Alcoa of Australia Limited

Pinjarra Alumina Refinery Revised Proposal

Environmental Review Document

Assessment No 2253

March 2025

Document control

Revision	Description of Changes	Author	Approved by	Date
1	Preparation of ERD for EPA review.	H Morgan M Brook	J Zimmerman	31/01/2022
2	Revised ERD for EPA and DMA review. ERD revised for ESD addendum, s43A amendments	H Morgan T Sleigh	A Bird	1/12/2023
3	Revised ERD for publication ERD revised for EPA and DMA comments on Revision 2 and changes to Mine DE including addition of O'Neil DE and enhanced avoidance measures.	H Morgan	K Moyle	17/03/2025

Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on the environmental review for this proposal.

Alcoa of Australia Limited (Alcoa) is proposing to increase production at the Pinjarra Alumina Refinery by 5 per cent from 5.0 million tonnes per annum (Mtpa) to 5.25 Mtpa and transition the Huntly Bauxite mine to the proposed Myara North and Holyoake mine regions and re-enter the O'Neil mine region. The Proposal is in the Peel region of Western Australia (WA), approximately 100 km south-east of Perth. The Proposal is located within a 23,900 hectare Mine Development Envelope and will require the clearing of up to 7,500 hectares of native vegetation.

The Environmental Review Document (ERD) has been prepared in accordance with the EPA's Procedures Manual. The ERD is the report by the proponent on their environmental review which describes this proposal and its likely effects on the environment.

The ERD is available for a public review period of twelve (12) weeks from 29 May 2025, closing on 21 August 2025.

Information on the proposal from the public may assist the EPA to prepare an assessment report in which it will make recommendations on the proposal to the Minister for the Environment.

Why write a submission?

The EPA seeks information that will inform its consideration of the likely effect of the proposal, if implemented, on the environment. This may include relevant new information that is not in the ERD, such as alternative courses of action or approaches.

In preparing its assessment report for the Minister for the Environment, the EPA will consider the information in submissions, the proponent's responses, and other relevant information.

Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the Freedom of Information Act 1992.

Why not join a group?

It may be worthwhile joining a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group. If you form a small group (up to 10 people) please indicate the names of each participant. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on information in the ERD.

When making comments on specific elements in the ERD:

- clearly state your point of view and give reasons for your conclusions
- reference the source of your information, where applicable
- suggest alternatives to improve environmental outcomes.

What to include in your submission

Include the following in your submission to make it easier for the EPA to consider your submission:

- Your name and address
- Date of your submission
- Whether you want your contact details to be confidential
- A summary of your submission, if it is long
- A list of points so that issues raised are clear, preferably by environmental factor
- Refer each point to the page, section and if possible, paragraph of the ERD
- Attach any reference material, if applicable. Make sure your information is accurate.

The closing date for public submissions is: 21 August 2025

The EPA prefers submissions to be made electronically via the EPA's Consultation Hub at https://consultation.epa.wa.gov.au/

Alternatively, submissions can be:

- posted to: Chairman, Environmental Protection Authority, Locked Bag 10, Joondalup DC WA 6919, or
- delivered to: Environmental Protection Authority, Prime House, 8 Davidson Terrace, Joondalup 6027.

If you have any questions on how to make a submission, please contact EPA Services at the Department of Water and Environmental Regulation on 6364 7000

Executive Summary

Alcoa in Australia

Alcoa's two bauxite mines (Willowdale and Huntly) and two operating alumina refineries (Pinjarra and Wagerup) in Western Australia produced in 2023 about 50 per cent of Australia's alumina which is the primary feedstock for aluminium production. Alcoa transports a portion of this alumina to the Portland Aluminium Smelter in Victoria, where in 2023 it produced about 18 per cent of Australia's aluminium.

Across its Australian operations Alcoa employs approximately 4,670 people, with around 4,100 employees located in Western Australia. Approximately 2,300 of its Western Australian employees live in the Peel region and across the communities near to where it operates, delivering significant economic and social benefits across the region. In 2023, Alcoa paid about $831 million in Australian wages, salaries and associated benefits.

The Pinjarra Alumina Refinery Revised Proposal

This Proposal is essential for the continued operation of Alcoa's Huntly Bauxite Mine, the Pinjarra Alumina Refinery and the potential future recommissioning of the Kwinana Alumina Refinery[1]. These operations are integral to the overall viability and success of Alcoa's Western Australian business, which has been operating since 1963.

This Environmental Review Document (ERD) has been prepared to support the Proposal which is seeking environmental approval to:

- Increase alumina production at the Pinjarra Refinery by 5 per cent from 5.0 Mtpa to 5.25 Mtpa.
- Transition the Huntly Mine to the proposed Myara North and Holyoake mine regions and re-enter the O'Neil mine region, for the purpose of mining bauxite for the Pinjarra Alumina Refinery and the Kwinana Alumina Refinery[1].

For the year ending 2024, the Huntly Mine produced approximately 19.9 Mtpa of bauxite which supplied the Pinjarra and Kwinana Alumina Refineries. Efficiency and operational improvements to existing process and procedures are expected to enable the Pinjarra Refinery to refine this bauxite to achieve an alumina production rate of up to 5.25 Mtpa.

Alcoa's approval modernisation transition

Alcoa is committed to enhancing the way it operates its longstanding bauxite mines and downstream processing alumina refineries in Western Australia to meet evolving requirements and expectations. Consequentially, environmental regulation of Alcoa's bauxite mining activities in Western Australia is transitioning from bespoke, longstanding legislated agreements to modern environmental legislation.

The Pinjarra Alumina Refinery Revised Proposal, referred to the Environmental Protection Authority (EPA) in 2020, is part of Alcoa's commitment to transition its approvals framework to more contemporaneous assessment processes and initially involved Alcoa's Huntly mining operations moving to the Myara North and Holyoake mine regions. As a result of the extended assessment timeframe for this Proposal, Alcoa has developed plans to re-enter the O'Neil mine region of the Huntly Mine and incorporated these plans into the Proposal in 2024.

[1] The Kwinana Refinery was curtailed in 2024, but may reopen within the lifespan of this Proposal subject to a business decision.

Mining operations in the O'Neil mining region are detailed in Alcoa's Mining and Management Programs (MMP) for 2023-27[2], 2024-28 and 2025-29 (in draft) and are forecast to deliver bauxite to the Pinjarra Refinery ahead of any bauxite from the Myara North or Holyoake mining regions due to the presence of existing infrastructure.

The Proposal was referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act on 13 July 2022. The EPBC Act assessment (EPBC 2022/09204) will be undertaken as part of the EPA's assessment of the Proposal, as an accredited assessment in accordance with Part 8 of the EPBC Act. On 1 October 2024, Alcoa referred the O'Neil DE under the EPBC Act. The Proposed Action (EPBC 2024/10009) is still awaiting a determination as to whether it is a Controlled Action requiring assessment and approval under the EPBC Act. As such assessment findings for EPBC 2024/10009 are not included in this ERD.

Refining the Proposal footprint

Since the referral in 2020, Alcoa has made several changes to the Proposal to reduce potential impacts. These changes reflect study outcomes, responses to stakeholder feedback and our commitment to continuous improvement.

Examples of these changes include:

- Increasing the distance between Jarrahdale townsite and future proposed mining by creating a ~2,600 hectare mining avoidance zone
- Amending the development envelopes to avoid areas noted as having significant social value, such as the Bibbulmun Track, Wungong Campsite, and the Sullivan Rock Trail, and to remove the need for mine infrastructure crossings over Albany Highway, Kingsbury Drive, Jarrahdale Road, Pinjarra-Williams Road and the Bibbulmun Track.
- Maintaining public access to other recreational facilities and surrounding tracks and trails, such as Balmoral Prisoner of War camp and Inglehope Arboretum.
- Deferring plans to mine in the Reservoir Protection Zones (RPZ).
- Ensuring 100 per cent of bauxite mined is refined at our WA refineries to support local jobs and economies by withdrawing from the Proposal plans to export bauxite.

In addition, Alcoa has maintained public access to the Munda Biddi Trail for the life of mine by re-aligning the section which intersects within the Myara North Development Envelope.

In response to community feedback raised during consultation Alcoa has also confirmed the establishment of a mining avoidance zone around Dwellingup townsite, covering 8,344 ha. While not part of the Myara North, Holyoake or O'Neil mine regions, the establishment of the mining avoidance zone provides certainty to residents and community groups in these areas in relation to future mining activity from Alcoa.

[2] Alcoa's 2023-2027 MMP was the referred to the EPA by a third party, and consequently EP Act approval is being sought in parallel to this Proposal to undertake additional clearing within the Huntly Mine (EPA Assessment 2385).

Clearing and rehabilitation of the Huntly Mine

Alcoa does not operate in old growth forest, national parks or other areas of significant conservation value. All areas cleared for mining have been previously subject to timber harvesting.

Recognised as a global leader in mine site rehabilitation, Alcoa has contributed significantly to the evolving science on forest restoration and biodiversity over multiple decades.

Alcoa has rehabilitated more than 75% of the areas cleared for mining, with the rehabilitation in these areas at various stages of development.

The clearing required for the Huntly Mine transition is split between that required to construct long-term infrastructure and that required to develop mine pits to access bauxite, known as 'active areas'.

The long-term infrastructure will typically be in place for the full 'life of mine' of a mining area, and it may remain in place for longer if it will serve future mining areas, e.g. a conveyor. The long-term infrastructure is typically the last component of a mine area to be decommissioned and then rehabilitated.

Active areas comprise the mine pits and the haul roads that connect them to the long-term infrastructure. Active areas become available for rehabilitation once the economically viable bauxite ore has been extracted from the mine pits.

As part of this Proposal and to support a reduction in open areas, Alcoa commits to manage the rehabilitation of cleared areas across the Huntly Mine as follows:

- Ensure that in any three (3) consecutive rehabilitation season periods (May-April), commencing after the date of approval, that the hectares of rehabilitation of active areas within the Huntly Mine is equal to or greater than the hectares of clearing of native vegetation for active areas.
- Ensure that the commencement of decommissioning of areas cleared for long-term infrastructure occurs within 18 months of these areas no longer being required by either Alcoa or the landowner.

Preventative risk management of drinking water

While portions of the Huntly Mine operations occur within the South Dandalup Dam, North Dandalup Dam, Serpentine Dam and Wungong Dam Public Drinking Water Source Areas (PDWSAs), careful preventative risk management means Alcoa's operations have never resulted in a drinking water reservoir being taken out of service. Additionally, there has not been a substantial rise in salinity as a result of the company's operations or a major sediment release or a major spill from Alcoa's operations that has required remedial actions in these PDWSAs. .

