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Our Ref: *072_2022_08_26*
Your Ref: *EPA Assessment #2216*
File No.: *CM_CS_South32*

PHCC Working Together
Peel-Harvey Catchment Council

26 August 2022

Mr Matthew Tonts
Chair, Environmental Protection Authority (EPA)
Locked Bag 10
Joondalup DC WA 6919

Dear Mr Tonts

Submission for South32 Worsley Alumina Pty Ltd Mine Expansion – Revised Proposal - Public Environmental Review, closing 29 August 2022 – Not Supported [No Development Alternative / should be rejected by the EPA]

The Peel-Harvey Catchment Council (PHCC) thanks the EPA for the opportunity to comment on the South32 Worsley Alumina Pty Ltd Mine Expansion – Revised Proposal under Public Environmental Review (PER), closing 29 August 2022.

This submission provides the evidence-based rational for the proposal being unacceptable on all three grounds and supports the 'No Development Alternative/should be rejected' by the EPA.

Given compounding and cumulative pressures on the Northern Jarrah Forest (NJF) and the location and scale of proposed activities with the Peel-Harvey Catchment, PHCC is deeply concerned about the social, economic and environmental impacts of the Proposal. This is in context of the ecosystem being on the edge of collapse (IPCC 2022, Chapter 11) and the recent National State of Environment Reporting (2021) showing that overall the state, and trend of the environment and threatened species are poor and deteriorating as a result of increasing pressures from climate change, habitat loss, invasive species, pollution and resource extraction.

The Proposal will clearly adversely impact a range of conservation significant species and their habitats and the proposed mitigation and offsetting measures put forward in the PER are inadequate to counterbalance these. Furthermore, the Proponent is already a significant contributor to industrial greenhouse gas emissions that will continue through the Proposal, furthering Western Australia's struggle to reduce carbon emissions to meet National targets.

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Even if the Proponent undertakes additional EPA required work is addressed, the clear adverse social and environmental impacts will not be able to be mitigated by the Proponent, making the proposal unacceptable.

Key rationale and recommendations are provided below, supported in Attachment 1, being comprehensive, specific comments that document significant gaps, failures and deviation from principles and legislative requirements and inadequacies in meeting community expectations.

Key Rationale for PHCC's position:

1. Failure to meet the objective of the Environmental Protection Act 1986 (EP Act);
2. Failure to address the majority of EPA required work;
3. Failure to reasonably consider feasible alternatives to the proposal, including mining existing cleared land;
4. Unacceptable impacts to all EPA factors;
5. Unacceptable scale and extent of impacts to high value ecosystems and significant taxa, including MNES;
6. Requirement for application of the Precautionary Principle due to lack of scientific certainty and knowledge within the PAA and broader NJF, making it impossible to reliably quantify threats and characterise risk plausible with evidence of harm;
7. Potential for serious and irreversible impacts to ecosystems and significant taxa, with loss of ecosystem services;
8. Failure to consider and prevent impediments to the development of alternative economies;
9. Extent and scale of cumulative impacts;
10. Failure to correctly and adequately apply the mitigation hierarchy, particularly avoidance;
11. Lack of transparency, insufficient knowledge and narrow terms of reference not allowing full and appropriate Cumulative Impact Assessment; and
12. Offsets not being appropriate due to the environmental unacceptability of the proposal.

PHCC has provided these comments given regional community and environmental interests. PHCC is a community based, Natural Resource Management (NRM) not for profit regional body working across the Peel-Harvey Catchment, covering over 1.1 million hectares of the Serpentine, Murray, Hotham, Williams and Harvey River catchments. PHCC's core aim is agents for change towards a healthier Peel Harvey catchment. As environmental stewards we aim to encourage and enable effective catchment management to create a healthier natural environment through collaborative partnerships for on ground works and research, building community capacity and awareness, influencing and leading critical thought and practice and exemplifying best practice.

With funding provided through the Australian Government's National Landcare Program, PHCC's current projects support a suite of activities and actions that closely align with the Peel-Harvey NRM Strategy – Bindjareb Boodja Landscapes 2025 and the Australian Government's Threatened Species Recovery Plans and Conservation Advice. The focus is working with the community, landholders and other relevant stakeholders to improve the trajectory of a range of threatened species, including threatened Black Cockatoos across the Peel-Harvey Catchment. PHCC's Numbat Neighbourhood, Greening Farms, Black Cockatoo and Wetlands and People (Peel-Yalgorup Ramsar 482) projects have

the objective of improving the health, biodiversity and ecosystem services of the Peel-Harvey Catchment.

The Northern Jarrah Forests (NJF) of the South West of Western Australia are a key part of a Global Biodiversity Hotspot that is under enormous pressure from a variety of sources including native forest logging, mining, agriculture, urban development, dieback, prescribed burning and climate change. The ecosystems of the forests are incredibly important for cultural, social and economic reasons. It is highly valued for its social, cultural, economic and environmental values. It is important for recreation, nature-based tourism and Aboriginal and non-Aboriginal heritage. It has supported logging and mining industries and continues to provide economic benefit through large scale mining. However the forest, its biodiversity and services it provides are under increasing stress from climate change and mining and can no longer absorb these pressures without increased protection particularly from large scale mining.

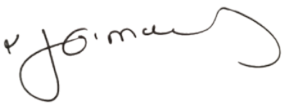
In view of this, PHCC has the following key recommendations (refer to Attachment 1, Section 1.2):

1. The Proposal be rejected and the State work with the proponent and its employees to transition out of mining to sustainable, long-term industries that protect the NJF and the species that is supports;
2. If the Proposal is not rejected outright, the remaining EPA required work be completed and a further 12 week consultation process be provided to enable quality assessment and submissions to assist the EPA with their assessment of the Proposal, including the deliverance of rigorous, measurable, and effective offset outcomes;
3. As the quality and quantity of environmental and social investigation work submitted by the Proponent is inadequate and detailed surveys and mapping of the 8,400ha conditional approval area under MS719 have not been completed, cumulative impacts cannot be assessed appropriately. The 8,400 ha with conditional approval under MS719 and all other mining approved and proposed areas should be included in the Proposal to enable a genuine Cumulative Impact Assessment rather than a piecemeal assessment;
4. The Precautionary Principle be applied where noted, including avoidance of all Priority flora, high-quality Jarrah, Marri and Wandoo, potential medium to high old growth forest, ecological linkages and the largest in-tact isolated patch of bushland in the south-eastern area of the PAA, with a 100 metre buffer around all priority areas;
5. All proposed outcomes in this submission be considered;
6. Mitigation hierarchy be properly applied. e.g., demonstration of protection of key species and habitats through avoidance of clearing, and provision of appropriate offsets that will demonstrate sound conservation of NJF into the future;
7. EPA undertake a regional cumulative impact assessment of past, current and proposed activities and developments (including but not limited to bauxite mining, logging and prescribed burning) of the NJF in accordance with commitments made in the EPA Strategic Plan 2019-2022 to "best practice approaches to the assessment and management of cumulative impacts with a focus on: landscape scale and regional assessments";
8. Stronger conservation and protection measures for NJF, including nomination of old growth forest and vegetation complexes within the NJF as a Threatened Ecological Community under the EPBC Act;

9. That no further clearing or fragmentation of native forest in the Northern Jarrah Forest for mining be authorised; and
10. Greater transparency of State Agreements and Ministerial Statements, with these being made publicly available as well as being available for public review.

Should you wish to discuss any of the aforementioned please feel free to contact me.

Yours sincerely



Jane O'Malley
Chief Executive Officer

Encl: PHCC Submission - Attachment 1: Tables 1-9, References and Appendices

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1. SUMMARY

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
1.1 Context			*PHCC supports the No Development Alternative. Our key recommendations are detailed in* ***Section 1.2***	The Northern Jarrah Forests (NJF) of the South West of Western Australia are a key part of a Global Biodiversity Hotspot that is under enormous pressure from a myriad of sources including native forest logging, mining, agriculture, urban development, dieback, prescribed burning and climate change, each impacting different aspects of the NJF health, biodiversity, range, and future resilience. Forest ecosystems are recognised to be incredibly important and valued for cultural, social and economic reasons. The NJF provides important recreation and nature-based tourism opportunities and connection to cultural identity including Aboriginal and non-Aboriginal heritage. In addition to these values, the NJF is especially important for its environmental values. The forests support significant floristic and faunal diversity, as well as critical habitat for Threatened and other significant taxa including mainland Quokkas and three species of southwest Black Cockatoos and Short Range Endemic (SRE) invertebrates. Several of these species have been identified in the national *Threatened Species Action Plan* 2021-2026, recognising them as priority species requiring specific efforts and investment to improve their recovery. In addition to major ecological linkages, the NJF provides an array of ecosystem services such as carbon storage, climate regulation, water purification and storage. However, the forest has never been under such compounding and cumulative pressure as it is currently experiencing. Lying within a “biodiversity hotspot” means that despite being recognised as one of the world’s most biologically rich areas, it is one of the most threatened with the region suffering more than a 70% loss in species abundance. Australia has the worst mammal extinction record in the world, and broadscale habitat loss such as this proposal contribute to an already dire situation for many of our native species. Within the NJF, impacts have resulted from a long history of intensive logging, clearing for agriculture and infrastructure, large scale bauxite and gold mining. With current, ongoing and forecast pressures from mining and climate change, NJF is at high risk of cumulative impacts. Land clearing is the largest contributor to biodiversity loss and world carbon emissions (IPCC 2018). The Environmental Protection Agency (EPA) recognises that clearing of native vegetation is a key threat to WA’s biodiversity. The primary cause of deforestation in Western Australia’s southeast forests is bauxite mining, which is responsible for clearing at least 32,130 hectares of publicly owned forest and fragmenting 92,000 hectares to 120,000 hectares of the Northern Jarrah Forest up to December 2019, and the rate is accelerating. Of the 32,130 hectares forest that has been cleared, 11,290 hectares (more than a third) was cleared between 2010 and 2020 (WA Forest Alliance *et al* 2022). Clearing also has secondary impacts or reducing forest health, including fragmentation, increasing the chance of catastrophic wildfire and facilitating the invasion of feral species. The NJF is under increasing climate stress. Along with increased temperatures, rainfall in the region has declined by 20 per cent since 1975 (Water Corporation 2022). The impacts of this are already being observed, with the death of thousands of trees in the region from drought and heatwave in 2010/11. Through the Intergovernmental Panel on Climate Change (IPCC), the United Nations has recognised the NJFs as one of 19 Australian ecosystems at edge of climate collapse (IPCC 2022, Ch 11 p80). These risks are confirmed elsewhere (for example Bergstom et al 2021). Bauxite mining and refining is a significant contributor to greenhouse gas emissions in WA, as a State that is already struggling to cap emission increases, let alone reduce these to meet National carbon targets (Bourke 2022), this proposal should be rejected. The recent State of the Environment report (2021) found that climate change and extreme weather events are becoming increasingly important as direct drivers of changes in biodiversity. Australian ecosystems and associated species are expected to continue to change substantially in response. The same report states that ‘The resilience and adaptive capacity of the forests is being reduced by ongoing land clearing and degrading land management practices.’ It points out that this can be mitigated by ‘avoiding and reducing forest degradation’ (p11-80).	DAWE (2022) IPCC (2018) Water Corporation (2022) IPCC (2022) Chapter 11 Bergstrom, D.M. et al. (2021) “Combating ecosystem collapse from the tropics to the Antarctic”, Global

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				The Australian Government's own 2021 State of the Environment Report found that most indicators of the health, survival and trend of plants and animals show decline. 'Overall, the state and trend of the environment of Australia are poor and deteriorating as a result of increasing pressures from climate change, habitat loss, invasive species, pollution and resource extraction. Multiple pressures create cumulative impacts that amplify threats to our environment, and abrupt changes in ecological systems have been recorded in the past 5 years.' The report highlights the need for action at every level of Government and society to address the 'drivers, pressures and risks' affecting the environment. The WA Forest Alliance *et al* (2022) *A Thousand Cuts Report* highlights the significant current, present and future risks and failings to adequately protect the values of the forest. It is in this context of forest region with significant stressors already being exerted upon it that South32 Worsley Alumina (South32, the "Proponent") are proposing to clear 4,399ha of native vegetation and increase water abstraction to 900 million litres per annum in the lower rainfall zone of the NJF, in addition to their current approval and conditional approved mining areas. South32 already has approval to clear another 942 ha within the existing Primary Bauxite Area (PBA) and a further 8,400 ha within the Extended Mining Area. In total, The Proponent has existing approval to clear a further 9,342 ha and is seeking to add 4,399 ha to this, bringing the total area it hopes to clear over the next 15 years to 13,741 ha. The proposed mitigation and offsetting measures put forward in the PER are inadequate to counterbalance the significant impacts put forward in this proposal. Biodiversity offsets are rarely effective for their predetermined purpose, and lack rigorous standards for compliance, definitions of success or accurate tallies on the environmental losses that triggered them (Maron et al., 2012; Gibbons and Lindenmayer, 2007). Offsetting of environmental impacts demonstrating a net zero impact are rare, due to a lack of "like for like" habitat, a flawed ecological basis to secure a net benefit, lack of measurable and enduring outcomes to ensure net zero has been achieved or allocating an already "safe" parcel as an offset resulting in no additionally (May et al., 2017). A recent study assessed that fewer than 39% of Western Australian offsets delivered any environmental outcome that could be considered effective (May et al., 2017). The proposed clearing and dewatering will have an unacceptable impact to the area. The Proponent's proposal is a continuation of their previous and current mining impacts to the area, with cumulative impacts from past and current land uses in the context of a drying climate, will clearly adversely impact conservation significant species and their habitats. While advances have been made in bauxite mining rehabilitation in the Jarrah Forest, many problems remain, with the outcomes only partially mitigating loss and fragmentation of intact forests. The *A Thousand Cuts Report* (WA Forest Alliance *et al* 2022) highlights serious issues with rehabilitation including water use deficits, meeting criteria under climate change and failure to replace fauna habitat. PHCC has significant concerns for all EPA Factors relevant to the Proposal. This submission outlines the evidence and experience-based rationale, inadequacies and failures of the Proposal to meet legislative requirements as well as community and scientific expectations. In summation, based on social, economic and environmental unacceptability the PHCC strongly supports the 'No Development Alternative' and recommends the proposal be rejected by the EPA. Key recommendations are provided in **Section 1.2.**	Change Biology. 2021;00:1–12. Key findings | Australia state of the environment 2021 (dcceew.gov.au) WA Forest Alliance, The Wilderness Society WA, Conservation Council of WA (2022) A Thousand Cuts – Mining in the Northern Jarrah Forest Bourke (2022)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
1.2 Recomm-endations				PHCC supports the No Development Alternative and makes the following recommendations: 1. The Proposal be rejected and the State work with the proponent and its employees to transition out of mining to sustainable, long-term industries that protect the NJF and the species that is supports; 2. If the Proposal is not rejected outright, the remaining EPA required work be completed and a further 12 week consultation process be provided to enable quality assessment and submissions to assist the EPA with their assessment of the Proposal, including the deliverance of rigorous, measurable, and effective offset outcomes; 3. As the quality and quantity of environmental and social investigation work submitted by the Proponent is inadequate and detailed surveys and mapping of the 8,400ha conditional approval area under MS719 have not been completed, cumulative impacts cannot be assessed appropriately. The 8,400 ha with conditional approval under MS719 and all other mining approved and proposed areas should be included in the Proposal to enable a genuine Cumulative Impact Assessment rather than a piecemeal assessment. See (WA Forest Alliance, 2022); 4.The precautionary principle be applied where noted, including avoidance of all Priority flora, high-quality Jarrah, Marri and Wandoo, potential medium to high old growth forests, ecological linkages and the largest in-tact isolated patch of bushland in the south-eastern area of the PAA, with a 100 metre buffer around all priority areas; 5. All proposed outcomes in this submission be considered; 6. Mitigation hierarchy be properly applied. e.g., demonstration of protection of key species and habitats through avoidance of clearing, and provision of appropriate offsets that will demonstrate sound conservation of NJF into the future. 7. EPA undertake a regional cumulative impact assessment of past, current and proposed activities and developments (including but not limited to bauxite mining, logging and prescribed burning) of the NJF in accordance with commitments made in the EPA Strategic Plan 2019-2022 to "best practice approaches to the assessment and management of cumulative impacts with a focus on: landscape scale and regional assessments"; 8. Stronger conservation and protection measures for NJF, including nomination of old growth forest and vegetation complexes within the NJF as a Threatened Ecological Community under the EPBC Act 9. That no further clearing or fragmentation of native forest in the Northern Jarrah Forest for mining be authorised and 10. Greater transparency of State Agreements and Ministerial Statements, with these being made publicly available as well as being available for public review.	 WA Forest Alliance (2022) *See Appendices for large version* EPA Strategic Plan 2019-2022 https://www.epa.wa.gov.au/sites/default/files/EPA%20Strategic%20Plan%202019-2022.pdf
1.3 EP Act, EPBC Act Significant Impact				The objective of the Environmental Protection Act 1986 (EP Act) is to protect the environment of the State through the application of the: • Precautionary Principle • Principle of Intergenerational Equity • Principle of the Conservation of Biological Diversity and Ecological Integrity. When considering significant impact or effect, the EPA should give regard to the following (EPA 2020): a) Values, sensitivity and quality of the environment which is likely to be impacted: The Northern Jarrah Forest has a significant biodiversity conservation function, however, little is known about the NJFs sensitivity to persistent and	(ENVIRONMENTAL PROTECTION ACT 1986 - SECT 4A (austlii.edu.au))

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				cumulative disturbances. The proposal does not provide clear maps outlining cumulative clearing in the NJF and ignores key studies that suggest the Jarrah Forest is drought-susceptible and at risk of climate collapse. The Proposal has inadequate flora/vegetation data, under-reporting of site vegetation types and failure to consider the regional significant of flora in the NJF suggesting a poor understanding of its environmental quality. b) Extent (intensity, duration, magnitude and geographic footprint) of the likely impacts: The Proponent has not considered the extent of impacts as they have not included the additional 8,400 ha of forest cleared from nearby mining activities (gold mine and Alcoa mines) in their cumulative impacts assessment, thus underestimating the impact of cumulative clearing on flora and fauna. The extent of vegetation complexes recorded by Mattiske Consulting (2021, page 57, Table 6, Column 4) is confusing as the larger area is referred to as the 'Southwest Forest'. There is no definition/map of this area and should instead be the NJF. It is expected that this Column 4, Table 6 refers to the remaining area of the Southwest Forest with native vegetation/bushland but this is far from clear. c) Consequence of the likely impacts (or change): We do not know whether the rehabilitated forest will survive on the drastically altered substrate. Rehabilitation results show the inability to reinstate vegetation structure, and the long-term consequences of this is unknown. d) Resilience of the environment to cope with the impacts or change: Again, we do not know the NJFs resilience to persistent and cumulative disturbance, particularly in the context of climate change. The proposal does not consider how the rehabilitated forest may respond to increasing frequency and intensity of fires and disturbances in the NJF. e) Cumulative impact with other existing or reasonably foreseeable activities, developments and land uses: Does not assess the cumulative impact of more than a century of logging and clearing in the NJF. f) Connections and interactions between parts of the environment to inform a holistic view of impacts to the whole environment: The EPA should consider the disruption to ecological linkages during and after mining, because there is a very high likelihood that linkages will be severed, disrupted or rendered non-functional by the proposed mining activities. The Proposal is to not clear more than 10% of these ecological linkages but, as they have not defined where this 10% clearing will occur, it is impossible to assess the direct and indirect impacts on habitat linkages. g) Level of confidence in the prediction of impacts and the success of proposed mitigation: The prediction of impacts has been based on the EPA Environmental factors as required, however the proposed mitigation measures (including their success) has been determined as not adequate in many areas and this is outlined in the assessment of the Proposal by the EPA Environmental Factors in Sections 2 to 9. h) Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and public information that informs the EPA's assessment: The public interest in the proposal is high and evident with 113 of the 122 of public comments recommending the Proposal go through a Public Environmental Review (93%) (CMS17540-CD-220719.pdf (epa.wa.gov.au) . In addition, through requests by community groups, an extension of the Public Environmental Review comment period was extended from 8 weeks to 10 weeks. Significant impacts cannot be adequately assessed due to the oversights mentioned above. Given the extent of cumulative clearing in the Jarrah Forests and failure to reinstate ecosystem dynamics in post-mined landscapes, the EPA should require a full, lease-wide review of the environmental and social costs of its 100+ year mine-life (the proposal considers only the current expansion).	Mattiske Consulting Pty Ltd (2021) Assessment of *Flora and Vegetation on Worsley Mine Expansion Primary Assessment Area*, Prepared for South32 Worsley Alumina Pty Ltd, Mattiske Consulting Pty Ltd, Kalamunda WA CMS17540-CD-220719.pdf (epa.wa.gov.au)
1.4 Precaution-ary Principle				The objective of the EP Act is to protect the environment of the State through the application of the Precautionary Principle. The Precautionary Principle should be applied where the threats are serious and irreversible when there is "plausible evidence of possible harm, but scientific uncertainty and ignorance makes it impossible to reliably quantify the threats and characterise the risks" (UNESCO 2005). It is the objective of the EPA to use its best endeavours to protect the environment and lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (EPA 2021). Application of the Precautionary Principle is warranted in this situation.	EPA (2021) UNESCO (2005)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				The Proponent commissioned numerous studies to inform the design of the proposal to help minimise impacts, however, there remains significant knowledge gaps, that even with this knowledge would lead to environmental degradation and serious or irreversible damage. In summary concerns relate to: • Significant gaps in scientific data and knowledge thus the risks have not been adequately and reliably quantified and characterised for potential impacts from clearing native vegetation and ground water abstraction on groundwater dependent ecosystems, including impacts on the Red-tailed phascogale, Numbat, Chuditch, Black Cockatoos and SREs • Lack of data transparency and peer-review of data is noted throughout the proposal. • Flora and vegetation data is too old to be relevant, particularly for areas outside of the PAA. • No assessment or consideration is provided on the thresholds of species and ecosystems proposed to be impacted, despite their conservation status and ongoing decline. • Assessment of potential future impacts on aquatic fauna values are precluded by the lack of relevant, contemporary baseline information. Furthermore, some significant potential impacts have not been addressed. • It is inappropriate to suggest that the baseline for environmental and social factors be shifted to current, rather than prior to combined impacting activities. In situations like this, where there is lack of full certainty data and potential cataclysmic ecological outcomes, the EPA should apply the Precautionary Principle, or at the very least, the EPA should recommend the avoidance of all Priority flora, high-quality Jarrah, Marri and Wandoo, ecological linkages and the largest in-tact isolated patch of bushland in the south-eastern area of the PAA (due to its significance for *Caladenia hopperiana* (T) and as an ecological linkage around mining activities and possibly dysfunctional rehabilitated areas). Furthermore, the EPA should include conditions to minimise impacts on these avoidance areas by requesting buffer zones to a minimum of 100m around protection/avoidance areas. In the application of the Precautionary Principle, decisions should be guided by a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and b) an assessment of the risk-weighted consequences of various options (EPA 2020). The risk-weighted consequences of the proposed clearing have not been adequately assessed due to knowledge gaps around the long-term impacts for forest resilience and biodiversity. For example, some studies suggest that species richness in 20-year-old restored Jarrah Forest is reduced between 20 and 25% as a result of initial fertiliser application during rehabilitation and we are still learning about fertiliser impacts on long(er)-term vegetation trajectories (Daws et al. 2019, 2021). We also do not know how cumulative clearing impacts forest resilience to climate change (see below), fire and increasing pressures including edge effects. No mapping of the current approval area of 8400ha of conditional approval under MS719, or other mining areas is able to reasonably forecast the full scale and implications of impacts.	Daws *et al.* (2019) Daws *et al.* (2021)
1.5 Inter-generational Equity				The objective of the EP Act is to protect the environment of the State through the application of the Principle of Intergenerational Equity. The principle specifies that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (EPA 2020). As is clear in the aims of the EIA process in WA, (EPA, 2021 Statement of environmental principles, factors, objectives and aims of EIA - Section 4) proponents are expected to "take primary responsibility for the protection of the environment relating to their proposals". Similar to the principle of inter-generational equity, the definition of "protection" in the EP Act 1984 (s3) includes "conservation, preservation, enhancement and management" of the environment. The Proponent has not demonstrated the first three tenets of environmental protection; the development that they are proposing represents management of ongoing net loss of the environment only. The Proponent has not demonstrated that the proposal can be developed without significant impacts on the health, diversity or productivity of the environment. The Proponent attests that their proposal aligns with this principle based on business planning, impact assessment and offsetting of significant residual impacts. The business planning processes which they state “protect ecosystems and minimise biodiversity	EPA (2020) https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Statement%20of%20environmental%20principles%2C%20factors%2C%20objectives%20and%20aims%20of%20EIA.pdf

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				impacts" through such as activities as conservation of high biodiversity value areas, preclearance and progressive rehabilitation" (ERD, p87) have been highlighted throughout this submission as failing to meet industry standard and achieve these outcomes. For example, many high conservation biodiversity value areas have already been cleared and mined. The Principle of Intergenerational Equity requires the EPA to consider whether the health, diversity and productivity of the environment would be maintained, with regard to the diversity and productivity of flora and vegetation and terrestrial fauna, therefore, the large rehabilitation deficit must be considered. With the large offsets package for rehabilitation areas and inability to restore native plant diversity after strip-mining, extensive areas will have reduced ecological value and plant diversity. The EPA should recommend conditions to ensure the biological environment is maintained for the benefit of future generations by applying the Precautionary Principle for scenarios above (Priority flora, ecological linkages and high-quality Forests, etc.). Therefore, the EPA must consider their rehabilitation deficit and inability to restore vegetation structure and diversity.	
1.6 Conserving biological diversity and ecological integrity				The objective of the EP Act is to protect the environment of the State through the application of the Principle of the Conservation of Biological Diversity and Ecological Integrity. The principle of the Conservation of Biological Diversity and Ecological Integrity states that 'conservation of biological diversity and ecological integrity should be a fundamental consideration' (EPA 2020). While it has been considered to some extent, the principle appears to have not been a fundamental consideration in the proposal. A failure to meet this principle is evident in the reliance on avoidance, minimisation and conservation measures that are identified as "where practical" throughout the ERD. Examples are provided throughout this submission of other failures to meet this principle, including: • The vast majority of native vegetation the Proponent plans to clear is considered to be 'excellent' or 'very good' quality Jarrah, Marri and Wandoo Forest and woodlands (ERD, p 193 - 194); • Clearing of a large area of medium to high potential old growth forest (3,713.1 ha, ERD table 5-10); • Lack of avoidance of clearing large areas and percentages of high value significant fauna habitat; • Lack of consistent preferential clearing and mining or locating infrastructure on degraded and or cleared lands; • Poorly designed and inadequate Protected Areas largely comprising small and highly isolated remnants; • No Protected Areas to avoid disturbance of Priority 1 and 2 flora or other recognised high conservation values, including the excellent and very high-quality Jarrah, Marri and Wandoo forests, medium to high potential old growth forest.; • Insufficient monitoring and modelling undertaken to ensure there will be no significant hydrological impacts to waterways, wetlands, flora and vegetation and forest and wildlife; • Low survey effort within the NJF means there is a high probability of under-reporting native diversity for baseline benchmarks and thus lower benchmarks for successful rehabilitation. Given these factors, combined with shifting baseline benchmarks for rehabilitation targets, it is irresponsible to presume 'no net loss for vegetation and species'. For the purpose of conserving biological diversity and ecological integrity, the EPA must recommend avoidance of all Priority flora, ecological linkages and high-quality Jarrah, Marri and Wandoo (the Precautionary Principle applies – see above) and • Being unable to adequately assess cumulative impacts of the current approval area of 8400ha which has conditional approval under MS719 as detailed surveys and mapping of these areas has not been completed. The EPA should also recommend surveying the adjacent NJF with higher intensity to better understand site vegetation types and distribution of conservation significant flora and fauna.	
1.7 ESD guidelines	*Not supported*	*The Proposal fails to demonstrate it meets ESD guidelines*	*The Proposal be rejected* *The rate of current mining should be slowed to reduce*	For it to be recognised as ecologically sustainable, the Proponent's proposal should meet criteria under the *National Strategy for Ecologically Sustainable Development*, endorsed by all Australian jurisdictions in 1992. This defines the goal of ESD as: "development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends". ESD principles are outlined in Section 3A of the EPBC Act (DEWHA 1999).	EPBC Act Section 3A

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
		Perceived social licence and financial benefit to WA no longer justifies the impacts and risk *The proposal is unsustainable given forecast environmental and ecosystem collapse and extent of cumulative impacts and loss of ecosystem services* *No consideration is provided on alternative economies, instead the Proposal would severely impede development of economic alternatives including tourism* *The Proposal fails three criteria for sustainable aluminium industry*	*impacts and address knowledge gaps* *No new bauxite mines or expansions are approved in the Jarrah Forest and southwest WA* *The WA Government explores avenues for greater resource recovery and industry transition* *The WA Government work to transition away from mining in the Jarrah Forest and southwest WA*	PHCC recognises the importance of socially and environmentally acceptable sustainable development in supporting local and broader economies, particularly in supporting jobs, communities and businesses particularly in the local Boddington Community. However, the Proposal does not meet these expectations or the principle of intergenerational equity by failing to ensure the health of the environmental values, maintaining ecological functions for future generations, whilst minimising any impacts on the environment. This is evident in, even with proposed avoidance and minimisation measures, the remaining significant risks to the health, diversity and productivity of the environment. Social and environmental licence The Proponent and the broader bauxite industry in Western Australia operate on the premise of several key assumptions around environmental and social acceptability. In terms of environment, impacts including cumulative impacts are portrayed as low. The perception to date has been that the financial benefit to the WA economy justifies the impacts and risk. Furthermore, State Agreements and Ministerial Statements give bauxite mining priority over all other considerations including water catchment, tourism and agriculture. These social and environmental licences are no longer sustainable given environmental and ecosystem collapse in a biodiversity hotspot suffering significant cumulative impacts under climate change is a probable outcome with permanent consequences; loss of ecosystem services, the ongoing decline and thresholds being exceeded for many threatened species in the northern Jarrah Forest, including Black cockatoo and Quokka and social impact on recreation, amenity, water loss, air quality and loss of future earnings from related and alternate industries. While South32 employ 5% of the Boddington's workforce, this figure should be weighed against local and regional social and environmental impacts, alternative economic opportunities and the need for continued mining, discussed in more detail below. Preferential mining of existing cleared lands and alternate economies While the Proponent discusses the aim in mining bauxite and economic contributions, no proposed alternatives are discussed in detail, including discussion of the value of the social and environmental benefit in conserving the remaining native vegetation and biodiversity in the region. Nor is there consideration of preferentially mining existing cleared and degraded lands in the PAA before further clearing of mature native vegetation and State Forest or development of alternate economies. On this, the Proposal fails to adequately address proposed alternatives as required by the EPA. In instructions on ***How to prepare an Environmental Review Document,*** the EPA (2021) states "An ERD must include the following information: Proposed alternatives: − to the extent reasonably practicable, describe any feasible alternatives to the proposal, including a comparative description of the environmental impacts of each alternative, and enough detail to make it clear why any alternative is preferred to another". Furthermore, the proposal fails to align with the ESD 'integration principle' of Section 3A of the EPBC Act *("a) Decision-making processes should effectively integrate both long-term and short term economic, environmental, social and equitable considerations")*. As discussed in more detail under **Section 7.2**, previous, current and proposed mining impacts in the PAA will directly and indirectly impede development of alternative economic opportunities, including tourism. Sustainable industry A sustainable aluminium industry would be one that: a) Does not mine in threatened habitat or threatened species habitat and other ecologically sensitive areas, b) Develops net zero carbon sources of electricity and heat energy; and c) Implements a circular aluminium economy through recycling aluminium. It can be argued that the proposal does not meet the three components given: a) The proposal will mine and fragment large, high value threatened species habitat and other ecologically sensitive areas;	EPA (2021) *Instruction and template: How to prepare an Environmental Review Document.* https://www.epa.wa.gov.au/forms-templates/instructions-how-prepare-environmental-review-document Bourke (2022) WA is the state with the most work to do to meet the federal government's emissions reduction target - ABC News Kuelmans (2022) The Conversation November 18, 2021, *We've smelted a billion tonnes of recyclable aluminium. Do we need to make more*? https://theconversation.com/weve-smelted-a-billion-tonnes-of-recyclable-aluminium-do-we-need-to-make-more-166784#:~:text=In%20Australia%2C%20recycling%20rates%20for,across%20industrial%20and%20consumer%20products

