigorous avoidance and mitigation measures during the mine planning process. This includes avoidance of National Parks, formal conservation reserves, old-growth forest, clusters of recorded Black Cockatoo known nesting trees and minimising impacts to mature forest and restricted range vegetation types (granite outcrops, swamp and streamzone vegetation). Additional avoidance and mitigation options will continue to be advanced as part of the mine planning process. Alcoa successfully rehabilitates cleared areas post-mining.</p>
<p>Environmental offsets are not appropriate for all Proposal.</p>	<p>Environmental offsets are appropriate for an operation of this scale. Alcoa has been operating as an integrated bauxite mining and alumina producing business in the south-west since 1963. The end product, alumina, is important to transition towards a decarbonised future and is essential to modern day living. Operations in Western Australia add considerable value to the national, state and local economies.</p> <p>Alcoa implements progressive clearing followed by progressive rehabilitation and has a proven track record in establishing and restoring a diverse, healthy and resilient eco-system in the Northern Jarrah Forest following mining.</p> <p>The significant residual impacts are the result of 1) time lags between clearing and benefits from rehabilitation of the mine pits and 2) areas unlikely to be rehabilitated in the short-term (for example haul roads, facilities).</p>
<p>Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value impacted.</p>	<p>Funding environmental offset projects is a cost-effective and relevant offset for the scale of Alcoa's operations.</p> <p>Financial contributions toward environmental offset projects are likely to be significant. The funding will be targeted to conservation actions in Northern Jarrah Forest or appropriate bioregion.</p> <p>The Environmental Offset Program provides certainty to the Commonwealth and State that ongoing funding will be available to implement conservation actions in the region over the life of the offset.</p> <p>Environmental offset projects will deliver conservation outcomes for the impacted species and will be aligned to complement or support other conservation actions implemented in the region.</p>

Principle	Consideration
Environmental offsets will be based on sound environmental information and knowledge.	<p>Alcoa has a wealth of scientific knowledge of the Jarrah Forest. Alcoa has more than 50 years of research and knowledge, establishing and restoring a diverse, healthy and resilient eco-system in the Northern Jarrah Forest.</p> <p>Since 1975, Alcoa has supported the publication of more than 260 refereed journal papers and book chapters, 80 technical studies, and 60 higher-degree research theses.</p> <p>Environmental offsets will be developed and/or reviewed by technical advisors including Alcoa environmental, biodiversity and research specialists, external subject matter experts and scientists, Traditional Owners and on-ground delivery partners.</p> <p>Environmental offsets will use advice from subject matter experts (qualified and/or experienced environmental practitioners) and the lessons learned from previous conservation actions along with the best available science to deliver the offsets project. Only offset projects where the anticipated outcomes, based on sound environmental and scientific understanding, are likely to be successful and risks have been appropriately identified and mitigated, will be selected for implementation.</p> <p>Environmental offsets will be reviewed against species recovery plans, threat abatement plans, the Forest Management Plan and peer-reviewed research findings to ensure they meet overall strategic outcomes.</p>
Environmental offsets will be applied within a framework of adaptive management.	Contingency actions will be built into environmental offset project plans to account for risks of unexpected events. The project plan will effectively account for and manage the risk of the project not succeeding.
Environmental offsets will be focused on longer-term strategic outcomes.	<p>Environmental offsets can be implemented as a series of conservation actions, that over the long term provide a strategic outcome for impacted species and/or their habitat. For example, increasing the amount of the Northern Jarrah Forest that is being actively and intensively managed for conservation.</p> <p>Environmental offsets will be aligned to complement or support other conservation actions implemented in the region, which collectively will lead to long term strategic outcomes for impacted species, their habitat and the region.</p>

Table 8-6: Application of the principles in the WA Environmental Offset Guidelines

Concept	Consideration
Type	The offset is an on-ground management offset. These offsets include revegetation (re-establishment of native vegetation in degraded areas) and rehabilitation (repair of ecosystem processes and management of weeds, disease or feral animals). The objective of on-ground management actions is tangible improvement to environmental values in the offset area.
In proximity to area of impact	Alcoa intend for offset conservation areas to be located in the same bioregion, as close to the areas of impact as possible.
Similar or better vegetation condition than area impacted	Given the offset conservation areas are proposed to be in State Forest in the same bioregion as the impacts the vegetation is likely to be similar. Alcoa will seek areas where the vegetation requires management to maintain or improve the current condition.