For this Proposal Alcoa has completed a Drinking Water Risk Assessment (including Quantitative Microbial Risk Assessment) in accordance with the *Australian Drinking Water Guidelines* and Water Quality Protection Note 77 *Risk assessment process for public drinking water source areas.* Alcoa has also taken account of feedback received from stakeholders and in response the Proposal has be amended to exclude:

- The Serpentine Pipehead Dam Priority Drinking Water Source Area
- The development of mine pits within:
    - Reservoir Protection Zones.
    - Areas with an average slope greater than 16 per cent.
    - 100 m of riparian and swamp vegetation.

In addition to these exclusions, in the Proposal Alcoa is committing to:

- Limit unrehabilitated cleared areas (open areas) within water subcatchments to no more that 30% of the subcatchment[3].
- Undertake mine pit specific groundwater investigations to identify any saline groundwater.
- Design mine pits to maintain a 2 m separation between the predicted groundwater surface and planned pit floor where mining is proposed in areas where the groundwater table is expected to be shallow (modelled Topographical Wetness Index (TWI) > 9).

Alcoa is committed to working with the Western Australian Government and its regulatory agencies to ensure that the Huntly Mine operations do not impact the public drinking water supply, recreational values and to protect water dependent ecosystems that contribute to maintaining the ecological integrity of the Northern Jarrah Forest.

Biodiversity offsets

Alcoa acknowledges that its activities have the potential to impact threatened fauna species. As part of the process of transitioning to a contemporary environmental approvals framework, the Proposal includes the commitment to provide biodiversity offsets in addition to Alcoa's already comprehensive forest rehabilitation program.

Alcoa's biodiversity offsets aim to attain the following environmental outcomes across an area of approximately 19,000 ha within the Northern Jarrah Forest:

- Deliver landscape scale conservation outcomes through the delivery of environmental offset projects.
- Protect and enhance important habitat areas for threatened species.
- Support the implementation of priority actions identified 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.

[3] Except for the Myara North Infrastructure Corridor, where clearing would be undertaken in parallel with existing operations in the Huntly Mine's Myara region.

Proposal Content

Table ES-1 and Table ES-2 provide a summary of the key elements of the Proposal for which approval is being sought under the State's EP Act and the Commonwealth's EPBC Act (Myara North and Holyoake only).

Table ES-1 Summary of the Proposal's elements

Proposal Title	Pinjarra Alumina Refinery Revised Proposal
Proponent Name	Alcoa of Australia Limited (Alcoa)
Short Description	Alcoa of Australia Limited is proposing to increase production at the Pinjarra Alumina Refinery by 5 per cent from 5.0 million tonnes per annum (Mtpa) to 5.25 Mtpa and transition the Huntly Bauxite mine to the proposed Myara North and Holyoake mine regions and re-enter the O'Neil mine region (the Proposal). The Proposal is located in the Peel region of Western Australia (WA), approximately 100 km south-east of Perth, see Figure ES-1. The Proposal is located within a 23,900 hectare (ha) Mine Development Envelope and will require the clearing of up to 7,500 ha of native vegetation.

Table ES-2 Location and proposed extent of physical and operational elements

Proposal element	Location / description	MS 646 Current Authorised Extent	Proposed change to the existing Proposal	Maximum extent, capacity or range
Physical elements				
Refinery Development Envelope (DE)	Figure ES-2	1,396 ha of clearing within a 3,241 ha Refinery DE	No change.	1,396 ha of clearing within a 3,241 ha Refinery DE
Huntly Mine Development Envelope (DE)	Figure ES-3 Figure ES-4 Figure ES-5 Figure ES-6	Clearing to occur within a 27,574 ha Mine DE.	Clearing of no more than 7,500 ha within the 23,900 ha Myara North, Holyoake and O'Neil Mine DE	Clearing of no more than 7,500 ha within the Myara North, Holyoake and O'Neil Mine DE. Clearing within Current Authorised Extent as approved via other State processes. Combined DE (Existing + Proposed) 51,474 ha

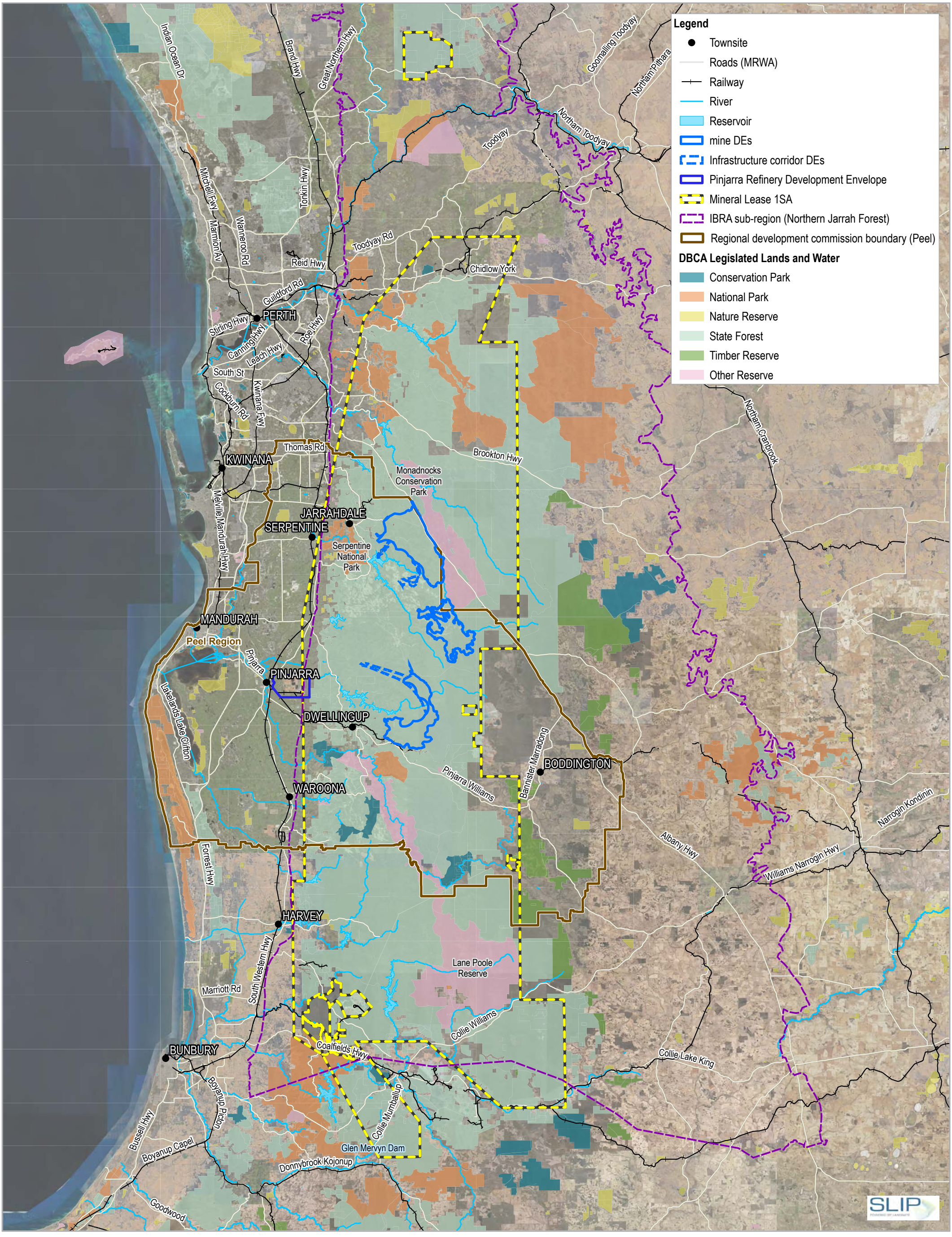
Proposal element	Location / description	MS 646 Current Authorised Extent	Proposed change to the existing Proposal	Maximum extent, capacity or range
Operational elements				
Alumina production	Figure ES-2	5.0 Mtpa	0.25 Mtpa increase	5.25 Mtpa
Bauxite residue	Figure ES-2	10.0 Mtpa	1.6 Mtpa increase	11.6 Mtpa
Refinery outputs (atmospheric emissions)				
Particulates (from stacks)	n/a	140 tpa	10 tpa increase	150 tpa
NOx	n/a	860 tpa	40 tpa increase	900 tpa
CO	n/a	900 tpa	50 tpa increase	950 tpa
VOCs	n/a	162 tpa	No change	162 tpa
Proposal elements with greenhouse gas emissions				
Operation elements[1] (all values are approximate):				
Refinery (to 2045)	Scope 1 & 2	2,581,700 tpa	Addressed separately	Addressed separately
	Scope 1	Not defined	1,874,250 t CO2e peak annual emissions as managed by the Safeguard Mechanism (SGM)	1,874,250 t CO2e peak annual emissions as managed by the Safeguard Mechanism (SGM)
Clearing, Mining and Infrastructure	Scope 1	Not defined	158,000 t CO2e peak annual gross emissions. ≤ 100,000 t CO2e annual net emissions as managed by the SGM[2]	158,000 t CO2e peak annual gross emissions. ≤ 100,000 t CO2e annual net emissions as managed by the SGM[2]
			6,337,492 t CO2e cumulative non-NGERs related gross emissions at 2050 (initial estimate)[3]	6,337,492 t CO2e cumulative non-NGERs related gross emissions at 2050 (initial estimate)[3]

Proposal element	Location / description	MS 646 Current Authorised Extent	Proposed change to the existing Proposal	Maximum extent, capacity or range
Refinery (to 2045)	Scope 2	Not defined	600,000 t CO2e per year	600,000 t CO2e per year
Clearing, Mining and Infrastructure	Scope 2	Not defined	90,000 t CO2e peak annual emissions[4]	90,000 t CO2e peak annual emissions[4]
Combined	Scope 3	Not defined	47,409,000 t CO2e per year[5]	47,409,000 t CO2e per year[5]

1. Peak emissions subject to date of approval decision and finalisation of mine plan.
2. Net emissions arise following the application of any Safeguard Mechanism credit units/carbon offsets as required by the SGM
3. Non-NGERs reported Scope 1 emissions are those not covered by the National Greenhouse and Energy Reporting Act 2007, and in this instance relate to the potential release of carbon stored in the forest ecosystem.
4. Peak electricity use occurs when conveyors are running to two mine regions, estimated using the 2023/24 emission factor for the SWIS, which is expected to decline during the mine life.
5. Scope 3 emissions related to downstream smelting are calculated using the 2022 International Aluminium Institute average. Scope 3 emissions for the categories and sources included in the calculation are consistent with the International Aluminium Institute's (IAI) cradle-to-gate primary aluminium life cycle assessment

Rehabilitation
All clearing within the Mine DE will be rehabilitated to Alcoa's objective of establishing a 'self-sustaining jarrah forest ecosystem, planned to enhance or maintain water, timber, recreation, conservation and other nominated forest values' in accordance with an approved Huntly Mine Closure Plan and completion criteria. All disturbance within the Refinery DE will be rehabilitated to an agreed post closure land use in accordance with an approved Pinjarra Alumina Refinery Closure Plan.
Decommissioning
Mine facilities will be decommissioned at the end of mine life in accordance with an approved Huntly Mine Closure Plan. The Refinery will be decommissioned at the end of life in accordance with an approved Pinjarra Alumina Refinery Closure Plan.