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				b) Will contribute significant greenhouse gas emissions over the 15 year operation. Australia also ranks high in CO_2 emissions from alumina refining, an intermediate stage of processing. A recent article showed that WA is already failing to reduce emissions reduction targets to reach the Federal 43 per cent reduction in emissions by 2030. Indeed, rather than decrease emissions like all other states, WA has gone the other way, increasing its total greenhouse gas emissions by 4 per cent compared to 2005 levels (Bourke 2022); and c) Continue mine expansion at current rates with little to no consideration of resource recovery through recycling. New mining for aluminum, resource recovery and transitioning industry The need to slow and stop new aluminum production and increase resource recovery to stem climate change and environmental impacts is now being recognised. Aluminium itself is 100% renewable indefinitely however is “plentiful and cheap”, thus currently experiencing low recovery rates. Australians consume 3 billion aluminium drink cans per years and 44% (19,800 tonnes) ends up in in landfill. Recycling rates for aluminum packaging are between 44% to 66%, but likely lower across industrial and consumer products. Recycling aluminum requires only around 5% of the energy of smelting, the highest recycling energy saving for any major material. While global demand for new aluminum is set to increase by 2050, it should be considered how current and existing approved bauxite mining, and greater efficiencies in aluminum recycling can contribute towards meeting this demand, as well potential alternative materials that are able to replace aluminum (Bourke 2022). UNSW Research fellow Guy Keulemans wrote in November 2021 that: “It’s entirely possible to end the need for new aluminium”. Around 75% of aluminium is in current use, and available for recycling as it becomes necessary. Planning to stop producing new aluminium would create an incentive to better care for the metal we have and reduce waste” furthermore that “Slowing and eventually stopping new aluminium production would demonstrate how the world’s economy can thrive under degrowth – a controlled contraction of production to stem climate change and function within the planet’s ecological limit.	
1.8 Holistic Impact Assessment	*Not supported*	*Significant flaws and inadequacies with HIA and the approaches to address holistic impacts.*	*Significant adverse impact will arise for each factor and interaction of factors therefore should the project proceed*	The Proponent needs to provide a holistic impact assessment whereby consideration is given to their overall project in terms of the individual environmental factors in combination with each other. This relates to the ”Integration principle” under Ecologically Sustainable Development principles application through the EPBC Act. -The Integration principle dictates that decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitability considerations. This approach aims to ensure that decisions are based on all aspects of a proposal in a sustainable manner achieved by taking a holistic approach to management and understanding how each factor interrelates with others. The proponent has broadly considered and discussed major interactions with other key environmental factors in respective sections and considered holistically throughout the assessment. For example, they state ”recognition that clearing of vegetation, as an example, will impact on fauna, social surroundings and other factors“ (ERD, p 90) and in their holistic impact assessment in Section 10 of the ERD. However, there are significant flaws and inadequacies with their HIA and the approaches to address these impacts. The Proponents ERD has failed to properly adhere to and apply the principles of the EP Act in undertaking HIA and applying the mitigation hierarchy to address these interacting and complex impacts. Holistic Impact Assessment • Most importantly, while the Proponent acknowledges a set of interacting impacts of factors these assessments are based on incomplete and flawed understandings, as outlined in assessment of EPA required work in Section 1.1.10 and examples provided throughout this submission). • Secondly, the HIA has only been undertaken at a macro level for EPA factors under the HIA but not adequately for specific significant taxa, high value habitats or sensitive receivers.	EPBC Act 1999 EP Act

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				• The assessment has failed to consider important potential risks and impacts from synergistic impacts on other factors identified through in this submission. For example, the ERD does not address direct and indirect impacts from other factors on terrestrial fauna relating to soil moisture resulting from increased water abstraction, soil health under terrestrial environmental quality (see Section 4.2) and greenhouse gas emissions contributing to rainfall and temperature changes under climate change. Other impacts assessed under Air quality and Social Surroundings related to noise, dust and pollutants are minimally acknowledged and assessed for terrestrial fauna. • The Proponent states it "understands that impacts to climate will affect other Key Environmental Factors" and discuss this further in the Holistic Impact Assessment (ERD Section 10) but fail to consider the impacts across multiple values. While it is acknowledged, GHG emission contributions to climate change is poorly assessed and underplayed as a holistic impact. Despite this affecting other key environmental factors. <u>Management, avoidance and mitigation</u> • While acknowledging the extent of impacts on other factors particularly from native vegetation the Proponent does little to actually address reduce these holistic impacts. • Instead they rely on avoidance, mitigation and minimisation measures for individual factors, which have been shown throughout this submission to fail to meet EPA principles, scientific or community expectations. • The proponent's proposed management measures fail to adequately address holistic impact. The Proponent relies on extension of their existing and well-established practices "contemporised to reflect current expectations for environmental outcomes to be achieved" (ERD, p712) however numerous examples have been provided through this submission showing that these approaches fall short of standard, let alone best practice to address HIA (for examples see **Section 3.2.6**, **6.2.4** and **9.1**). While the Proponent states that existing project activities and elements associated with the project are already operational and will not undergo changes but are considered in temporal impacts at a holistic level (ERD, p xvi, p 6), including activities which are the subject of existing approvals and/or EPBC Act exemption (ERD p 6), few references are made to improving these operational activities to adequately address holistic or cumulative impacts. • The Proponent acknowledges the complexity of interactions between factors and "the link between all factors and Social Surroundings, emphasising the significance of the environment to people in the region" (ERD p 712) but dismiss, downplay and fail to adequately avoid or minimise risks, including Aboriginal and non-Aboriginal cultural and heritage values, amenity and aesthetic values discussed in detail in this submission under **Section 7.2.** • The existing and proposed mitigation measures being undertaken through current operations which reportedly take into consideration the holistic impact, while providing some compensatory benefit over time, do not adequately mitigate holistic impacts. For example, the Proponent claims that rehabilitation improves visual amenity and retention of logs benefit fauna and prevent erosion in rehabilitation (ERD, p 712). While this is true to some extent, this measure provides only marginal benefit considering the scale and degree of impact. Benefit is also delayed, which also exacerbates other impacts such land degradation. For example, the time lags between the Proponents clearing and mining of large areas for 3 years, coupled with delays in rehabilitation (evident in the Proponents record of rehabilitation deficit of >45%) results in synergistic and compounding effects across factors for an extended period of time. • The Proponent also claims their avoidance and mitigation and management measures in design and planning stages reduce impacts that would otherwise contribute holistic impact reduction, such as avoid significant areas and buffers (ERD, p712), however this submission highlights major inadequacies in these which only very marginally reduce holistic impacts (for examples see **Section 1.1.11, 2.2.9, 2.2.11, , 3.2.3, 3.2.4, 3.2.6**). In particular, the Proponent stresses that management buffers are implemented to reduce holistic impacts, however as discussed in this submission, buffer zones are applied inconsistently and inadequately across values and sensitive receivers at least four factors (see **Section 3.2.3, 5.2.10, 6.2.3, 7.2.8)**. • PHCC's evaluation of the environmental and social factors for the proposal in this submission has shown that significant adverse impact will arise for each of them, should the project proceed. Further we have demonstrated that the principles (s4A	

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				of EP Act) have not been upheld in this proposal. Therefore, taken as a whole the proposal is shown to be environmental unacceptable and should not proceed. • The existing and proposed mitigation measures being undertaken through current operations which reportedly take into consideration the holistic impact, while providing some compensatory benefit over time, do not adequately mitigate holistic impacts. For example, the Proponent claims that rehabilitation improves visual amenity and retention of logs benefit fauna and prevent erosion in rehabilitation (ERD, p 712). While this is true to some extent, this measure provide only marginal benefit considering the scale and degree of impact. Benefit is also delayed, which also exacerbates other impacts such land degradation. For example, the time lags between South32s clearing and mining of large areas for 3 years, coupled with delays in rehabilitation (evident in their poor record of rehabilitation deficit of >45%) results in synergistic and compounding effects across factors for an extended period of time. • The Proponent also claims their avoidance and mitigation and management measures in design and planning stages reduce impacts that would otherwise contribute holistic impact reduction, such as avoid significant areas and buffers (ERD, p712), however this submission highlights major inadequacies in these which only very marginally reduce holistic impacts (for examples see **Section 1.1.11, 2.2.9, 2.2.11, , 3.2.3, 3.2.4, 3.2.6**). In particular, the Proponent stresses that management buffers are implemented to reduce holistic impacts, however as discussed in this submission, buffer zones are applied inconsistently and inadequately across values and sensitive receivers at least four factors (see **Section 3.2.3, 5.2.10, 6.2.3, 7.2.8)**. • PHCC's evaluation of the environmental and social factors for the proposal in this submission has shown that significant adverse impact will arise for each of them, should the project proceed. Further we have demonstrated that the principles (s4A of EP Act) have not been upheld in this proposal. Therefore, taken as a whole the Proposal is shown to be environmental unacceptable and should not proceed.	
1.9 Consisten-cies with Plans and Policies				Native Vegetation Policy for WA The Proposal is inconsistent with the Native Vegetation Policy for WA (Government of Western Australia 2022) which seeks to "contribute to a net gain and landscape- scale conservation and restoration" as a key outcome. Forest Management Plan (2014 - 2023) Activities associated with the Proposal have major inconsistencies with the current Forest Management Plan (2014-2023), currently under revision. The Forest Management Plan 2014 – 2023 (Conservation Commission of WA 2013) was developed to align with the principles of Ecologically Sustainable Forest Management (ESFM) with the objective to "conserve biodiversity and self-sustaining populations of native species and communities, and to allow for the recovery of biodiversity from operational disturbances. This includes the threat to flora and fauna caused by disturbance from South32's mining activities within State Forest". International Agreements The Proposal is in conflict with international understanding of biodiversity importance, trends and agreements. A global scale assessment of the trends and impacts on biodiversity and ecosystem services have shown that there has been a significant increase in our understanding of biodiversity and ecosystems, as well as their importance to the quality of life of every person (IPBES 2019). There is also greater understanding now about which policies, practices, technologies and behaviours can best lead to the conservation and sustainable use of biodiversity and the achievement of many of the Sustainable Development Goals, the Aichi Biodiversity Targets and the Paris Agreement on Climate Change. Australia signed onto the Paris Agreement in 2016 (United Nations 2015) along with other world leaders to tackle climate change and its negative impacts. However, biodiversity is still being lost, ecosystems are still being degraded and many of nature's contributions to people are being compromised. Refer to the Global Assessment Report on Biodiversity and Ecosystem Services (https://ipbes.net/global-assessment).	https://www.wa.gov.au/system/files/2022-05/WANativeVegPol2022.pdf The Forest Management Plan 2014 – 2023 (Conservation Commission of WA 2013 The Paris Agreement | United Nations https://ipbes.net/global-assessment

<table>
<tr><th>THEME</th><th>PHCC Position</th><th>Rationale</th><th>Proposed outcomes</th><th>PHCC comment/s</th><th>Reference/s and Plates</th></tr>
<tr><td>1.10 EPA Required work</td><td>Not supported</td><td>The majority of EPA required work has either been partially addressed or not addressed at all</td><td>The Proposal should be rejected on the basis of failure to address all required work

Even if all required work is completed, clear adverse environmental and social impacts unable to mitigated make the Proposal unacceptable</td><td>PHCC has evaluated completion and adequacy of all EPA required work required for each factor under the Environmental Scoping by South32 under the Revised Proposal. Detailed comments are provided under each factor. The adequacy of the Proponent’s response has been summarised in the table below. This has been evaluated as either not addressed, partially address or adequately addressed. A summary of this evaluation by factor and by total (below) shows that the Proponent has in the majority not undertaken or provided information or only partially provided information on required work. Only 10 of the 71 line items of required work have been adequately addressed, with 27 not addressed and 34 only partially addressed. This highlights the lack of adequate information and assessment in the ERD.

It is PHCC’s strong view that even if all required work is completed, the Proposal should be rejected due to clear adverse environmental and social impacts of the Proposal that are unable to be mitigated.
<table>
<tr><th>EPA Factor</th><th>Relevant section</th><th>Number of required work line items</th><th>Not addressed</th><th>Partially addressed</th><th>Adequately addressed</th></tr>
<tr><td>Flora and Vegetation</td><td>Section 2.1</td><td>21</td><td>7</td><td>12</td><td>2</td></tr>
<tr><td>Terrestrial Fauna</td><td>Section 3.1</td><td>18</td><td>6</td><td>8</td><td>4</td></tr>
<tr><td>Terrestrial Environmental Quality</td><td>Section 4.1</td><td>6</td><td>2</td><td>3</td><td>1</td></tr>
<tr><td>Inland Waters</td><td>Section 5.1</td><td>10</td><td>8</td><td>2</td><td>0</td></tr>
<tr><td>Air quality (including GHG emissions)</td><td>Section 6.1</td><td>4</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td>Social surroundings</td><td>Section 7.1</td><td>12</td><td>4</td><td>7</td><td>1</td></tr>
<tr><td>TOTAL</td><td></td><td>71</td><td>27 (38%)</td><td>34 (48%)</td><td>10 (14%)</td></tr>
</table></td><td>EPA (2021). Statement of environmental principles, factors, objectives and aims of EIA, October. https://www.epa.wa.gov.au/statement-environmental-principles-factors-and-objectives</td></tr>
<tr><td>1.11 Mitigation hierarchy – Avoidance and Mitigation</td><td>Not supported</td><td>The Proponent has failed to demonstrate adherence to the mitigation hierarchy with high levels of significant residual impacts

Avoidance measures vastly inadequate, with no preferential clearing of existing cleared and degraded areas, over reliance on “where</td><td>The proposal should be rejected

At the very least the EPA should require South32 to adequately demonstrate all avoidance measures have been considered</td><td>The EPA defines the mitigation hierarchy as a sequence of actions to help reduce adverse environmental impacts. With the order of preference as a) avoidance (preferred); b) mitigation and c) offsets (least preferred) (EPA 2021 p7).

<u>Avoidance</u>
To avoid significant residual impacts, proponents need to demonstrate that all reasonable efforts are undertaken at avoidance as the first tier of the hierarchy. The proponent claims they have applied the mitigation hierarchy to avoid impacts to conservation significant species, high value ecosystems as a first principle but have failed to demonstrate this.

Firstly, despite almost half of the area of the PAA comprising land historically cleared for agriculture, plantations or mining (12,708ha of 44%) and other areas of degraded vegetation, South32 have not considered or attempted preferential clearing and to mining of existing cleared or degraded lands, instead plan almost all disturbance in native vegetation.

The extent of significant residual impacts to MNES and consistent reference to avoidance applied only “where practical” is evidence that that they have failed to adequately demonstrate implementation of the mitigation hierarchy required by the EPA. Revision of previous proposals have only minimally reduced residual impacts to MNES and remain unacceptability high (for example proposed Woylie and Red-tailed phascogale habitat clearing remains at 2,631 ha and 449 ha respectively (ERD, p383).</td><td>EPA (2021) Statement of environmental principles, factors, objectives and aims of EIA</td></tr>
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		practical" measures, poor protected areas planning *Inadequate and outdated minimisation and mitigation measures* *Overreliance on offsets reflects failure to adhere to hierarchy*		The reliance on the statement "where practical" for many of the proposed avoidance and minimisation measures, is of great concern, as this in effect allows many measures to be non-binding, unquantified, unmonitored and thus not held to account to avoid and minimise. For example (ERD 385) South32 state that "Access road and infrastructure will be preferentially located over ore in existing cleared, or disturbed or rehabilitated areas...where practical" but then propose 942ha of clearing of high quality wandoo, which comprises low ore content, for long term infrastructure. Moreover, in Protected Areas planning, the Proponent has not demonstrated all reasonable avoidance of clearing and disturbance of high conservation values areas, including large areas of high quality MNES habitat, instead propose limited protection areas based largely on existing legal or other protection while conceding few other areas "where practical" for South32 (see **Section 2.2.10** and **3.2.4**). <u>Minimisation and mitigation</u> The Proponent claims that continuation of current procedures, of which many flaws and inadequacies have been identified in this submission. The Proposal inadequately addresses mitigation of impacts (for example "comprehensive procedures regarding clearing and association habitat loss and fragmentation, and fauna management have been in place and implemented" at the mining operation for many years and that these procedures will "continue to be implemented" for the Revised Proposal (ERD, p 383).). For example see **Section 3.2.7**. No commitment or demonstration is made to bring the procedures and practices into industry standard, let alone best practice, and no principles of continuous improvement considered. There are limited references and detail of adaptive management strategies aiming to minimise and mitigate impacts. The consistent oversight throughout the proposal of using current and peer reviewed data, procedures and planning is environmentally and socially unacceptable. <u>Offsets</u> The extent of offsets proposed to mitigate significant residual impacts to MNES are reflective of the failure to adhere to the required mitigation hierarchy to avoid impacts. Offsets are discussed in more detail in **Section 1.10**.	
1.12 Mitigation Hierarchy - Offsets	*Not supported*	*Offsets are not appropriate in this case due to the environmental unacceptability of the Proposal and difficulty in replacing environmental values* *Despite offsets being the least preferred option under the mitigation hierarchy, the Proponent has demonstrated an over-reliance on a large offsets package*	*The Proponent needs to provide more detail on long term strategic objectives, including consultation, and how offsets will be funded long term and how they will appropriately offset local impacts*	It should be noted at the outset that the WA offsets policy acknowledges that "some environmental values are not readily replaceable" and offsets are not appropriate for all projects" (DWER 2019). It is PHCC's view that offsets are not appropriate in this case due to the environmental unacceptability of the Proposal and difficulty in replacing environmental values. PHCC has the following overarching comments on the offsets proposed. Specific comments are provided in Flora and Vegetation **Sections 2.19, 2.1.10, 2.12** and Terrestrial Fauna **Sections 3.3, 3.4, 3.5 and 3.6.** No offsets are proposed for Inland Waters or Social Surroundings Factors. Western Australian and Federal policy maintain that offsets will only be considered once avoidance and mitigation measures have been exhausted. Offsets are the least preferred option under the mitigation hierarchy (EPA 2021, p7) however, rather than demonstrating adequate avoidance and mitigation, South32s Proposal relies heavily on an offsets package. The WA offsets Policy (2011) expects "positive environmental outcomes" to be delivered while the associated guidelines (2014) state that " Proponents/applicants should demonstrate how a proposed offset counterbalances the significant residual impact of its project and how it will deliver long term environmental benefits" (Govt. of WA, 2014, p14). International best practice in biodiversity offsetting is similarly founded on net environmental benefit, not residual adverse impact and net loss. (E.g. see Sanchez et al. 2022). The WA Environmental Offsets Guidelines (WA Government 2014) state that when identifying an appropriate offset site, the following values should be considered. Application of these guidelines ensure that decisions made on environmental offsets are consistent and accountable under the *Environmental Protection Act* 1986 (the EP Act). The offsets proposed do not provide a local compensatory environmental benefit or reduction in impact enough to counterbalance the adverse impacts of the proposal, as required under the EPA WA's principles and objectives. PHCC comments on the Proposal are provided for each of the EPA Guidelines/Principles (below):	EPA (2021) *Statement of environmental principles, factors, objectives and aims of EIA*, Environmental Protection Authority October 2021 Sanchez et al (2022) WA Government (2014) WA Environmental Offsets Guidelines DWER (2019) Review of the WA environmental offsets framework, https://www.wa.gov.au/government/public

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
		The offsets proposed do not provide a compensatory environmental benefit or reduction in local impact enough to counterbalance the adverse impacts of the proposal, required under the EPA WA's principles and objectives.		• It provides better condition / less disturbance compared with the impacted environmental value: No. The shortcomings in claiming rehabilitation as a mitigation strategy for no net loss, i.e., equivalent condition or no less disturbance is discussed in **Section 9.7**. • Flora values are not considered in the Biodiversity Offsets Package, despite no Protected Areas for Priority flora. The value of offsets has been over-estimated considering most are rehabilitated lands, and rehabilitation fails to restore vegetation structure and diversity (see **Section 2.2.10** and **9.2)**. Many species do not recruit/survive on rehabilitated soils after strip mining (i.e., re-sprouter and rare species). This is particularly important for ground-dwelling fauna that rely on specific understorey species for protection from predators and habitat. • For MNES fauna, the proposed rehabilitation and restoration provides lesser condition and significantly more disturbed habitat compared with the impacted value, in at least the short to medium term. For example, rehabilitation provides suboptimal habitat value for Woylies (see **Section 3.2.19**) and it can take over a century to meet the habitat requirements for cockatoos (see **Section 3.2.7**). More detail on shortcomings of rehabilitation as an equivalent offset for fauna characteristics is provided in **Section 9.3**. • It contains habitat structure as similar as possible to undisturbed examples of the vegetation type to be impacted: No. See above. • It has a better area to perimeter ratio than the impacted site: No. The proposed offsets in the NJF are fragmented and small in size, thus have reduced area to perimeter ratio compared to the impact site. • It contains additional numbers of rare or otherwise significant species and threatened species or community compared with the impact site: No. As mentioned above, most offsets involve progressively rehabilitated lands, which have significantly lower diversity than forested areas pre-clearing (refer to Section 2.2.10 and 9.7). This is made worse by the fact that Conservation Significant species are not protected from clearing. • It is contiguous with an existing conservation area; No. Offsets are more fragmented than the existing forest. No regional context is provided. All proposed offsets in the NJF are small and isolated, therefore, a major loss for the NJF and Dwellingup area. • It enhances biological corridors or ecological linkages between conservation areas; No. The proposed offsets are fragmented. Reduced area to perimeter ratio of offsets increases pressures associated with edge effects. No attempt to address the potential 10% clearing of existing ecological linkages or of impacts association to increased noise/human activity around existing linkages during mining operations. Currently ecological linkages are protected by large buffers of high-quality vegetation that will be significantly altered and potentially degraded after clearing. • It includes actions to address threatening processes; and/or • It allows for secure management arrangements in place that will provide for long term conservation. The offsets proposed includes very few actions to address threatening processes and is vague and noncommittal in terms of secure arrangements for long term conservation. Page 68 of the Biodiversity Offsets Plan states that South32 is "considering" establishing a charitable trust fund that Worsley Alumina contributes to over the life of the project and that may be used to fund offset activities that need to continue after mining finishes to achieve specified objectives. This should be mandated. Additionally, to meet principles of WA offsets policy the offsets must meet the following principle however the Proponent fails to align with these principles for reasons outlined. <u>Principle 1: Avoidance and mitigation</u> In WA, proponents must address avoidance and mitigation in applications under Parts IV and V of the EP Act. As aforementioned the Proposal fails to make all reasonable attempts at avoidance and mitigation.	ations/review-of-the-wa-environmental-offsets-framework

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				Principle 2: Appropriateness The Proposal includes statements specifying significant residual impacts and the rationale for an offset to address those impacts for MNES, with the exception of Numbats where no impacts and thus offsets have been identified (see **Section 3.2.12**). Refer to Principle 4 and 6 for comments. Principle 3: Cost-effectiveness, relevance and proportionality Despite stating that "proposed offsets are not only proportionate to the significance of the environmental value being impacted, but that compensation will be more than adequate (i.e. provide a net benefit) factoring in time, risk and changes in environmental quality" does not reflect true circumstances. Firstly, for reasons provided elsewhere in this submission, the proposed rehabilitation and restoration does only partially mitigate impacts contributing to a benefit, falling well short with other proposed offsets to a net benefit. Secondly, environmental offsets should relate to the value being impacted (like-for-like), or a similar value (like-for-similar), however South32s offsets package for Woylies varies from the significant residual impact, in terms of location at a significant distance from impacted areas, magnitude and values, discussed in more detail in **Section 3.2.11**. Refer to Principle 6 below regarding comments on Direct Offset 5 (ERD Appendix L08). Principle 4: Sound information and knowledge The Proponent attests that the offsets have been developed with sound information and knowledge, however there is a clear lack of appropriate level of consultation regarding the Woylie enclosure (see 3.2.10) and sound information on Black Cockatoo offsets (see Section 3.2.7). For example, the Proponent acknowledges (page 6) of their "Offset Implementation Plan – Offset 4 Black Cockatoo Artificial Hollows Installation" that there is uncertainty within the scientific literature in relation to the use of artificial hollows in all circumstances, particularly for forest Red-tailed black cockatoos. As there is lack of strong support from the scientific community that forest Black cockatoos will readily breed in artificial nesting hollows, this offset is unlikely to mitigate the loss of breeding in natural hollows. Although not confirmed through the ERD, the Proponent has verbally advised PHCC on 2nd March 2022 and 19th July 2022 (South32 Worsley Alumina personal communication) that the installation of Black cockatoo artificial hollows as part of Direct Offset 4 (ERD Appendix L07) may be on the Swan Coastal Plain based on breeding success of Black cockatoos in the area. The Offset Implementation Plan Section 3.1 states "Worsley Alumina will target sites within 50 kilometres of the PAA "where possible". Sites outside this range may be selected dependent on suitability." The use of the term "where possible" is non-committal and PHCC does not support the location of artificial hollows which will not directly benefit the local Black cockatoo species populations. Protection and restoration of existing nesting, roosting and food habitat is always in preference to an offset. There is currently limited data of breeding sites within the Boddington and surrounding wheatbelt area and this needs to be a focus for the location of proposed offsets. Principle 5: Adaptive management South32 provide very few references and detail of adaptive management strategies aiming to mitigate and offset impacts. Principle 6: Longer-term strategic outcomes Principle 6 of the offsets policy provides that environmental offsets will be focused on longer-term strategic outcomes and they will be designed to be enduring, enforceable and deliver long-term strategic outcomes. South32 do not adequately detail how offsets contribute to longer term strategic outcomes, indicative of the lack of external consultation with appropriate agencies nor how they will achieve long term maintenance offsets only that they are "exploring options" (ERD p 644). Direct Offset 5 (ERD Appendix L08) is for the provision of an invasive predator free conservation reserve for Woylies. A 500ha fenced reserve is proposed. Currently, there are at least 5 enclosures across WA. Preservation and restoration of existing Woylie habitat with target feral control far out ways this proposed offset. There are long terms maintenance costs associated with this offset due to the fencing costs and long-term maintenance which will be required, hence this Offset does not meet Principle 5 of	

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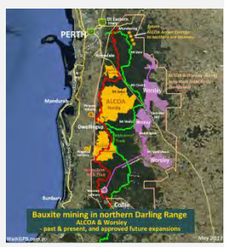
				the EPA offset policy that ”Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted.” The proposed offset is also not within the Boddington vicinity where most of the loss of Woylie habitat is proposed and therefore does not benefit the Boddington community and Boddington fauna. PHCC does not support the statement on Page 636 of the ERD “Effective control at a local scale is infeasible to achieve complete eradication of feral animals (cats and foxes). Additionally, long term baiting techniques can reduce in effectiveness over time due to factors such as bait resistance and shyness, and strong selective pressure against individuals that take baits (T. Fleming pers. Comm. 21 July). On this basis, the most successful management measure to provide benefit to woylie populations through establishment of a predator-free enclosure within suitable, secure habitat.” Only one opinion has been provided here. More effort is required in protecting known populations through significant feral animal management as well as restoration of current habitat. WA has a range of feral animal control measures available (see WAFCWG 2022 https://wafcwg.org.au/) which have shown in cases to significantly increase Woylie populations. This is evident through the PHCC’s Farmers for Fauna Project and Numbat Neighbourhood Project (funded through the Australian Government). In partnership with Department of Biodiversity, Conservation and Attractions, local landholders and Project Numbat, Woylie numbers have increased significantly since 2007 through a range of baiting, trapping and shooting programs. A trial on the Felixer Unit is currently underway to demonstrate another tool for feral animal control in the Wheatbelt area through PHCC’s Dryandra Woonta project (funded by the Australian Government). Direct Offset 1b (ERD Appendix L05) focusses on targeted ecological restoration. PHCC supports targeted ecological restoration of waterways, drainage lines, bushland/woodland area and other remnant vegetation, rocky outcrops, waterlogged and saline areas which are generally classified as non-arable or non-productive land. Concerns have been raised by the local farming community with productive agricultural land being used as offsets area and being “locked up” and unable to support the local “food bowl”. Many local farmers lease land from the Proponent which contributes to the local and regional economy. There are also concerns with Proponent owned lands not being managed appropriately for feral animals and weeds which has also been expressed by community members through the Mine Community Liaison Committee. <u>Risk Assessment and Offset Ratios</u> As well as the requirement to be designed to counterbalance the impact, offsets are required to “take into account any risk of failure in implementing the offset” (WA Government 2014, p13) and adjust offsets based on this risk. Review of the State’s offsets policy (DWER 2019) outlines that risk of failure should consider wide ranging risks including project management, resourcing and environmental risks including climate change. The Offsets proposal fails to do this by only considering natural disasters, despite the considerable risks posed by other factors. For example, South32 propose rehabilitation as an offset but do not address the risk of failing to implement this at required rates, based on their poor deficit percentages, nor do they consider the risk of climate change in undertaking rehabilitation of restoration. There is a general view that offset ratios need to be much higher to address risk (Bull, Lloyd & Strange 2017; Lindenmayer et al. 2017 cited in DWER 2019). Based on this, the offsets package needs to properly address risk and adjust offset ratios based on this risk. <u>Indirect Offsets</u> These are listed in the ERD as targeted research projects and partnerships, some of which are already in place and some that are proposed. These partnerships and potential research projects are supported provided they are not used as an offset to leverage conditional approvals and expansions.	https://wafcwg.org.au
1.13 Cumulative Impact Assessment	*Not supported*	*The NJF is under enormous cumulative pressure, the PAA has been mined for 35 years and*	*Due to the extent of previous, current and forecast mining and significant knowledge gaps in the NJF, CIA is more appropriate*	<u>Context</u> The Jarrah Forest is under enormous cumulative pressure from a variety of sources including native forest logging, mining, agriculture, urban development, dieback, prescribed burning and climate change. The primary cause of deforestation in Western Australia’s southwest forests is bauxite mining. Bauxite mining has cleared at least 32,130 hectares of publicly owned forest (80 times the size of Perth’s Kings Park) and fragmented 92,000 to 120,000 hectares of the Northern Jarrah Forest up to December	WA Forest Alliance *et al* (2022)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
		partly rehabilitated, yet cumulative impacts are largely downplayed or dismissed *Climate change is a major threat that is exacerbating mining and non-mining impacts, but is barely acknowledged* *The Proponent has undertaken a narrow CIA with baseline and terms of reference for all factors except terrestrial fauna as the current state and the PAA* *There are significant gaps, and inadequacies in the Proponent's CIA, including failure to define additional 8,400ha of conditional clearing approval and consider non-mining major impacts* *The Proponent have failed to adequately address whether the combined effects of multiple mining and non mining activities are currently or likely to overload natural capacity*	*considered through a strategic assessment, rather than on a proposal basis* *The Proponent needs to complete a CIA with clear temporal and spatial terms of reference for all factors that define baseline state at commencement of mining in approximately 1980* *The CIA needs to reasonably consider impacts from major non-mining activities including logging, climate change, forest disease and fire* *The CIA needs to be conducted for all EPA Factors*	2019, and the rate is accelerating. Of the 32,130 cleared forest hectares, 11,290 hectares (more than a third) was cleared between 2010 and 2020 (WA Forest Alliance *et al* 2022). Previous, current and forecast state The PPA has been subject to significant historical land clearing and disturbance contributing to cumulative impacts. 44% of the PAA is in completely degraded condition, with 43% of the PAA comprising cleared areas (12,708ha), leaving 46% of native vegetation or 13,504ha. These areas have been subject to logging, housing and other infrastructure. Historical impacts are added to by contemporary pressures including the Proponent's previous and current mining and other mining activities (see right and **Appendices** for aerial image of the PAA at 2020 (Google Earth 2020). The majority of the Boddington Gold Mine lies within the PAA and due to the mine's scale, historical and contemporary impacts, including clearing and water use, cannot be considered sufficiently separate for cumulative impacts to be unlikely and must be considered in the assessment of cumulative impacts of South32s proposal. Cumulative impacts must be considered both in terms of historical clearing and disturbance and contemporary disturbances, including current gold mining within the PAA, with baseline condition pre-mining not current state. The current proposal represents an extension of the existing development envelop in the PAA by 33%. This represents a significant increase in an environment that is already under stress. The Proponent acknowledges the proposed expansion is within a "highly modified and extensively fragmented landscape" (ERD, p704). In total, South32 has existing approvals to clear a further 9,342 ha and is seeking to add 4,399 ha to this, bringing the total area it hopes to clear over the next 15 years to 13,741 ha. The Proponent downplays and dismisses cumulative impacts stating that "however in the context of the pre-existing land use of the ongoing mine area and surroundings over the previous 35 years the incremental contribution does not represent a significant cumulative impact" (ERD Scoping Document). The cumulative impacts of past, current and approved exploration and mining activities, including forecast mining areas in the broader spatial context are incorrectly rated as low, dismissed or largely ignored for all environmental and social factors. This is despite the extent of historical and contemporary impacts from mining and non-mining activities, climate change impacts, context of widescale declining threatened species and environmental condition (State of the Environment Report 2021), knowledge gaps and local evidence to the contrary (see **Section 3.2.14**). Given the low rating and gaps in assessment, the correct and most contemporaneous EIA approach has not been selected to properly address cumulative impacts. Overarching inadequacies and failures of South32's CIA are outlined below. Specific comments are provided on cumulative impacts to EPA Factors throughout this submission (see Flora and Vegetation **Section 2.1.15,** Terrestrial Fauna **Section 3.2.1**, Terrestrial Environmental Quality **Section 4.2.9**, Inland Waters **Section 5.2.10**, Air Quality **Section 6.2.5**, Social Surroundings **Section 7.2.10**, including under individual species comments. a) Narrow terms of reference – related development • The spatial terms of reference for CIA are poorly defined, as such the Proponent has on the whole, only narrowly considered cumulative impacts spatially, despite significant related developments in the NJF (see image right, and **Appendices** for map showing cumulative bauxite mining in the NJF). With the exception of regional assessment of vegetation complexes in southwest WA and Black cockatoos, all CIA has included the PAA, not past, current and forecast mining from Alcoa's operations. Based on this, the Proponent has failed to consider whether other existing and future actions cause or potentially cause impacts that may interact with the potential impacts caused by the mining proposal under review. • Contemporary EIA practice incorporates the potential environmental impacts from additional related (facilitated) development that may arise from the existence of the project undergoing assessment (Minerals Council of Australia 2015), yet no assessment is provided for impacts to Alcoa's previous, current and forecast mining in the NJF. While not yet granted approval, Alcoa expansion constitutes a "reasonably foreseeable future activity" given that it is publicly announced and applied for.	 *View of PAA showing extent of cumulative clearing (Google Earth 11/19/2020), see Appendices for large version*  *Cumulative bauxite mining in the NJF (Walk GPS 2017), see Appendices for large version.* Minerals Council of Australia (2015)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
		and exceeding species thresholds		b) Narrow terms of reference – non-mining activities • It is a significant oversight that non-mining impacts have not been included in terms of reference for any factors, despite the high likelihood of these contributing to cumulative impacts. • The CIA should consider past, present and reasonably foreseeable future larger scale non-mining activities. The sources of impacts on the NJF range from simple additive impacts to complex interactions of stressors and are not necessarily brought about by only one activity or cause. As such an adequate CIA needs to comprise consideration beyond South32s and Boddington Gold's current mining. The Proponent's CIA should also consider other major non-mining activities and threats at the pre-mining state, including timber harvesting, other clearing for infrastructure, prescribed burning, forest disease, fire and climate change. This should include CIA for all volant and non-volant conservation significant fauna where populations extend across the PAA and broader the NJF, for example Quokka and Chuditch. c) Inconsistent CIA of EPA factors The Proponent has only undertaken CIA considering previous mining, present mining and foreseeable future mining for Terrestrial Fauna but not any other factors. Given the likelihood and significance of cumulative impacts, South32 should be required to undertake a comprehensive CIA for all factors considering all previous mining, present mining and foreseeable future mining within and in proximity of the PAA. d) Inconsistent or no assessment of Terrestrial Fauna Despite EPA requiring CIA consider past, present and foreseeable mining for conservation significant terrestrial fauna, this has been inconsistently assessed, with some species being largely ignored and other's impacts dismissed or under-rated. Refer to Terrestrial Fauna EPA Required Work **Section 3.1**, **Section 3.2.1** and individual species comments. e) Failure to adequately assess cumulative impacts – shifting baseline • South32 have failed to adequately assess cumulative impacts, and as such largely dismiss cumulative impacts from their mining operation for all factors except terrestrial fauna. At the heart of this failure, is that impacts are based on the current state as a highly cleared and fragmented landscape. On this baseline South32 rate cumulative impacts as low for all factors, stating that further impacts from clearing and fragmentation do not contribute discernible or appreciable cumulative impacts, and that any impacts can be mitigated by rehabilitation. In other words, impacts are already being experienced and systems degraded, thus further impacts will be low. • For example, cumulative visual impacts are considered low when measured against the extent of existing previous and current clearing i.e. an already impacted system. However, using this shifting baseline rather than a pre-mining baseline is unacceptable given that it presumes current levels of impacts are acceptable, incremental impacts won't exceed acceptable limits, particularly when impacts encroach closer to communities. • The Proposal does not appropriately consider the baseline condition of the environment at the point of mining commencement in the 1980s. Given the baseline data availability at that point in time, it is highly appropriate that the temporal reference for CIA be defined as prior to the commencement of mining in the 1980s. This aligns with best practice temporal bounds on EIA driven CIA should be "Project life cycle and past, present and reasonably foreseeable future developments in the project's region" (Minerals Council of Australia 2015). • The temporal boundaries of the CIA should extend back in time to the commencement of initial mining activities, given that it is reasonable to assume sufficient baseline would exist and the current proposal represents a continuation of similar activities. f) Failure to adequately assess cumulative impact – extended mining area lack of transparency and data South32s own CIA and lack of transparency in relation to areas approved under 719, comprising 22,102 ha for mining (ERD, 704) result in inadequate assessment, and restricts comment on the cumulative impacts. Under conditional approval to clear an	