Concept	Consideration
Similar habitat structure to undisturbed examples of impacted vegetation type	Alcoa proposes to provide environmental offsets in State Forest. Both the impact areas and offset areas have been subject to disturbance from timber harvesting, fire and <i>Phytophthora</i> dieback. Generally, the habitat structure is likely to be similar between the impact area and offset area.
Has a better area to perimeter ratio than the area impacted	Bauxite occurs as tabular ore pods that vary in depth from 2–10 m with an average depth of about 3.5 m. 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. Therefore, the mining footprint can be considered as linear or in pods, with an area to perimeter ratio greater than other open pit mining operations e.g., iron ore. The proposed offset conservation areas are expected to be large (~1,000 ha) areas and will therefore have a better area to perimeter ratio than the area impacted.
Contains additional rare or otherwise significant species and threatened species of community compared with the impact site	The proposed offset conservation areas are likely to contain similar flora and fauna species to that present in the impact area. Although some offset areas may contain additional significant species and threatened species of community compared with the impact site.
Close to or contiguous with an existing conservation area	The offset conservation areas are proposed to be close to or contiguous with an existing or proposed conservation areas.
Likely to enhance biological corridors or ecological linkages between conservation areas	The management actions are likely to enhance existing connections through installation of key habitat features, feral predator controls and management of streamzones and riparian vegetation, couple with improved monitoring.
It includes actions to address threatening processes	The management actions have been proposed based on actions to address the following threatening processes identified in species recovery and threat abatement plans. Actions may include: <ul style="list-style-type: none"> • Feral fauna control • Establishment and improvement of key habitat features • Early fire detection • Climate Change mitigations.
Allows for secure management arrangements in place that will provide for long term conservation	The areas proposed for offset conservation are State Forest, owned by the Crown, vested to the Conservation and Parks Commission and managed on behalf of the Commission by the DBCA. Alcoa will seek to cooperate with the State government to allow for management of the offset area for the longer term (at least 20 years).
Sound knowledge and adaptive management	This offset has been prepared by Alcoa based on recovery plans, approved conservation advice documents, threat abatement plans, research findings and discussions with experienced subject-matter/species experts and fauna ecologists. Findings from the implementation of on-ground management actions will be evaluated and used to inform future actions. The adaptive management process will be included in Offset Project Plans and Offset Area Management Plans.
Likely offset success. Can the values be defined and measured?	Alcoa considers this offset has a very high likelihood of success. Management actions have been used in similar environments with proven results.

Concept	Consideration
What is the operator experience / evidence of previous success?	<p>Fauna habitat extent and condition can be defined and measured. Fauna presence, abundance and density can be measured or estimated using existing methodologies.</p> <p>Alcoa has been operating in the Northern Jarrah Forest for over 60 years. Alcoa's rehabilitation program has successfully returned fauna habitat following mining and its research program has provided valuable information to the broader scientific community.</p>
Time lag	The offset will commence once the Offset Proposal, Environmental Offset Project Plans and Offset Management Plan(s) have been agreed and accepted by the regulators and stakeholders. Offset actions are likely to commence prior to impacts. On-ground actions will provide benefits from between 5 years (increased feral predator controls) and 10 years (improved habitat for Black Cockatoos).
Long term strategic outcomes	The commitment to fund, manage and monitor fauna habitat areas for a period of 20 years provides confidence that the habitat will be maintained for the foreseeable future. This long-term management will promote species resilience to threats, but also a rapid response to emerging or unforeseen threats.

8.7.7 Alignment with Relevant Plans, Policies, and Recovery Plans

Environmental offset projects will be informed by the objectives and strategies in species conservation advice documents, recovery plans and threat abatement plans. Alcoa will also consult with species experts and fauna ecologists to tailor the recovery requirements to the Northern Jarrah Forest or to those that are appropriate for the local habitat.

Alcoa will employ an adaptive management approach towards its Environmental Offset Program, whereby new research findings and updates to conservation advice documents and recovery plans will be incorporated into environmental offset projects.

8.8 Stakeholder Consultation

The scope, objectives and quantum of the Offset Proposal will be prepared in consultation with relevant Government departments and stakeholders as part of the Part IV EP Act assessment processes.

Alcoa has presented and sought engagement of the proposed approach to fund environmental offset projects with key government agencies, including EPA Services, DBCA and DJTSl. Further engagement will be sought on the governance and financial arrangements to ensure the offset quantum of the current Proposal can be defined as clear and measurable on-ground projects consistent with the offset objectives.

Furthermore, as part of the assessment process key government, community stakeholders, Traditional Owners and other proponents operating in the region will be consulted to identify the most appropriate offset approaches that leverage synergies with existing projects and significant regional knowledge gaps.

8.9 Finalisation and Implementation of Offsets

The finalised Offset Proposal is expected to be delivered as a package of offset actions, prepared in consultation with stakeholders. Coordination of offset elements creates an opportunity to deliver more value and additionality.

Alcoa's Environmental Offset Strategy is provided in Appendix 13.

The Environmental Offset Project Plans and Offset Area Management Plans are under development and will be provided to the EPA during Alcoa's assessment process, however further information is included in the Pinjarra Alumina Refinery Revised Proposal (Assessment 2253) ERD.