Other elements which affect extent of effects on the environment				
Proposal time	Maximum project life	> 45 years	2045 (Refinery operations) 20 years of mining construction and operational activity within the Mine DE	2045 ~2026-2045



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0 5 10 15 20

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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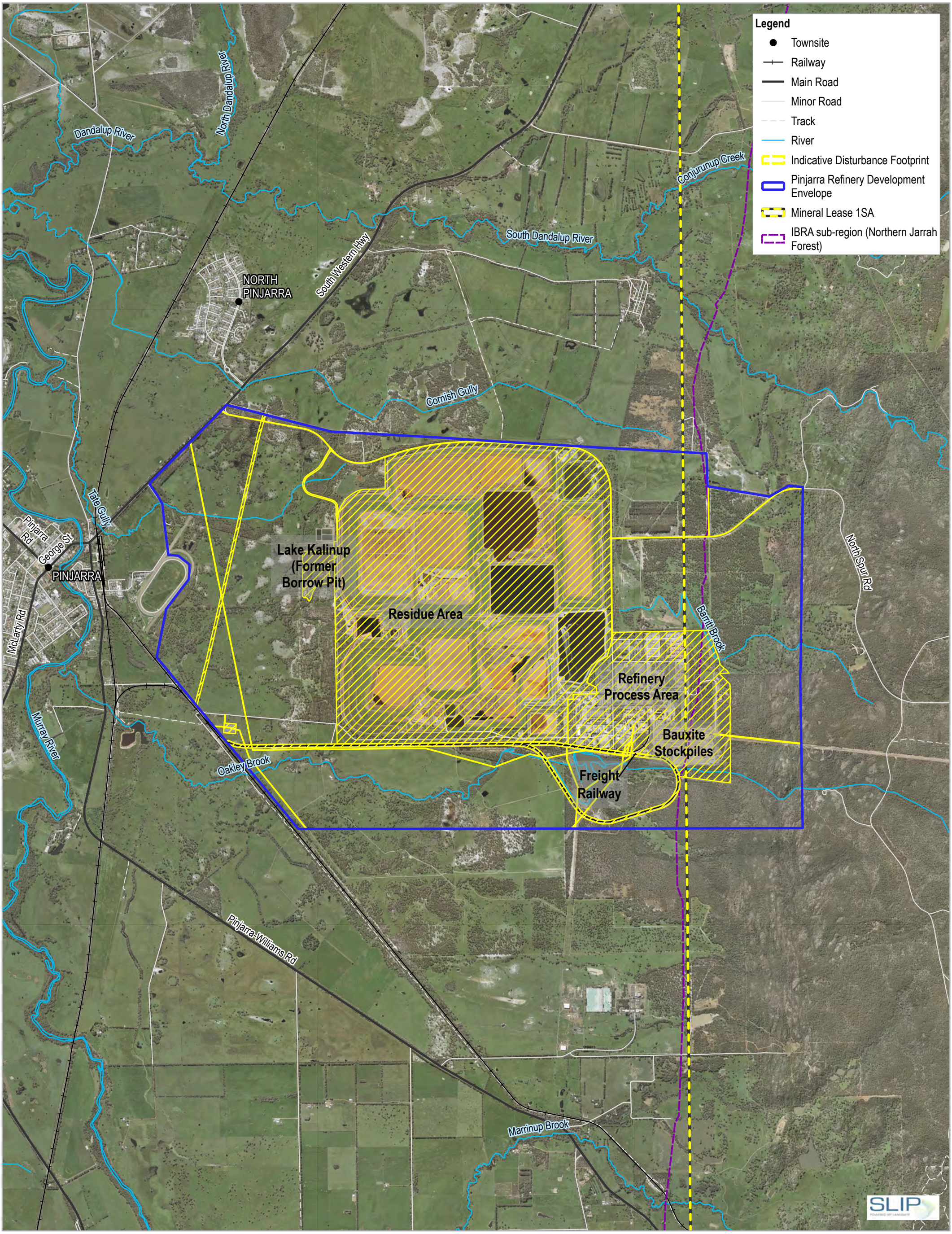
Alcoa of Australia Limited
Pinjarra Refinery Revised Proposal - Environmental Review Document

Project No. **12633192**
Revision No. **3**
Date **07/03/2025**

Mineral Lease and Locality Plan

FIGURE ES-1

Data source: WANow: Landgate / SLIP



Scale: 1:40,000 at ISO A3

0 0.5 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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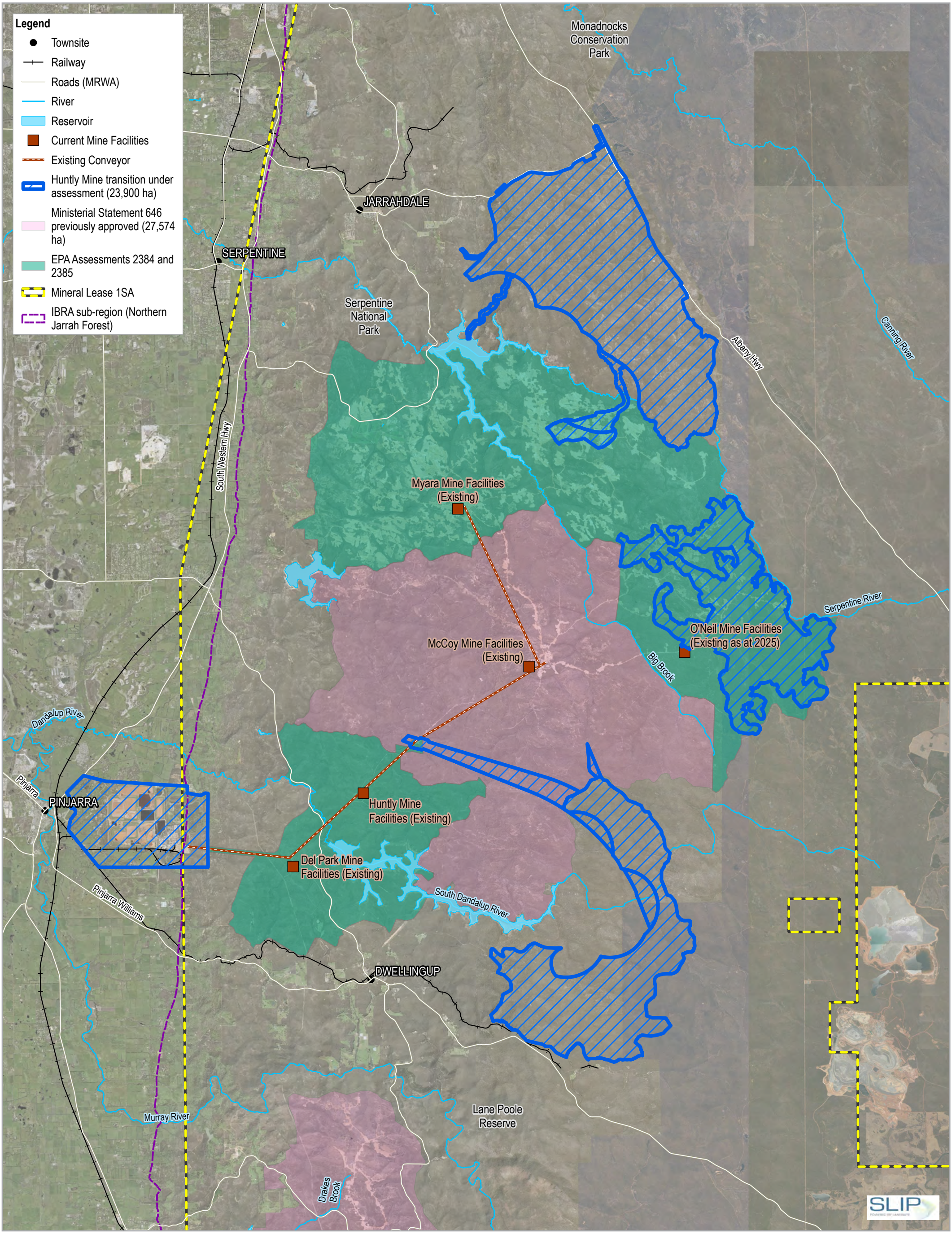
Pinjarra Refinery Revised Proposal - Environmental Review Document

Pinjarra Alumina Refinery Development Envelope

Project No. **12633192**
Revision No. **3**
Date **07/03/2025**

FIGURE ES-2

Data source: Landgate_Subscription_Imagery\WANow: Landgate / SLIP



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0 1 2 3 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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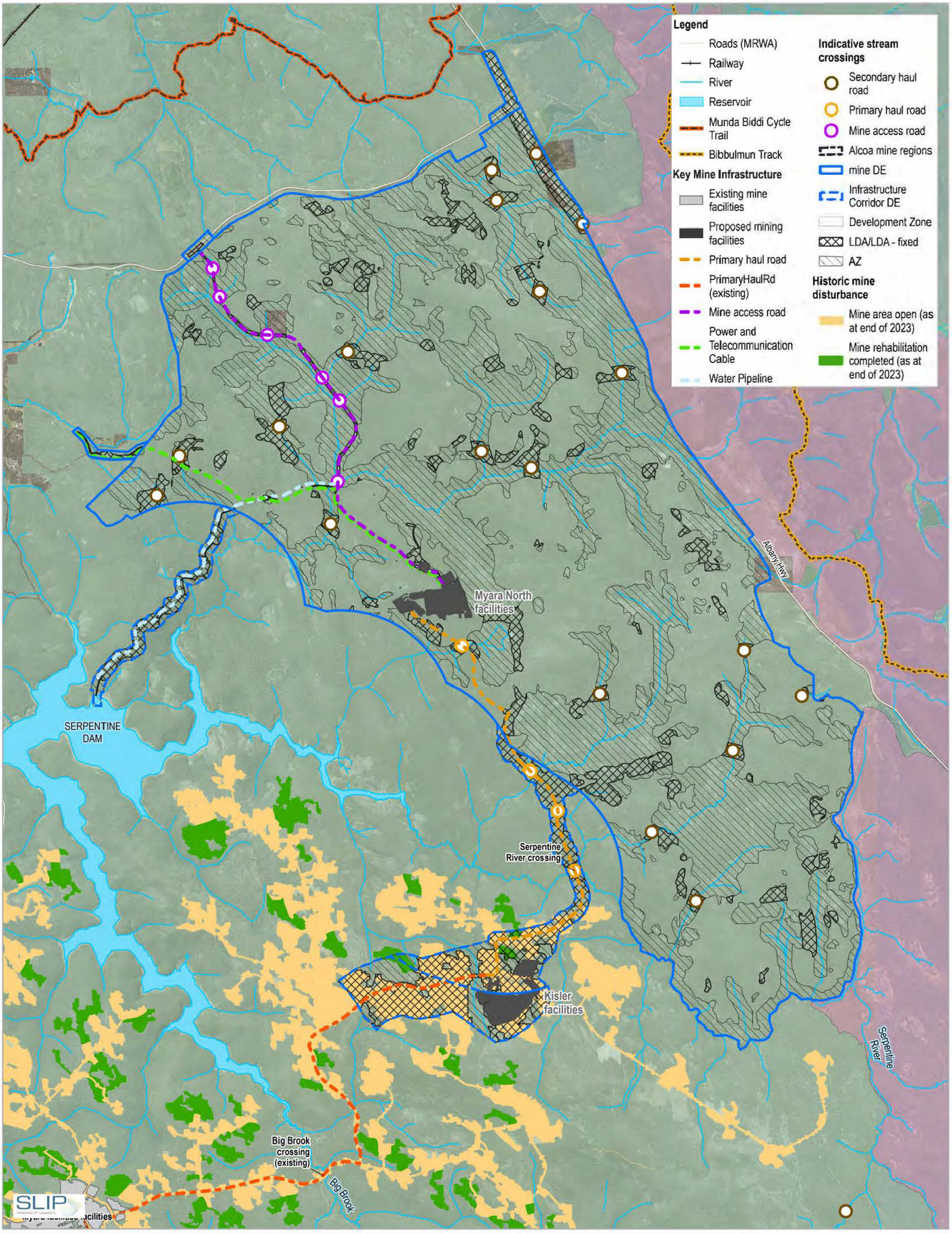
Alcoa of Australia Limited
Pinjarra Refinery Revised Proposal - Environmental Review Document