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				additional 8,400ha with no mapping of this IDF or biodiversity data is provided in order for South32 to adequately assess their own cumulative impacts, nor to be able to provide comment on in this PER. g) Flawed assumptions and scientific robustness Assessment of low cumulative impact across factors is based on lack of flawed assumptions, underestimation of impacts, lack of scientific robustness related to impacts of previous, current and forecast mining within the PAA and in a broader spatial context, including non-volant fauna species where populations extend beyond the PAA. More broadly, the NJF has been understudied and surveyed for a range of species (for example SRE fauna) making it difficult to have high confidence of South32s CIA in regional context. Locally there are significant pre-mining and current baseline knowledge gaps for several species including the Red-tailed phascogale and Numbat. These knowledge gaps are not discussed or factored in CIA, where the Precautionary Principle should apply. h) Species thresholds and overloading natural capacity • Even with narrow terms of reference, South32 have failed to adequately address whether the combined effects of multiple activities and proposals risk exceeding species thresholds and overloading natural capacity. • No assessment or justification is provided that further clearing will not lead to exceeding thresholds for species and ecosystems, especially where there are data gaps and documented in declines in species within the PAA and more broadly. No consideration of this is provided despite clearing of native vegetation for mining occurs in an area that has already been heavily cleared and fragmented and that further fragmentation of the remnant vegetation will reduce connectivity below ecological thresholds. • The Proponent assumes the presence of the range of threatened species within the PAA reflects tolerance and ability to absorb current and further impacts to 33% or 4,399ha of the of the PAA. No justification in the CIA or throughout the ERD is provided that further impacts will not jeopardise the viability and sustainability of remaining populations of significant species and habitats. In broader context, southwest WA threatened fauna species are suffering declines, supported by the key findings for threatened species in the recent State of the Environment Reporting (2021). More locally within the PAA, there are indications that these thresholds are being exceeded or may be close to those thresholds. For example, South32 note recent declines in MNES Chuditch may be attributable to impacts of large scale clearing and fragmentation from mining and agriculture (see Section 3.2.14). However, given clearing from agriculture within the PAA is predominantly historical, it is more likely the declines are a direct and indirect result of South32s previous and current mining operations. • South32s reliance on rehabilitation as a no net loss mitigation strategy to address cumulative impacts fails to acknowledge the time lag, and suboptimal quality of fauna habitats. Observation of significant fauna species within rehabilitation areas is not an indication that these areas are meeting species needs. For example, in the case of Black cockatoo species, while they may be observed foraging in 6-year-old rehabilitation, these areas would provide significantly lower quantity of tree-based food resources, in addition to a medium to long term absence of suitable tree hollows. i) Mitigation, offsets, monitoring and management Due to South32s lack of adequate CIA and their underestimation of cumulative impacts, the proposed efforts to mitigate, offset, monitor and manage this significant individual Proposal, as well as or multiple, project-based contributions to cumulative impacts cannot be assessed at this time. Conclusion Given the significant knowledge gaps and multiple past, present and foreseeable activities impacts in the NJF, it is more appropriate for cumulative impact assessment to be considered more closely through strategic assessment rather than on a piecemeal project by project basis.	

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				The species and ecosystem knowledge gaps in context of current and potential significant impacts means that CIA should have been carefully considered, however the shallow analysis undertaken by South32 is unlikely to meet regulator or community expectations. On this basis, the proposal should be rejected, or at the very least, a more contemporaneous and comprehensive CIA based on the points raised, should be undertaken to inform the EIA process and clear environmental benefits must be established as outcomes that South 32 will deliver.	
1.14 Monitoring	*Not supported*			• No monitoring plan is included in the ERD and very little detail is provided on monitoring with the exception of the rehabilitation plan (which has a number of gaps). • No specific monitoring of ecological linkages and protection areas. • Very little monitoring in the NJF outside the PAA. • No groundwater monitoring Mt Saddleback areas. • There is no monitoring plan for aquatic fauna. A contemporary baseline dataset including vertebrate fauna (including Rakali, long necked turtles, and fish), crayfish, macroinvertebrates and microinvertebrates (zooplankton) should be included as a minimum, alongside a detailed aquatic ecosystem monitoring plan, including threshold levels to trigger fauna monitoring and corrective actions. This should continue post-rehabilitation in mined areas, for as long as groundwater abstraction occurs. • There is no monitoring plan for TSS or sedimentation. This should involve set-up of monitoring points at riffle and pool areas, with routine and events based monitoring. • No monitoring plan is proposed from Ground Water Dependant Ecosystem's, despite GHD (2020a) indicating that there was minimal monitoring of GDE's, with not enough GW bores to assess the impacts of mining on GDE's. • As a result of sediment incidents which have occurred in 2021 and 2022 as described in Section 5.2.8, PHCC has concerns with current and future management of stormwater runoff from mining operations and the impacts to inland water including the Hotham River and its tributaries in terms of river health, including impacts to water quality and also aquatic fauna.	

2. FLORA AND VEGETATION

EPA Objective: To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	
Relevant activities: The mine expansion involves an increase of the mine and infrastructure footprints and clearing of up to 4399 ha of native vegetation.	
Potential impacts and risks	• Further loss and fragmentation of native vegetation in the local area from clearing, including threatened species. • Habitat loss for fauna species. • Spread of weeds and dieback, and introduction of pathogens into new unaffected areas. • Changes to vegetation structure and composition through altered surface drainage flow patterns. • Potential impacts on ecological and social values of forests, including within public reserves, through increased water use associated with the proposal.

2.1 EPA REQUIRED WORK

Required work		Have these been adequately addressed	PHCC comment/s
1	Identify and characterise flora and vegetation in the Primary Assessment Area (WMDE, BTC and CBME) in accordance with the requirements of EPA guidance. Survey should include all areas that are likely to be directly or indirectly impacted (including by changes to groundwater, or surface water flow) as a result of the proposal. In areas where land is not accessible and surveys have not been undertaken, describe actions to avoid direct and indirect impact to these areas.	No	There is no consolidated flora list, no herbarium specimens submitted and no baseline data supplied. The restoration survey area is small, but even fewer surveys exist for the Northern Jarrah Forest (NJF) generally. Most data is old, Quindanning Surveys are old (1993, 1999 and 2019) and this is the area where *Caladenia hopperiana* (T) was recorded. This area should be surveyed with a higher intensity in the search for any new populations (see survey tracks in Fig 3, Mattiske Consulting Pty Ltd, 2021). Timing of field work, the large number of taxa identified to genus or family indicate that survey timing was often not suitable. Surveys were predominantly undertaken in the spring months, to coincide with flowering times for most species, but not suitable for all species. For example, most *Caladenia hopperiana* individuals have been recorded during the wetter 2008/2009 surveys (EPBCA 2018), which may suggest that the species is more prolific and/or identifiable during winter.
2	Demonstrate how surveys are relevant, representative and demonstrate consistency with current EPA guidance. Ensure database searches and taxonomic identifications are up-to-date. If multiple surveys have been undertaken to support the assessment, a consolidated report should be provided including the integrated results of the surveys. All surveys may be appended to the environmental review documentation.	No	There is an overall lack of data transparency throughout the ERD and much of the flora survey data is from old and outdated studies. There is no consolidated flora list, many taxa were identified to genus level only and 30 of these were listed twice. There is insufficient data to address the regional significance of species and major under-reporting of site vegetation types. Vegetation condition data has not been provided, which must include a list of all species recorded and notes from the quadrat surveys. It is difficult to assess whether survey effort is sufficient because this data is not made publicly available. Peer review of data and reports is lacking throughout the ERD.
3	Reports provided should be accompanied by IBSA Data Packages prepared following EPA Guidance.	Unknown	Unknown as 'IBSA data is provided separate to the ERD' (ERD, piv).
4	Undertake baseline weed mapping in areas likely to be directly or indirectly impacted by the proposal	Partial	A number of significant weeds in rehabilitated and disturbed vegetation in the NJF are not discussed (see 'Weeds' section below for more details).
5	Provide a map of the survey effort applied in relation to the Primary Assessment Area, identifying the direct and indirect impact areas.	Partial	Map of survey effort within the PAA is provided (ERD, Fig. 5-2) but does not show which survey work was undertaken prior to GPS units being available. Considering much of the survey data is very old, the map should show the approximate year the survey was undertaken, to understand whether survey data is sufficient.
6	Determine whether any flora species recorded are significant, and provide an analysis of local and regional context, (refer to Environmental Factor Guideline – Flora and Vegetation for definition of significant flora).	Partial	The Proponent has determined whether flora species recorded are significant but have not provided a thorough analysis of the regional context of significant flora. There is reference to Mattiske recording and collecting Priority flora within the PAA (ERD, p141) but these collections have not yet been lodged with the Western Australian Herbarium. *Hibbertia ambita* (P1) was only recently described in 2019 and regular 'reclassification of a range of species previously identified as *Hibbertia*

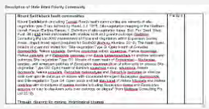
Required work		Have these been adequately addressed	PHCC comment/s
			commutata' (ERD, p141) highlight the importance of lodging herbarium samples collected in the Northern Jarrah Forest and Boddington and Collie areas. As stated, records of Priority flora are based on confirmed locations only and 'it is likely that more locations will be confirmed with time within the region'. Further surveys of the Northern Jarrah Forest are required to understand the regional context of Priority species (and MNES) recorded within the PAA.
7	Undertake targeted searches for conservation significant flora in accordance with EPA and Commonwealth guidance (EPBC Act). Include an assessment of all MNES within a 5 km radius surrounding the proposal area.	Yes	
8	Determine whether any vegetation identified is significant, including old growth areas, and provide an analysis of local and regional context (refer to Environmental Factor Guideline – Flora and Vegetation for definition of significant vegetation).	Partial	As mentioned above, although the Proponent has determined whether any vegetation identified is significant, including old growth areas, low survey effort within the Northern Jarrah Forest means it is impossible to provide an analysis of the local and regional context of significant flora recorded.
9	Provide figures of the proposed clearing and predicted indirect impact to vegetation and significant flora species including but not limited to threatened/priority ecological communities, threatened/priority flora, old growth forest areas, and significant flora and significant vegetation as defined by EPA guidance.	Partial	Detailed surveys have not occurred within the conditional approval area of 8,400ha under MS719.
10	Provide a quantitative assessment of impact for: a. significant flora, including: i. number of individuals and populations in a local and regional context; ii. numbers and proportions of individuals and populations directly or potentially indirectly impacted; and iii. numbers/proportions/populations currently protected within the conservation estate (where known). b. vegetation units (noting threatened and priority ecological communities and significant vegetation) including: i. area (in hectares) and proportions directly or potentially indirectly impacted; and ii. proportions/hectares of the vegetation unit currently protected within conservation estate (where known).	Partial	The quantitative assessment of impact for significant flora and vegetation units is flawed due to low survey effort of the surrounding Northern Jarrah Forest and major under-reporting of site vegetation types, which makes it impossible to assess the regional context of significant flora and vegetation.
11	Analyse the direct and indirect impacts from the proposed mining, and discuss the significance of the direct and indirect impacts to flora and vegetation at a local and regional level. This may include reference to Scheduled species in other approved areas (MS 719).	No	Major under-reporting of site vegetation types makes it difficult to assess impacts to vegetation at a regional scale. There is a failure to address how significant flora, including shallow-rooted species like *Caladenia hopperiana* (T), and nearby Eucalypt Woodland TEC may be impacted by reduced groundwater levels. Impacts from progressive and accumulative clearing on the Northern Jarrah Forest's resilience to climate change, or the hydrological impacts from this on-going clearing have not been analysed. There is also no attempt to address indirect impacts in the context of the edge effects, which is important given the number of 'Protected Areas' that weave through the PAA with minimal buffer zones to protect vegetation. Detailed surveys have not occurred within the conditional approval area of 8,400ha under MS719.

Required work		Have these been adequately addressed	PHCC comment/s
12	Assess the impact(s) of increased water consumption for operations and dust suppression on flora and vegetation, including the ecological values it supports.	No	Potential impacts from increased groundwater drawdown to the Mount Saddleback Heath Communities (P1) as a result of indirect impacts associated with abstraction are not predicted as the bores are located >1.5 km from the Priority Ecological Community (PEC) (ERD, p225). Bores should be established closer to this PEC to assess and monitor the impacts of reduced groundwater levels. As mentioned above, there is a failure to address how increased groundwater abstraction will impact significant flora, including shallow-rooted species like *Caladenia hopperiana* (T), and nearby Eucalypt Woodland TEC may be impacted by reduced groundwater levels. They have also ignored the impacts to shallow-rooted Priority fauna and nearby Eucalypt Woodland (TEC), as mentioned above. Cleared areas have greater evaporative water loss, but the impact of increased evaporation on groundwater levels has not been considered throughout the proposal. Further detail is provided in **Section 5.2.5**. Dust generated from mining activities will likely impact flora and vegetation within the PAA, particularly for those in 'Protected Areas' within the PAA and may be a contributing factor to lower diversity in rehabilitation areas. The only reference provided to suggest there is little impact from low levels of dust is from Bennet, 2008 (ERD, p224) however, data and methods used in this study are not publicly available. 'The study was specifically focused on determining whether dust was entering the stomata on the leaves as these pores facilitate the exchange of carbon dioxide, oxygen and water in/out of plants', however, dust can impact vegetation health and structure in many ways. Dust may affect photosynthesis, respiration, transpiration, and reproduction processes such as pollination, seed production and seedling survival. The failure to consider up-to-date and peer-reviewed knowledge when assessing impacts on the flora and vegetation, is a consistent oversight throughout the proposal. Furthermore, it is not clear what length of new hauls roads are expected to be developed and the impact this will have on vegetation clearing and dust generation.
13	Analyse risk of Phytophthora cinnamomi and Armillaria luteobubalina within the development envelope, undertake surveys (if relevant) and describe management actions to prevent introduction to protectable areas within the proposal area and to adjacent conservation areas.	Partial	Although the Proponent analyses the risk of *P. cinnamomi* and *A. luteobubalina* within the development envelope, some of the actions described to prevent introducing dieback to adjacent protected and conservation areas are vague and unrealistic. For example, on page 98-99 of the Closure Plan they claim 'pit and rehabilitation drainage will be designed so that no water can flow from the infested area into uninfested areas', but they provide no details plans about how they will achieve this and fail to address the control of surface run-off during high rainfall events. On page 23 of the Closure Plan, the Proponent claims 'no new introduction of forest disease as a result of mining operations', but evidence to support the efficacy of current hygiene practices in achieving this objective is not provided. It is impossible to assess whether appropriate management actions will be applied when a clear dieback management plan has not been provided. The dieback management plan must be developed prior to approval, as well as a detailed plan with methods to control the spread of dieback during periods of high rainfall.
14	Demonstrate that the proposal has been designed to avoid and minimise impacts regarding placement of access roads and infrastructure within vegetated areas, and that placement has had regard to utilising existing areas of disturbance.	Partial	The final alignment of haul roads and conveyor route are yet to be finalised, therefore, it is difficult to assess whether placement utilises existing areas of disturbance. Furthermore, page 34 of the ERD states that 'previously disturbed areas will be selected for the development of new mining infrastructure (e.g., primary crusher), where practicable'. 'Where practicable' means the Proponent is not held to prioritising or committing to avoid disturbing new areas. Clearing of Wandoo is mostly for infrastructure and the Proponent has not demonstrated effort to avoid disturbance to Wandoo Woodlands in the placement of infrastructure.
15	Discuss proposed management, monitoring and mitigation methods to be implemented demonstrating that the proposal has addressed the mitigation hierarchy, and ensure residual impacts (direct and indirect) are not greater than predicted.	Partial	Although the proposal has addressed the mitigation hierarchy, failure to consider the rehabilitation deficit and inability to restore vegetation structure and diversity, suggests that the residual impacts will be greater than predicted. As stated on page 241 of the ERC, 'the current rehabilitation deficit will be reduced from approximately 45% to <35% over a 10-year period'. There appears to be no attempt to address the short or long-term impacts of this deficit.

Required work		Have these been adequately addressed	PHCC comment/s
16	Discuss the regional and cumulative impacts of other existing or reasonably foreseeable development in the vicinity of the proposal with the potential to impact the flora and vegetation values, particularly the Jarrah Forest. These may include rehabilitation, fire, mining, timber harvesting, disease, weed invasion, impacts to biodiversity, recreation and water management.	No	The ERD fails to adequately address regional significance for both the flora and the vegetation (see 'regional', 'cumulative' and 'climate change' sections below for more details). The major under-reporting of vegetation units and failure to address how cumulative clearing of the NJF impacts the forest's resilience to climate change, demonstrates a lack of consideration for the regional and cumulative impacts. Rehabilitation in a drying climate is more difficult and takes longer, but these risks appear to not be considered.
17	Determine and quantify any significant residual impacts by considering the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the WA Environmental Offsets Guidelines (2014) and include reference to the Commonwealth Assessment Guide for any MNES.	Partial	Clearing of 60% or 2,631 ha of habitat of highest conservation category MNES, with a large offset proposal, demonstrates that avoidance measures have not been reasonably applied (offsets are at the bottom of the mitigation hierarchy).
18	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and Guidelines. Spatial data defining the area of significant residual impacts should also be provided.	Partial	Given the rehabilitation deficit and failure to recreate vegetation structure, rehabilitation is not an acceptable mitigation strategy (refer to 'Offsets' section further in this document). **Section 1.1.11** provides further details on review of offsets. The majority of offsets are located far from the area of direct impact (most offsets are in Collie, whereas the direct impacts occur in Boddington), thus there is significant environmental deficit for the Boddington area.
19	Describe the proposed rehabilitation methodology, using current practice, evidence and demonstrated outcomes, including but not limited to: a. physical and chemical characteristics of soil and soil profile; b. topsoil management; c. retention or reuse of vegetative material; d. return of species and communities consistent with the preexisting composition of the affected area; and e. timeframes for rehabilitation, including sequencing of excavation and progressive rehabilitation.	Partial	Lack of data transparency and prescriptions established to measure the success of vegetation rehabilitation over time is flawed. There should be regular publicly released assessments of vegetation rehabilitation success in all mining areas across the state and the success of otherwise should be peer reviewed with the reports and reviews provided for public comment.
20	Prepare a Rehabilitation and Closure Plan consistent with the DMP and EPA (2015) Guidelines for Preparing Mine Closure Plans. The plan should include but not be limited to: a) closure objectives and completion criteria (quantitative or qualitative) addressing post mining landforms and soil profile reconstruction, native vegetation and habitat for conservation significant flora and fauna; and b) establish and where possible measure, vegetation and fauna reference and analogue sites, to inform completion criteria.	Partial	The rehabilitation shortfall is unacceptable and there has been no attempt to address the cumulative impact of this shortfall (see comments for 'Vegetation Rehabilitation' below). The Rehabilitation and Closure Plans do not address the impacts associated to restoration lag times (i.e., with temporal delays between clearing, rehabilitation and restoring ecological function, there will be long periods where critical ecological values are missing from the landscape). Protected areas must be expanded to include woodlands and forests with high quality vegetation. There are few analogue sites in the NJF which has impacts for their baseline restoration targets and completion criteria (few survey plots in the NJF mean potential under-reporting of vegetation units and significant flora).
21	Demonstrate and document in the ERD how the EPA's objective for this factor can be met.	No	Given the high rehabilitation deficit, large offset proposal and inability to reinstate vegetation diversity and structure, the EPA's objective for this factor cannot be met. The proposal should be rejected, on the basis that flora/vegetation data provided is not adequate and failure to consider the regional significance of flora and indirect impacts of cumulative clearing in the NJF. At the very least, all conservation significant flora and vegetation communities, habitat linkages, old growth forests and woodlands with high quality vegetation in the PAA must be protected from clearing, now and in the future. To protect *Caladenia hopperiana* (T), the isolated and large patch of remnant bushland in the south-eastern area of the proposed PPA must be avoided.

2.2 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
2.2.1 Survey Method: Vegetation	*Not supported*	*Base data (i.e. data from each sample point–grid recording sites, plots or quadrats) is not provided. The data provided is not adequate to support the mapped vegetation complexes and the site vegetation types.*	*Base data be supplied and another 4 weeks allowed for assessment. If not supplied an outline of the data lodged with IBSA be supplied and the following given:* • *timing field work per point* • *diversity for each point* • *weed numbers per point* • *vegetation condition at each point percentage of expected flora be quoted for PAA and subareas.*	• In failing to supply point data the adequacy of the data is unable to be adequately determined/assessed. Interpretation of the flora data supplied demonstrates this issue. • The justification for not supplying the point data is unacceptable. The Proponent advised "Raw data from surveys remains commercially sensitive and is considered the intellectual property of the consultant/proponent" personal communication to South32 03/08/2022). The position that the data should be released to the community is supported by the following: – Majority of the data was collected on government lands; – If data collected for the Regional Forest Agreement for Ecological Vegetation Systems (Havel and Mattiske 1999) has been used this data was collected for government contracts; and – Much of the data is aged and should have been released with past assessments. • Without the data the following cannot be considered adequately assessed: – Timing of field work, the large number of taxa identified to genus or family indicate that survey timing was not suitable (see comments on 'Flora Lists' below); – Patterns of species diversity per sampling point (species diversity per unit area/vegetation unit); – distribution of individual species (i.e., all species not just Threatened and Priority taxa, and especially other conservation significant taxa); – Presence and absence of all weeds per point; – Vegetation condition (while there is a vegetation condition map, Keighery 1994 is based on recording condition at each sample point, accompanied by notes on various aspects that aid determination of condition–weeds, fire frequency, etc.); – Vegetation complex mapping does NOT indicate the distribution of floristic groupings (vegetation complex units and site-vegetation types include a variety of floristic units). • Much of the data appears to have been collected 3-4 decades ago. Over this time many new taxa have been described and species limits in others better defined. See comments on Flora Lists below, for examples of this issue. • This data was requested from the EPA by telephone, and from the Proponent by telephone and email. The EPA officer directed these enquires to the Proponent. Access to the data and the above issues were initially discussed by telephone (27/07/2022) with the Proponent. A number of the points above were discussed. The Proponent stated that the data had been seen by the EPA and DBCA and was of an acceptable quality, holding that 'the community' would not find the base data useful in their consideration of the assessment documents. When the issue of peer review (a standard in scientific process) was raised it was not acknowledged that the community may have a different view of the interpretation of the data. These discussions concluded with the Proponent committing to investigate providing the data, but it has not been made available to enable review as part of this PER.	PER Appendix F1 - Assessment of Flora and Vegetation on Worsley Mine Expansion PAA, p14-17
2.2.2 Survey Method: Flora	*Partially supported*	*See above*	*See above. Flora data needs to be 'cleaned' and flora Appendices and associated tables redone.*	• Much of the data appears to have been collected 3-4 decades ago. • Over this time many new taxa have been described and species limits in others better defined. See item 'Flora Lists' below for examples of this problem. • We are unable to check taxa determinations as very few specimens are lodged in WA Herbarium and about half of these were lodged in 1982 (over 4 decades ago). • There should be many more specimens lodged considering the number of studies on the area. • With such a large number of the taxa identified to genus or family (around 150) more specimens should have been lodged in the Herbarium, especially those with a specimen number, e.g., *Hibbertia* sp (JK150) Appendix H (Mattiske 2021). • Timing of field work, the large number of taxa identified to genus or family indicate that survey timing was often not suitable to make an accurate determination of impacts (see 'Flora List' comments below).	PER Appendix F1 - Assessment of Flora and Vegetation on Worsley Mine Expansion PAA, p14-17
2.2.3 Vegetation	*Partially supported*	*Reference area for regional representation should be the*	*Table 6 Mattiske 2021, Table 9-1 ERD be supplied*	• This data was used to look at the regional significance of each VC based on the percentage of reach remaining (Table 6 Mattiske, Table 9-1 ERD). Using Table 6 Mattiske as an example it was found that the data was so confusing that it cannot be used. The following points validate this position:	Table 6 Mattiske 2021 , Table 9-1 ERD

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
complexes (VC)		*Northern Jarrah Forest (NJF).*	*based on figures for NJF.*	– Table name refers to the larger area as the 'Southwest Forest'. There is no definition/map of this area. This area should be the NJF. – Column 4 'Current extent' is unclear what this is (the current extent of what). On page 57 (first page table) there is the following footnote that may apply to this column but does not make sense. It is expected that this column refers to the remaining area of the Southwest Forest with native vegetation/bushland but this is far from clear. The notes make it more confusing. 'Source: Government of Western Australia (2019). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca Notes: 2018 South West Vegetation Complex Statistics -DBCA-047 does not take into account detailed site rehabilitation, plantation and pasture areas, these are derived from Mattiske, 2021.' As a consequence, Table 6 Mattiske and Table 9-1 ER need to be revised and regional significance according to percentage remaining be reworked and a clearer table be produced with each column referenced to the dataset used (See Keighery *et al* 2008 for examples of such table keys). The wider area should be the NJF (an IBRA Subregion, mapped across Australia). With the errors inherent to remnant vegetation mapping (i.e., difficulty interpreting mining areas, including bauxite and gravel, areas not dominated by WA trees, etc) the threshold used should be 40% not 30%, to account for the difficulties in determining if an area is bushland. These difficulties exist for a number of reasons: • Using VC alone for percentage remaining of each type is very broad scale, units being widespread and describing a multiple of floristic communities on a single landform unit. • VCs should be supported by floristic analysis (Keighery *et al* 2008, Luxton 2021) in determining regional conservation value. • Not suitable to identify TECs, as these are best described from floristic data (the use of Site-vegetation types to describe the Mt Saddleback Priority 1 Ecological Community (see **Appendices**). • There is no discussion about changes in NJF from west to east, or north to south. Reference should be made to distribution of VCs and significant taxa in the full sense.	
2.2.4 Site Vegetation Types	*Partially supported*	*Lack of suitable point data for floristic analysis*	*Base data be supplied and another 4 weeks allowed for assessment. Floristic analysis of suitable point data be undertaken to better determine regional significance in the NJF*	• A finer degree of floristic analysis needs to be provided and applied outside the PAA and within the NJF. • Site-vegetation types also contain multiple floristic communities as illustrated by the description of the Mt Saddleback Priority 1 Ecological Community (see **Appendices**). • An analysis of the base floristic data would better inform the determination of the regional significance of the vegetation. • Appendices J and K indicate limited data was collected at each sample point for the Site-vegetation types (i.e., Appendix J lists 98 determined native taxa in the eastern PAA for 16 Site-vegetation types and Appendix K lists 104 native taxa in the Collie PAA for 7 Site-vegetation types. • A single floristic group dominated by Jarrah from the northern Whicher Scarp (Keighery *et al* 2008, see Appendix 3 for basis for using this data) has a mean of 79.6 for the number of native taxa and the full dataset analysed 742 taxon. This indicates that the determination of VCs and Site-vegetation types was based on very few taxa. The Whicher Scarp is part of the Jarrah Forest. ERD Appendices J and K list many undetermined taxa (these have not been included in the numbers above).	 *See Appendices for multiple floristic communities for Mt Saddleback Priority Ecological Community*
2.2.5 Threatened Ecological Communities (TEC)	*Partially supported*	*Ecological communities not adequately addressed.* *Failure to address indirect impacts on Mt Saddleback Community (P1)*	*Base data be supplied and another 4 weeks allowed for assessment. Floristic analysis of suitable point data be*	• The Mt Saddleback Ecological Community (also referred to as the Tunnel Road Heath) appears to be understood since 1982 (reference Atkins 1982 specimens in WA Herbarium, see **Appendices**). • The Mt Saddleback Ecological Community is listed as a state Priority 1. It should be noted that no state TECs have been listed for several decades, with nominations over this period being listed as priority ecological communities. The community is likely to meet the requirements to be listed as a TEC. • The Mt Saddleback Priority 1 Ecological Community is recognised by the Proponent and should have been nominated for listing at the federal level.	Mattiske Consulting Pty Ltd (2021) *Assessment of Flora and Vegetation on Worsley Mine Expansion Primary Assessment Area*, Prepared for South32 Worsley Alumina Pty Ltd,

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
		and Eucalypt Woodland (TEC)	*undertaken to better determine impacts.* *The process for monitoring the indirect impacts (ie. reduced groundwater level) on Mt Saddleback Community (P1) and Eucalypt Woodland (TEC) be further detailed*	• Approximately 23 ha, or ~35% of the Wider Total Area Mapped of the Mt Saddleback Priority 1 Ecological Community will be directly impacted by the proposed mining areas (Mattiske Consulting Pty Ltd, 2021; Table 14). • Although Mt Saddleback Priority 1 Ecological Community are earmarked for protection, the protection plan (i.e., 100m protection zone around communities) is likely to mitigate only the direct impacts and not the indirect impacts mentioned below, including changes to soil hydrology. • 'Old growth forest' should be listed as a federal TEC. At the time of the Regional Forest Agreement (RFA), TECs were not developed and these should be updated to TECs. Categories of Forest of High, Medium/High and Medium condition (Figure 5-11 ERD) should be included. • Eucalypt Woodlands of the Western Australian Wheatbelt (TEC) occur ~20km east of the PPA. Indirect impacts from changes in groundwater levels should be considered and monitored, as changes in groundwater levels are likely to impact their distribution.	Mattiske Consulting Pty Ltd, Kalamunda WA.
2.2.6 Flora lists	*Partially supported*	*Data not clean and no consolidated flora list provided.*	*Base data be supplied and another 4 weeks allowed for assessment. Flora tables 'cleaned' and associated table be revised*	• Flora data is confusing and repetitive. There is no consolidated flora list for the eastern PAA or the Collie PAA. • In all, 6 appendices (D, F, H, I, J, K) are included in Mattiske, being 97 pages of the document, almost as many pages as in the body of the document (126 pages). This gives the appearance of large amounts of flora data when this is not the case. For example, of the 97 pages, 37 are not necessary, being the results of FloraBase/Nature Map search. It would be far more informative if these were in a column in Appendices H and I. This would allow an appraisal of how many were not found in the field and vice versa. • Table 3 (p30) gives a figure of a total of 499 native taxa for eastern PAA and 289 for the Collie PAA, combined 873. No indication is given as to how these were derived, with reference confusingly being made to all Appendices listing flora. • Appendices H and J are flawed as the data has not been 'cleaned'. For example, in Appendix H: 119 taxa are only identified to genus or family; 30 taxa are listed twice as species and subspecies (e.g., *Conostylis aculeata* is listed as well as *Conostylis aculeata* subsp. *aculeata*); and one taxon, *Nemcia* sp. is not current. Also, cases of taxa not listed as subspecies or variety in the area, some of these are conservation significant taxa. For example, *Hovea trisperma* is listed. *Hovea trisperma* has two varieties, var. *trisperma* and var. *grandis*, one or both may occur in the area (these are easily distinguished and are considered to be two species, yet to be distinguished at this level). • Many other species with subspecies, varieties and forms are not listed. This is particularly important when seed is collected for the rehabilitation areas. For example, *Hypocalymma angustifolium* has long been recognised as a variable taxon (with multiple subspecies). The form in the PAA is a multistemmed shrub flowering in September. Observations in August 2022 observed the single stemmed wheatbelt taxon growing on the rehabilitated areas, flowering in August (GJ Keighery pers. comm.). Other taxa with distinct subspecies, varieties and forms used in rehabilitation are: *Kennedia coccinea* and *Calothamnus quadrifidus*. Comment: Luxton (2021) used a dataset of 525 species for analysis after removing 186 after data cleaning.	
2.2.7 Conservation Significant Flora	*Partially supported*	*Data not clean* *Measure to protect the few remaining populations of Caladenia hopperiana are inadequate.* *Failure to address how Caladenia hopperiana may*	*Identify and select all categories of significant flora. Clean data.* *The WMDE should be reduced to avoid disturbing the isolated and large patch of remnant*	• As listed in the EPA factors for conservation significant flora, the ERD was required to 'Provide a quantitative assessment of impact for significant flora, including: – number of individuals and populations in a local and regional context; – numbers and proportions of individuals and populations directly or potentially indirectly impacted; and – numbers/proportions/populations currently protected within the conservation estate (where known).' • The ERD confines its consideration to state listed threatened (T) or priority flora. This is a limited subset of conservation significant flora. Range ends, outliers, distinct forms, etc., should also be addressed. • The identification of all categories of significant flora has been an integral part of Jarrah Forest assessment for 2 decades (Stoneman *et al* 2003; 2011).	EPBCA (2018) *Conservation Advice for Caladenia hopperiana, Quindanning spider orchid*, Threatened Species Scientific Committee, Environment Protection and Biodiversity Conservation Act 1999. Accessed on

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
		be impacted by reduced groundwater levels	*bushland in the south-eastern area of the proposed WMDE where Caladenia hopperiana is known to occur.* *Prior to clearing areas that Caladenia hopperiana is known to occur in, further research should be undertaken to better understand its biology and ecology.* *Protected Areas must be expanded to include all Priority species.*	• The full dataset is not adequate to assess the significant flora. For example, the priority listed form of *Darwinia thymoides* (Appendix E) cannot be linked to the data as this taxon is only listed as *Darwinia thymoides*, and there is a similar issue with *Hibbertia ambita* (T) not being distinguished from *Hibbertia commutata*. There are many other examples of only recognising the species when the taxon is highly variable across its range and distinct forms (often species or subspecies when taxon revised) are not referenced with herbarium material with phrase names. • *Caladenia hopperiana* (T) is recorded within the PAA, and almost all individuals recorded are in the large patch of native vegetation in the southeast section of the PAA. The species has a very restricted geographic range. The extent of occurrence is 18km^2 and, despite the increase in plant numbers, two subpopulations have declined and there has been an ongoing decline in condition of habitat due to salinity, timber extraction, feral pigs and weed invasion and now potential threat from mining. The management actions for *Caladenia hopperiana*, as stated in the species recovery plan (EPBCA 2018) includes ensuring future mining operations do not impact on the species, its habitat and the hydrology of the area. The species is shallow rooted and relies on seasonal rainfall, therefore, indirect impacts from changes in groundwater levels should be minimal. Given most individuals recorded are along creeklines (Fig. 10.13; *Mattiske Consulting Pty Ltd, 2021*), populations sizes are likely to decline under decreasing groundwater levels. • Mattiske Consulting Pty Ltd (2021) state that direct impacts should be managed through protection areas and minimum 50m buffer, however, given *Caladenia hopperiana* (T) is highly restricted geographically and is potentially vulnerable to indirect impacts from mining, a 50m buffer is unlikely to protect it from further decline. Thus, the protection zones outlined in Fig. ES4 of the ERD (p. xx in Executive Summary) are insufficient. This supports the recommendation below for 'habitat linkage', that the PAA, or WMDE, be reduced marginally to avoid disturbing the isolated and large patch of remnant bushland in the south-eastern area of the PAA, where the species is known to occur. • Much of the survey work for *Caladenia hopperiana* is old (prior to the introduction of GPS units) and details of some of the WA Herbarium records are very general in terms of location and number of individuals. • Prior to clearing areas that *Caladenia hopperiana* is known to occur in, further research should be undertaken to better understand its pollination ecology, seed germination requirements, seed viability, and longevity, associated fungal symbionts and fire responses (EPBCA 2018). In the event that the proposed PAA is approved, a thorough species recovery plan should be mandated. The recovery plan should include methods to collection of seed and mycorrhizal fungi for storage and ex situ propagation, and establish new populations on secure tenure with appropriate mycorrhizal fungi through implementation of translocations (EPBCA 2018). • Several Priority species have been recorded within the WMDE and BTC, including *Gastrolobium* sp. *Prostrate Boddington* (H. Hislop 2130) (P1), *Isopogon* sp. *Canning Reservoir* (M.D. Tindale 121 & B.R. Maslin) (P1) *Papistylus intropubens* (P1), *Synaphea panhesya* (P1) and *Banksia subpinnatifida* var. *subpinnatifida* (P2), however, there are no protected areas to avoid disturbance of Priority flora. *Synaphea panhesya* (P1) and *Banksia subpinnatifida* var. *subpinnatifida* (P2) would be cleared in their known entirety within the PAA, which represents less than 12% and 4% respectively of the local extent for these species, and that it is 'likely' they occur in greater numbers regionally (ERD, 200). It is unacceptable to presume that these Priority flora species are 'likely to occur in greater numbers regionally', when there are no such records. Protected areas must be expanded to include areas that Priority and rare flora are known to occur in.	14/07/2022. http://www.environment.gov.au/biodiversity/threatened/species/pubs/88195-conservation-advice-15022018.pdf Mattiske Consulting Pty Ltd (2021) *Assessment of Flora and Vegetation on Worsley Mine Expansion Primary Assessment Area*, Prepared for South32 Worsley Alumina Pty Ltd, Mattiske Consulting Pty Ltd, Kalamunda WA.
2.2.8 Regional significance of flora and vegetation	*Not supported*	*See above*	*Address distribution of VCs as outlined above.* *Assess recorded and possible TECs using all data.* *Address all significant flora as above.*	As outlined above, the ERD fails to adequately address regional significance for both the flora and the vegetation.	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
2.2.9 Protected Areas	*Not supported*	*Inadequate*	*Include all vegetation and flora data analysed as in amended data in the determination of these.* *No 're-clearing' of protected areas* *High-quality forests must be protected through avoidance*	• Figure ES4 of the ERD show protected areas. These are associated with several issues, including the following: – Too small (would suffer edge effects) and fragmented (need to link). – Not representative of the common and uncommon vegetation and flora in the area of the PAA. – Large perimeter to area ratio exposing the whole area to water drawdown, weed invasion, wind desiccation, etc. – Failure to identify the distribution of flora, all significant flora and floristic units in adjacent NJF. – Lack of protection from clearing and disturbance for medium to high potential old growth forest, totalling 3713.1ha (ERD table 5-10). • South32 state (ERD, p96 and p115) that it will designate some rehabilitation areas as protected and not re-clear these, but there is no indication of which areas are protected from re-clearing (i.e., how much is rehabilitation). All 'Protected' areas must be protected from further clearing, in perpetuity. • Given the high conservation value and ecological importance of the NJF, high-quality Jarrah, Marri and Wandoo forests that occur within the PAA should be given the same protection as Old Growth Forest areas (i.e., avoid disturbance to very high-quality Jarrah, Marri and Wandoo forests). • It's difficult to ascertain the actual sizes of each protection area identified. • Protected areas that are small and fragmented will have reduced viability and functionality, and suitability as fauna habitat, particularly if mining operations (mechanical clearing, burning, blasting, other machine operation) occurs at the boundaries of the remnants. Protection areas should be just that – not just protected from actual mining but protected in their design, size and location to ensure they are ecologically functional.	
2.2.10 Vegetation Rehabilitation	*Not supported*	*Rehabilitated lands are not equivalent the original native forest*	*Establish and describe reference sites for all floristic groupings. Taxa in these plots should be matched with a Herbarium record. Ensure that the local variant of all taxa are used in rehabilitation* *Given the rehabilitation deficit and failure to recreate vegetation structure, rehabilitation is not an acceptable mitigation strategy.*	• To our knowledge rehabilitated land has yet to be effectively established as a replacement of the original native vegetation both structurally and floristically. • Prescriptions established to measure the success of vegetation rehabilitation is flawed as they have under-estimated the floristic and vegetation diversity of the NJF, thereby lowering baseline targets for rehabilitation. There should also be regular publicly released assessments of vegetation rehabilitation success, against criteria, in all mining areas across the state and these must have a public comment period. • Resources are not sufficient for appropriately qualified experts and support staff to adequately address rehabilitation and in many cases assessment of vegetation clearing, therefore leading to mediocre rehabilitation outcomes (see point above lack of diversity in the understorey) and under-reporting of vegetation types and plant diversity in remnant forests. A large amount of expertise is held by broader community, but the Proponent has made no attempt to engage with the community or qualified experts to improve restoration or inform baseline targets with up-to-date information on vegetation and plant diversity in the NJF. • This is well illustrated by an area of Jarrah Forest mined for mineral sands at Yarloop. Rehabilitation of the mined area failed even though it has 'been signed off' by DBCA. When the recent hot fire decimated Yarloop the 'rehabilitated land' had such sparse cover that it did not burn. Similarly, there has been no assessment or research undertaken by the Proponent to understand how rehabilitated lands differ from remnant vegetation in terms of fire resilience and flammability. • The WAFA report "A Thousand Cuts" details further consideration of rehabilitated land and original native vegetation. • Rehabilitated areas remain vastly altered, with much lower plant density and species richness than surrounding mature forests (ERD, 245-246). Furthermore, there is a current 45% rehabilitation deficit (ERD p103) and South32 propose to reduce this to under 35% by 2033. South32 has only 'completed a total of 3,200 ha (as at 2019) of rehabilitation since operations commenced in the 1980s (54% of the total mined area; ERD, p226). This rehabilitation shortfall is unacceptable and there has been no attempt to address the cumulative impact of this shortfall, particularly for the 10 years after clearing. Given the failure to restore both vegetation structure and plant diversity, rehabilitation cannot be considered an acceptable mitigation strategy.	
2.2.11 Weeds	*Partially supported*	*Weeds not adequately addressed*	*See above*	• A number of significant weeds in rehabilitated and disturbed vegetation in the NJF are not discussed. These include *Leptospermum laevigatum*, *Acacia trigonophylla*, many eastern tree Acacia species and *Calothamnus quadrifidus*. The underlined taxa have been used for revegetation in the NJF but the Acacia only grows in limited locations near granite rocks and the Calothamnus has many forms and the form widely planted is not the local one in the NJF. The planted forms of these two species are now widespread weeds. • All plantings of non-local flora have the potential to become invasive weeds.	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
2.2.12 Habitat Linkages	*Not supported*	*Measures to address loss of habitat linkages are currently inadequate*	*Habitat linkages should be maintained or re-created through protection, avoidance or restoration activities.* *No clearing of habitat linkages.* *Maintain and protect habitat linkages around mining activities.* *Protect and avoid disturbance to the patch of remnant bushland in the SE area of the PAA.* *Identify the up to 10% ecological linkage area planned for disturbance so it can be adequately assessed.*	• The PAA intersects with at least 4 important linkages outlined in the SWREL report (Molloy *et al.* 2009). These linkages are the main habitat linkage between the NJF and eastern reaches of the Peel-Harvey Catchment. Should these main linkages be disrupted through direct or indirect impacts from clearing activities, only two in-tact linkages remain, connecting the NJF to eastern areas of the Peel-Harvey Catchment (one approximately 8 km northeast of the WMDE and one in the very southern area of the Catchment). • Although habitat linkages are earmarked for protection, most fauna would avoid these habitat linkages when mining commences due to increased noise, vehicle activity and human presence around the exposed and isolated linkages. Considering the loss of all main habitat linkages from eastern regions of the Catchment to the NJF, additional linkages should be maintained or re-created through protection, avoidance or restoration activities. Should mining occur within the proposed PAA, several patches of remnant vegetation immediately east of the proposed mining envelope will provide a critical link to the NJF whilst avoiding the mine area (see **Appendices Section 1.13** for illustration of this). • It is recommended that mining activities avoid disturbing the isolated and large patch of remnant bushland in the south-eastern area of the proposed WMDE. This is the largest (approx. 2,562 ha) patch of remnant vegetation adjacent to the mine and provides an important habitat link around mining activities. The proposed PAA will impact more than half, or approximately 1,457 ha, of this important patch of remnant bushland. The loss of key ecological corridors and habitat linkages will have greater impacts for ground dwelling species (see Fauna section for further information). • It is proposed to not clear and mine more than 10% of these ecological linkages. The Proponent does not identify where the 10% of this area would be impacted and it is possible without this information that an important linkage may be severed or rendered non-functional. These are priority areas critical for the time period during mine operation and beyond for protection and movement of species, so should be protected in their entirety from mine operations.	Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. (2009) *South West Regional Ecological Linkages Technical Report*, Western Australian Local Government Association and Department of Environment and Conservation, Perth. Mattiske Consulting Pty Ltd (2021) *Assessment of Flora and Vegetation on Worsley Mine Expansion Primary Assessment Area*, Prepared for South32 Worsley Alumina Pty Ltd, Mattiske Consulting Pty Ltd, Kalamunda WA.
2.2.13 Water	*Not supported*	*Insufficient information to determine*	*Demonstrate how Proponent will mitigate the impacts of altered groundwater levels on conservation significant species and communities.*	• Water availability will decrease significantly on the basis of – a) significantly greater mine water required as an increase of 400 megalitres per annum (MLpa) of water is required for continuation of all mining activities, totalling 900 MLpa for mining operations – reduction in groundwater and streamflows, b) climate change – rainfall reduction rainfall in Southwest WA has declined by about 20% since the 1970s, warming temperatures, changing of isoheyts marginal areas already, and c) rehabilitation vegetation. • The proposal does not demonstrate how the Proponent will arrest or improve groundwater and/or streamflow to conservation significant flora, communities and ecosystems, despite increased water use in mine operations and within rehabilitation areas.	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
2.2.14 Disease	*Not supported*	*Evidence that current hygiene practices prevent* P. cinnamomi *from spreading into uninfested forest not provided.*	*Provide detailed procedures for soil and hygiene management. Provide evidence that water diversion strategies are legitimate, particularly during heavy rainfall events.*	Evidence that current hygiene practices are successful in preventing *P. cinnamomi* from spreading into uninfested forest are not provided. Refer to Closure section for further details explaining why PHCC do not support the Proponents dieback management plan. This includes the absence of hazard dispersal mapping (or agent-based modelling of the movement of soil-borne pathogens such as *Phytophthora spp*.) and data gaps regarding the susceptibility analysis of uninfested landscapes.	
2.2.15 Cumulative impacts	*Not supported*	*Forest resilience to climate change and hydrological impacts of on-going clearing not considered.*	*Provide an assessment and review of the NJFs threatened future under climate change and persistent clearing, considering hydrological impacts.* *Detailed surveys are required over the MS719 8,400 ha area to enable assessment of cumulative impacts.*	• It is difficult to assess the cumulative impacts, without assessing the NJFs threatened future under climate change. Such assessments have not been undertaken. The proposal documents do not consider how cumulative clearing impacts the forests resilience to climate change (i.e., have not addressed the impacts of cumulative bauxite mining outlined in Appendix 4). Similarly, they have ignored key studies that suggest the Jarrah Forest is drought-susceptible and at risk of climate collapse. The Precautionary Principle should apply. • The hydrological impacts of persistent clearing have been ignored and should be provided prior to approval. Similarly, there should be thorough assessments undertaken of the hydrological impacts of clearing for species in protected areas. Appendix 4 shows the cumulative bauxite mining map for the Jarrah Forest, and there has been no attempt to address the impacts of the cumulative clearing. Refer to Section 5 Inland Waters for further detail. • Refer to page 704 of the ERD, volume 2: The Proponent has used cumulative impacts to inform an updated baseline of the current state of the environmental, thus, are not factoring in the impacts of their rehabilitation deficit, or inability to reinstate vegetation diversity and structure. Baseline should not be 'shifting' and must reflect the floristic/vegetation characteristics of the NJF prior to disturbances. • Baseline data is flawed, with not enough long-term monitoring plots in the NJF to accurately assess baseline conditions. • Base data (i.e., data from each sample point–grid recording sites, plots or quadrats) is not provided (see above) and the data provided is not adequate to support the mapped vegetation complexes and the site vegetation types. Without the data it is impossible to assess the relevance or accuracy of their baseline data. • The statement that 'there are no significant cumulative impacts for site vegetation types' (ERD Vol. 2, p704) is dismissive and highly unlikely, particularly considering the lack of suitable point data for floristic analysis and under-reporting of site vegetation types (see comments above). • Detailed surveys have not yet occurred for the 8,400 ha area subject to conditional approval under the Proponent's MS 719, therefore cumulative impacts are unable to be adequately assessed.	
2.2.16 Climate change	*Not supported*	*Failure to address the impacts of clearing in the context of climate change.*	*Identify the risk to conservation values in the context of climate change.*	• A key finding of the Review of Silviculture in Forests of South-west Western Australia (Burrows et al. 2011) is that "declining rainfall has significantly impacted water availability in the FMP area and predicted future climate change is likely to lead to further impacts. Further declines in streamflow and impacts on aquatic environments are likely. The impact of climate change needs to be closely, monitored with adaptive management strategies." • Large scale bauxite mining reduces ecosystem health with few/limited strategies able to mitigate reductions in water availability that would allow for ecosystem health and function, and biodiversity maintenance, let alone enhancement. • Changes to groundwater and flow days may result in gradual changes to the health and distribution of ecosystems. More immediate, but localised effects may occur as a result of extreme weather events such as storms and heatwaves, with higher maximum temperatures, more hot days and more intense precipitation events considered very likely as a result of climate change (Arthrington *et al.* 2003). Mitigating the effects of reduced rainfall and higher temperatures on the forest and associated communities will require adaptive action to help to align density and structure of the forest with current and future climate. Targeted	Review of Silviculture in Forests of South-west Western Australia (Burrows et al. 2011)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
				action may protect susceptible ecosystems, retain water availability in some parts of the forest, improve the health of forest and associated ecosystems, reduce susceptibility to high intensity fire and allow for the persistence of ground and surface water dependent ecosystems. • There is a lack of strategies in place to identify and address the risk to ecological values or communities where the effects of climate change will escalate the threat from large scale clearing and increased water use - p54. • Action needs to be undertaken to prioritise ecological values or communities in relation to the potential risk associated with the likelihood and degree to which soil moisture, ground and surface water availability will decline in the areas in which the value or community occurs. • Potential impact on other values of conducting silvicultural treatment to arrest soil moisture, ground and stream water decline.	
2.2.17 Wandoo Forest	*Not supported* *mitigated by strategies to ensure structural complexity is maintained* *The scale of the disturbance is not appropriate to support biodiversity and its recovery. Increased water use in rehabilitation area versus intact vegetation has the potential to adversely impact on protected area vegetation and ecosystem health (potential risk of drought related deaths, and reduce vulnerability to pest insect and disease attack), in*	*Mining of wandoo forest is the highest disturbance activity, converting the existing mature stands to the establishment development stage, with very little structural complexity and no legacy elements with disturbance unable to*	*Avoid clearing of Wandoo Forest*	DPAW Silviculture Guide for Wandoo Woodlands provides guidance on the application of silvicultural practices in those parts of the wandoo forest that are subject to timber harvesting (DPAW 2004). Guidelines are generally not prescriptive, but provide the intent and guidance for forest managers. The guide provides the following comments/advice specific to Wandoo Forest: • "Wandoo most frequently occurs as uneven aged forest in open woodlands characterised by clumps of regrowth, groups of mature trees and large gaps. The lack of secondary storey and the low scrub understorey enhance its open nature. The wandoo forest is valuable for many purposes (recreation, catchment protection, timber production, Forest Management Plan Silvicultural Reference Material for Wandoo Forest Silviculture Guideline for Wandoo Forest Associated guidance documents e.g. Soil and Water Guidelines Silviculture Manual for Wandoo Forest Silviculture Procedures for Wandoo Forest Last updated: 23 June 2014 Effective from: 1 January 2014 Custodian: Manager, Ecosystem Health Branch Approved by: Director, Forest and Ecosystem Management Page 7 of 53 conservation of flora and fauna and honey production) and State forest management practices must support all values". • The clumped distribution of wandoo trees reflects their dependence upon ashbed for regeneration and possibly the limited site capacity. The importance of linking several steps (seed, ashbed, burning and long-term protection) to achieve regeneration after timber harvesting is demonstrated by the scarcity of regrowth in some cutover stands, and the successful restocking of areas where correct procedures are followed P7. • "Towards the end of the FMP (2004-2013) a review of current silvicultural practice was undertaken (Burrows et al. 2011) and a series of recommendations were made for changes. The primary recommendation was to implement forest management to achieve a better water balance in a drying climate. Concern was raised over the impacts of human induced climate change, particularly decreased water availability and its effect on forest health and the health of associated ecosystems, especially aquatic ecosystems. This has been addressed within the current guidelines in Guiding principle 10 – Promote ecosystem health and vitality through silvicultural management. The purpose of Guiding principle 10 is to apply silvicultural management to protect threatened ecological values potentially at risk because of human induced climate change. The review recommended the practice of mechanical scarification and scalping be minimised and care taken to preserve the diversity of understorey" i.e., silvicultural practices were adjusted over concern of impacts of climate change on water availability and effects on forest health. • Summary of guiding principles for silviculture in wandoo forest - "Guiding principles for socio-economic benefits - 24. Minimise the disturbance associated with the extraction of basic raw materials" p9. • "Disturbance supports biodiversity so long as the scale and intensity of disturbance are appropriate" p10. • "The wandoo forest generally occurs as a multi-aged forest with stands of different regeneration age occurring throughout. Even-aged stands are generally relatively small. Providing a mix of structural types across the landscape can encourage a wide variety of habitats and plant and animal communities". • Natural disturbances leading to changes in stand structures include stand replacing bushfire, storm damage, frost, drought, insect attack, and tree deaths in senescent stands. Adaptations to these natural disturbances enable the forest to respond and recover. However, "The highest intensity disturbance in the forest is mining, converting the existing mature stands to the establishment development stage, with very little structural complexity and no legacy elements. There is potential for the impact of mining on the wandoo forest to increase significantly as the mining for bauxite and other minerals (including gold) moves further eastward". Timber harvesting for regeneration establishment also impacts on forest structure where the mature forest structure is	https://www.dpaw.wa.gov.au/images/documents/conservation-management/forests/FMP/preparing_FMP_2014-23/silvic_guideline_2_2004_wandoo.pdf

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s and Plates
		a drying climate under climate change and with increased mine water usage		converted to establishment forest. However, the impact of disturbance from timber harvesting is mitigated by the application of a number of strategies to ensure structural complexity is maintained. • The intensity and size of disturbances and their separation in space and time are an important consideration in managing biodiversity at a landscape scale. • Additional strategies for forest subject to mining: During harvest planning avoid greater than 40 per cent of the landscape scale area being in the establishment to immature developmental stages at any one time. During harvest planning, schedule thinning of the non-mined forest to coincide with periods of high water use in the mine rehabilitation. • A risk to connectivity in the multiple use forest area is open cut mining, which has long lasting effects on the structure and function of the soil profile and forest. • Climate change has the potential to impact on forest health. Competition for water may lead to drought related deaths of trees and other vegetation, particularly on upper slopes, shallower soils and others with low water holding capacity. The predicted increased incidence of extreme weather events may also lead to an increase in tree deaths from bushfire, storm and frost. Disease and insect attack may also have detrimental impacts on forest health. Water stress may predispose trees to insect attack and compromise their ability to recover from damage. • Wandoo crown decline is a syndrome affecting wandoo and occasionally other eucalypts. Its exact cause is unknown but may be related to changed hydrological conditions (decline in water availability), changed fire regimes or the activities of wood boring insects and fungal pathogens p18. • Large scale clearing and bauxite mining will seriously impede and impact nutrient cycling in wandoo forest. “The soils of the wandoo forest are generally infertile, and growth of the forest is often nutrient limited. Nutrient cycling within the forest conserves and recycles nutrients and prevents their loss from the system. Nutrient release from the breakdown of leaf litter occurs at a slow rate” One of the silvicultural strategies to prevent this is “49. Avoid excessive removal of leaf and fine branch material from forest harvesting operations.”	

3. TERRESTRIAL FAUNA

EPA Objective: To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	
Relevant activities: The mine expansion involves an increase of the mine and infrastructure footprints, and clearing of up to 5,841 ha of fauna habitat.	
Potential impacts and risks	• Further loss and fragmentation of habitat from vegetation clearing and disturbance of riparian areas. • Death, injury and displacement from construction and mining operations, and vehicle strikes. • Secondary impact from dust, noise and vibration during construction and mining operations. ADDITIONAL RISKS AND IMPACTS IDENTIFIED BY PHCC: • Decline in breeding success of threatened species from removal of breeding habitat, causing a reduction in population and pushing threatened species closer to the brink of extinction • Mine rehabilitation providing poorer quality habitat for terrestrial fauna and unreliability and uncertainty in attempting to re-establish habitat in a drying climate • Cumulative impacts of historical activities in the jarrah forest and woodland area from clearing, timber harvesting, intense fire, forest disease, tracks and roads and 35 years of South32 mine operation, over a large scale • Indirect impacts from water quality and quantity, increased predation risk, including reduced soil moisture • Increased competition, predation, stress and exceedance of carrying capacity of protection areas

3.1 EPA REQUIRED WORK

Required work		Have these been adequately addressed	PHCC comment/s
1	Conduct a desktop study, including a literature review, in accordance with EPA guidance. The desktop study should identify knowledge gaps and identify fauna, including aquatic fauna and short-range endemic (SRE) invertebrate fauna, recorded in the Primary Assessment Area (WMDE, BTC and CBME), in the context of the fauna habitat and approved areas (MS 719).	Yes	
2	Based on the outcomes of the desktop study, identify areas in the Primary Assessment Area where fauna surveys have not been previously undertaken, or surveys are not recent and/or do not meet the requirements of EPA guidance, and undertake the appropriate surveys in these areas in accordance with EPA guidance. The consolidated data from historical and new surveys should be sufficient to place the impacts of the proposal into local and regional contexts.	Partial	No appropriate targeted recent or historical surveys that meet EPA guidance for Numbats have been undertaken within the PAA or in proximity to the PAA. Without providing historical and new survey data on Numbats, assessment of impacts of the proposal with local and regional context has not been sufficiently undertaken. Limited discussion of broader species data trends and trajectories has been included to place the impacts of the proposal into regional, state and where appropriate national context.
3	Undertake a fauna habitat assessment to identify the types and quality of fauna habitats and map the extent.	Partial	It is unclear whether the area of habitat identified for conservation of significant fauna, used to evaluate against area proposed to be cleared, excludes mining areas disturbed under previous or current approvals.
4	Undertake targeted surveys for conservation significant fauna species, including but not limited to those listed below, in accordance with EPA and Commonwealth guidance (EPBC Act): i. Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*); ii. Baudin's black cockatoo (*Calyptorhynchus baudinii*); iii. Carnaby's black cockatoo (*Calyptorhynchus latirostris*);	Partial	Appropriate targeted surveys have not been undertaken for Numbat, Rakali, Red-tailed phascogale and Carter's freshwater mussel. See below and PHCC Comments on Inland Waters Section 5 Required Work Item 2 "Surveys for Carter's mussel (Stantec 2021) for the Freshwater Lake does seem sufficient for that system, however no surveys were conducted within the mining assessment area and mussels are assumed not to occur on the basis of a desktop study (GHD 2019). However, the potential for mussels to occur in smaller tributaries (particularly in forested areas) cannot be ruled out, at a minimum a field survey to screen waterways and tributaries for mussels needs to be conducted".

	iv. Peregrine falcon (*Falco peregrinus*); v. Woylie (*Bettongia penicillata ogilbyi*); vi. Chuditch (*Dasyurus geoffroii*); vii. Red-tailed phascogale (*Phascogale calura*); viii. Western ringtail possum (*Pseudocheirus occidentalis*); ix. Quokka (*Setonix brachyurus*); x. Carter's freshwater mussel (*Westralunio carteri*).		
5	Provide figures and maps illustrating the locations of all relevant survey sites, including those identified in the desktop study, in relation to the proposal areas and fauna habitats.	Partial	No figures, only description of habitat types, have been provided for the Numbat habitat in relation to the proposal area.
6	Based on the outcomes of the desktop study and field surveys, list and evaluate the likelihood of occurrence of all other significant vertebrates and SRE invertebrates potentially occurring in the Primary Assessment Area and conduct additional targeted surveys for significant species, as appropriate. Map the known locations of significant species, with reference to their occurrence in the Primary Assessment Area and in relation to the fauna habitat.	Partial	South32 have listed and evaluated the likelihood of occurrence for all other conservation significant vertebrates, however the evaluation of the likelihood of Numbat occurrence contains significant flaws and no additional targeted surveys have been conducted (see detail below).
7	Justify that the desktop study, field surveys and habitat assessment have addressed all baseline knowledge gaps; are representative of the current conditions in the Primary Assessment Area; provide current information on populations and locations of significant fauna; and have been carried out using methods consistent with EPA guidance.	No	Field surveys have failed to address all baseline knowledge gaps for the Numbat, through lack of appropriate survey effort and method (see previous comment and detail below). Desktop study, field survey and habitat assessment have failed to address all baseline knowledge gaps for SRE taxa, in terms of taxonomy, survey limitations, lack of broader context, lack of understanding of cumulative impacts, limited spatial assessment and data surrogates used (see detail below). Field surveys and habitat assessments have not been undertaken for Rakali and Carters freshwater mussel (in the mining assessment areas), as the proponent has failed to provide current information on populations and locations of these significant fauna.
8	Quantify, map and discuss the cumulative impacts of past, current and approved exploration and mining activities in all approved areas (MS 719), with respect to significant habitats, significant fauna, and fauna that are known or likely to occupy restricted habitats (including SRE), based on data from relevant, contemporary local and regional surveys.	Partial	South32 discuss cumulative impacts in various sections of the ERD and the Cumulative Environmental Impact Assessment (ERD Vol2, 703) for several conservation significant fauna. While the ERD acknowledges the cumulative impacts from other mining activities, logging and clearing for agriculture, it only quantifies the total hectares of habitat loss for MNES associated with the Boddington Gold Mine and the Worsley Revised Proposal (ERD, 376-377). It is a significant shortcoming in the scope of CIA that consideration of other impacting activities to sensitive receivers and conservation significant fauna, principally timber harvesting and clearing for agriculture post commencement of mining, are not included as considerations either within the Revised Proposal (PAA) or in reasonable spatial context of the north eastern Jarrah Forest. The Proponent fails to quantify, map or asses these other impacts from South32's previous mining and current approvals, including approval to clear another 942 ha within the existing Primary Bauxite Area (PBA) and a further 8,400 ha within the Extended Mining Area. The Proponent fails to provide details including mapping of the location of the additional conditional 8,400ha approval area (MS719), showing a lack of transparency and failure to fulfil this required work. Furthermore, no CIA is undertaken for previous, current and approved mining in the Northern Jarrah Forest in proximity to the PAA and where mining is reasonably forecast. The latter includes Alcoa's recent publicly announced proposal to clear over 11,000 ha in the Northern Jarrah Forest. This is a significant gap given the extent of South32's previous bauxite mining area in their current approvals and further losses from Alcoa. This clearing and other impacts, including logging and agriculture, are not quantified at all.