Project No. **12633192**
Revision No. **3**
Date **07/03/2025**

Huntly Mine EP Act Approval Areas

FIGURE ES-3

Data source: Alcoa/GHD: Refinery Sites - 20200221, Mine Development Envelope, Mining Areas - 20210125; DMIRS: Mining Tenement - 20180719; DBCA: Legislated Lands and Water - 20200301; DoW: Watercourse - 20200221; Landgate: Railway - 20190304, Roads - 20190114,WANow: Landgate / SLIPaccessed 20200204.



Scale: 1:60,000 at ISO A3

0 0.5 1 1.5 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Alcoa of Australia Limited
Pinjarra Refinery Revised Proposal - Environmental Review Document

Myara North Development Envelope and Indicative Layout

Project No. 12633192
Revision No. 3
Date 07/03/2025

FIGURE ES-4

Data source: WANow; Landgate / SLIP

White facilities facilities

Huntly facilities facilities

South Dandalup River crossing

South Dandalup River

Holyoake facilities

Pinjarra Williams

Lane Poole Reserve

Murray River

Legend

- Roads (MRWA)
- Railway
- River
- Reservoir

Tracks and Trails

- Munda Biddi Cycle Trail
- Bibbulmun Track

Key Mine Infrastructure

- Existing mine facilities
- Proposed mining facilities
- Conveyor
- Primary haul road
- PrimaryHaulRd (existing)
- Mine access road
- Power and Telecommunication Cable
- Water Pipeline

Indicative stream crossings

- Secondary haul road
- Primary haul road
- Mine access road

- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ

Historic mine disturbance

- Mine area open (as at end of 2023)
- Mine rehabilitation completed (as at end of 2023)

DBCA Legislated Lands and Water

- National Park
- State Forest
- Other Reserve

SLIP

Scale: 1:60,000 at ISO A3

0 0.5 1 1.5 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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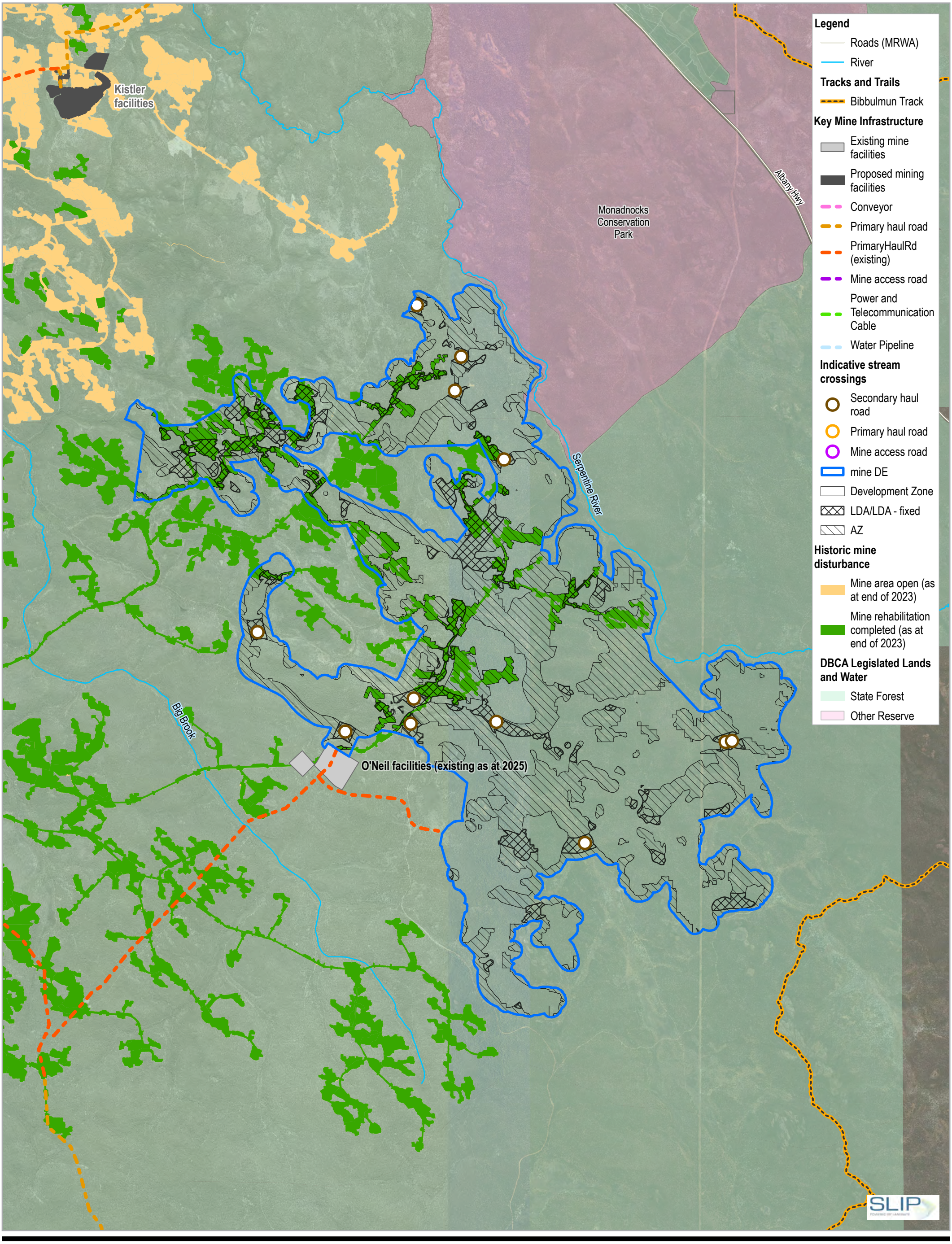
Holyoake Development Envelope and Indicative Layout

Project No. **12633192**
Revision No. **3**
Date **07/03/2025**

FIGURE ES-5

Data source: WANow: Landgate / SLIP



Scale: 1:60,000 at ISO A3

0 0.5 1 1.5 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Alcoa of Australia Limited
Pinjarra Refinery Revised Proposal - Environmental Review Document

O'Neil Development Envelope and Indicative Layout

Project No. **12633192**
Revision No. **3**
Date **07/03/2025**

FIGURE ES-6

Data source: WANow: Landgate / SLIP

Environmental Assessment Summary

This ERD has been prepared with the intent to provide the EPA sufficient information regarding the potential environmental impacts to enable assessment of the Proposal. The ERD has been prepared in accordance with the EPA (2021b) Instructions on how to prepare an Environmental Review Document, including assessment against the following seven environmental factors as identified by the EPA:

- Flora and Vegetation
- Terrestrial Fauna
- Terrestrial Environmental Quality
- Inland Waters
- Air Quality
- Greenhouse Gas Emissions
- Social Surroundings

The assessment is based on conformance with the Environmental Scoping Document (ESD) and its addendum, and various relevant EPA policy position statements and guidance documents.

For each of the seven environmental factors identified by the EPA in the ESD Table ES-3 provides a high-level summary of the potential impacts, proposed mitigation measures, and corresponding environmental outcomes.

Table ES-3 Summary of potential impacts, proposed mitigation and proposed environmental outcomes

Flora and vegetation	
Potential impacts	The following Proposal activities have the potential to impact flora and vegetation: • Construction of mine access and haul roads, conveyors and facilities • Extension of mining activities and operation of mining and haulage equipment The Proposal may result in the foll\owing potential direct and indirect impacts to flora and vegetation: • Direct impacts to flora and vegetation as a result of clearing • Indirect impacts to flora and vegetation as a result of: o Introduction and/or spread of weeds o Introduction and/or spread of Phytophthora dieback or other forest diseases o Spills and/or leaks from storage and handling of hazardous materials and waste o Dust emissions o Water use in dust suppression o Altered hydrology/groundwater regimes.
Mitigation hierarchy	Direct loss of flora and vegetation due to clearing
	Avoid • No mining within National Parks, formal conservation reserves or formal DBCA Old Growth forests. • Avoidance Zone established that avoids the following within the Mine DE: o all mapped Old Growth Forest o 68 per cent of mapped mature age forest o 89 per cent of mapped potential occurrences of ‘Granite communities of the northern Jarrah Forest’ Priority 3 ecological community (PEC) o 79 per cent of mapped potential groundwater dependent ecosystems (GDEs) o all recorded threatened flora populations • Targeted surveys once clearing footprints are defined, to identify occurrence of the following which if present will be avoided and managed in accordance with Alcoa’s operational Flora and Vegetation Environmental Management Plan (FVEMP): o Old Growth Forest un-mapped patches o refinement of potential occurrences of granite communities PECs o threatened and priority flora that are known or have potential to occur in the Mine DE • Threatened flora identified by targeted surveys avoided with a 50 m buffer, unless clearing is for Critical Infrastructure. No clearing of important populations of threatened flora. • Where a population of priority flora is identified by targeted surveys of defined clearing footprints, clearing will be no more than ten per cent of the known species population if greater than 100 plants, or otherwise no more than two per cent of the known species population. Minimise • Disturbance to mapped potential occurrences of granite communities PECs and potential GDEs limited to that necessary for Critical Infrastructure • Clearing of priority flora populations minimised where practicable. • Infrastructure designed to minimise disturbance to mapped stream zone vegetation where practicable. • Construction compounds located within existing or proposed cleared areas. • Vehicle and equipment movements limited to designated roads, access tracks and cleared areas. Rehabilitate • All cleared areas within Development Envelope rehabilitated to a Jarrah forest ecosystem in accordance with approved completion criteria.
	Introduction and/or spread of weeds
	Minimise • Pre-construction weed surveys over high risk areas and treatment of identified significant weeds within the Mine DE. • Vehicle and equipment movements limited to designated roads, access tracks and cleared areas. • Cleaning of construction vehicles and equipment of soil and vegetative material prior to entry to Mine DE. • Rehabilitation plants sourced from nursery industry accredited suppliers.
	Introduction and/or spread of dieback and forest diseases
	Minimise • Dieback assessment including other high risk forest diseases prior to ground-breaking activities within the Mine DE. • Dieback hygiene including demarcation of infested, uninfested and uninterpretable areas, clean on entry points, vehicle and equipment clearing, and restrictions on movements of soil and vegetative material. • Vehicle and equipment movements limited to designated roads, access tracks and cleared areas. • Containment of stormwater runoff from identified Dieback infested areas. • Manage entry into Disease Risk Areas (DRA) via delegated DRA Permits.