			Given the Proponent has been operating in the area of the PAA for 35 years and have collected baseline and monitoring data throughout, the argument should be made that sufficient data is available to justify that the CIA should be evaluated against the immediate pre-mining baseline. It is highly problematic that no other cumulative impacts, including climate change impacts such as reduced rainfall, increased temperatures and reduced streamflow, roads and other developments, changes in groundwater including from South32's increased water abstraction, other landuses, broad scale fragmentation and introduced fauna and flora are discussed. Furthermore, it is unclear whether the area figures of habitat identified for conservation significant fauna used to evaluate against area proposed to be cleared excludes mining areas disturbed under previous or current approvals. For example, the Proponent proposes to clear 2,631 ha of the 4,385 ha of Woylie habitat identified in the PAA, however, it is unclear where the 4,385 ha of habitat has been, or is, excluded from current mining approvals. Without this information, the direct impacts of current proposal and the cumulative impacts have not been adequately discussed and further comment cannot be provided. No comments are provided on impacts from Alcoa and Boddington Gold Mine on the broader linkages and corridors to the west, north and southeast outside of the PAA.
9	Describe and assess the direct and indirect impacts of implementation of the proposal to fauna, significant fauna including SREs and matters of national environmental significance (MNES) (include an assessment of all MNES within a 5 km radius surrounding the proposal area), and fauna habitats. Provide figures illustrating the likely extent of loss of habitat types and the extent of habitat areas predicted to recover from both direct and indirect impacts. Quantify the extent of direct, indirect and cumulative impacts, including percentages of habitat types to be disturbed or otherwise impacted.	Partial	The extent of direct and indirect cumulative impacts has not been quantified for the majority of MNES, SREs and other significant fauna and is largely ignored. Across all species, the impacts of climate change, other large-scale mining and clearing and secondary impacts are largely ignored. No description or assessment of the direct and indirect impacts of the proposal for the Numbat is provided, including the likely extent and loss of habitat types impacted. Cumulative impacts to SREs are ignored.
10	Determine the likelihoods of the fauna habitats to supporting SRE invertebrate species. Provide figures identifying the locations of known, likely and potential SRE species in relation to the fauna habitat and predicted areas of impact clearly showing impacts to SREs.	Partial	While figures on the likelihoods of the fauna habitats supporting SRE invertebrates have been provided, there are major errors and contradictions in the assessment of the habitat value and therefore assessment of impact.
11	Demonstrate that the proposal has been designed to avoid and minimise impacts to fauna and significant fauna habitat, including the placement of any access roads and infrastructure, within fauna habitat areas and that placement has had regard to utilising existing areas of disturbance.	No	The Proponent has failed to adequately demonstrate all reasonable and acceptable effort to avoid and minimise impacts to significant fauna and habitats, for reasons outlined below: • Despite almost half of the area of the PAA comprising land historically cleared for agriculture, plantations or mining (12,708ha or 44%) and other areas of degraded vegetation, The Proponent has not considered or attempted preferential clearing and to mining of existing cleared or degraded lands. The Proponent is instead proposing the majority of disturbance associated with native vegetation and fauna habitat, resulting in the direct loss of 4,399 ha of native vegetation, comprising of 12 vegetation complexes, much of which is in very good or better condition, high fauna value and potential old growth forest. The majority of vegetation that would be directly lost is considered to be “excellent” or very good quality Jarrah, Marri and Wandoo forest and woodlands (ERD, 193 -194). Furthermore, over a quarter of the PAA is considered to have high to medium potential of being old growth, being relatively undisturbed (ERD, 193). The impact to intact native vegetation is proposed in addition to the previous and current approvals (942 ha within the existing Primary Bauxite Area (PBA) and a further 8,400 ha within the Extended Mining Area). With the current proposal, clearing and disturbance to native vegetation in the PAA totals 11,902 ha or an unacceptably high 88.1% and fragmentation of a significantly larger area, in a landscape that already comprises of predominantly cleared lands.

			• The massive extent of significant residual impacts for MNES fauna, particularly Woylies and black cockatoos, after the Proponents application of the mitigation hierarchy is indicative of a failure to undertake all reasonable effort to avoid impacts. • Avoidance through identification and retention of Protection Areas is tenuous as the majority of protection areas are small scale, isolated and poorly designed (see detail below). • Avoidance and minimisation through Ecological Linkages is suboptimal due to limited linkages being identified, spatial bias, unacceptable levels of clearing proposed within these and linkages being subject to heavy vehicle movement and associated disturbance (see detail below). • The Proponent states where practicable they will preferentially avoid clearing high value habitat. However, this practicality for operation consistently outweighs retention of significant fauna habitats. For example, the Proponent does not suggest re-designing access roads and infrastructure within high conservation value Wandoo vegetation complex in the north of the PAA, resulting in clearing of 942 ha proposed for infrastructure with no rehabilitation of these areas proposed until at least the long term. • Proposed pre-clearance surveys for Threatened Fauna, designed to minimise and mitigate impacts, will be largely ineffective and have major inadequacies (see detail provided below).
12	Describe the proposed management, monitoring and mitigation methods to be implemented to address direct and indirect impact on fauna, including actions to prevent fauna death, injury and displacement as a result of the proposal.	No	The methods proposed to manage, monitor and mitigate impacts to fauna are either not discussed, are inappropriate or are vastly inadequate. More detail is provided for each species, however, in summary of concern is: • No translocation is planned or considered for any fauna species in preclearance surveys. Instead, there is reliance on ineffective destructive searches to prevent fauna death and injury, which are associated with high risk of injury and mortality (even if habitat features can be identified and timed outside of breeding periods). • No monitoring of direct and indirect impacts of active clearing is proposed, and no consideration of SMART objectives. • No quantification of fauna death, injury and displacement is provided for any previous clearing activities. • Significant impacts are proposed to SREs and habitats, however, no translocation is considered viable, and this group of taxa are highly unlikely to disperse in distance and rate with directional clearing. • No monitoring is included for displaced fauna and fauna occupation in remnant vegetation where animals are encouraged to disperse into.
13	Demonstrate that the proposed management, monitoring and mitigation methods to be implemented address the mitigation hierarchy, and ensure residual impacts (direct and indirect) are not greater than predicted.	No	The Proponent has attempted to demonstrate that the management, monitoring and mitigation methods address the mitigation hierarchy, but have failed to adequately address this against minimum EPA and offset standards. The Proponent claims to have applied the mitigation hierarchy to avoid impacts to conservation significant fauna as a first principle. However, they state this is applied only “where practical”. To avoid significant residual impacts, the Proponent needs to demonstrate that “all reasonable” and “exhaustive” efforts are undertaken (EPA, 2011). The Proponents own wording of “where practical” and the extent of significant residual is reflective of failure to adequately demonstrate implementation of the mitigation hierarchy required by the EPA. The Proponent uses the reduced clearing of native vegetation from an original area of 7,119.5 ha to 4,399 ha as commitment to avoidance, however, this should not be considered as an avoidance measure within the Revised Proposal, which proposes a significant area of clearing. Detail is provided below as to why the avoidance measures (defined as where practical) including through protection areas within BFMP and preclearance surveys fail to adequately avoid and mitigate impacts to conservation significant fauna. There is no dedicated fauna monitoring plan provided for areas outside of rehabilitation including linkages, protected areas and areas outside of the PAA for context. Monitoring methods and effort for terrestrial fauna, key habitats and threatening processes, including protection areas are vastly inadequate and do not allow confidence of the evaluation of direct and indirect residual impacts to conservation significant fauna.

14	Determine and quantify any significant residual impacts by considering the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014) and include reference to the Commonwealth Assessment Guide for any MNES.	Yes	
15	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the *WA Environmental Offsets Policy and Guidelines*. Spatial data defining the area of significant residual impacts should also be provided.	No	No offsets are appropriate due to the proposal being environmentally unacceptable. The offsets package proposed for Woylie and potentially Black cockatoos are inconsistent with the Offsets Policy and do not meet South32s Offset Plan objective.
16	Demonstrate and document in the ERD how the EPA's objective for these factors can be met.	No	The proposal would have profound impacts on fauna and it cannot meet the EPA objective for this factor. Detailed rationale for this is outlined in the following and under each species comments. The vast majority of the native vegetation the Proponent proposes to clear has been assessed as being excellent or very high quality (ERD, 193 -194) and is important habitat for wildlife, including a high number of 'conservation significant' species (ERD, 302 - 303). There are seventeen conservation significant fauna species recorded in the Primary Assessment Area (PAA) and the Proponent acknowledges that after avoidance and mitigation measures there will be 'significant residual impacts' on eight of these species that it proposes to address through offsets (ERD, 419 - 421). Another species, the Brush-tailed phascogale, also faces a serious threat, with the potential for the proposal to 'impact the species at both an individual and population level' (ERD, 347), however the Proponent does not propose off-sets for this species (ERD, 422). The Proponent ignores the likely impact on Numbats altogether, despite the being recently recorded sighting of Numbats in and near the PAA and the PAA comprising 11,858 ha of suitable habitat. PHCC has identified additional potential impacts not included in the ERD (p336). Although not included in the list of likely impacts, the proposal is likely to cause a decline in breeding success of threatened species through the removal of breeding habitat, causing a reduction in population and pushing threatened species closer to extinction, and increased competition, predation, stress and exceedance of carrying capacity of protection commitment areas. For many of the threatened fauna in the PAA, habitat loss and fragmentation are a major contributor to their decline. Recovery Plans for each species refer to habitat loss as being a major driver of decline and for several species, mining is specifically identified as a key threat. There is no robust evidence that more habitat can be lost without significant adverse impacts on these threatened species. The extent of significant residual impacts for multiple MNES fauna after the mitigation hierarchy is applied is indicative of the Proponent not demonstrating all reasonable and exhaustive effort to avoid impacts to conservation significant terrestrial fauna. The proponent fails to make all reasonable efforts to avoid impacts on fauna species (e.g., Protected Areas), and the remaining impacts have not been adequately mitigated. As a result, the ERD relies heavily on offsets for conservation significant species, which are known to be problematic and should only be a last resort option. There is reliance on unproven biodiversity offsets to address the significant environmental impacts on 8 conservation significant fauna, half of them listed as endangered or critically endangered.

The Proponents mitigation proposals, including rehabilitation, insufficient ecological linkages, nest boxes and a remote enclosure for Woylies (nearly 100 km away from the impact site), are wholly insufficient and cannot adequately protect the impacted fauna. The proposed clearing would occur within a broader landscape that has been subject to extensive fragmentation as a result of cumulative logging and clearing for existing mining operations, agriculture and plantations.

Further clearing and fragmentation of the landscape would further degrade habitat and result in an increase in predation as fauna move between fragments. The loss of habitat and increase in fragmentation that would occur if this proposal were granted is expected to result in localised impacts to individuals and populations and, for a number of the species, there is potential for these impacts to be at a regional and even population level.

The Proposal is likely to cause, or in the very least contribute to, serious and irreversible impacts to species and ecosystems, due to:

- Extent of cumulative impacts in relation to the direct loss and fragmentation of habitat for fauna have been under-estimated, dismissed or largely ignored in the Cumulative Impact Assessment, but are significant, particularly in the context of climate change and the proposal contributing to loss of carbon storage and carbon emissions.
- The proposal contributing to and exacerbating key threatening processes in species Recovery Plans.
- Broader context of key findings of the State of the Environment Report, IPCC report on ecosystem collapse, Death by Thousand Cuts report.
- Sensitive features and high conservation value habitat have only been avoided where practical to the Proponents proposed function, not based on minimum requirements to adequately conserve species and their habitats and ecosystem function and resilience.
- The proposal fails to adequately address if it can meet the Principle of the Conservation of Biological Diversity and Ecological Integrity for terrestrial fauna.
- The Proponents attests that their proposal aligns with the Principle of Intergenerational Equity that dictates that the present generation should ensure that the health, diversity and productivity of the environment is maintained and enhances for the benefit of future generations. This principle is based on business planning, impact assessment and offsetting of significant residual impacts. The business planning processes which the Proponent states “protect ecosystems and minimise biodiversity impacts” through activities such as “conservation of high biodiversity value areas, preclearance and progressive rehabilitation” (ERD, p87). However, throughout comments on terrestrial fauna, the proposal is shown to fail to meet industry standard let alone best practice and achieve these outcomes, for example in pre-clearance surveys. More detail is provided for each of these areas.
- The proposal fails to demonstrate alignment with objectives of the Forest Management Plan 2014–2023 (DBCA) relating to conservation of biodiversity and recovery of fauna from disturbance from The Proponents mining activities within State Forest.

On these grounds, the proposal is environmentally unacceptable and should be rejected.

3.2 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
3.2.1 Cumulative Impacts	*Not supported* *The Proposal is released at a time when key findings of the recent State of the Environment Report (2021) confirm that **many of Australia's threatened species are suffering declines from "cumulative and compounding pressures"***	*Cumulative impacts of historical land uses, Proponents current approvals and broader environmental stressors on terrestrial fauna have been vastly underestimated* *With the current proposal, clearing and disturbance to native vegetation in the PAA totals 11,902ha or an unacceptably high 88.1% and fragmentation of a significantly larger area, in a landscape that already comprises predominantly cleared lands (12,708ha of 44% of historical clearing).*	*Cumulative impacts need to be adequately addressed for all conservation significant species, using pre mining as a baseline not the current state, and to be broadened to include major non-mining activities and climate change*	As previously mentioned, the NJF is under enormous cumulative pressure from a variety of sources, including broad scale mining. The primary cause of deforestation in Western Australia's Southwest forests is bauxite mining (WA Forest Alliance et al, 2022). The PAA has been subject to significant historical land clearing and disturbance contributing to cumulative impacts. 44% of PAA is in completely degraded condition, with 43% of the PAA comprising cleared areas (12,708ha), leaving 46% of native vegetation or 13,504ha. These areas have been subject to logging, urban development and other infrastructure. Historical impacts are added to by contemporary pressures including the Proponents previous and current mining and other mining activities. In total, the Proponent has existing approval to clear a further 9,342 ha and is seeking to add 4,399 ha this, bringing the total area it hopes to clear over the next 15 years to 13,741 ha. <u>Terms of reference</u> As stated in **Section 1.11** cumulative impacts must be considered both in terms of historical clearing and disturbance and contemporary disturbances, including current gold mining within the PAA (and more broadly), with baseline condition provided for pre-mining conditions rather than current state only. <u>Underestimated, dismissed or lack of CIA</u> For terrestrial fauna and their habitats, the cumulative impacts of past, current and approved exploration and mining activities, including forecast mining areas in the broader spatial context are underestimated, downplayed, dismissed or largely ignored. South32s broad statement that "however, in the context of the pre-existing land use of the ongoing mine area and surroundings over the previous 35 years the incremental contribution does not represent a significant cumulative impact" (ERD Scoping Document) is reflective of this. The extent of historical and contemporary impacts, climate change impacts, context of widescale declining threatened species and environmental condition (State of the Environment Report, 2021) and local evidence to the contrary, highlights this statement is at best disingenuous and blatantly untrue. <u>Broader context – State of the Environment (2021) Report</u> Key findings of the recent State of the Environment Report (2021), reveal that many of Australia's threatened species and ecosystems are experiencing suffering declines from "cumulative and compounding pressures, leading to ecosystem collapse characterised by loss of key defining features and functions". The report found that 'Overall, the state and trend of the environment of Australia are poor and deteriorating as a result of increasing pressures from climate change, habitat loss, invasive species, pollution and resource extraction. Multiple pressures create cumulative impacts that amplify threats to our environment, and abrupt changes in ecological systems have been recorded in the past 5 years. <u>Climate change</u> Climate change in particular represents a major risk to species and ecosystems within the PAA and region. Climate change is listed as threatening process in the Recovery Plans of many of the significant fauna within the PAA (for example, Woylies, Black cockatoos, Carter's freshwater mussel). Southwest WA has been identified as one of a global set of bioregions at high risk of climate change impacts, with reduced rainfall, increasing temperatures and increased risk of extreme weather events. Rainfall in Southwest WA has declined by about 20% since the 1975 and that decline is projected to continue (Water Corporation 2022). The 2022 Intergovernmental Panel on Climate Change report found that the Northern Jarrah Forests are at particular risk of climate collapse, stating that 'The resilience and adaptive capacity of the forests is being reduced by ongoing land clearing and degrading land management practices.' The IPCC points out that this can be mitigated by 'avoiding and reducing forest degradation' (p11-80). Despite these findings, the Proponent dismisses, downplays and ignores cumulative impacts, and indeed state that their continued operations will contribute to release CO2 emissions, that "contribute to climate change" (p, 680). The proposal to clear an additional 4,399 ha in this context is environmentally unacceptable.	WA Forest Alliance et al (2022) *A Thousand cuts report* Water Corporation (2022)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				Thresholds and exceedance of natural capacity The Proponent states that "While there will be a loss of fauna habitat, all fauna habitat types will continue to be represented within the PAA and broader region, including the neighbouring State Forest" (ERD, page xxix). The Proponents previous and current approvals (totalling 7,503 ha) represents clearing and disturbance to 55.6% of vegetation in the PAA. With the current proposal, the total disturbance to native vegetation (totalling 11,902 ha) within the PAA is equivalent to disturbance to 88.1% of the native vegetation within the PAA and fragmentation of a significantly larger area, in addition to the areas of the PAA currently and historically cleared for other mining and agriculture (see image right, and in **Appendices**). With current proposal and conditional approval under MS719 this would take the total area granted for clearing to a massive 20,302 ha. The proposal does not discuss this area, or the quantity remaining, and does not acknowledge the cumulative impacts of large scale clearing and fragmentation on thresholds or exceedance of natural capacity, as required under contemporary best practice EIA (Minerals Council of Australia, 2015). The Proponent makes the assumption that despite the large scale clearing and fragmentation undertaken so far, the presence of threatened species supported in contiguous vegetation in part of the PAA and remnant vegetation in the remainder is evidence of low impact and reasoning to continue large scale clearing. "Despite the relatively large-scale clearing in these collective development envelopes, there are substantial tracts of contiguous native vegetation, particularly in the north of the WMDE and BTC and in the south of the WMDE. A high diversity of Threatened species is supported by this remnant vegetation (BIOSTAT, 2021a) (ERD, p264)". This statement is problematic as it fails to recognise that the remaining contiguous vegetation in part of the PAA is of great importance to retain threatened species as South32 propose to significantly extend clearing and disturbance into these areas particularly in the north of the PAA. Secondly and perhaps more importantly, it fails to recognise the cumulative impacts of this clearing, that many threatened species are at their limits of disturbance, are experiencing declines in trajectories (State of the Environment Report 2021) and that further impacts through clearing and disturbance to remaining vegetation is likely to reduce the viability of these species and populations at a local, if not regional scale. This is already the case for Chuditch, where the Proponent already acknowledges that large scale clearing and fragmentation as a result of their operations is causing observable declines (see **Section 3.2.13**). The removal of habitat of a threatened species is proposed in an area where the existing threatening processes remain substantially unmitigated and where additional future developments have been foreshadowed, with consequent concerns that the combination of these pressures will result in a decline in numbers to below those required to sustain a viable population, yet the CIA approach and terms do not allow this to be assessed. Extent of impact Note that area of fauna habitat South32 are proposing to clear is 5,841 ha, well above the new proposed native vegetation clearing of 4,399ha, due to inclusion of plantation and regrowth areas. Large sections and vegetation types within the PAA have already been intensively cleared, including Jarrah/Marri vegetation communities in the Saddleback area that's already been subject to large scale clearing, but this would be continued under the current clearing proposal - "A large proportion of the jarrah/marri fauna habitat type has been cleared for approved mining in the southern WMDE (Saddleback area)" (ERD, p257). The Proponent already acknowledges that "habitats including western sheoak within the jarrah marri community are already fragmented (ERD, p257). With the current proposal, clearing and disturbance to native vegetation in the PAA totals 11,902 ha or an unacceptably high 88.1% and fragmentation of a significantly larger area, in a landscape that already comprises predominantly cleared lands 44% of historical clearing). In addition to this, the Proponent has conditional approval to clear another 8,400 ha of intact habitat in the extended mining area under MS719. This conditional approval is only indicated on a handful of maps within the ERD (including Figure 2-1 (a) and Figure 2-1 (b)., It is misleading that this this area is labelled as "Extended Mining Area" as it is still subject to conditional approval by the EPA and the Minister for Environment following Biodiversity Investigations which as PHCC understand are yet to be completed. This area is significant and without survey information cumulative impacts are unable to be assessed in detail. MS719 condition 8-4 also states that	 *Central PAA using satellite imagery 11/19/2020 showing extent of clearing and disturbacne (Google Earth), see Appendices for larger version.*

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				the Proponent shall make the endorsed Scope of Biodiversity Investigations document [referred to in condition 8-3] publicly available.The ERD acknowledges that “Collectively, the WMDE and BTC development envelopes consist of a large portion of cleared lands (approximately 44%) within a predominantly agricultural landscape (Table 5-22 and Figure 5-18). The cleared lands represent a highly homogenous landscape type and are generally of poor value for native fauna as they provide limited foraging and shelter values (BIOSTAT, 2021a). At a landscape level, all of the fauna habitats of native and remnant vegetation are utilised by fauna where resources are available and therefore are of relatively high value and of importance to fauna, including Threatened species (BIOSTAT, 2021a).” (p 256 ERD), yet the Proponent largely dismisses cumulative impacts and proposes to clear and fragment high proportions of the remaining habitat. Rehabilitation to attempt to address cumulative impacts The Proponent relies on rehabilitation to address the cumulative impacts of clearing. They acknowledge some of the impacts from the extent of this clearing but state that the 3,200 ha (11% of the PAA) currently under rehabilitation and rehabilitating 70-80% of these areas within 10 years will minimise the cumulative impacts. This is of concern given rehabilitation provides suboptimal habitat post-mining, including for threatened species. Recent and current rehabilitation has limited value for many conservation significant fauna species, with greatly reduced floristic diversity, biomass and absence of suitable hollows, reduced foraging resource and, for a long period of time, rehabilitation areas cannot be categorised as high value habitat. This is exacerbated by the Proponents poor recent record of rehabilitation deficit of approximately 45% as providing limited confidence in achieving forecast improvements. Indirect cumulative impacts • Likely high fauna injury and mortality rates associated with large scale clearing with reliance of ineffective destructive preclearance surveys resulting in local population declines (as evident in Chuditch – refer to specific comments on Chuditch). • As well as climate change impacts and other indirect impacts including noise, dust, *Phytophthora* dieback and introduced predation risk are either downplayed or largely ignored. • Impacts of increased road network, traffic causing noise, dust and increased risk of vehicle injury and mortality. Conclusion Given the Proponent has not adequately assessed cumulative impacts, but these are significant, with cases of decline in MNES due to their previous large scale clearing and disturbance the proposal should be found environmentally unacceptable.	
3.2.2 Secondary Impacts	*Not Supported*	*Missing Indirect impacts listed in potential impacts in ERD* *Indirect impacts vastly underestimated* *Secondary impacts from water quality and quantity changes, including reduced soil moisture in a drying and warming climate not considered for terrestrial fauna*	*The level of secondary impacts likely to affect conservation significant fauna is unacceptable with current avoidance and minimisation measures*	Despite being identified as potential risks, secondary impacts including dust, noise, disturbance, displacement and predation, reduced water availability to conservation significant fauna are either underestimated, dismissed or no assessment provided despite clear risks and impacts. For example, in the NJF, the decline of the Quokka colony may have been related to noise disturbance and roadkill from bauxite mining (Australian Government Species Profile and Database - Quokka Op. Cited in WA Forest Alliance *et al* 2022.). More detailed comments and examples are provided under each specific species’ comments. However the following comments apply to most of the terrestrial fauna. Noise, dust and air quality The Proponent generally underestimates and dismisses the impacts of noise, dust and other air quality issues to terrestrial fauna. Discussion of the lack of monitoring air quality in protection areas is provided in **Section 6.2.2**. Crusher, machinery and blasting noise can significantly impact all species but particularly more sensitive species. No monitoring is proposed specifically to measure these impacts specifically on fauna including in Protected Areas and Ecological Linkages. Water abstraction In the context of a drying and warming climate, the Proponent’s proposed increased water abstraction is likely to have profound direct and indirect impacts to fauna, which the Proponent has insufficiently addressed and dismissed. The company proposes to use 400ML/annum of ground and surface water in addition to the 500ML/annum already being used. This is likely to have a profound effect on water directly available to fauna, soil moisture and to water availability in adjacent intact fauna habitat comprising jarrah forest,	 *Southern PAA showing broad scale clearing and fragmentation, clearing and roads as barriers to fauna movement (Imagery from 11/19/202) Google Earth. See Appendices for large scale version.*

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		Increased predation risk, increased competition, predation, stress and exceedance of carrying capacity of Protection Commitment Areas not considered *Priority Commitment Areas vastly inadequate (including no requirement for buffers) to limit secondary disturbance to more sensitive fauna*		streams and reservoirs, particularly if water is removed during low flow periods. The Proponent proposes this will be offset by increased water infiltration through cleared lands and rehabilitation. Flaws in these arguments are addressed in Inland Waters **Section 5**. <u>Introduced predators</u> The Proponent states that in their revised proposal, predation by foxes and feral cats known to occur within the PAA is not expected to exacerbate impacts on MNES species including red-tailed phascogale and Woylie. They also state that the feral animal control program established in the form of targeted 1080 baiting replicated by DBCA in State Forest is sufficient to address this risk, particularly given DBCA's program is within large areas of intact forest versus large scale clearing and fragmentation areas within the PAA. This is contradictory to information provided on page 636 "Effective control at a local scale is infeasible to achieve complete eradication. Additionally, long term baiting techniques can reduce in effectiveness over time due to factors such as bait resistance and shyness, and strong selective pressure against individuals that take baits (T. Fleming pers. Comm. 21 July)". It would be a far more effective measure for resilience of native species against predators to retain large areas of intact and connected mature native vegetation with baiting programs to replicate those of DBCA. This is strongly preferable rather than clearing large areas of high value habitat, rather than relying on bating in a highly fragmented landscape and establishment of relatively small Woylie predator free enclosure considerable distance from the impact locale. The Project design should avoid and minimise further clearing and a range of feral animal control methods need to be utilised for effective feral animal control (see www.wafcwg.org.au). <u>Fire</u> The Proponent state that approximately 44% of the PAA has been cleared for agriculture and other purposes (e.g., mining - p682), and is "unlikely to support a significant fire". However, under climate change we know that fire severity and frequency is increasing and likely to increase nationally and within southwest WA. With the extent of native vegetation remaining with the PAA, it is very possible the vegetation within the PAA will support a significant fire. Any significant fire would have a catastrophic impact on the remaining habitats within the PAA. <u>Vehicle strike</u> Added to noise, water quality and quantity impacts and predation, vehicle strike is a major indirect risk particularly with expansion of tracks, haul roads and other operations further dissecting fauna habitats and pathways and proposed clearing of 96 ha of regionally important ecological linkages (**r**efer to **Section 3.2.4)**. Mortality of conservation significant fauna in the PAA associated with mining operations recently include Chuditch and Western brush wallaby, however the Proponent provide no data or discussion on the records to date nor future impacts, only that impacts can be mitigated by speed reduction. The effectiveness of this is unknown, however, given observable conservation significant fauna deaths associated with the Proponents operations, this is worthy of more detailed assessment.	
3.2.3 Protection Areas	*Partially supported*	*PHCC strongly supports the implementation of Priority Protection Areas, however in the current proposal these are poorly designed, based on narrow criteria, do not support contiguous mature intact vegetation, are vastly*	*All high value fauna habitats and connecting vegetation should be protected from clearing and other disturbance within the PAA* *At the very least, protected area planning*	Protection areas where no timber harvesting, clearing, mining and associated activities occur are extremely important to maintain ecological function, for fauna habitat, for connectivity and allow recolonisation, and allow recovery of species and communities from the proposed major disturbances. With only large-scale maps provided showing current protected and proposed protected areas, no detailed analysis and comment can be provided on the size, connectivity and location of these parcels without this spatial data. Only a qualitative assessment can be made of the plan and a quantitative assessment made of total areas of protected and subcategory areas. The Proponent relies on proposed "protection commitment areas" to avoid and minimise impacts to significant fauna and "maintain ecological values" (p2 E04 p xxviii). The Protected Area Plan does not provide for the protection of all areas of high-quality vegetation and overall, it does not adequately protect fauna habitats in the Primary Assessment Area.	 *PAA showing extent of fragmentation and isolation of remnants (Imagery from 11/19/202) Google Earth (see*