	Spills and/or leaks from storage and handling of hazardous materials and waste Erosion • As per terrestrial environmental quality key environmental factor
	Dust emissions • As per air quality key environmental factor
	Water use in dust suppression Altered hydrology/groundwater regimes Avoid • Groundwater investigations undertaken in each subcatchment where mining is proposed and mine pits designed to maintain waterlogging to six months or less per year and maintain stream salinity within baseline range. Minimise • As per inland waters environmental factor
Residual impacts, including assessment of significance	• Clearing and rehabilitation of 7,500 ha within the Mine DE gives rise to an impact due to partial loss of floristic diversity, ecosystem diversity and structural complexity of predominantly widespread vegetation complexes that are well retained within the Northern Jarrah Forest, thus the impact is unlikely to be significant. This impact will also occur in the context of more widespread cumulative impacts from past timber harvesting, climate change, fire and dieback. • The Proposal is unlikely to cause significant residual direct or indirect impacts to significant vegetation or flora.
Proposed environmental outcomes	• Clearing of up to 7,500 ha of native vegetation within the Mine DE. • No clearing in National Parks, formal conservation reserves or mapped Old Growth Forest patches. • No clearing of threatened ecological communities or mapped conservation category wetlands • Clearing of no more than 49 ha of potential occurrences of the Granite communities PEC • Clearing of no more than 1,341 ha of potential GDEs • No clearing of important threatened flora populations • Clearing of priority flora populations limited to no more than ten per cent of the known species population, if the known population is more than 100 plants, or otherwise limited to no more than two per cent of the known species population. • Groundwater levels maintained to avoid waterlogging for more than six months per year in mapped potential GDEs • Stream salinity maintained within baseline range for subcatchments with a recorded groundwater salinity greater than 500 mg/LD total dissolved salts • All cleared areas within Mine DE rehabilitated to Jarrah forest ecosystem in accordance with approved completion criteria.
Assessment of offsets (if relevant)	n/a
Terrestrial fauna	
Potential impacts	The following Proposal activities have the potential to impact terrestrial fauna: • Construction of mine access and haul roads, conveyors and facilities • Extension of mining and operation of mining and haulage equipment. The Proposal may result in the following potential direct and indirect impacts to terrestrial fauna: • Direct impacts to terrestrial fauna as a result of clearing • Direct impacts to terrestrial fauna as a result of injury/mortality from fauna entrapment or vehicle/equipment collisions • Indirect impacts to fauna as a result of: o Attraction of feral animals o Habitat fragmentation o Altered hydrological regimes o Light emissions from infrastructure o Noise emissions from construction and operational equipment o Introduction and/or spread of weeds or dieback o Spills and/or leaks from storage and handling of hazardous materials and waste.
Mitigation hierarchy	Direct impacts to terrestrial fauna as a result of clearing
	Avoid • Avoidance Zone established that avoids the following within the Mine DE: o 82 per cent of mapped riparian and swamp vegetation, including 100 m buffer o 80 per cent of mapped seasonal streams, including 100 m buffer o 89 per cent of mapped granite outcrop vegetation o Jack Rocks seasonal pool on 39 Mile Brook • Targeted surveys once clearing footprints are defined, to identify occurrence of the following which if present will be avoided and managed in accordance with Alcoa's operational Fauna Environmental Management Plan (FEMP): o Black Cockatoo known and suitable nesting and nighttime roosting trees o threatened fauna that are known, likely or have potential to occur in the Mine DE • Where identified by targeted surveys, the following avoidance will be implemented: o Black Cockatoos: known nesting trees, suitable nesting trees and confirmed nighttime roosting with a suitable buffer (minimum 30 m radius) unless clearing is required for Critical Infrastructure. o Woylie: population extent avoided and contained within a 6 ha Avoidance Zone

	○ Chuditch: active nursery dens identified by targeted surveys avoided ○ Quokka: population extent avoided with a 50 m buffer, unless clearing is required for Critical Infrastructure ○ Western Ringtail Possum: population extent avoided and contained within a 2.7 ha Avoidance Zone ○ Numbat: population extent avoided and contained within 50 ha Avoidance Zone ○ Carter's Freshwater Mussel: population extent avoided with a 100 m buffer, unless clearing is required for Critical Infrastructure in which case the population will be permanently translocated • Clearing will be avoided within 50 m of records of short-range endemic taxa identified during baseline surveys as only occurring within the Mine Development Zone. Minimise • Infrastructure designed to minimise disturbance to mapped stream zone vegetation where practicable. • Construction compounds located within existing or proposed cleared areas. • Vehicle and equipment movements limited to designated roads, access tracks and cleared areas. • Where disturbance to recorded populations of Carter's Freshwater Mussel cannot be avoided, undertake translocation in accordance with approval under *Biodiversity Conservation Act 2016*. Rehabilitate • All cleared areas within Development Envelope rehabilitated to a Jarrah forest ecosystem in accordance with approved completion criteria.
	Direct impacts to terrestrial fauna as a result of injury/mortality from fauna entrapments or vehicle/equipment collisions
	Avoid • Construction during night-time hours avoided as far as practicable. • Nighttime operations to be limited to mining, ore haulage and mine facilities. Minimise • Conduct clearing in a progressive manner to allow fauna to relocate, as far as practicable. • Vehicle and equipment movements limited to designated roads, access tracks and cleared areas, as far as practicable. • Treatment and care of trapped or injured vertebrate fauna. • Low speed zone (40 km/hr) with speed detection / advisory signs and fauna warning signs established along mine access roads.
	Indirect impacts to fauna as a result of attraction of feral animals
	Minimise • Food and domestic waste management. • Prohibition of workforce feeding feral or native animals or keeping domestic animals on site.
	Indirect impacts to fauna as a result of habitat fragmentation
	Avoid • Mine infrastructure to avoid crossing swamp and stream zone fauna habitats, as far as practicable. • Where swamp and stream zone fauna habitats cannot be avoided, minimise disturbance as far as practicable. Minimise • Ecological linkages established within the Mine DE via a network of Avoidance Zones along riparian corridors. • Fauna crossing structures established where infrastructure crosses the network of Avoidance Zones along riparian corridors. • Fencing provided for fauna crossing structures along mine access roads. Fauna crossing structures subject to targeted feral predator control, monitoring program, and inspection / repair following major storm events.
	Indirect impacts to fauna as a result of altered hydrological regimes Avoid • Groundwater investigations undertaken in each subcatchment where mining is proposed and mine pits designed to maintain waterlogging to six months or less per year and maintain stream salinity within baseline range. Minimise • As per inland waters environmental factor
	Indirect impacts to fauna as a result of noise and light emissions from construction and operational equipment
	Avoid • Construction during nighttime hours avoided as far as practicable. • Nighttime operations to be limited to mining, ore haulage and mine facilities. Minimise • Permanent and temporary lighting designed and placed in accordance with the National Light Pollution Guidelines for Wildlife, while maintaining a safe working environment for employees.
	Indirect impacts to fauna as a result of introduction and/or spread of weeds or dieback • As per flora and vegetation key environmental factor
	Indirect impacts to fauna as a result of spills and/or leaks from storage and handling of hazardous materials and waste • As per terrestrial environmental quality key environmental factor

Residual impacts, including assessment of significance	• Clearing and rehabilitation of 7,500 ha within the Mine Development Envelope may cause a direct significant residual impact due to partial loss of fauna diversity and ecological integrity over the medium to long term, primarily due to the loss of coarse woody debris and mature trees. The impact will reduce the quality of habitat for conservation significant fauna species and occur in the context of more widespread cumulative impacts from historical timber harvesting, historical mine rehabilitation under past prescriptions, climate change, fire and dieback. • Mining may cause a direct significant residual impact due to habitat fragmentation over a period of 15-20 years in each mine Development Envelope, which is expected to predominantly impact ground mammals. Mammal populations impacted by fragmentation are expected to recover in the medium term following establishment of rehabilitation. The impact will occur in the context of existing fragmentation from the Myara mine region and the presence of reservoirs and public roads. • The Proposal is unlikely to cause any indirect significant residual impacts to terrestrial fauna.
Proposed environmental outcomes	• Clearing of up to 7,500 ha of native fauna habitat within the Mine Development Envelope. • Clearing of no more than the following areas of threatened fauna habitats with a quality score >= 5: o Forest Red-tailed Black Cockatoo: 7,415 ha of foraging habitat and 7,118 ha of potential breeding habitat. o Carnaby's Cockatoo: 7,431 ha of foraging habitat and 7,160 ha of potential breeding habitat. o Baudin's Cockatoo: 7,427 ha of foraging habitat and 7,065 ha of potential breeding habitat. o Chuditch: 6,334 ha of suitable habitat. o Quokka: 1,359 ha of suitable habitat. o Woylie: 7,354 ha of potential suitable habitat. • No clearing in defined Avoidance Zones. • No clearing within 100 m of mapped riparian and swamp vegetation unless clearing is required for Critical Infrastructure. • No clearing within 30 m of Black Cockatoo known and suitable nesting trees and confirmed nighttime roosting sites, unless required for Critical Infrastructure. • No clearing of active Chuditch nursery dens. • No clearing within 50 m of mapped Quokka population extent, unless clearing required for Critical Infrastructure. • No clearing within confirmed Woylie population extent 6 ha Avoidance Zone. • No clearing in confirmed Western Ringtail Possum population extent 2.7 ha Avoidance Zone. • No clearing in confirmed Numbat population extent 50 ha Avoidance Zone. • No clearing within 100 m of mapped Carter's Freshwater Mussel population extent, unless clearing required for Critical Infrastructure whereby the population will be permanently translocated. • No clearing within 50 m of SRE taxa records identified as only occurring within the Mine Development Zone. • All cleared areas within Mine DE rehabilitated to Jarrah forest ecosystem in accordance with approved completion criteria.
Assessment of offsets (if relevant)	Offsets to be implemented in accordance with approved Offset Strategy.
Terrestrial environmental quality	
Potential impacts	The following Proposal activities have the potential to impact terrestrial environmental quality: • Clearing of native vegetation • Alteration of natural drainage regimes • Waste disposal • Storage and handling of contaminants • Closure and decommissioning. The Proposal may result in the following potential impacts to terrestrial environmental quality: • Soil salinisation as a result of mining-induced saline groundwater rise • Disturbance of potential acid sulfate soils • Erosion of post-mining landforms • Contamination from spills and/or leaks from storage and handling of hazardous materials and waste.
Mitigation hierarchy	Soil salinisation as a result of mining-induced saline groundwater rise
	Minimise • All cleared areas within Mine DE rehabilitated to a Jarrah forest ecosystem in accordance with approved completion criteria. • Completion of rehabilitation as soon as practicable in areas with identified salinity risk.
	Disturbance of potential acid sulfate soils
	Avoid • Mine infrastructure to avoid crossing mapped swamp and stream zone landforms, as far as practicable. Minimise • Where swamp and stream zone landforms cannot be avoided, minimise disturbance as far as practicable. • Undertake Acid Sulphate Soils (ASS) investigation for excavation > 100 m^3 or dewatering of swamp sediments. • Manage ASS identified in investigations in accordance with an approved ASS management plan.
	Erosion of post-mining landforms
	Minimise • All cleared areas within Mine Development Envelope rehabilitated to a Jarrah forest ecosystem in accordance with approved completion criteria.