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		inadequate to maintain ecological function and only have protection from mining for the life of the current operating period of 10years *The Protected Area Plan does not provide for the protection of all areas of high-quality vegetation and overall, it does not adequately protect fauna habitats in the PAA* *Buffers to high quality vegetation and habitat are only where required, i.e., at the discretion of the Proponent, with none defined in the proposal*	*needs to be greatly improved and expanded to adequately protect high value areas and ensure recovery and resilience* *This should include increased representation of high conservation value habitats for MNES and SRE taxa* *All medium and higher potential old growth forest should be protected* *All high quality wandoo habitat and medium to high potential old growth forest should be protected* *Mandate requirement of connectivity and appropriate buffers for all protection areas* *Additionally, conditions must be imposed and appropriate monitoring to ensure Protected Areas are not disturbed or impacted by increased spread of weeds or forest disease; groundwater or*	In an attempt to follow the mitigation hierarchy, the Proponent proposes “Avoidance of areas of potential high conservation value “wherever practicable” using the Biodiversity and Forest Management Plan. Areas of potential high conservation value include specific vegetation communities of conservation value, high quality vegetation with potential significant habitat for Threatened species and identified fauna corridors and ecological linkages” (ERD, p xxvii). In practice, in their protected areas planning, the Proponent has not demonstrated all reasonable avoidance of clearing and disturbance of high conservation value areas and fauna protection, and instead propose limited protection conservation areas based largely on existing legal or other protection while conceding few other areas where practical and economical for South32. The following provides detailed critique of the plan: <u>Lack of expertise in development, consultation or independent review</u> It appears the Protected Areas have only been identified through internal processes and not with external consultation or peer review “In support of the Revised Proposal, The Proponent has undertaken a comprehensive internal evaluation process to identify and realise opportunities to avoid key environmental values within the PAA over and above its existing practices and legal requirements” (E04, p4). There is no evidence that planning has been undertaken with expertise or consultation or independent review, including with the DBCA and those with expertise in corridor and landscape biodiversity planning. The Proponent does not evaluate the protection plan against objectives of Forest Management Plan 2014-2023 (DBCA) that specifically refer to South32's mining activities in State Forest, in relation to planning for and allowing for the resilience and recovery of biodiversity from disturbances including threat to flora and fauna. <u>Poorly designed and inadequate</u> Protection areas on the whole are poorly designed and located, relatively small and isolated and with limited dedicated MNES fauna protection areas. It is clear in the proposed protected area planning, that despite the Proponents commitment to protecting high conservation value areas as an avoidance strategy, the plan is vastly inadequate and fails to meet its objective to allow ecological function across an already heavily cleared and impacted landscape. <u>Poorly represented and minimal area</u> The Proponents proposed protected areas in the PAA comprise 1,322 ha of “key avoidance Alumina Protection Commitment areas” (equivalent to 4.5% of the PAA) and 1,415 ha of “Current Protected Areas” (equivalent to 4.7% of the PAA), along with scattered potential habitat trees with a 30 m buffer, some of which occur in the protected areas. Without consideration of location or design, these protected areas are minimal and vastly inadequate when considered against the figures of proposed maximum native vegetation allowance up to 9,622 ha, comprised of 5,263 ha of previously approved clearing and 4,399 ha of proposed additional clearing (ERD, p xvi) within the PAA. The Proponent states that they will limit impacts particularly to MNES through “Avoidance of an identified amount of significant habitat within the PAA”. In comparison to clearing amounts both in previous and current approvals, scale of existing cleared areas within the PAA and cumulative impacts, this represents a minimal area of fauna habitat. While the Proponent has claimed MNES fauna habitat where this is included in the protection areas identified for other reasons, aside from a proportion of scattered Black cockatoo habitat trees, small percentages of MNES high quality fauna habitat are included in protection area planning. Significant areas of MNES high quality fauna habitat have been identified in the ERD and proposed to be cleared, with limited avoidance and minimisation measures in place indicative of significant residual impacts. The majority of proposed protection areas are relatively small scale and isolated with no connectivity to intact vegetation, except for the Hotham River buffer, at best mined and young rehabilitation. Only a small subset of protected areas is located in or in proximity to	*Appendices for larger version)*

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
			surface water alterations, dust , noise or light	Ecological Linkages, with only one linkage identified in the majority of the PAA south of Nullaga. It is not clear whether any such areas will have buffers as the Proponent states these will only be included “where required”. The genuine commitment to adequately protect conservation significant fauna habitat is tenuous when considering the avoidance of this habitat is largely attributable to criteria not related directly to terrestrial fauna conservation but instead based on existing legislative or similar protection (such as Bibbulmun track buffer, Aboriginal and European Heritage sites and UNESCO sites, areas identified under the International Union for Conservation of Nature (IUCN) Protected Areas Categories I-IV). Figures are provided on the areas set aside for areas otherwise legislatively protected, which has been counted toward fauna habitat. Protection areas in the north of the PAA including the BTC cover a larger area, with greater connectivity, and a buffer is proposed for the majority of the Hotham River. The relatively small scale and isolation of the majority of protection areas increase their susceptibility to direct and indirect impacts, particularly edge effects from disturbances associated with surrounding mining and operations including blasting, hydrological disruption from soil removal, increased water use in rehabilitation, greater wind and temperature exposure, risk of Phytophthora introduction and exacerbation of feral predator impacts (discussed in more detail elsewhere). This is particularly the case in key avoidance areas (“Worlsey Alumina Protection Areas”). South of Nullaga, these are very small scale, highly isolated and scattered throughout an area that is already highly fragmented from large scale previous and current clearing and degradation from mining and associated activities such as haul roads, roads and tracks, along with impacts from timber harvesting and agriculture, the relatively small scale and isolated proposed protected areas in this area of the PAA and cumulative impacts of large scale clearing and disturbance in these areas. Given this, the viability of these areas will be severely compromised due to lack of connectivity, high edge effects and exposure to other disturbances such as hydrological change from clearing, blasting, increased phytophthora risk that affects vegetation structure, lag periods of exposed soils and ultimately rehabilitation. The small scale and lack of connectivity between the majority of protection areas will result in reduced viability and functionality for all fauna and particularly conservation significant fauna with lower sensitivity thresholds, larger home ranges or unique dispersal requirements such as SREs. For example, species such as Quokka rely on large areas of habitat to migrate with habitat change and high levels of fragmentation with small protection areas, will greatly restrict their ability to move and adapt and increased exposure to predators. <u>Narrow criteria</u> The criteria for protected areas are so narrowly defined it completely excludes any representative other than high conservation value areas identified through the Proponents own studies. For example, the Proponent only identifies old growth forest to be included in protection areas, only comprising 37.4 ha (ERD Table 5-10)) whereas medium and above potential old growth forest that are of key importance to fauna (totalling 3713.1ha) have been excluded from protection areas (see comments in Section 2 Flora and vegetation for more detail). <u>Rehabilitation</u> The Proponent proposes isolation and dispersal distances as barriers for fauna movement can be mitigated by “prompt rehabilitation” of surrounding areas. This is unreliable and problematic in several ways. Firstly, the Proponent acknowledges that even once rehabilitated, rehabilitation areas provide suboptimal habitat for a range of species (for example SREs, Woylies). The Proponent has demonstrated that once cleared, large areas are left unmined for over 3 years, in effect leaving small, protected remnants highly isolated with many species unlikely to disperse into large hostile cleared areas. Finally, the Proponent has demonstrated failures to meet rehabilitation versus mining targets, identified by the Department of Mines, Resources, Industry and Safety (DMRIS). <u>Wandoo vegetation complex</u>	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				Impacts to high quality Wandoo are unacceptable given that intact Wandoo vegetation complexes are significant habitat for a range of conservation significant species, particularly Black cockatoos and arboreal species relying on tree hollows and Numbats relying on termite assemblages. Despite the values as habitat, the Proponent proposes to clear 298 ha of the 1,228 ha of high-quality Wandoo habitat identified within the PAA. At 25% this is an unacceptably high proportion of high-quality habitat to be cleared, the majority for infrastructure, with no detail provided on attempts at avoidance of relocating infrastructure to cleared or degraded lands. Additionally medium to high potential old growth forest is largely undisturbed and similarly provides significant habitat for threatened fauna, especially those more sensitive to disturbance and or relying on structural complexity, such as quokka. No high-quality Wandoo or medium and above potential old growth forest should be cleared. <u>Buffers</u> No buffers for protected areas are mandated for protection areas, instead the Proponent states these will only be implemented “where required”. No detail is provided as to where and why this may be required and in how many instances. Buffers are important to protect these areas from the major localised disturbances from heavy vehicle movements, harvesting, clearing, blasting and rehabilitation such as compaction, noise, dust and hydrological change. <u>Protection beyond 10 year mining plan</u> Added to the shortcomings in planning, the majority of protection areas are at risk of clearing and other disturbance beyond the Proponents 10-year mining plan, with no provision for in perpetuity protection to maintain the values identified. This means that these areas may be cleared either by South32 or other mining companies in the future. <u>Lack of clarity over Linkages versus Protected Areas</u> It is not clear whether ecological linkages area calculations contribute to the protected areas total, given the former are described as protected areas. <u>Conclusions</u> Adequate scale and suitably located and connected protection areas, including from a landscape perspective, are vital to maintain viability of MNES fauna, as well as SRE and other fauna species. Proposed key avoidance (“Protection Commitment Areas”) are wholly inadequate in terms of size, location and connectivity to maintain ecological function, conserve biodiversity, allow self-sustaining populations and allow for recovery of biodiversity from disturbances. This is particularly the case where avoidance is proposed in areas that are already heavily impacted by large scale contemporary mining and associated activities and cumulative impacts, such as the Saddleback, Hotham West and Marradong areas. Given the extent of historical clearing (12,708ha or 44%) of the PAA, the Proponents previous and current approved clearing, cumulative, compounding and contemporaneous pressures, and the State of the Environment Report indicating that Australia's environments and threatened species are in decline, all high value fauna habitats and connecting vegetation within the PAA should be exempt from clearing.	
3.2.4 Ecological Linkages	*Partially supported*	*Ecological linkages are critical to maintaining genetic diversity, dispersal, recovery from disturbance and ecological function across the*	*The integrity of all ecological linkages must be maintained with protection from all clearing, unless suitably designed and appropriate*	The Proponent has committed to establish “Spatially defined conservation corridors to maintain connection of remnant habitat across the mining landscape” and “ensuring conservation” (ERD, p95) as an attempt to avoid, minimise and mitigate impacts. Linkages are especially important in allowing dispersal and mitigation for genetic diversity and adaption to changing habitat conditions. However, the design and protection of these corridors is vastly inadequate, thus severely impacting ecological function and resilience, particularly for fauna movement and recolonisation. <u>No subregional corridors</u>	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		landscape but are vastly inadequate in quantity, scale and distribution *Linkages are not fully protected with clearing of 96ha proposed, putting their integrity and viability at risk* *No subregional level linkages are defined or committed to*	*fauna under or overpasses can be implemented* *The Regional and subregional linkage network needs strategic expansion in scale and spatial distribution to ensure connectivity is adequately maintained in all areas of the PAA* *All linkages should have mandated appropriate buffers*	Only those regional ecological linkages identified by Molloy et al (2009) have been included for protection, with no sub regional linkages or corridors identified, or commitments to these included in mine planning. The Proponent states that "Localised ecological linkages and corridors have not yet been identified in the PAA". B based on this, there is no guarantee that these will be appropriately identified based on conservation and connectivity value or will be of appropriate scale and size to meet their objectives as linkages. <u>Limited numbers proposed</u> Only a limited number and area of linkages are identified and proposed for protection, totalling 962 ha of the PAA. With 10% of linkages proposed to be cleared, the total would be reduced to even smaller net area of 866 ha of linkages. This would represent only 2.9% added to uncleared linkages within the PAA. <u>Spatial bias</u> Linkages identified within the PAA are a subset of regional linkages and have spatial bias within the PAA. Most are concentrated in the north, with only one linkage in the south-eastern area of the WMDE Saddleback ("Quindanning Timber Reserve'). No linkages are proposed in the majority of the PAA. The result of this is greatly reduced opportunity for dispersal, ecological function and reduced ecological resilience throughout all other remaining areas of the PAA. <u>Clearing of linkages</u> • The importance of ecological linkages is noted by the Proponent, however 96ha of clearing is proposed within linkages for roads, transport, maintenance, and construction activities (not ore mining activities) (EO1 p19). No information is provided on the location or design of those areas to be cleared. Clearing of this size and for these activities will impact the integrity of the linkage. Construction of roads, even with proposed mitigation measures of speed limits, will increase the likelihood of fauna injury and mortality. Certain species will avoid crossing roads and other access altogether. • Mapping provided of protection areas in in the WMDE Saddleback areas shows that only part of the single Ecological Linkage located east of Saddleback, is partially excluded from mining as protection commitment area or current protected areas in the PAA. Not protecting this linkage from clearing in its entirety will significantly impact the integrity and function of this linkage, particularly given it is the only linkage identified in the area south of Nullaga, which represents the majority area of the PAA. <u>Buffers</u> No ecological buffers are proposed for linkages to reduce direct and indirect impacts including disturbances such as noise, dust and light. <u>Rehabilitation</u> In the timeframe of the proposed clearing, given current mining and other mining approvals, rehabilitation deficits over the past several years, and rehabilitation providing suboptimal habitat for set time and species dispersal, it is unlikely that there will be sufficiently maturing rehabilitation to provide adequate ecological connectivity in lieu of a more comprehensive network of protected linkages of intact vegetation. <u>Monitoring</u> The Proponent provides no detail or monitoring data of condition and threats to assess the effectiveness of their current protection areas in order to ascertain the adequacy of their current linkages to grant further approval based on an extension to these. <u>Conclusion</u> Reductions in at least one MNES within the PAA is indicative that the current linkages in an environment of broadscale clearing and fragmentation are unable to adequately avoid or minimised impacts. The ERD notes the reduction in the number of Chuditch in recent years in the PAA "potentially be due to habitat fragmentation from land clearing associated with agricultural activities and mine	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				operations, and the lack of sufficiently mature rehabilitated areas to support this species, or predation from introduced fauna (e.g., cats and foxes) (BIOSTAT, 2021a)" (ERD, 321).	
3.2.5 Terrestrial Fauna MNES Offsets	*Not supported*	*PHCC does not support the Offsets Plan due to the environmental unacceptability of the proposal* *The mitigation hierarchy has been mis-applied resulting in significant residual impacts for fauna MNES and over-reliance on offsets* *The value and likelihood of rehabilitation as an effective offset is over-estimated for fauna MNES* *Parts of the offset proposal do not meet Policy objectives being non-local and not like for like*	*No offsets are appropriate* *The Proposal should be rejected*	Due to a significant residual impact for loss of habitat for MNES species the Proposal includes a large offsets package. It should be noted at the outset, that offsets are considered inappropriate for proposals that are environmentally unacceptable and, based on this, PHCC does not support the Offsets Plan proposed by South32. Offsets have been proposed for 8 of the 17 conservation significant fauna species Black cockatoos (Forest red-tailed, Carnaby's and Baudin's), Woylie, Chuditch, Red-tailed phascogale, Western ringtail possum and Quokka, through a Biodiversity Offsets Plan (BOP). Offsets sit at the bottom of the mitigation hierarchy and are 'the least preferred option' (EPA 2021, p7). Previous studies have considered the implementation of offsets policies in WA and elsewhere, and have identified a need for greater emphasis on avoidance and mitigation, risk assessment (including determining the likelihood of success), adaptive management and contingency planning, and consideration of socioeconomic and local governance aspects (Bidaud et al. 2016; Bull, Lloyd & Strange 2017; Burton, Rogers & Richert 2016; Gelcich et al. 2017; Lindenmayer et al. 2017; Pilgrim et al. 2013; Smokorowski et al. 2015) cited in DWER 2019. The Proponent's offsets proposal falls short in all these aspects. The Proponent's Biodiversity Offset Plan focuses on: • Habitat protection - 'protection and enhancement of habitat that is otherwise under threat of clearing or disturbance' is 25% of the total offset offering (ERD, p631). The target species are Carnaby's, Baudin's and Forest Red-tailed Black Cockatoos, Chuditch, Western Ring-tail Possums, Red-tailed Phascogales and Quokkas. • The habitat protection area is 4,175 ha across 13 areas of varying size and 220 ha across 4 areas of varying size (Appendix L01: Biodiversity Offsets Plan, p39 and p47) – total of 4,395 ha. (Direct Offsets 1 and 2) • The PAA includes a specially flagged note on page 4 that says: The Protected Areas identified in the plan in Figure 4 may be *modified, reduced or removed* with approval from the EMLG. (Appendix E04, p4) • Ecological restoration – 'the re-establishment of native vegetation' on forest areas cleared for mining (rehabilitation) and already cleared agricultural land will be 50-55% of the offsets (ERD, 634). The targeted species are Carnaby's, Baudin's and Forest Red-tailed Black Cockatoos, Chuditch, Red-tailed Phascogales and Quokkas. The total area of ecological restoration will be 5,151 ha (Direct Offsets 1, 2 and 3). • Ecological restoration for habitat has significant time delays. For foraging and roosting habitat for black cockatoos this is between 6 to 8 years after vegetation establishment; for breeding habitat for black cockatoos the delay is >100 – 200 years (ERD, p635 and Appendix L01: Biodiversity Offsets Plan, p40). For Chuditch a conservation benefit takes 10 years, for Quokkas up to 20 years (Appendix L01: Biodiversity Offsets Plan, p40). • Installation of 200 artificial hollows for breeding habitat for black cockatoos and some further measures, such as creating linkages between nesting and feeding areas (ERD, p635 & p640). (Direct Offset 4) • Woylie conservation actions – establishment of an additional 'insurance' population' in a fenced, predator enclosure 'within a dedicated conservation reserve' (ERD, p635 and p638). Expected area is 3,586 ha (ERD, p640). The aim is a 'net gain of at least 40 individuals' (Appendix L01: Biodiversity Offsets Plan, 33). (Direct Offset 5) • The 5 Direct offsets are described at ERD, pages 636-7. The effectiveness of biological offsets generally have been called into question, discussed in the following: • The *2021 State of the Environment Report* cites critical findings with respect to biological offsets' effectiveness. • The Australian National Audit Office identified several concerns with increased reliance on offsets to achieve the objectives of the EPBC Act (DAWE 2020). For example, there is no departmental guidance for reviewing offsets, no quality assurance process for reviewing approved offset plans, no agreed method for estimating averted risk, and no appropriate systems to map offsets for internal or external use.	EPA (2014) DWER (2019) Appendix L01, Biodiversity Offsets Plan, p37 ANAO 2020 Gibbons et al 2018

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				• The effectiveness of offsets is often not evaluated after they are implemented, and it is becoming clear that some types of impacts can be difficult to offset and that the underlying principle of 'no net loss' can often not be demonstrated (Gibbons et al. 2018).' Further significant problems with the Plan are: • The application of the mitigation hierarchy has been mis-applied with limited avoidance, minimisation and mitigation measures proposed resulting in an over reliance on offsets. This has been discussed in more detail under the Protected Areas plan as well as specific species comments. • No offset calculations have been undertaken for Numbats. • The Proponent includes rehabilitation as a mitigation and offset measure, that includes progressive rehabilitation of approximately 80% of disturbed areas to reduce the clearing deficit to <35% over a 10-year period. This over-estimates the measures, as elsewhere they state that between 20-30% will not be rehabilitated and based on their own track record cannot guarantee they will be able to achieve a deficit below 35%. • The Proponent bases their offset calculations and plan on the assumption that rehabilitation provides like for like habitat for the MNES species requiring offsets, whereas in reality this provides partial offset for the majority of MNES at least until the medium to long term. This fails to meet the provision of "like for like habitat consistent with the contemporary expectation that the majority (notionally 90%) of the total offsets is delivered via direct offsets". • Several of the proposed offsets are inconsistent with the objectives in the WA offsets policy and broader strategic objectives of the Worsley Alumina Biodiversity Offsets Policy. The latter "aims to deliver ecological, community and economic resilience across the region" (ERD p xxii). However in addition to offsets being proposed for social impacts, the offsets proposed for MNES and habitats erode community and ecological resilience due to significant proposed loss of local area native vegetation and fauna habitats in the case of the PAA for non like for like offsets (Woylie enclosure) in the Collie area (nearly 100km away) and potentially substitution of cockatoo habitat trees in the PAA for artificial tubes on the Swan Coastal Plain. The proposed offset packages mean a net loss for forest species in the Boddington area, where most of the proposed mining will take place. Most direct offsets for Habitat Protection (offset package 1) occur in SW land parcels (south west of the Worsley Refinery; Fig. 5, p37). Proposed offset packages should include more options for land parcels in areas with the greatest disturbance impact (i.e., in the Jarrah forests around Boddington). • The Proponent states that "In most cases, the proposed offset packages will provide a net gain for impacted conservation significant species" (ERD p 649, 651). However the offset packages only 'provide a net gain for impacted conservation significant species', when rehabilitated areas are considered as offsets. Rehabilitated areas remain vastly different to remnant areas (i.e., low diversity of understorey species) therefore, should not be considered as offsets. • The Proponent proposes achieving direct offsets "primarily through providing land parcels for land protection (3,377 ha)" however this results in a tenure change only rather than net gain in vegetation, a criticism made of this offset type in the recent review of the WA Offsets Policy (DWER 2019). • The Proponent's proposed restoration offsets will account for 50-55% of land/area based offsets and do not include adequate provisions for risks including natural and unforeseen disasters, despite this being a recommendation in WA offsets review and standard in contemporary offsets planning (DWER 2019). Assessment of current and foreseeable risks that can affect successful rehabilitation and restoration offsets particularly under climate change, should be undertaken in offsets planning, factoring these risks in offset calculations and funding. Additionally, PHCC has the following concerns relating to financial contributions to manage proposed offsets: • 'Worsley Alumina is exploring options for ensuring funding is available for these long term requirements, especially for requirements that may continue after revenue from mining ends. These include a trust fund and a bank guarantee" (ERD, p 644) It should be mandated that Worsley Alumina commit to long-term funding for management of offsets through a charitable trust fund or bank guarantee. This will ensure funds remain available for offset management, should Worsley Alumina be in default or unable to meet the relevant offset requirements in the future. • Protection of offsets will require substantial financial commitment long after mine closure. For example, maintaining a predator exclosure reserve for Woylies will involve ongoing monitoring and maintenance including fencing and landcare works, veterinary care (including a long-term feeding program) and research. Funds contributed should be similar to amounts required to operate	ERD, p644

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				other Woylie exclosure reserves (for example the three enclosures within Dryandra Woodland). A portion of these funds should be made available after fence installation.	
3.2.6 Threatened Fauna Management and Preclearance	Not supported	*South32 have failed to demonstrate adequate minimisation and mitigation through an outdated ineffective and harmful preclearance plan, that has serious animal welfare implications* *For appropriate species, no targeted trapping and relocation is proposed* *Despite mentioning numbats, no preclearance planning is provided* *In its current form relying on destructive searches and dispersal, to remnants, there is high likelihood of broad scale direct and indirect injury and mortality*	*The preclearance plan should be rejected*	All native fauna protected under the Biodiversity Conservation Act and MNES are given further protection under the EPBC Act. Injury, mortality and displacement of fauna during operations, along with secondary impacts from competition and predation is high risk and likelihood in the Proponents proposal. Specific comments have been provided on individual Threatened fauna management plans and preclearance surveys, the following are general comments on the inadequacy of the plans: • Mining activities proposed presents a high risk to mortality or injury to all native fauna in the proposed area but MNES and SREs are of particular concern. Pre-clearance surveys are required to identify, record and delineate habitat considered to be essential in the lifecycle and to minimise the mortality or injury risk of fauna species including threatened species potentially impacted by clearing operations. • The Proponents threatened fauna pre-clearance fauna survey and management fails to mitigate injury and mortality risks to MNES and raises serious animal welfare concerns. Contrary to stated, the Proponents proposed threatened fauna pre-clearance surveys were not conducted in accordance with best practice, EPA guidance nor DBCA recommendations. • Industry standard preclearance plans include statement on humane or animal welfare principles. No trapping and relocation is proposed for species where this has been shown to be effective (e.g., quolls) and no sensitive clearing principles have been proposed for species which suffer stress and myopathy under trapping and relocation. Instead, the Proponent is relying on being able to identify habitat features which is ineffective particularly for woylies and quokka which rely on specific or difficult to detect habitat features. The Proponent's preclearance relies on “destructive searches” and encouraging dispersal into disturbed areas toward remnants, where there is risk of secondary impact from predation, competition, lack of resources and vehicle strike. Concerningly, the Proponent also proposes habitat feature salvage but at the same time quotes destructive searches of habitat features. • Directional clearing is mentioned however there is no reference to staged clearing operations to encourage fauna movement into suitable habitat, which should not include small and/or fragmented remnants, beyond the clearing area. • No detail is provided on licensing and qualification requirements, required for terrestrial fauna handling or on internal or external reporting and compliance. No performance indicators, trigger criteria and threshold criteria and contingency actions for outcome-based SMART performance standards SMART performance standards are included despite the EPA specifies their inclusion under Part IV Environmental Management Plans (EPA 2021). • The Numbat is not included in required species for consideration under Threatened Fauna Pre-clearance Survey and Management Plan due to “Numbat *Myrmecobius fasciatus* (Endangered EPBC Act and BC Act) - likelihood of occurrence low and population highly unlikely”. However, Numbat has been recorded as present within the PAA in 2021. Refer to Section 3.2.12 for further information. • No non-MNES listed fauna species are considered in pre-clearance surveys, including quenda and brushtail phascogale, despite being of conservation significance and at high risk of injury and mortality from clearing operations.	ERD, Threatened fauna preclearance survey and management Plan p6
3.2.7 Black cockatoos	*Not supported*	*Unacceptably high impacts to Black cockatoos* *There is no robust evidence that more habitat can be lost without significant adverse impacts on these threatened species*	*The Proposal cannot meet the EPA objective for Black Cockatoos* *The EPA should reject the proposal to prevent unacceptable impacts on*	The forest that the Proponent proposes to clear is known habitat for Red-tailed, Baudin’s and Carnaby’s black Cockatoos, with Red-tails the most abundant (ERD, p307). All three species are highly threatened and are suffering ongoing declines. Carnaby’s and Baudin’s Cockatoos are endangered, with the latter likely shortly to be elevated to Critically Endangered while Red-tailed Cockatoos are vulnerable. The ERD acknowledges (page 307) that all three species have “suffered a decline in their distribution and population sizes due to a reduction in available breeding, roosting and foraging habitats resulting from vegetation clearing” (DAWE, 2020b cited in ERD 2021). Similarly, Johnstone and Kirkby (2019) found that there has been a significant decline in breeding success in the Northern Jarrah Forest compared to the Perth Peel region (ERD, p308).	DAWE (2020b) Johnstone and Kirkby (2019)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		Measures to protect nesting trees are not adequately addressed *Decline in food availability not adequately addressed*	*black cockatoos* *All confirmed and potential habitat for black cockatoos must be protected from clearing* *Mine pits and access roads be designed to avoid the clearing of all confirmed and high potential Black Cockatoo nesting trees (with suitable 50m buffer)*	The report *A Thousand Cuts* (WA Forest Alliance *et al* 2022, p 24), explains that bauxite mining is the primary cause of deforestation of forest habitat for all three species of SW black cockatoos. Habitat loss and fragmentation is a major contributor to the species' decline and the Recovery Plans for each species refer specifically to threat from mining. There is no robust evidence that more habitat can be lost without significant adverse impacts on these threatened species. The Recovery Plans for these species have called for protection of habitat but these recommendations have not been implemented. It is in this context that the Proponent propose to clear large areas of 'high value' foraging and nesting habitat as follows: Species | Foraging Habitat (ha) | Breeding Habitat (ha) Red-tailed black cockatoo | 5,446.3 | 4,699.7 Carnaby's black cockatoo | 3,656.3 | 0 Baudin's black cockatoo | 5,098.1 | 5,199.5 <u>Breeding habitat</u> • Confirmed breeding trees for Carnaby's and Red-tailed Black Cockatoos exist within the areas the Proponent proposes to clear (ERD, p313 – 314). The Proponent proposes to remove 65 confirmed and high potential breeding trees (ERD, p341). There are no doubt many more actively used and high potential breeding trees that have not been identified. • EO3 – Threatened Fauna Pre-Survey Clearance and Management document indicates that Potential Habitat Trees (PHTs) that have been confirmed as breeding trees will be checked prior to clearing and if they are currently "not-occupied" by Black cockatoos they may be felled. PHCC does not support the felling of ANY confirmed Black cockatoo nesting trees. • Table ES3 states "mine planning will preferentially avoid clearing within areas identified as having high value breeding habitat where practicable". PHCC does not support allowing the proponent a choice to decide what is practicable or preferred. Giving the proponent a choice is allowing them the option to choose profit over environment. For example, a confirmed breeding tree may seem impractical to avoid clearing as it's on a proposed haul road or in the middle of a pit. Given the choice the proponent may choose to clear the tree due to perceived impracticality to retain it. • The Biodiversity and Forest Management Plan states that the Proponent will not remove more than 10% of confirmed Black cockatoo nesting trees (confirmed at time of surveys prior to clearing). Pre-clearing surveys (EO3 document "Table 1 "Survey Timing") state that surveys "should" be monitored during the peak breeding season. PHCC suggests "should" be replaced with "will" and take into consideration that FRTBC generally breed every second year (Black Cockatoo Conservation Centre, 2016), so getting no confirmed breeding in one season does not mean that that hollow won't be used the following season. FRTBCs also breed all year round so could be missed if surveys are only done during "the peak breeding season". Surveys should be undertaken from at least 2 years in advance of proposed clearing, right up until clearing. PHCC does not support Phase 2 Threatened-Species Pre-Clearance Survey and Management in its entirety. • Surveys and modelling have inferred the presence of a large number of high potential habitat trees and a commitment to not clear more than 10% of confirmed or high potential trees. However, there is no commitment to retain a percentage of next-generation habitat trees (e.g., younger Marri/Wandoo around 50-100 years old that are yet to develop hollows), a class of trees that are important as retaining for the next generation of breeding hollows. As confirmed and high potential hollows (generally >200 years old), senesce from age, disease, extreme weather, or fire, these trees (within. a relatively short period of time) will become the next generation of nesting trees, and extremely important in the succession and survival of the species. PHCC does not support that next-generation habitat trees will not be protected. • Allowing a 10% loss of breeding hollows from clearing (equal to 65 hollows infers that the Proponent accepts a 10% reduction in breeding success in the IDF. PHCC believes this is an unacceptable loss for a threatened species which cannot be adequately mitigated through offsets due to forest black cockatoos not readily breeding in artificial nests. • The Threatened Fauna Pre-Clearance Surveys and Management states (page 17) that greater than 90% of confirmed habitats trees or potential habitat trees will be protected from disturbance with a 30m buffer applied from the base of the tree. PHCC	Black Cockatoo Conservation Centre (2016) "Forest Red-tailed Black Cockatoo, Factsheet". Available online Fact-sheet-Forest-Red-tails.pdf (blackcockatoorecovery.com) *Personal Communication (2022) Birdlife WA.*

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates

suggest that this should be extended to a **50m** buffer to provide the tree adequate protection from for example, storms and high winds.

- No definition of what constitutes the differences between a potential habitat tree, high potential habitat tree and extremely high potential tree is provided, although all these terms are used interchangeably within the documents and appendices.
- Even though replacement of food resources through rehabilitation has been documented, the quantity of food that a mature forest provides versus young and progressive rehabilitation is substantially different. This decline and gap in food availability in quantities in pre-mined forest significantly impacts the breeding success and survival of Black cockatoos. PHCC does not support the claim that rehabilitated forest provides quality foraging habitat after 6-8 years, due to the fact that the quantity of food in rehabilitated forest is far inferior to that of a mature forest.
- When determining Significant Residual Impact on habitat quality, the proponent used "habitat importance/suitability" scores as a proxy for species stocking rate, because stocking rates were not broadly available. Habitats were given a score of 1 if they were potentially important habitat or 0 if not used by the species. Substituting a "use" score for a "stocking rate" score, is not a good representation of the stocking rate of a particular habitat and ignores the fact that the stocking rate of a rehabilitated forest will be substantially lower than a mature forest due to less canopy thus less fruit/seed availability.

<u>Cumulative Impacts</u>

The ERD acknowledges the cumulative loss of fauna habitat from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss associated with the Boddington Gold Mine and the South32 Revised Proposal (ERD, p376-377), ignoring other approved and proposed forest clearing, for example for bauxite mining by Alcoa (ERD, p376-377).

The cumulative loss of habitat **t**hat would result from the Boddington Gold Mine and South32 proposal, if this clearing goes ahead would comprise (ERD, p377):

Species	Suitable habitat (ha)	Cumulative clearing (ha)	Percentage
Forest red-tailed black cockatoo	36,162	7,523	21%
Baudin's black cockatoo	32,397	6,961	22%
Carnaby's black cockatoo	34,997	7,387	21%

Further losses from Alcoa clearing and other impacts including logging and agriculture are not quantified but must be, given the species ranges.