	Contamination from spills and/or leaks from storage and handling of hazardous materials and wastes
	Avoid • Vehicles and equipment will use PFAS free fire-fighting foams. • No on-site disposal of wastes apart from treated sewage effluent. Minimise • Refuelling of haul trucks, heavy vehicles and light vehicles at mine facilities fuel bays, as far as practicable. • Mobile fuel tankers that service equipment in the field limited to 15 m^3 capacity. • Hydrocarbon, hazardous material and waste storage in accordance with relevant provisions of Dangerous Goods Safety Regulations, Water Quality Protection Note (WQPN) 56 and WQPN 65. • Planned maintenance of vehicles and equipment will occur within workshops, as far as practicable. • All wastes stored in designated containers and compounds prior to transport off-site. • Emergency response plan in accordance with WQPN 10 supported by spill response equipment and training. Rehabilitate • Contaminated areas identified at closure remediated in accordance with Huntly Mine Closure Plan.
Residual impacts, including assessment of significance	• The Proposal is unlikely to cause significant residual impacts to terrestrial environmental quality.
Proposed environmental outcomes	• No waste disposed of within Mine DE except treated sewage effluent. • All cleared areas within Mine DE rehabilitated to Jarrah forest ecosystem in accordance with approved completion criteria. • No soil or water contamination exceeding ecological or health guideline criteria within the mine facilities footprint following decommissioning.
Assessment of offsets (if relevant)	n/a
Inland waters	
Potential impacts	The following Proposal activities have the potential to impact inland waters: • Clearing of native vegetation • Alteration of natural drainage regimes • Water use for construction, mining and refining activities • Waste disposal • Storage and handling of contaminants • Closure and decommissioning • Mining activities within Public Drinking Water Source Areas (PDWSAs) • Human and mining presence within the Reservoir Protection Zones (RPZs) • Application of chemicals (fertilisers and pesticides) within PDWSAs • Alteration of hydrological regimes. The Proposal may result in the following potential impacts to inland waters: • Increases in stream salinity as a result of mining-induced saline groundwater discharge • Increased water supply for alumina refining • Increased sediment from erosion of post-mining landforms • Contamination from spills and/or leaks from storage and handling of hazardous materials and waste • Development of river crossings • Potential impacts to public health • Potential for service interruption of the public drinking water supply • Water quality deterioration in streams and reservoirs (for example, turbidity, salinity, pathogens, hydrocarbons, PFAS, nutrients, pesticides), including cumulative impacts from existing mining operations • Potential disturbance to the Peel-Yalgorup System Ramsar site through potential changes to water quality and changes to the hydrological regime of the region.
Mitigation hierarchy	Increases in stream salinity as a result of mining-induced saline groundwater discharge
	Avoid • Open areas within the Mine DE limited to no more than 30 per cent of a subcatchment, with the exception of the Myara North Infrastructure Corridor. • Groundwater investigations undertaken in each subcatchment where mining is proposed and mine pits designed to maintain stream salinity within baseline range. Minimise • All cleared areas within Mine DE rehabilitated to a Jarrah forest ecosystem in accordance with approved completion criteria. • Completion of rehabilitation as soon as practicable in areas with identified salinity risk.
	Increased water supply for alumina refining
	Minimise • Investigate a range of water supply options including water efficiency initiatives to meet the Refinery's water requirements. • Investigate and implement feasible alternative dust suppression techniques at Mine to minimise the use of water.

	Increased sediment from erosion of post-mining landforms
	Avoid • No mining in the Serpentine Pipehead Dam Priority Drinking Water Source Area (PDWSA). • No mining within Reservoir Protection Zones (RPZs) of other PDWSAs. • No mining in areas with an average slope greater than 16 per cent. • Avoidance Zone protects 82 per cent of mapped riparian and swamp vegetation including a 100 m buffer. Minimise • Minimise disturbance of swamps and stream zones as far as practicable. • All cleared areas within Mine DE rehabilitated to a Jarrah forest ecosystem in accordance with approved completion criteria. • Rehabilitated mine pits designed to prevent overflow during a 1 per cent 24 hour AEP rainfall event.
	Contamination from spills and/or leaks from storage and handling of hazardous materials and waste Avoid, minimise and rehabilitation • As per terrestrial environmental quality key environmental factor. Minimise • Bulk fuel tankers to construction compounds or mine facilities will not cross the Serpentine River main channel.
	Development of Serpentine and South Dandalup river crossings Minimise • River crossings constructed during periods of no river flow and dry catchment conditions as far as practicable. • If river crossings constructed during a period of river flow, then impoundment of river water limited to the duration required to construct and stabilise culverts. • No impoundment of river water following completion of construction of river crossing. • Disturbance of riparian vegetation limited to push over and covering of vegetation, and to not commence until seven days of forecast no rain. • Construction emergency response plan for rainfall events > 20 mm. • All refuelling at least 100 m from mapped riparian vegetation. • All fuel storage, ablutions and waste disposal located at designated compounds outside of RPZ. • Speed limit of 30 km/hr over river crossing causeways. • Limit of 15,000 litre hydrocarbon volume to be transported across river crossings. • Triple stage sumps installed at crossings, including dual HDPE lined sumps and total capacity of 1 per cent AEP (one in 100 year), 7 day storm event. • Triple stage sumps installed at crossings maintained in a storm ready state. Any discharge of sump water subject to hydrocarbons below detectable limits and turbidity < 5 NTU. • Spill response equipment maintained at all times adjacent to triple stage sumps.
	Potential impacts to public health Potential for service interruption of the public drinking water supply Water quality deterioration in streams and reservoirs (for example, turbidity, salinity, pathogens, hydrocarbons, PFAS, nutrients, pesticides), including cumulative impacts from existing mining operations Potential disturbance to the Peel-Yalgorup System Ramsar site through potential changes to water quality and changes to the hydrological regime of the region

	Avoid
	• No mining in the Serpentine Pipehead Dam Priority Drinking Water Source Area (PDWSA).
	• No mining or mine facilities within Reservoir Protection Zones (RPZs) of PDWSAs.
	• Open areas within Mine DE limited to no more than 30 per cent of a subcatchment, with the exception of the Myara North Infrastructure Corridor.
	• No mining in areas with an average slope greater than 16 per cent.
	• Where mining is proposed in areas with a modelled topographic wetness index (TWI) > 9, mine pits designed to maintain a 2 m separate between predicted groundwater surface and planned pit floor.
	• Groundwater investigations undertaken in each subcatchment where mining is proposed and mine pits designed to maintain stream salinity within baseline range.
	• Avoidance Zone protects 82 per cent of mapped riparian and swamp vegetation including a 100 m buffer.
	• Construction and operational vehicles and equipment to use PFAS free fire-fighting foams
	• All wastes (except treated sewage and oily water) transported off-site for recycling or disposal.
	Minimise
	• Sewage treatment plants located outside of RPZ.
	• All sewage tanker movements tracked in accordance with *Environmental Protection (Controlled Waste) Regulations 2004*.
	• Mine drainage to be designed and executed with minimum capacity of:
	  ○ Mine pits: 1 per cent AEP 24 hours
	  ○ Haul roads: 1 per cent AEP 72 hours
	• All cleared areas within Mine DE rehabilitated to a Jarrah forest ecosystem in accordance with approved completion criteria.
	• Rehabilitated mine pits designed to prevent overflow during a 1 per cent 24 hour AEP rainfall event.

	• Construction of mine facilities and infrastructure will be in accordance with the Water Resources Management Plan.
Residual impacts, including assessment of significance	The Proposal is unlikely to cause significant residual impacts to inland waters. Alcoa implements preventative risk management involving multiple barriers to prevent and reduce hazards to drinking water reservoirs and has proposed additional barriers to further avoid and minimise hazards. This includes: • amendment of the Mine DE to avoid the Serpentine Pipehead Dam PDWSA and avoid mining in the RPZ of other PDWSAs • Avoidance Zone includes a 100 m buffer to mapped riparian and swamp vegetation, through designated Avoidance Zone • avoidance measures to minimise the likelihood of a loss of hydraulic containment from mine drainage, including limits on open area, avoiding mining in high slope areas, and maintaining a minimum separation of mine pits from groundwater. River crossings within the RPZs of the Serpentine and South Dandalup PDWSAs will be subject to specific management measures to prevent impacts during construction or operations, and if required, will be subject to regulation through a Bed and Banks Permit under the RIWI Act. The effectiveness of rehabilitation, including resilience during drought and heat waves and effectiveness at preventing high turbidity events downstream, has been demonstrated through long-term research and monitoring, and is at a high level of confidence. Alcoa has operated in the Northern Jarrah Forest for over five decades including substantial operations within the South Dandalup, North Dandalup, Serpentine and Wungong PDWSAs. To date there has not been a noticeable rise in salinity, a major sediment release (i.e. the majority of sediment controls failing across a mine region during a major storm event) or a major diesel spill from Alcoa's operations that has required remedial actions in a reservoir or for a reservoir to be taken out of service.
Proposed environmental outcomes	• No Proposal related disturbance in Serpentine Pipehead Dam PDWSA. • No bauxite extraction within the RPZ of any PDWSA. • No mining within 100 m of mapped riparian and swamp vegetation. • Open areas within Mine DE limited to no more than 30 per cent of a subcatchment, with the exception of the Myara North Infrastructure Corridor. • No mining in areas of average slope greater than 16 per cent. • Where mining is proposed in areas with a modelled TWI > 9, mine pits designed to maintain a 2 m separation between predicted groundwater surface and planned pit floor. • Decommissioning of long-term infrastructure within the RPZ to commence within 18 months of redundancy. • Bulk fuel tankers to construction compounds or mine facilities will not cross the Serpentine River main channel. • No waste disposal areas located within the Mine DE, with the exception of mine facilities treated sewage effluent irrigation area. • No Proposal-related exceedance of salinity, turbidity or other contaminant criteria (defined in Alcoa's Water Resources Management Plan) within stream inflows to drinking water reservoirs, Davis Brook or Swamp Oak Brook. • Mine site rehabilitation will ensure that in any three (3) rehabilitation season period (May-April) commencing after the date of approval that the hectares of rehabilitation of active areas within the Huntly Mine is equal to or greater than the hectares of clearing of native vegetation for active areas. • No soil or water contamination exceeding ecological or health guideline criteria within the mine facilities footprint following decommissioning.
Assessment of offsets (if relevant)	n/a
Air quality	
Potential impacts	The following Proposal activities have the potential to impact air quality: • Clearing of native vegetation and soil disturbance from construction, operation and rehabilitation activities • Power generation • Alumina refining and residue storage. The Proposal may result in the following potential impacts to air quality: • Dust generation from construction and mining activities • Gaseous and particulate emissions from power generation, alumina refining and residue storage.
Mitigation hierarchy	Dust generation from construction and mining activities – Mine DE
	Avoid • No burning of clearing residues. Minimise • Mine DE selected to avoid proximity to sensitive receptors (see Figure 1-4.1, Figure 1-5, Figure 1-6.1). • Locate mine pits and mine infrastructure to maximise separation distance from sensitive receptors as far as practicable. • Long haul overland conveyors within the mine to be covered. • Haul truck load to be limited to prevent ore spillage. • Blast charge sizing and spacing to be optimised to avoid unnecessary energy releases. • Dust suppression applied on high traffic roads. • Light vehicle parking areas and roadways at mine facilities to be sealed. • Routine housekeeping practices at mine facilities.
	Gaseous and particulate emissions from power generation, alumina refining and residue storage
	• Implement updated Refinery Air Quality Management Plan.

Residual impacts, including assessment of significance	The Proposal is unlikely to cause significant residual impacts to air quality. Air quality modelling and health risk assessment (HRA) indicate that Refinery air emissions at 5.25 Mtpa production will pose a low risk to human health. The air quality modelling and HRA are conservative and at a high confidence, based on an updated emissions inventory informed by over five years of stack monitoring and a comprehensive stack testing program. Mining in the Myara North DE has potential to cause exceedance of 24-hour TSP and PM_{10} criteria at surrounding rural properties and to campsites on the Bibbulmun Track and the Munda Biddi Trail for approximately 10 to 20 days per year (approximately five per cent or less). The potential for exceedance of 24 hour dust criteria will be minimised through targeted dust controls during worst-case meteorological conditions. Mining is unlikely to cause exceedance of annual dust criteria or 24-hour $PM_{2.5}$ or Respirable Crystalline Silica (RCS) criteria at sensitive receptors. Mining in the O'Neil DE under worst-case conditions has potential to cause exceedance of 24 hour dust criteria at two campsites on the Bibbulmun Track. Mining is unlikely to cause exceedance of annual dust criteria or 24-hour $PM_{2.5}$ or RCS dust criteria at sensitive receptors. Mining in the Holyoake DE is unlikely to cause exceedance of dust criteria at sensitive receptors.
Proposed environmental outcomes	• No exceedance of PM_{10} and $PM_{2.5}$ standards under the National Environment Protection (Ambient Air Quality) Measure at monitoring locations representative of nearest sensitive receptors. • No exceedance of authorised extent of Refinery air emissions, as demonstrated to maintain air quality that poses a low risk to human health.
Assessment of offsets (if relevant)	n/a
Greenhouse gases	
Potential impacts	Ongoing scope 1 and 2 emissions from the Proposal in excess of 100,000 t CO_2 annually. Thus scope 1 emissions for the Huntly Mine and the Pinjarra Refinery will be regulated by the Commonwealth's Safeguard mechanism.
Mitigation hierarchy	Greenhouse gas emissions from mining and refining activities.
	Reduce Alcoa's ability to maintain net scope 1 emissions below its safeguard mechanism baselines will depend on the technology development, marginal cost of abatement, access to third party funding, and for the Huntly Mine, timing of mine region moves. Scope 1 mitigation options assessed are presented in Table 10.1 for the Huntly Mine and Table 10.2 for the Pinjarra Refinery, in Section 10 of this ERD. Emission reduction options will not be limited to maintaining net emissions below the current Safeguard Mechanism baselines.
Residual impacts, including assessment of significance	Scope 1 emissions The Huntly Mine's production-adjusted baseline values are not expected to exceed 100,000 t CO2e per year and therefore the Safeguard mechanism will set this threshold value as the mine's default baseline. Settings for the Safeguard Mechanism, including the threshold value, will be reviewed at regular intervals by the Climate Change Authority to ensure alignment with Australia's targets, including net zero by 2050. Non-SGM regulated emissions from the Huntly Mine relate to the release of stored carbon within the cleared forest, and the corresponding loss of carbon sequestration potential. This is in turn counterbalanced by the carbon sequestration potential of Alcoa's mine rehabilitation. Alcoa's Initial estimates indicate that these non-SGM regulated emissions will fully be counterbalanced by 2077-78. At the maximum alumina production rate (5.25 Mtpa) the safeguard mechanism baseline for Pinjarra Refinery is forecast to increase to financial year 2030 with the transition from baselines using predominately site specific values to 100% industry average. This reflects the refinery's significantly lower than average emissions intensity for both alumina and onsite electricity generation. After 2030, the trajectory is expected to follow the default emissions reduction contribution set by the safeguard mechanism. This will be reviewed at regular intervals by the Climate Change Authority to ensure alignment with Australia's GHG emission reduction targets, including net zero by 2050, which aligns with EPA's expectations. Scope 2 emissions Huntly Mine's scope 2 emissions are not expected to exceed 100,000 t CO2e in any year based on the current mine plans. At the maximum alumina production rate of 5.25 Mtpa, the scope 2 emissions from Pinjarra Refinery are estimated to be approximately 600,000 t CO2e per year. Electrification of processes to reduce scope 1 emissions at both the mine and refinery may increase scope 2 emissions for a short term, however this will be mitigated by ongoing decarbonisation of Western Australia's main electrical supply grid, the South West Interconnected System and potential renewable energy options.
Proposed environmental outcomes	Alcoa considers that the legislative requirements of the Safeguarding Mechanism will adequately regulate the Proposal's reduction in Safeguard Mechanism related scope 1 emissions, with standard regulatory reporting requirements (NGER) already in place. Alcoa does not consider additional conditions are required to ensure consistency with the EPA's environmental factor objective for Safeguarding Mechanism regulated scope 1 greenhouse gas emissions. Alcoa will continue to refine its estimates of non-Safeguarding Mechanism scope 1 emissions and take appropriate actions to align with the WA Government's policy objective and the EPA's expectation, that major projects will achieve net zero scope 1 GHG emissions by 2050.
Assessment of offsets (if relevant)	• Surrender appropriate offsets as required by the safeguard mechanism • Subject to further estimations, surrender appropriate offsets to achieve net-zero non-safeguard mechanism regulated scope 1 emissions by 2050

Social surrounds (heritage)	
Potential impacts	The following Proposal activities have the potential to impact social surroundings (heritage): • Clearing of native vegetation • Construction, mining, refining and operational activities • Physical presence of infrastructure. The Proposal may result in the following potential impacts to social surroundings (heritage): • Disturbance (direct or indirect) to Aboriginal heritage sites • Disturbance (direct or indirect) to European heritage sites.
Mitigation hierarchy	Disturbance to Aboriginal Heritage sites and cultural values – Mine DE

	Avoid
	• Avoidance Zone incorporates known Aboriginal heritage sites within the Mine DE.
	• Avoid direct impacts to Aboriginal heritage sites identified by surveys and consultations, where possible.
	Minimise
	• Where direct impacts of identified Aboriginal heritage sites cannot be avoided:
	  ○ seek free, prior and informed consent of Traditional Owners and document that consent and any mitigating actions in a Cultural Heritage Management Plan (CHMP) agreed with Traditional Owners
	  ○ seek Ministerial Consent if required under Section 18 of the Aboriginal Heritage Act 1972.
	• Implement CHMP for the Mine DE, to guide management and monitoring of Aboriginal heritage during construction and operations:
	  ○ CHMP to be developed collaboratively with Traditional Owners and the Gnaala Karla Booja Aboriginal Corporation.
	  ○ CHMP to include stormwater, erosion and sediment management to prevent indirect impacts to Aboriginal heritage during construction and operations.
	• All Aboriginal heritage sites identified within the Mine DE that are not yet recorded by Department of Planning, Lands and Heritage (DPLH) will be reported to the Registrar of Aboriginal Sites.
	• Workforce inductions on cultural and heritage awareness, heritage management and obligation to report any suspected Aboriginal sites or objects.

	Disturbance to European heritage sites – Mine DE

	Avoid
	• Avoid direct impacts to DPLH mapped Local Heritage Survey Places within the Mine DE.
	• Avoidance Zone established to minimise potential indirect impacts to European heritage sites.
	• Avoid direct impacts to the following European heritage sites identified within the Mine DE:
	  ○ Myara North - Prisoner of War Camp
	  ○ Holyoake - Log Landing
	• Avoid direct impacts to other European heritage sites and features identified within the Mine DE, including shield / reference trees recorded by DBCA, where practicable.
	Minimise
	• Where avoidance of identified European heritage sites and features within the Mine DE is found not to be practicable, manage any disturbance in accordance with a site specific European Heritage Management Plan (EHMP):
	  ○ EHMP to be developed collaboratively with key stakeholders.
	  ○ EHMP to include stormwater, erosion and sediment management to prevent indirect impacts to European heritage during construction and operations.