- On page 707 of the ERD, the Proponent considers the cumulative impact of the Revised Proposal to Black cockatoos, in a regional context, as low. The justification given for this is that Carnaby's black cockatoo breeding rate within the PAA is naturally low due the PAA being outside its preferred breeding area, and due to lack of mature nesting trees directly related to historic timber harvesting. In its assessment the Proponent has dismissed that the PAA is the preferred nesting habitat for Forest red-tail black cockatoos. The Proponent has also failed to adequately assess the cumulative impact that clearing will have on breeding for both species due to loss of forage to support breeding birds, and the destruction of breeding hollows from an already depleted population of suitable trees. Yet the Proponent acknowledges (Table 8-1 p662) that the PAA supports breeding for Carnaby's and Forest Red-tail Black Cockatoos when assessing its potential impacts to MNES. PHCC argues that the revised proposal has a high cumulative impact on Black Cockatoos because 1) The PAA is the preferred breeding habitat for Forest red-tailed black cockatoo and removal of this vegetation will have a cumulative high impact on breeding, and 2) Historic timber harvesting, climate change and fire have all contributed to decline in the availability of suitable hollows, and any additional pressures (in the form of clearing from mining) will further attribute to the decline, resulting in pushing Black cockatoos (especially Red-tail cockatoos in this context) closer to the edge of extinction.

<u>Offsets</u>

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				• The significant extent of offsets proposed for Black cockatoos is reflective of the failure to adequately apply the mitigation hierarchy to make all reasonable effort to avoid and minimise impacts to Black cockatoo species. The policy of offsets is designed as a last resort) but in this case it is being heavily relied upon. The review of offsets policy in WA (refer DWER 2019) found that environmental offsets" are poorly designed and implemented, delivering an overall net loss for the environment. The stated intent of the offsets policy, to only be used once proponents have exhausted all reasonable options to avoid or mitigate impacts on Matters of National Environmental Significance, is not occurring. In practice, offsets have become the default negotiating position, and a normal condition of approval, rather than the exception (Samuel 2020). • There is no guarantee that all species of Black cockatoos will readily breed in supplemented artificial nesting hollows and therefore this offset may not mitigate the loss of natural hollows. PHCC does not support that this offset will mitigate the loss of breeding incurred as a result of clearing natural nests. • Artificial nesting hollows for Black cockatoos provide only a "short-term" conservation action for Carnaby's black cockatoos. The study by found that on average, artificial hollows required maintenance within 3-4 years of being deployed and that in the absence of maintenance there is the risk that these hollows will cease to provide value over time. The Proponent will monitor and manage these hollows for a minimum of 30 years, and where required provide an endowment to a third party to ensure monitoring and management after this period. It is of concern that no details are provided on who will be responsible for the necessary maintenance of the artificial nesting resources for Black Cockatoos after 30 years for up to 200 years until rehabilitated Eucalypt species are old enough to produce suitable nesting hollows. • The Proponent acknowledges on page 6 of their "Offset Implementation Plan – Offset 4 Black Cockatoo Artificial Hollows Installation" that there is uncertainty within the scientific literature in relation to the use of artificial hollows in all circumstances, particularly for forest red-tailed black cockatoos. As there is lack of strong support from the scientific community that forest Black Cockatoos will readily breed in artificial nesting hollows, this offset is unlikely to mitigate the loss of breeding in natural hollows. PHCC does not support that this offset will mitigate the loss of breeding incurred as a result of clearing natural nests, especially for forest red-tailed black cockatoos. Although not confirmed through the ERD, the Proponent has verbally advised PHCC that the installation of Black Cockatoo artificial hollows as part of Direct Offset 4 (ERD Appendix L07) may be on the Swan Coastal Plain based on breeding success of Black cockatoos in the area. The Offset Implementation Plan Section 3.1 states "Worsley Alumina will target sites within 50 kilometres of the PAA where possible. Sites outside this range may be selected dependent on suitability." The use of the term "where possible" is non-committal and PHCC does not support the location of artificial hollows which will not directly benefit the local Black cockatoo species populations. Protection and restoration of existing nesting, roosting and food habitat is always in preference to an offset. There is currently limited data of breeding sites within the Boddington and surrounding wheatbelt area and this needs to be a focus for the location of proposed offsets. • The WA offsets review found that "Offsets do not offset the impact of development, and overall there is a net loss of habitat and the offsets policy permits continued environmental decline" and "Despite land acquisition offsets, there has been an overall reduction in the area of native vegetation". The review specifically notes for Carnabys cockatoos that the EPA found that "the high proportion of land acquisition offsets for this species has contributed to the overall reduction in the area of its habitat" (EPA cited in DWER 2019).	DWER (2019) Review of WA offsets policy framework DAWE (2020) Independent Review of the EPBC Act - Interim Report, Chapter 8 – Restoration, Dept. Of Agriculture, Water and the Environment, Accessed on 25/08/2022. https://epbcactreview.environment.gov.au/resources/interim-report/chapter-8-restoration
3.2.8 Quokka	*Not supported*	*There are significant impacts to Quokkas which are not adequately addressed through avoidance and mitigation (rehabilitation and pre-clearance) residual impacts* *No detail is provided on*	*Any clearing of known and likely habitat and linkages between habitats is contrary to advice of experts and the precautionary principle which must be applied under the EP*	Quokkas have been recorded in the Primary Assessment Area in three habitat types: Jarrah/Marri communities, Blackbutt (Yarri) woodlands and Jarrah/Marri/Allocasuarina complexes, which make up approximately 493 ha of the Contingency Bauxite Mining Area (CBME) (ERD, p325). Approximately 236 ha of this habitat is planned to be cleared, which is equal to 48% of the Quokkas' habitats in the PAA (ERD, p349). Mainland Quokkas face a particular and significant threat of extinction in the Northern Jarrah Forests with as few as 150 individuals estimated to remain in the sub-population (Bain 2015; Department of Environment and Energy 2016). Bauxite mining is the primary cause of clearing of this threatened mammal's forest habitat in the Northern Jarrah Forest sub-population (*A Thousand Cuts*, p20). The species requires a very particular habitat, are impacted by fragmentation of their habitats, and are losing resilience and the ability to recover from disturbance (WA Forest Alliance *et al* 2022, p20).	ERD, p235 Bain 2015 Department of Environment and Energy 2016

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		cumulative impacts for the species *Clearing of known and likely quokka habitat and impacts to linkages on this scale is contrary to technical advice, Recovery Plan objectives and is likely to have serious impacts to a species already under stress/in decline*	*Act and EPBC Act* *The EPA objective for terrestrial fauna specific to Quokka cannot be met* *The proposal should be rejected by the EPA*	The Quokka Recovery Plan (Department of Environment and Conservation 2013) finds that certain actions occurring in habitat critical to the Quokka's survival may have significant impacts. These actions include: any increase in human activity that leads to degradation of habitat; any significant increase in land clearing that leads to cumulative loss or degradation of available foraging, nesting, feeding, hibernation or migration habitat; and clearing of existing habitat that is to be offset by revegetation at another location that results in a net loss in the short or long-term (p17). Clearing of known and likely quokka habitat and impacts to linkages on this scale is contrary to technical advice, Recovery Plan objectives and is likely to have serious impacts to a species already under stress/in decline. <u>Cumulative Impacts</u> No detail or assessment of cumulative impacts is provided on this species, a critically important gap given the localised and broader impacts from Alcoa's previous, current and forecast mining to the west of the PAA in the northern Jarrah Forest. <u>Avoidance</u> • Proposing clearing of 48% of Quokka habit in the PAA is indicative of no reasonable attempt to reduce direct impacts. • The protection areas plan and ecological linkages fail to ensure that large areas of contiguous mature forest habitat is protected to meet the species requirements. <u>Mitigation</u> • The Proponent acknowledges that rehabilitation is of low mitigation value for Quokkas as anything less than 20 years old will not meet the species' habitat requirements (ERD, p410 and 659). Accordingly, addressing impacts will rely on offsets, specifically the implementation of the Protection Areas Plan. • As part of the preclearance surveys to mitigate impacts to quokkas, no targeted pre-clearance trapping and suitable relocation is proposed. As no specific habitat features are defined for quokkas, no searches are proposed. No reference is provided to staged clearing only directional clearing toward remnants as a mitigation strategy. Given mitigation and measures proposed do not adequately address risk of mortality and injury, greater avoidance measures are needed to prioritise protection of larger area of quokka habitat and breeding sites.	WA Forest Alliance et al (2022) Death by thousand cuts report Department of Environment and Conservation (2013)
3.2.9 Western ringtail possum	*Not supported*	*An unacceptable amount of 236 ha of habitat for the Critically Endangered WRP in the CBME is proposed to be cleared representing approximately a 48% reduction of potential habitat* *87 individual WRP at direct and indirect risk of injury and mortality* *Unethical and ineffective preclearance surveys*	*There should be no clearing of known and potential habitat, or linkages between habitats, for Western Ringtail Possum given its Critically Endangered Conservation Status* *The EPA should reject this proposal to prevent potentially severe impacts on this species*	The Western ringtail possum is a Critically Endangered marsupial recorded in the Contingency Bauxite Mining Envelope (CBME) and the Refinery Lease Agreement (RLA) area. The species is considered likely to be using habitats covering approximately 493 ha of CBME. Under the species' National Recovery Plan (Department of Parks and Wildlife 2017) habitat loss and degradation is listed as a key threatening process and that any habitat where western ringtail possums occur naturally are considered critical and worthy of protection (p7). It states "The loss and fragmentation of native vegetation cover is identified as one of the principle factors threatening western ringtail populations. This is due to their high dependence on midstorey and overstorey vegetation for food, shelter and protection from predators. The long-term viability of populations is further compromised by the size of, and connectivity between, habitat remnants" (ERD, p14). In the ERD, the Proponent states that 'approximately 236 ha of potential habitat for the species is located in the CBME IDF" and that "Habitat loss within the CBME may impact this species" (ERD, p348). The clearing of known and potential habitat and impact to linkages between habitats is likely to detrimentally impact the species, with unacceptable impacts that cannot be adequately offset to a critically endangered species. <u>Cumulative Impacts</u> No cumulative impacts have been assessed for this species. <u>Mitigation</u> • The Proponent acknowledges that its rehabilitation under 20 years of age is of low mitigation value to Western Ringtail Possums because of their particular habitat needs (ERD, p410 and p660). Accordingly, the company proposes specific offsets through the implementation of the Protected Areas Plan (ERD, p348) (see below). • Preclearance surveys plan for WRP fails to mitigate impacts to this species. The Proponent fails to follow current standard or best practice for species, which includes sensitive preclearance to reduce myopathy or trapping and relocation with appropriate	ERD, p324 Department of Parks and Wildlife (2017) ERD, p348

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				monitoring. The former has been found to be ineffective in recent Main Roads WA clearing for the Bunbury Outer Ring Road in Gelorup, where they have reverted to trapping and relocation. In contrast, the Proponent proposes no trapping or relocation, and instead rely on identifying and checking all suitable hollows prior to clearing, marking of the tree, temporarily deferring clearing until the "animals have moved from the hollow whereby clearing will again be permitted" (ERD, p 388). This is of significant concern given no trapping and relocation with appropriate monitoring is proposed (subject to licencing), searches for dreys is not mentioned in the ERD but only the Preclearance plan, clearing of trees would be deferred but animals would be expected to disperse into already cleared areas and the relatively small home ranges of the species (averages of <5 ha and 2.7 ha in jarrah forest areas reported by DPaW, 2017c) means that animals are unlikely to move from hollows unless during night time. Consequently, there is high risk of direct injury and mortality to animals remaining in hollows or dreys during the day. Based on home ranges of 2.7ha in the jarrah forest, 236ha of clearing could result in direct impacts to approximately 87 individual WRP. Waiting for animals to leave hollows or dreys in small home ranges during the day into cleared areas is a completely unethical and ineffective means to mitigate impacts. • Furthermore, there is no mention of increased effort for introduced predator control in or near clearing areas, where animal is encouraged there is increased risk to the species, as shown with the predation of WRP directly associated with clearing in the Gelorup corridor clearing (August 2022).	
3.2.10 Woylie	*Not supported*	*Unacceptably high direct and indirect habitat impacts on a local and regional level to a Critically Endangered species* *Failure to adequately apply mitigation hierarchy to avoid, minimise and mitigate impacts reflective in extent of residual impacts and offset required* *The proposal will exacerbate key threatening processes identified in the National Recovery Plan* *The Proponent has not met the EPA or EPBC standards for Woylie*	*The proposal cannot meet the EPA objective for this species under the Terrestrial fauna factor* *The EPA should reject the proposal to prevent potential impacts at a local and even regional level*	Woylies were once widespread across Australia but are now listed as Critically Endangered 'following estimates of a 90% decline in population size between 1999 and 2006' (DBCA 2017). Decline and threats to Woylies include habitat alteration directly from landclearing which have reduced the effective area of habitat that meets all of the food and shelter requirements of woylies and increases their vulnerability to exotic predators, vegetation change caused by the root pathogen *Phytophthora cinnamomi* and impacts of climate change, P 68- In the National Recovery Plan (DEC 2012 the known and potential threat is habitat alteration (including land clearing, altered fire regimes and vegetation change due to dieback). These threats are all associated either directly or indirectly with the Proponents mining operations. The proposal and subsequent impacts are incongruent with Recovery Plan objectives. Known and potential threats listed in the National Recovery Plan as habitat alteration (including land clearing, altered fire regimes and vegetation change due to dieback). The Proponent states in the ERD that the revised proposal "may" exacerbate these threats, however it is likely that the proposal will contribute and exacerbate these threats. • The species "preferred habitat exists throughout the PAA" (ERD p679) thus direct and indirect impacts to Woylies are likely to be large scale and widespread across the PAA. The Proponent acknowledges that there is potential to impact the Woylie not only at a local level as a result, but also at a regional level (ERD, p377 – 378). • The Proponent openly states in their ERD that the mine operations' emissions alone (without factoring loss of forest stored carbon) will contribute to climate change, listed as threatening process for Woylie in the National Recovery Plan. • Woylies now require particular and active habitat protection for their well-being and survival. Key habitat for Woylies is known to be long-unburnt tall forests and woodlands, which is a habitat in short supply across their range. Woylies are likely to be associated with the 'larger contiguous forested areas in the PAA' and the Proponent acknowledges that the 'loss of larger stands of contiguous remnant native forest may impact the local population of the species' (Table 5-34) (ERD, p337). • The Proponent proposes to clear up to 2,631 ha of the 4,385 ha (60%) of the Woylie habitat identified within the PAA (Appendix E04 Protected Areas Plan, p11). The estimated 'adjusted impact' (after mitigation measures and in consideration of habitat quality) is 1,857 ha for the Woylie (ERD, p640). The identified 4,385 ha of Woylie habitat in the PAA is shown in Appendix E04 (p13). This direct impact is in addition to other impacts from fragmentation, cumulative impacts and rehabilitation providing suboptimal habitat for the species. • The Proponent acknowledges that the Woylie is particularly threatened by its proposed clearing and that the loss of larger stands of contiguous remnant native forest may impact the species at a local and even regional level (ERD, p337 and 343). They acknowledge that there is potential to impact the Woylie not only at a local level as a result, but also at a regional level (ERD, p377 – 378).	DBCA (2017) Fauna Profile - Woylie Bettongia penicillata ogilbyi, Dept. Of Biodiversity and Conservation, accessed on 25/08/2022. https://www.dpaw.wa.gov.au/images/documents/plants-animals/animals/animal_profiles/woylie_fauna_profile.pdf Department of Environment and Conservation WA (2012) *Woylie National Recovery Plan*

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				• The Proponent states the “revised proposal “may” exacerbate the threat from habitat loss and degradation” (p682) which is a key threatening process under the species National Recovery Plan. Through clearing of 1,754ha of Woylie habitat, fragmentation of a significantly larger area of habitat (4,385 ha) and progressive rehabilitation of cleared areas which takes years, centuries to rehabilitate and provides suboptimal habitat for Woylies, the proposed activities will cause a direct loss of habitat and degradation of a wider area of habitat. Impacts on this scale, both local and regional, which contradict conservation advice within the Recovery Plan cannot be adequately offset for a species that is at risk of extinction. Avoidance measures of not clearing of 2,631 ha but clearing 1,754ha is not sufficient to avoid significant impacts which are not able to be offset. • The Proponent has failed to demonstrate they have made all reasonable and exhaustive attempts to avoid impact to Woylies. The extent of clearing of Critically Endangered species’ habitat highlights that the hierarchy of considerations that is embedded in State and Federal offsets policy when planning impacts on MNES has not been properly applied. In the first instance impacts to MNES should be avoided with all reasonable efforts made to avoid, then remaining impacts mitigated. The 'residual impacts', those remaining after all reasonable efforts to avoid and mitigate have been exhausted, can then be offset, in accordance with the rules of the offsets policy. Clearing of 60% or 2,631 of the highest conservation category MNES species with a large offset proposes indicates that avoidance measures have not been reasonably applied. • Recognising the significant residual impact, the Proponent proposes further measures in the form of specific offsets for Woylies including a fenced enclosure (Direct Offset 5) (see comments below). <u>Cumulative Impacts</u> • The ERD acknowledges the cumulative impacts from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss for Woylies associated with the Boddington Gold Mine and the South32 Revised Proposal (ERD, p376-377). The cumulative loss of habitat that would result from the Boddington Gold Mine and South32 proposal, of the 15,033 ha of suitable Woylie habitat if the proposal is approved would comprise a massive 3,215 ha or 21% of the PAA (ERD, p377). <u>Mitigation</u> • As a minimisation measure for Woylies, the Proponent suggests that “Rehabilitated habitat is likely to provide a level of value for Woylies given it will provide a suitable amount of habitat complexity to provide protection from predators, and also facilitate movement” (ERD, p660). However, no detail is provided on the probability of re-establishing high quality Woylie habitat in mined areas, or the timeframe to do so. • The Proponent’s mitigation measures for Woylies, including pre–clearance survey and post mining rehabilitation do not adequately address or risk of impacts. They acknowledge that its rehabilitation under 20 years of age is of low mitigation value to Woylies because of their particular habitat needs (ERD, p410). By way of mitigating impacts, the company proposes not to ‘clear more than 2,631 ha of the 4,385 ha of Woylie habitat identified within the PAA as outlined in the Protected Areas Plan’ (ERD, p425). The Proponent will thus avoid clearing 40% of the Woylies preferred suitable habitat (ERD, p343). The company further proposes protection of inadequate ‘ecological linkages’ and there is a specially flagged note in the Protected Areas Plan (Appendix E04, p4) that states that the Protected Areas identified in the plan in Figure 4 may be modified, reduced or removed with approval from the EMLG. <u>Management Plan and Preclearance</u> As part of preclearance surveys to mitigate the high-level impact across 2,631 ha to Woylies, the Proponent does not propose any targeted trapping and relocation program. This is despite this being regarded as best practice and standard in other clearing projects where threatened fauna species are involved and are readily trappable and able to be successfully relocated. Instead, pre-clearance survey focusses on identification of habitat features and destructive to encourage dispersal to a remnant. While signs of foraging activity can be identified, locating nests is extremely difficult given the hidden, minimal changes made for nesting. Furthermore, Woylies have no specific breeding period thus destructive searches of habitat at any time of the year can impact adults and young. <u>Offsets</u>	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				• The significant offsets proposed are reflective of the failure to make all reasonable and exhaustive attempt to adequately avoid and mitigate impacts to the Woylie. • The offset of a fenced enclosure proposed for the Collie area is problematic for the following reasons: – The offset does not fully counterbalance the significant residual impact of the proposal and does not represent the preferred "like for like" or at the very least "like for similar" principle in state and federal offsets policy. – As it contains existing native vegetation, the proposed offset results in net loss of vegetation from the 2,631 ha of habitat cleared. – The enclosure site is located on Lot 102 and 100 currently owned by Worsley Alumina, and the offset would not offset or provide local benefit to the area impacted. – It does not appear that the Proponent has undertaken adequate levels of consultation with stakeholders, including DBCA and Woylie Recovery Team, only that it will aim to "develop…a process to effectively manage the Woylie population". – While predator free fenced enclosures are an important conservation tool, there are already at least 5 Woylie fenced predator free enclosures already in existence in Western Australia, with more throughout Australia. – No information is provided on agreements, consultation or suitable recipient sites for translocated Woylies, and what agency would be responsible for management of recipient sites and populations. – No details are provided on the long-term management of the enclosure, including maintenance cost and maintenance of animals within it.	
3.2.11 Red-tailed phascogale	Not supported	*The ERD does not contain or consider current sighting records* *Clearing of 35% of red-tailed phascogale habitat is unacceptably high* *Preclearance surveys are inadequate and do not reflect humane welfare principles, industry standard or best practice* *Cumulative impacts are largely ignored*	*Given knowledge gaps in population size and trends in the PAA the Precautionary Principle must apply and no further clearing of the species habitat should be permissible* *The potential for the clearing to impact the species at a whole of population level makes the proposal unacceptable* *All remaining populations of Red-tailed Phascogale within the PAA should be protected from clearing and habitat degradation to prevent further*	Red-tailed phascogales are listed as vulnerable under the EPBC Act and the Western Australia population has contracted to less than 1% of its former range. Up to 84% of the native vegetation in its former range has been cleared for agriculture (Greening Australia, 2018). Red-tailed Phascogales rely on hollows, particularly in Wandoo trees, for nesting and denning, as well as hollows in logs and grass skirts of grasstrees (ERD, p323). The Proponent states it 'will not clear more than 449 ha of the 690.9 ha of Red-Tailed Phascogale habitat identified within the PAA as outlined in the Protected Areas Plan' (ERD, p425) and proposes offsets for residual impacts. This equates to clearing of a massive 65% of the species' habitat. Comments and rationale as to why this is acceptable is outlined in the following: • The Approved Conservation Advice from the Federal Department of the Environment, Water, Heritage and the Arts' Threatened Species Scientific Committee (2016) states that the 'main identified threats are loss of habitat to land clearing and salinity, increasing habitat fragmentation… loss of tree hollows (including old growth paddock trees) and drought (Short and Hide 2012). The Advice lists Regional and Local Priority Actions, including, 'Ensure there is no disturbance in areas where the Red-tailed phascogale occurs' and 'Protect populations of the listed species through the development of conservation agreements and/or covenants.' • Also listed as a threat to Red-tailed phascogales in the Approved Conservation Advice for the species is predation by European red foxes and cats which have the potential to increase under the revised proposal (ERD, p369). • Habitat loss and clearing is one of the key threatening processes of the Approved Conservation Advice for the species. The Proponent acknowledges that 'the loss of nesting hollow trees and fragmentation of habitats due to clearing associated with the Revised Proposal has the potential to impact the species at both an individual and population level' (ERD, p347). • Activities proposed are in direct contradiction of Approved Conservation Advice for Phascogale calura (Red-tailed phascogale) objectives and will likely contribute to ongoing decline. Unacceptably high impacts proposed given the extent of decline and current threats. • All known populations are considered essential for the species recovery and long-term survival because of male die-off life history of this species, it is considered more susceptible to local extinction due to stochastic events or threats. • No overall population size or trend data are available for the species. Population numbers are unknown and reaching an accurate estimate is very difficult as the species exists as many small, scattered sub-populations. The species also demonstrates annual male die-off, so population size fluctuates within and between years. • 2 Red-tailed phascogale sightings have been recently reported near Boddington. One recent sighting on Forest Street just east of the Boddington townsite was only 1.3km from the WMDE. This Red-tailed phascogale was captured on a monitoring camera and	Greening Australia, 2018 Approved Conservation Advice for *Phascogale calura* (red-tailed phascogale) Threatened Species Scientific Committee (2016) Short and Hide (2012) Species Profile and Threats Database (SPRAT Profile), Department of Climate Change, Energy, the Environment and Water Olsson, 2021 (Fauna report form)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
			declines and provide for survival recovery of this species	reported to DBCA through a fauna report form (Olsson, 2021). Habitat type where the Red-tailed phascogale was sighted was open jarrah woodland. Another Red-tail phascogale was reported to DBCA on the 10/06/2021, 12km from the WMDE. Both of these sightings were not present in Figure 31 of the "Worsley Mine Expansion Primary Assessment Area PAA Desktop Fauna Assessment" (BIOSTAT, 2021). <u>Cumulative Impacts</u> The ERD largely ignores the cumulative impacts on this species. <u>Mitigation</u> • The Proponents statement that "impacts at a population level are less likely as suitable habitat will remain in the PAA and surrounding forested areas. It has been observed that the Red-tailed phascogale appears to have adapted to inhabiting small remnants; an attribute that has allowed it to exist throughout its current range (Short & Hide 2012; Short, Hide & Stone 2011, cited in BIOSTAT, 2021a)" these is problematic as the species is highly vulnerable to local extinctions in these small populations because of the male die off life history of the species (SPRAT Profile). • Expert advice is that old-growth values, including hollows in very old trees, are key habitat that the species relies on and calls for known populations and habitats to be protected. • As part of the pre-clearance surveys proposed for Red-tailed phascogales, the Proponent does not propose any targeted trapping, suitable hollows searching either pre or post clearing and animal relocation. Instead, they propose that where wandoo, *Allocasuarina* and grass tree dominated habitat is cleared they will "undertake the harvesting and habitat modification to discourage the species from utilising these habitat types", with no information provided how this will be undertaken and how it will minimise injury and mortality risk. • An increase in the number of pest animal species such as feral cats, foxes, pigs and rabbits the ERD states that the Revised Proposal has the potential to result in an increased presence of introduced fauna species as clearing can create corridors that facilitate movement of introduced fauna (ERD, p369). There is mention within the ERD that 1080 poison will be used, however feral cats are notoriously difficult to control using traditional 1080 baiting techniques due to the preference for hunting live prey (Fancourt et al, 2019). Eradicat baits are more effective at controlling feral cats however trapping and ground shooting should also be undertaken. There is no mention of using Eradicat as a control method for controlling feral cats in the ERD. <u>Offsets</u> The following offsets are proposed for the species: • 185 ha for habitat protection and management • 417 ha for ecological restoration and management • Value of mine site rehabilitation applied as an offset – 339 ha Habitat protection may provide habitat for Red-tailed phascogales however the value of this is considerable reduced due to lack of connectivity, sufficient introduced predator management and edge effects. Furthermore, the 417 ha of ecological restoration will be insufficient to provide suitable and high-quality habitat as the rehabilitated areas will not have the same vegetation structure and hollows to provide nesting sites. <u>Conclusion</u> Given Red-tailed phascogales survive in 1% of their former range (Greening Australia 2018), proposed land clearing of 449 ha of species preferred habitat is clearly unacceptable. It directly conflicts with formal conservation advice that there is no disturbance where Red-tailed phascogales occur. The Proponents statement that the likelihood of occurrence of Red-tailed phascogales within the CBME is unfounded, the cumulative impacts are largely ignored.	Fancourt et al, 2019) Greening Australia (2018)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				No offsets are appropriate for the species given the clear adverse and unacceptable impacts unable to be mitigated.	
3.2.12 Numbat	*Not supported*	*Impacts have been dismissed despite the PAA containing 11,858ha of total suitable numbat habitat* *Occurrence of the numbat has been rated as unlikely, despite evidence in four separate sightings within or close to the PAA in 2021* *Conclusions have been made based on incorrect, flawed assumptions* *The Proponent attempts to use previous non-target species survey , however insufficient targeted numbat surveys have been undertaken* *Due to the aforementioned, numbats have not been considered in habitat or impact assessment, management, preclearance survey planning, thus there is no consideration for avoidance,*	*The Precautionary Principle must apply to this species and the proposal be rejected* *At the very least, no clearing should be permissible until appropriate survey method and effort for Numbats is undertaken in the PAA and surrounding areas, including the north-eastern Jarrah Forest*	The Numbat is an emblematic, small, unique mammal that is difficult to detect by traditional survey methods and subject to significant knowledge gaps in its ecology and distribution, particularly in the northern Jarrah Forest. The Proponents PAA contains 11,858.4 ha of numbat habitat which would be impacted by large scale bauxite mining but attests occurrence of a Numbat population within the PAA and nearby forest areas as “unlikely”. This is despite Numbats being recorded in 5 records (1 opportunistic sighting and 4 captures on camera) of numbat within the WMDE (as per information provided to PHCC by South32), and 2 additional sightings within 1.5km of the PAA in 2021. This assumption is based on lack of appropriate targeted survey effort and method, incomplete and outdated information and assumptions incongruent with evidence. Due to this conclusion, Numbats have not been considered in any targeted survey, impact assessment, management, relocation planning, thus no consideration for avoidance, mitigation, rehabilitation or offsets measures, despite being listed as Endangered under State and Commonwealth legislation as a MNES. It is recommended that no approvals be granted until such time as the occurrence and assessment of impacts to numbat as a MNES are adequately determined. The state mammal emblem of Western Australia, the numbat is a small unique mammal listed as EN in state and Commonwealth legislation as a Matter of National Environmental Significance. With fewer than 1000 individuals currently remaining, most of which occur in southwest WA, each remaining subpopulation is of high value for the conservation of the species. The Numbat needs large areas of natural woodland vegetation because of their relatively large home ranges and exclusively diet resource of termites. The species’ strictly diurnal nature sets it apart from almost all other Australian terrestrial mammals. In addition to specific foraging requirements feeding exclusively on termites, Numbats are difficult to detect because of their solitary lifestyle, large home range and elusive nature and as such numbats have particular survey requirements as they are not able to be recorded via traditional survey methods and not able to be trapped. The National Recovery Plan (WA DPW 2017) lists key threats as habitat destruction, invasive predators and climate change (WADPW 2017), all of which are activities that are proposed and associated with the Proponents expansions proposal. <u>Suitable habitats</u> The Proponent has identified suitable habitat types for Numbat within PAA as Wandoo woodland (WO) - 2686.6 ha, Jarrah/Marri woodlands on slope (JM) - 3512 ha, Jarrah/Marri/Allocasuarina woodlands on slopes and ridges (JC) – 5208.6 ha, Marri/Jarrah on lower slopes (DL) – 437.1 ha and Low eucalypt woodland over low shrubs (ML) – 14.1 ha. The total suitable area habitat for Numbat within the PAA is therefore 11,858.4 ha however no information is given on the area of Numbat habitat that would be cleared aside from the 4,399ha of total native vegetation proposed to be cleared. The cumulative impacts of this to Numbats, as well as a number of other MNES, would be significant given the extent of historical and ongoing land clearing, fragmentation and disturbance, with cleared areas accounting for approximately 43% (12,708 ha). Current approvals and operations for mining are contributing to this, for example a large portion of the jarrah/marri fauna habitat type has been cleared for approved mining in the southern WMDE (Saddleback area). Other cumulative impacts include effects of a drying climate on feeding resources and pressures from feral cats and foxes, exacerbated by land clearing and fragmentation. The ERD wrongly states “there has been no other records of the numbat in the areas since the 1960s despite the extensive survey effort” (ERD, p322). The ERD should acknowledge a) there was 4 sightings within nine twelve months (April 2021, sept 2021, Dec	(ERD, p 322) WADPW (2017) Numbat (*Myrmecobius fasciatus*) Recovery Plan, WA Dept. Of Parks and Wildlife, Aust. Govt. Accessed on 25/08/2022. https://www.dcceew.gov.au/sites/default/files/documents/numbat-recovery-plan.pdf