Residual impacts, including assessment of significance	The Avoidance Zones within the Mine DE have incorporated known Aboriginal heritage sites, and where they are located on Low Disturbance Areas any disturbance will be in accordance with consent under Section 18 of the Aboriginal Heritage Act (or equivalent approvals under the Aboriginal Heritage Regulations). The findings of pre-clearance surveys and consultation may identify currently unknown sites. In this situation Alcoa will implement avoidance, minimisation and management measures (as discussed in Section 11.5 of Section 11 of this ERD) such that there are no significant residual impacts to Aboriginal heritage. No State Heritage Register sites lie within the Mine DE and no Local Heritage Survey Places will be subject to physical disturbance. Alcoa will implement impact avoidance and management measures to protect other European heritage sites and features within the Mine DE and no significant residual impacts to European heritage are likely to occur. The long-term restriction to public access and informal use over areas of State Forest is expected to restrict access to Country for Noongar people, causing an impact on associated Aboriginal cultural values. This impact will occur in the context of extensive and permanent restrictions to access to Country from agricultural, urban and rural residential developments in the NJF and SCP subregions. The cumulative impacts to access to Country could potentially cause a significant residual impact on Aboriginal cultural values of the NJF. Alcoa will engage with Traditional Owners as part of the CHMP development for the Huntly Mine to develop practicable arrangements for access to Country that also meet statutory requirements for public safety in mine areas.
Proposed environmental outcomes	• No direct impact to DPLH mapped Local Heritage Survey Places • No mining within defined Low Disturbance Areas. • Aboriginal cultural heritage sites maintained in accordance with the consent and recommendations of Traditional Owners.
Assessment of offsets (if relevant)	n/a

<table>
<tr><th colspan="2">Social surrounds (amenity)</th></tr>
<tr><td>Potential impacts</td><td>The following Proposal activities have the potential to impact social surroundings (amenity):
Clearing of native vegetation
Construction, mining, refining and other operational activities including transport
The physical presence of infrastructure
Rehabilitation activities
The Proposal may result in the following potential impacts to social surroundings (amenity):
Impacts to amenity through construction and operational noise
Impact to visual amenity and sense of place from mining and refining operations and associated infrastructure including lighting
Impact on recreational use of areas due to direct disturbance, noise, dust deposition and traffic</td></tr>
<tr><td rowspan="4">Mitigation hierarchy</td><td>Impacts to amenity through construction and operational noise</td></tr>
<tr><td>Minimise
Noise sensitivity zones established within the Mine DE to restrict certain mining activities to minimise noise impacts to sensitive receptors.
Alcoa will implement an exclusion zone for nighttime in the O’Neil DE where mining operations have the potential to cause exceedance of nighttime assigned noise levels at White Horse Hills Campsite.
Alcoa standard procedures on construction noise management implemented prior to ground disturbing activities within the Mine DE.
Alcoa standard procedures implemented to mitigate and monitor noise impacts from mine operations, including blast activities, at noise sensitive receptors
Alcoa procedures on construction noise management implemented prior to the upgrade or replacement of any Refinery components as part of the Proposal.
Pinjarra Refinery will maintain a current Regulation 17 approval to manage its obligations under the Environmental Protection (Noise) Regulations 1997.
To manage and monitor the performance of the Refinery’s noise reduction program, Alcoa will implement a noise management plan that:
Sets out the schedule and measures included in the noise reduction program that aims to reduce Refinery noise levels to as low as reasonably practical.
Commits to the installation of continuous noise loggers at locations representative of the noise sensitive receptors in North Pinjarra, Pinjarra and Meelon.
Details the noise monitoring program that will be conducted using the continuous noise loggers.
Details how no net increase over baseline noise levels will be demonstrated.
Describes Alcoa’s existing procedures for capturing and investigating noise complaints and providing noise related information to the community.
Detail the contents and timing of an annual report to be submitted to the CEO of DWER.</td></tr>
<tr><td>Impacts to visual amenity from mining operations and infrastructure</td></tr>
<tr><td>Minimise
Albany Highway and Jarrahdale Road intersection upgrade will comply with requirements of Main Roads WA and other decision makers.
Provide screening corridors to minimise landscape and visual impacts to recreational facilities and road interfaces within the Mine DE, where possible.
Screening corridors based on existing vegetation density and topography to screen the clearing of mine pits and infrastructure.
Material and structural finishes for all built form elements within Mine DE to be compatible with surrounding visual environment.
Where mine pits and infrastructure are proposed to be located near existing road corridors, rehabilitation to be commenced as soon as practicable.
Rehabilitate
Rehabilitation of mine pits to include contouring of pits to tie them into the surrounding landform and rehabilitation planting to restore the vegetated character of the area.</td></tr>
<tr><td>Impacts on recreational use of areas</td></tr>
<tr><td>Avoid
Maintain public access and avoid direct impacts to the Prisoner of War (POW) Camp for the life of mine through provision of an Avoidance Zone.
Minimise
Minimise direct impacts to other recreational facilities within Mine DE, where practicable. Where impacted, rehabilitate and reinstate these facilities where practicable, in consultation with DBCA and other key stakeholders.
Maintain a minimum separation distance of 650 m between a blast area any local, regional or state trails outside of the Mine DE.
Minimise direct and indirect impacts to the Wungong Catchment Trial (Cobiac Catchment) scientific site within the Myara North DE, where practicable.
Avoid direct and indirect impacts to Kennedy Forestcheck and Inglehope forest thinning experiment scientific sites within the Holyoake DE, where practicable.</td></tr>
</table>

	Impacts to amenity from light spill
	Avoid • Construction during night-time hours will be avoided as far as practicable, but may be required subject to the construction program. • Nighttime operations to be limited to mining, ore haulage and mine facilities. Mine development (including blasting) and rehabilitation activities to be limited to the daytime. Minimise • Lighting positioned to face away from nearby sensitive receptors, while maintaining a safe working environment.
	Impacts to amenity from dust deposition
	Avoid and minimise • As per air quality key environmental factor.
Residual impacts, including assessment of significance	The Proposal is unlikely to cause significant residual impacts to amenity, with the exception of potential significant residual impacts to the Bibbulmun Track from: • Audible noise from the Proposal during adverse meteorological conditions, cumulative with existing audible noise from the Boddington Gold Mine and potential future audible noise from the Willowdale Mine, which may affect two to three sections of the track at the same time. • Long term visual impact to elevated viewpoints in the Monadnocks Conservation Park and at Boonerring Hill and Mount Wells, cumulative with existing visual impact to elevated viewpoints from the existing Huntly Mine (Myara mine region) and Boddington Gold Mine. There is a potential significant residual impact due to the restriction to public access and informal use of State Forest, cumulative with existing restrictions from the Huntly Mine and Willowdale Mine. The restriction to public access may potentially cause a significant residual impact to Aboriginal access to Country and associated Aboriginal cultural values of the Northern Jarrah forest.

Proposed environmental outcomes	• Noise levels at the nearest noise sensitive receivers due to mining operations will remain within the Assigned Levels under the noise Regulations.
	• Implementation of a noise reduction program to reduce noise from the Refinery to as low as reasonably practicable.
	• No net increase in noise from the Refinery as a result of increasing production to 5.25 Mtpa
	• Visual amenity associated with landscapes within Avoidance Zones to remain unchanged.
	• Visual amenity experienced by users of recreational facilities and public roads in the vicinity of the Mine DE to be maintained through the retention of visual screening buffers.
	• All cleared areas within Mine DE rehabilitated to Jarrah forest ecosystem to approved completion criteria, thereby restoring landscape character
	• No interruption to public access to:
	  ○ Balmoral Trail section outside of Mine DE
	  ○ Windsor Rocks North Walk
	  ○ Etmilyn Forest Trail.
	• No direct disturbance to:
	  ○ POW Camp
	  ○ Balmoral Trail section outside of Mine DE
	  ○ Windsor Rocks North Walk
	  ○ Etmilyn Forest Trail.
	  ○ Inglehope forest thinning experiment site.
	  ○ Wungong thinning trial demonstration sites.
	  ○ Kennedy Forestcheck scientific site.

Assessment of offsets (if relevant)	n/a

Acronyms

Abbreviation	Definition
Alcoa	Alcoa of Australia Limited
AZ	Avoidance Zone
BAM	Biosecurity and Agriculture Management Act 2007
CALM Act	Conservation and Land Management Act 1984 (WA)
CAR	Comprehensive, Adequate and Representative
CCN	Community Consultative Network
COPC	Contaminant of Potential Concern
CWD	Coarse woody debris
DALY	Disability Adjusted Life Year
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
dB(A)	A-weighted decibels
DBCA	Department of Biodiversity, Conservation and Attractions (WA)
DE	Development Envelope
DFES	Department of Fire and Emergency Services (WA)
DJTSI	Department of Jobs, Tourism, Science and Innovation (WA)
DMA	Decision-making authority
DEMIRS	Department of Energy, Mines Industry Regulation and Safety (WA)
DPLH	Department of Planning, Lands and Heritage (WA)
DRF	Declared Rare Flora
DWER	Department of Water and Environmental Regulation (WA)
EIA	Environmental impact assessment
ERD	Environmental Review Document
ESD	Environmental Scoping Document
EPA	Environmental Protection Authority (WA)
EP Act	Environmental Protection Act 1986 (WA)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
EPS	Pinjarra Refinery Efficiency Upgrade, Environmental Protection Statement

Abbreviation	Definition
FMP	Forest Management Plan
FPC	Forest Products Commission
FRTBC	Forest Red-tailed Black Cockatoo
GDE	Groundwater dependent ecosystem
HRA	Health Risk Assessment
IBRA	Interim Biogeographic Regionalisation for Australia
LDA	Low Disturbance Area
LPS	Local planning scheme
mAHD	Metres Australian Height Datum
mbgl	Metres below ground level
MDZ	Mine Development Zone
ML1SA	Mineral Lease 1SA
MMP	Mining and Management Program
MMPLG	Mining and Management Planning Liaison Group
MNES	Matters of National Environmental Significance
MRS	Metropolitan Region Scheme
MS	Ministerial Statement
NJF	Northern Jarrah Forest
PDWSA	Public Drinking Water Source Area
PEC	Priority Ecological Community
PM10, PM2.5	Particulate matter with diameter less than 10 microns, particulate matter with diameter less than 2.5 microns
PMST	Protected Matters Search Tool
PREU	Pinjarra Refinery Efficiency Upgrade
PRS	Peel Region Scheme
RCS	Respirable crystalline silica
RFA	Regional Forest Agreement
RIWI Act	Rights in Water and Irrigation Act 1914
RPS	Regional planning scheme
RPZ	Reservoir Protection Zone

Abbreviation	Definition
RSA	Residue storage area
RTFMP	Recreational Trails and Facilities Management Plan
SCP	Swan Coastal Plain
SPL	Sound pressure level
SRE	Short-range endemic
SVT	Site vegetation type
SWALSC	South West Aboriginal Land and Sea Council
SWIS	South West Interconnected System
SWL	Sound power level
TEC	Threatened Ecological Community
VOC	Volatile Organic Compound
VT	Vegetation type
WA	Western Australia
WON	Weed of National Significance