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		mitigation, rehabilitation or offsets measures *Rehabilitation is likely to have low short to medium term value for numbats*		2021), b) provide results of searches of nature map, threatened flora records – 1908s, anecdotal info c) suitability of habitat, and d) provide results of an extensive appropriate survey (not undertaken). Despite 5 records (1 opportunistic sighting and 4 captures on camera) of Numbat within the WMDE (as per information provided to PHCC by South32) (See image to right and **Appendices** for Facebook post reporting the initial Numbat sighting), and 2 additional sightings within 1.5km of the PAA in 2021 a further record of a sighting 14 km North of the Williams town site on a property along the Albany highway in December 2021 (See image to right and **Appendices** for Facebook post reporting Numbat sightings on a landholders property in December 2021), and a lack of appropriate survey method and effort targeting the species beyond and only one localised, camera survey, the Proponent attests that the likelihood of a viable population currently existing in and around WMDE is considered low (BIOSTAT, 2021a). As such, no assessment of impacts, avoidance and mitigation, pre-clearance survey or offset calculations has been provided for the species. This is unacceptable given a) the species is recorded in the PAA b) the conclusions of low likelihood of a Numbat population are based on incomplete and outdated information and a set of scientifically unsound assumptions c) the extent of direct and indirect impacts on habitat and d) its persistence and occasional sightings to the north of WDME boundary (BIOSTAT, 2021 Fig 32). The statement that *"Given the lack of recent sighting reports in the decade before this one, long-term presence in the area is unlikely, as is the existence of unknown populations in the northern jarrah forest"* is unsound based on incomplete, outdated information, reflects the lack of appropriate survey method and effort. There has been a Numbat release in Mount Dale Northern Jarrah Forest that survived and thrived for some time. The NJF is within the numbats historical range. The Proponent states that the Numbat sighting was made on the eastern edge of the WMDE and is "immediately adjacent to areas of maturing rehabilitation (Biostat 2021a)". Three sightings (1 opportunistic and two camera captures) were in this location; however, another two camera captures were within intact mature vegetation in the WMDE. Note: Opportunistic sighting from March 2021, camera captures from April and September 2021 (note: September sighting not reported until December 2021). There has been extremely limited appropriate survey for numbats in the northern and eastern jarrah forest over the past decades despite occasional sightings in the same areas many years apart. The recorded individual on the eastern edge of the WMDE was not followed up with extensive wider scale survey using appropriate techniques for Numbats including cameras and dig surveys, no surveys for scats which would yield DNA comparison, rather only limited,very localised, non-continuous remote camera monitoring of the location site was undertaken. Key flaws, inadequacies and unsound assumptions in the Proponents assessment of a low likelihood of a population are: <u>Previous non-target survey</u> • Despite stating that there has been significant amount of survey effort in the PAA over many years there has been no targeted Numbat survey, with exception of camera trapping not undertaken independently, following a record in early 2021. No information is provided on the experience of field ecologists on detecting Numbat signs and scats nor the seasonality effort. The Proponent notes that at various times since 1982, searches targeting specific species were undertaken during the projects this does not include numbat (page 23). • The Proponents statement that the fauna data base contains over 39,444 observations (to the end of 2020) from many diverse sites and collected over 36 years (Extract from Existing Data page 8 Figure 2a-l2) is not sufficient reasoning to accept current data where target surveys for the Numbat have not been adequately undertaken. • Recent studies highlight the importance of finding the most appropriate detection method for Numbats (Seidlitz et al 2020) and acknowledging that a survey method's success depends on many factors, including species' characteristics, population density, habitat type, personnel skills, type of equipment used and survey timing. <u>Limited Numbat camera survey</u>	 *PHCC Facebook Post 18 May 2021 – see Appendices for larger image*  *PHCC Facebook Post 17 December 2021 – see Appendices for larger image*

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				• The data provided with the April 2021 South32 Numbat record does not include camera type, set up and placement or survey period. The gaps in the survey period, including during juvenile Numbat dispersal, fail to take into consideration seasonality and survey gaps therefore does not meet Targeted Surveys criteria, as defined in the current guidelines for fauna survey (Environmental Protection Authority 2020). • While camera trapping may detect elusive animals occurring in low densities, the method has not been tested for their efficiency for Numbats and if camera trap limitations are overlooked such as camera model, height and placement, animal population data from camera trap studies may be inadequate or flawed and misinform management (Seidlitz et al 2020). • Current research has shown that sign surveys can be more efficient than driven transects and cameras for Numbats (Seidlitz 2021). Despite this, the Proponent has not undertaken Numbat sign surveys by skilled and experienced observers and have only relied on limited camera surveys undertaken in 2021 and other non-target survey data. Current research (Seidlitz et al 2020) highlights that camera traps are not the preferred methodology for detecting Numbats, as such the high portion of camera trap data (camera days and hours) provided as a basis for precluding Numbat presence within the PAA are not entirely relevant. <u>Earlier sightings</u> • Dismissal of earlier sightings within the PAA, including a sighting in Marradong in 1997 as a Chuditch or Quenda, despite confidence at the time of submitting the record to State databases and the significant size, shape, patterning and behavioural (e.g., nocturnal and crepuscular nature) of these species even to an untrained observer. <u>Detection rates</u> • Contrary to statements that Numbats are highly visible and active during that day and thus would have been more observable within the PAA, and Numbats are small and well camouflaged, and therefore difficult to spot. The statement that "*a high degree of assurance that the very obvious signs of Numbat activity would have been identified*" (BIOSTAT Pty Ltd Fauna Assessment Aug 2021 page 88 -90) contradicts knowledge and research. • Numbats are incredible elusive and extremely well camouflaged. The white stripes on a Numbat back help them to disappear in their natural habitat. You can drive around Dryandra all day and not see a numbat and this area is highly populated. In a sparsely populated dense jarrah forest individual numbats would be incredibly difficult to see. • It is well documented that Numbats have low detection rates particularly in low density populations, even when appropriate survey methods are used. For example, in transect sampling drive surveys conducted in a semi–arid fenced feral predator free reserve where visibility and detectability would be greater than in a forest or woodland environment, 10 Numbats were observed in 500km, equivalent to one Numbat observed per 50km (Veira et al 2007). <u>Origin of sightings</u> • The Proponents record of a Numbat in April 2021 as representing a dispersal event from Dryandra to Boddington is *highly implausible.* Dispersal of this magnitude and across a hostile, extensively cleared landscape with 5 major road crossings does not align with recorded dispersal distances and evidence that farmland represents a significant barrier to dispersal. The species National Recovery Plan provides examples of dispersal of short distances across farmland, farmland represents a significant barrier to dispersing Numbats due to high predation risk both from native species and feral cats and foxes. The Recovery Plan notes that "radio-tracking of dispersing numbats has shown that they rarely cross farmland, but often end up in suitable habitat at the edge of cleared land. This evidence indicates that the farmland-forest interface is a barrier for dispersing numbats." • The direct straight-line distance of approximately 35 km would represent an extreme and unprecedented dispersal distance event that would defy all known recorded dispersal distances recorded in radio tracked individuals and all previously known dispersal events. • Given these reasons, it is highly implausible that any of the Boddington area numbat/s sighted, including those within the PAA, have dispersed from Dryandra. It is more probable, that sightings in the PAA and nearby area represent extension of a population in low densities between Quindanning and Youraling in the eastern Jarrah Forest. Whether or not a single Boddington sighting is a dispersal from Dryandra, it represents species presence in the PAA, and as such should be included in all South32 assessment.	Environmental Protection Authority (2020). Seidlitz *et al* (2020) Veira *et al* (2007)

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				• The dispersals quoted as occurring from Dryandra to at least the Pingelly townsite would have far more likely been dispersal from Boyagin Nature Reserve at a straight-line distance of 12.3 km rather than the quoted and far less likely 22km distance over a hostile landscape. "Specific instances of numbat sightings well away from Dryandra Woodland but most likely due to dispersal from Dryandra around the 1992 population peak include records from the Pingelly townsite (1991: 22 km from the closest part of the main block of Dryandra) and from Claypit nature reserve (1995: 25 km). <u>Avoidance, Mitigation, Rehabilitation and Offsets</u> No assessment of impact, avoidance, mitigation or offset calculations have been provided for the numbat despite evidence of recent occupation of the PAA and surrounds. No information has been provided on the suitability of proposed rehabilitation for numbat, particularly given their dependence on subterranean and above ground sources wood-based sources of termites. <u>Threatened Fauna management plan including preclearance</u> Despite Numbat being listed as a species that may be considered in addition to those listed within the Threatened Fauna Management Plan that includes the necessity for preclearance surveys, no preclearance surveys are proposed. <u>Conclusion</u> On the basis of five sightings in the WDME area in 2021 alone and all other information provided, it cannot be concluded with any scientific certainty that the continued occurrence of numbats in the PAA, and surrounding areas is low. For reasons outlined, there adequate information to indicate that Numbats occur within and/or close to the PAA and as such should be assessed for impacts in the proposal. Targeted surveys are required for EPBC listed species. The survey effort performed by South32 does not meet the EPBC Act 'Survey Guidelines for Australia's Threatened Mammals (2020) and cannot be considered a 'robust evaluation of Numbat absence' Based on the above the Proponent has failed to meet requirements to consider all threatened fauna under the EP Act and that approval for clearing and mining within the PAA should not be approved until numbat as a MNES is addressed.	
3.2.13 Chuditch	*Not supported*	*Significant impacts proposed even after avoidance and mitigation* *Chuditch habitat clearing exceeds intact proposed native vegetation clearing (5,915ha vs 4,399ha) leading to greater impact* *Proposed clearing reflects a key threatening process in the*	*The species is already in decline at least in part from the Proponents mining and further impacts are unacceptable* *The EPA objective cannot be met and the proposal should be rejected*	The Chuditch Recovery Plan explains that the mammal has disappeared from approximately 95% of their former range in the last 200 years', with habitat reduction being a primary cause (DEC 2012). Chuditch are 'most abundant in areas of contiguous Jarrah forest' (Australian Wildlife Conservancy 2022). 'Chuditch require large areas of intact habitat to survive. Chuditch are rarely found where habitat is severely fragmented by clearing, except as transient animals. Loss and fragmentation of quality habitat for agriculture, residential and mining development has contributed significantly to the decline of Chuditch populations in the south-west of Western Australia. Clearing is particularly deleterious where: the affected land includes or adjoins riparian habitat (Serena and Sodequist, 1989); it creates new gaps in otherwise homogeneous habitat; it leads to progressive fragmentation of habitat; or it necessitates the construction of roads (especially sealed roads) through, or adjacent to, uncleared habitat according to the *Chuditch Recovery Plan 2012*, p13-14. Noting the severe potential impact of mining on Chuditch, the Recovery Plan says: 'The presence of Chuditch has the potential to have an economic impact on development and mining where clearing of Chuditch habitat is proposed. This is becoming apparent in the south-west where extensive mining tenements exist in significant forest habitat. Exploration for bauxite in these tenements has commenced but currently no new mining operations have been approved' (*Chuditch Recovery Plan 2012*, 16-17). As stated in the Chuditch National Recovery Plan one of the major threats to Chuditch is land clearing, particularly of riparian vegetation, and the removal of suitable den logs and den sites from Chuditch habitat. Free-ranging population of Chuditch are now restricted to WA within 5% of their historical range. Also listed as a major threat to Chuditch is predation by and competition by foxes and feral cats and	DEC (2012) Chudtich Recovery Plan, Dept. Of Environment and Conservation, Govt. Of WA. Accessed on 25/08/2022. https://www.dcceew.gov.au/sites/default/files/documents/dasyurus-geoffroii-2012.pdf Australian Wildlife Conservancy (2022) Western Quoll / Chuditch - AWC - Australian Wildlife Conservancy

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		species Recovery Plan *The Proponent acknowledges recent decline of Chuditch in the PAA potentially due to large scale clearing and fragmentation due to mining* *Impacts are proposed at population level* *Small, disconnected remnants in protected areas and linkages planning is insufficient to avoid and mitigate impacts to clearing 5,915 ha of potential Chuditch habitat* *Proposed preclearance methods for Chuditch are ineffective and harmful* *Significant cumulative impacts, even without Alcoa's clearing and other impacts including logging and agriculture*		deliberate and accidental mortality including road kills, both of which will increase with increase land clearing and mining activities. There have been Chuditch sightings throughout the WMDE and the clearing of 4,399ha of native vegetation that provides habitat for Chudith should not be cleared as it goes against the first recovery action in the Chuditch Recovery Plan to retain and improve habitat critical for survival (DBCA 2021). • The ERD describes a reduction in the drop in the number of Chuditch in recent years and says: 'This could potentially be due to habitat fragmentation from land clearing associated with agricultural activities and mine operations, and the lack of sufficiently mature rehabilitated areas to support this species, or predation from introduced fauna (e.g., cats and foxes) (BIOSTAT, 2021a)' (ERD, 321). • Chuditch diet consist of insects and other large invertebrates, mammals, birds and lizards and carrion. Chuditch will consume the remains of animals killed on the road and forage along road and dirt tracks (DBCA, 2012) leaving Chuditch vulnerable to vehicle strikes with an increase in mine operations traffic. • Chuditch are solitary animals for most of their life. Chuditch have relatively large home ranges males 1500ha and females 300-400 ha. These home ranges may overlap, however there tends to be a smaller non-overlapping 'core' area defined by den locations. Core areas are 400ha and 90ha for males and females respectively. Females tend to be territorial (DBCA, 2012) and therefore clearing 5,915 of potential Chuditch habitat will displace Chuditch which may then not be able to find another den and females may not be able to find a new unoccupied territory. • 'Impacts at a population level may also occur if suitable habitats become highly fragmented and important movement corridors are lost.' (ERD, 343-44). <u>Mitigation</u> • The Proponent states it 'will implement a number of mitigation and management measures to minimise potential impacts to the Chuditch as a result of the Revised Proposal (Section 5.3.5), citing the Protected Areas Plan and proposed offsets and suggesting that rehabilitation areas will 'in time' provide habitat (ERD, 344 and Appendix L22, S118). • As part of preclearance surveys to minimise risk of mortality and injury to Chudtich, the Proponent does not propose any targeted trapping and relocation despite this being a standard practice for other recent large scale clearing applications for quoll species (Main Roads WA 2020). <u>Cumulative impacts</u> • Clearing associated with the Revised Proposal will result in the loss of approximately 38% of suitable habitat for the Chuditch within the PAA. Habitat loss is expected to impact individuals within the PAA.' The loss of approximately 38% of suitable habitat for the Chuditch is equal to 2,018 ha. Note that the actual area of Chuditch habitat proposed to be cleared (Pg 377 Chuditch) is approximately 5,915 ha of potential suitable habitat (comprising 5,310 ha of preferred habitat and 605 ha of rehabilitation), representing 14% of the WMA; which exceeds the 4,399ha applied for. The Proponent states that this area of Chuditch habitat exceeds the 4,399 ha amount due to clearing of rehabilitation and plantation, which nevertheless at least in part forms habitat for Chuditch. • The ERD acknowledges the cumulative impacts from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss for Chuditch associated with the Boddington Gold Mine and the Worsley Revised Proposal (ERD, p376-377). • The cumulative loss of Chuditch habitat that would result from the Boddington Gold Mine and this proposal would comprise 7,429ha from clearing, representing 21% of the PAA. Further losses from the Proponents conditional clearing approvals in the extended mining area (Ministerial Statement 719) comprise an additional 8,000ha on top of this 7,429 ha. Further losses including Alcoa clearing and other impacts including logging and agriculture are not quantified. • Further losses from Alcoa clearing and other impacts including logging and agriculture are not quantified. <u>Offsets</u>	Serena and Sodequist (1989) Main Roads WA (2020) EPBC 2017/7880 Annual Compliance Report, Govt. Of WA. Accessed on 25/08/2022. https://www.mainroads.wa.gov.au/globalassets/community-environment/environment/construction-reports/marble-bar-road-coongan-gorge-realignment-annual-compliance-report-2019-20.pdf?v=4963d4To

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				• 4,395 ha for habitat protection and management (Direct Offset 1,2) • 5,081 ha for ecological restoration and management (Direct Offset 1,2,3) • Value of mine site rehabilitation applied as an offset – 4,826 ha (ERD, p640) • Ecological restoration and rehabilitation don't provide appropriate habitat for Chuditch. <u>Conclusion</u> Habitat loss, habitat fragmentation and insufficient maturity of rehabilitated areas are likely to impact this species at a local level and potentially at a regional level. This revised proposal goes against recovery recommendations for this threatened species. PHCC believes that the Proponent has not demonstrated that on-ground works will not have an impact on the Chuditch, or on its habitat or potential habitat as outlined in the Chuditch Recovery Plan.	
3.2.14 Short Range Endemic (SREs)	*Not supported*	*The proposal is highly likely to result in impact to, including loss, of SRE fauna which includes endemic and possibly new taxa* *Mitigation measures are vastly inadequate* *High SRE value habitat is vastly underestimated due to contradictory ratings and calculations, thus impacts to SREs underestimated*	*Due to significant knowledge gaps, study limitations, miscalculation of impacts and seriousness and potential irreversibility of threats to SRE taxa the Precautionary Principle should be applied to SREs and the proposal be rejected.* *Given significant taxonomic and impact knowledge gaps, the Precautionary Principle must be applied to SREs and no approvals granted until taxonomic and impact gaps are addressed.*	Short-range endemic (SRE) fauna are highly localised fauna species that are highly represented in the area, with a total of 89 SREs recorded in the PAA, including 22 that have been recorded only in the PAA (ERD, p328). The collective studies in and around the PAA and the Huntly Mine expansion indicate that short-range endemism in the invertebrate fauna in this area of the Northern Jarrah Forest is much greater than previously understood (Phoenix, 2021b). While none of the SREs recorded in the surveys relevant to the PAA were listed under the EPBC Act, the BC Act or the DBCA Priority species list, the Proponent acknowledges that some taxa may still be considered conservation significant owing to either the poor state of taxonomic or genetic knowledge for the species collected, limited ability to identify some specimens (i.e. inadequate life stage or sex, or specimen in poor condition) and limited studies of SRE distribution within the Northern Jarrah Forest (ERD, p355). Moreover, these taxa may be formally listed as conservation significant taxa in the near future given taxonomic study and the extent of the cumulative and current threats to the Northern Jarrah Forest, including from large scale bauxite mining. <u>Proposed Impacts</u> The Proponent readily acknowledges that the area of occupancy and overall distribution, abundance and productivity of SRE taxa "could be reduced by the Revised proposal" and decline in the PAA and that some taxa will not recolonise or be favoured by rehabilitation. *"*As the majority of SRE taxa recorded within the PAA typically appear to have small ranges (generally <20 km), surveys to date suggest that rehabilitation does not appear to favour cryptic taxa and translocation is not considered a viable option for SREs, the area of occupancy and overall distribution of some taxa could be reduced by the Revised Proposal. Therefore, the distribution, abundance or productivity of SRE fauna within the PAA may decline" and "it is also possible that the area of occupancy of the known SRE taxa within the PAA IDF will be reduced by the Revised Proposal, given the distinct assemblages of the WMDE/BTC and CBME and nearby Huntly survey area and the scale of the Revised Proposal*"*. Given the extent of direct and indirect impacts to SRE habitat, even with errors and underestimates in assessment these consequences highly likely rather than just possible. <u>Protected Areas</u> The Proponent proposes that protection areas alone can satisfactorily avoid these impacts. However, the major inadequacies in the protection areas particularly for SRE taxa, do not reduce the threats from the clearing, particularly for the seven taxa which only occur in the IDF. More detail on this provided below and under **Section 3.2.3**. <u>Knowledge gaps and study limitations</u> There are study limitations in the Proponents assessment of SRE fauna and impacts. This is compounded by significant knowledge gaps in the SREs in the northern Jarrah Forest as well as in the PAA, even with the series of surveys undertaken through the ERD.	ERD, p 327

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				The EPA guidance for sampling of SREs acknowledges that conclusively determining the conservation significance of potential SRE taxa is often made difficult by the absence of regional context and given the knowledge gaps in the Northern Jarrah Forest for context, including trends and cumulative threats, the Precautionary Principle must be applied when assessing SREs within the PAA. There is significant uncertainty with the taxonomic classification with many of these, including potential new taxa. The Proponent states that "of the SRE species collected in the surveys [including of the wider area], twenty-eight remained indeterminate … It is possible that the indeterminate taxa represent any of the collected or previously collected taxa, or possibly new taxa" (ERD, p328). While additional survey was undertaken outside of the Worsley Refinery area over the last several years (Phoenix 2021b, ERD, p301), there are time limitations on the remainder of SRE survey undertaken outside of the PPA in all other areas. SRE surveys were undertaken in spring 2011 in the PAA in the north areas outside of the PAA, making these surveys over 11 years old. Given mass mortalities in the jarrah forest in 2010/11 (WA Forest Alliance et al 2022), extent of cumulative impacts described earlier (**Section 1.1** and **3.2.1**) that include large scale bauxite mining in the NJF and declining rainfall, 11-year-old data cannot be relied upon to provide accurate contextual information on occurrence of SREs (ERD, p300). There is also a significant limitation in the survey method affecting confidence in scientific rigour and uncertainty in assessment of impacts. The Proponent recognises that data is only available for a small portion of the proposed disturbance area as it "is impractical to characterise the entire area for all invertebrate fauna, given its significantly large size (ERD, p356). The significantly large size of the application area should not preclude the proponent from the requirement for spatially comprehensive and robust survey be undertaken. On the basis of study and data limitations, all results, assessments and conclusions are made with lower confidence, lacking significant scientific rigour and containing uncertainty. The Precautionary Principle should be applied in this case due to the seriousness and potential irreversibility of the threats to at least some SRE taxa and as there is "plausible evidence of possible harm, but scientific uncertainty and ignorance makes it impossible to reliably quantify the threats and characterise the risks" (UNESCO 2005) <u>Limited data – extrapolation and surrogacy</u> The Proponent has based spatial occurrence (hectares) for each SRE species on distances between known point locations for each species acknowledging that as many species recorded in the surveys are new previous records are limited it is difficult to define the spatial extent (hectares) of the majority of the SRE taxa (Phoenix, 2021b). In recognition of this, and considering the large scale of the dataset being analysed, the distance between known point locations for each species was used as a surrogate for spatial occurrence (hectares). Relying on the area between point-based data in restricted and data sets as a surrogate for spatial occurrence does not suffice for scientific rigour and high confidence in understanding of the distribution of SRE taxa. <u>High risk taxa</u> The Proponent concedes that "Of the 97 taxa recorded in the PAA from surveys and the WAM database records, six taxa were found to be at high risk from the Revised Proposal based on their local restriction of recorded occurrence (Phoenix, 2021b)" (ERD, p411). SRE fauna are generally at greater risk of being affected by habitat loss than other, more widely distributed taxa due to their existence as small, localised populations. Vegetation loss and fragmentation will be more likely to impact SREs that are restricted to certain vegetation types or by microclimatic variations (Phoenix, 2021b). The Proponent further concedes there may be a number of SRE species in the areas to be cleared that have never before been formally described and that while 'the more 'common' or 'widespread' SRE taxa can recolonise rehabilitation areas, the more cryptic taxa area less likely to disperse naturally and return to such areas (ERD, p328). Furthermore, there is limited information on the cumulative impacts of climate change, timber harvesting, previous mining and other disturbances and stressors to these species.	

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				Contradictions and miscalculations The contradictory statement is made that the “habitat that recorded the highest number of SRE taxa (57) was open forest of jarrah/marri on sandy-loam gravelly soils on mid slopes and ridges (Phoenix, 2021b)" (ERD, p355) but the Proponent go on to state that this habitat was “considered to have a low potential habitat value and is also the most widespread habitat in the PAA” (ERD 356) and assign it a ”low habitat rating” (ERD Table 5-37). Furthermore, the ERD concedes that “Collectively, the survey data indicates that all habitats within the PAA and surrounds represent high potential for SRE habitat (Phoenix, 2021b). Because of this contradiction, and statement that all of the PAA is high potential value habitat, the amount of low SRE value habitat (inclusive of rehabilitation within the IDF approximately 5,946 ha or 12,135ha in the PAA) has been significantly over estimated and consequently the amount of high SRE value habitat underestimated (currently calculated at approximately 13% or 761 ha in the IDF, 3,987 ha in the PAA). Based on these contradictory ratings, the Proponent has incorrectly equated this with loss of approximately 18% (731 ha of the possible 3,987 ha) of the mapped high potential habitat making the assumption that “a large portion of high potential SRE habitat will remain within the area” (ERD, p355) completely unreliable. Rehabilitation Although the ERD acknowledges that SRE taxa (no definition of which taxa) are known to survive in relatively small remnants (ERD, p357) if these taxa have limited dispersal capability and are unlikely to recolonise rehabilitation, as is suggested in the ERD, then even small remnants or protection areas disconnected from intact vegetation will have reduced value and impacts thus not able to be avoided or minimised for such taxa. The value of rehabilitation to SREs is overstated, with value measured against cleared and mined lands rather than intact vegetation - “the surveys demonstrated that rehabilitation has potential to provide refugia to SREs...” Consequently, areas of cleared land adjacent to SRE habitat have an increased value in relation to SREs". This also fails to consider any cumulative impacts that would be assessed from a pre large scale clearing and fragmentation baseline. Extent of impacts The ERD tries to defend that these impacts are acceptable due to “only a proportion of the area of available habitat within the PAA will be cleared (approximately 31%)” and “therefore, SREs habitats will only be partially cleared, with approximately 48% of any SRE habitat type continuing to be represented within the PAA” (ERD, p357). The figure of clearing of 31% of the available SRE habitat is an unacceptably high proportion of habitat. Furthermore, this assessment focusses only on the current proposed clearing with no regard for previous and current approvals which total 942 ha of current approvals within the PAA and the further conditional approval of 8400 ha in the extended mining area (MS719). No regard is given to other cumulative impacts including large scale fragmentation within the PAA, timber harvesting, road and other infrastructure, increased water abstraction and climate change, particularly rainfall declines and increasing temperature and mining outside the PAA in the Northern Jarrah Forest. Proposed clearing within the SRE habitats restricted to <50% of each SRE habitat recorded within the PAA (ERD, p355) is an unacceptably high figure given that “Some taxa may still be considered conservation significant owing to either the poor state of taxonomic or genetic knowledge for the species collected, limited ability to identify some specimens (i.e. inadequate life stage or sex, or specimen in poor condition) and limited studies of SRE distribution within the Northern Jarrah Forest” (ERD, p355). The Proponent also acknowledges that seven species were found to be restricted to the IDFs but suggest that these impacts can be avoided or minimised through protection areas which are inadequate (see detail provided earlier) and despite the likelihood of high impacts from clearing operations, with animals being unable to disperse with directional clearing and no translocation considered viable. It is unacceptable that these seven species are proposed to be impacted throughout their entire known range. Cumulative Impacts No cumulative impacts to SRE taxa are discussed or assessed.	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				<u>Avoidance</u> The impact of the aforementioned will not be able to be avoided with translocation not considered a viable option for SREs (ERD, p357) and directional clearing is unlikely to mitigate this for invertebrate species with low dispersal ranges. With no translocation and pre-clearance survey proposed, there is a high likelihood of SRE injury and mortality the results to population levels are poorly known. As such, the only avoidance and minimisation measure proposed by the Proponent for impacts to SREs is the proposed Protected Areas, however the shortcomings of these have been highlighted previously in this submission (see **Section 3.2.3**). <u>Mitigation</u> To attempt to mitigate and increase the acceptability of impacts to SREs, the Proponent proposes to "seek to partner with organisations to investigate the occurrence of SREs in the Jarrah Forest". This is inadequate given that it is not clear the partnerships have been and can be established, what actions would be proposed, the commitment is non-binding and does not address or mitigate impacts once mining commenced (i.e., it will be too late). <u>Conclusions</u> Phoenix 2021b found that SRE taxa are not necessarily habitat constrained within their narrow respective distributions and that on the basis of habitat analysis and biological surrogacy found "few high risk taxa" - this statement made on limitations of data and accounts for species occur across habitats but does not account for risk of large scale clearing of habitat, cumulative impacts and taxa unlikely to recolonise rehabilitation areas. The impact on SRE taxa, including loss of endemic and possibly undescribed taxa is serious and potentially irreversible and should not be supported. The Precautionary Principle must be applied given the significant taxonomic and impact knowledge gaps to SREs in the PAA and surrounding areas. The Proponent needs to justify why the vegetation type (open forest of jarrah/marri on sandy-loam gravelly soils on mid slopes and ridges) with the highest recorded number of SRE taxa (57) was given a low habitat rating, and given the large area of this habitat type, amend the Proposal to protect this vastly underestimated loss of high potential SRE habitat that will be directly impacted. Due to significant knowledge gaps, limitations of studies, miscalculation of impacts and seriousness and potential irreversibility of threats to SRE taxa Precautionary Principle should be applied to SREs and the proposal be rejected.	
3.2.15 Brush-tailed phascogale	*Not supported*	*When factoring in cumulative impacts from historical clearing for agriculture, mining and timber harvesting, current approvals the proposal is likely to have an unacceptable impact on the species at population level*	*The potential for the clearing to impact the species at a whole of population level makes the proposal unacceptable.* *The EPA should reject this proposal.*	Brush-tailed phascogales are a small arboreal marsupial reliant on tree hollows, which are scarce in the forests after 150 years of logging, clearing and inappropriate fire regimes. Individual Brush-tailed phascogales have been recorded in most areas of the PAA, making this particularly important habitat for this species, and clearing of their habitat would have severe impacts. The ERD states that: '…clearing associated with the Revised Proposal will result in an approximate 40% reduction of suitable habitat within the PAA, with an approximate 17% reduction in the Wider Mapped Area (WMA) (ERD, p347). The PAA is listed as containing 28,966 ha of suitable habitat for the species, however the cumulative clearing area of this equates to 6,501 ha or 22% of the PAA, with further losses from Alcoa clearing and other impacts including logging and agriculture are not quantified. "The loss of nesting hollow trees and fragmentation of habitats due to clearing associated with the Revised Proposal has the potential to impact the species at both an individual and population level (ERD, p347). <u>Cumulative Impacts</u> The ERD acknowledges the cumulative impacts from other mining activities, logging and clearing for agriculture, but only quantifies the total hectares of habitat loss for Brush-tailed phascogales associated with the Boddington Gold Mine and the Worsley Revised Proposal (ERD, p376-377).	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				Mitigation Despite the level of impacts, no specific mitigation measures are proposed for the Brush-tailed phascogale in the Protected Areas Plan or Section 5.3.5 (ERD, p383).	
3.2.16 Rakali	*Not supported*	*Rakali have only been desktop assessed and have not been nor are generally able to be recorded in the Proponents terrestrial fauna programs, including those used to inform the ERD* *The proposal will result in disturbance to habitat already under stress* *The assessment shows a lack of knowledge of the species and 'cherrypicking' of threats, to the exclusion of threats associated with the proposal The proposal fails to acknowledge or assess the potential broad scale and chronic or acute localised potential impacts to water quality and quantity with direct and indirect consequences for the species* *No consideration of cumulative impacts*	*The Precautionary Principle must apply* *The EPA factor for Rakali cannot be met* *At the very least, undertake targeted, systematic survey and cumulative impact assessment at the premining, current and forecast mining activities state, including climate change and other relevant impacts*	Although common and widespread throughout Australia, Rakali have experienced declines in southwest WA, and particularly the limits of its range in the northern southwest and Wheatbelt due to loss and degradation of streamside habitat, concomitant salinisation, drying largely due to climate change, and predation by introduced species such as cats and foxes (DWER, 2022). The species identified in the PAA through desktop searches (ERD 5.3.3.3.2, Table 5-27) with 2,964 ha of habitat identified within the of which 1,028 ha is within the PAA, equivalent to 4% (ERD, p322). Approximately 135 ha of potential habitat for the Rakali is located in the IDF with a confirmed record in this location. There are a range of problems with the Proponent's assessment of Rakali. Lack of targeted survey Being semi-aquatic, Rakali occupy unique habitat niches within southwest systems, and have not nor been generally able to be recorded in terrestrial fauna programs, including those used to inform the ERD. No targeted or systematic survey has been undertaken by the Proponent to establish a baseline, monitor the impacts of previous and current mining or field data to inform an adequate impact assessment for the species. The Proponent correctly states that "deeper pools present within the riparian and wetland habitat types that support water for substantial periods act as refuge for aquatic species…such as the Rakali (ERD, p258)" and acknowledge that riparian vegetation and associated communities provide important habitat for aquatic and semi-aquatic species, such as the Rakali and numerous wetland bird and frog species. They add that fringing vegetation in these areas are "mostly narrow" and "disturbed", meaning their habitat is already under stress. Despite this, no restoration of fringing vegetation along major tributaries is proposed. The statement that "It [Rakali] is a relatively resilient species, however, damage to riparian systems and permanent water sources, impact on the foraging quality of its habitat" shows a lack of knowledge and cherry picking of threats that overlooks direct and indirect impacts associated with the proposal. Declines in abundance and area of occupancy of the species in southwest WA have been well documented, as have the significant threats beyond damage to riparian systems and permanent water sources impacting on foraging resources which are potential threats. These include hydrological change due to wetland and waterway loss, water quality impacts, salinisation, loss of food resources, a drying and warming climate and introduced predators. All of these impacts are likely already affecting local Rakali populations but given a lack of survey data cannot be quantified. Refer to Section 5.2 Inland Waters for further information. Underrating of impacts The Proponent rates impacts to Rakali unlikely based on the narrow consideration of local impacts to fringing and wetland vegetation within the IDF and that an incomplete management buffer is considered sufficient to minimise species impacts - "Given the limited impact to the species preferred habitat, significant impacts as a result of the Revised Proposal are considered unlikely. The implementation of a management buffer along the major waterways of the Hotham River and key tributaries/streams within the IDF also minimises the potential for impact to this species" (ERD, p345). This reveals significant failures to acknowledge or assess the potential broad scale and chronic or acute localised potential impacts to water quality and quantity with direct and indirect consequences for the species. The only minimisation measure proposed is retention	Department of Water and Environmental Regulation (2022) Rakali – water rat Hydromys chrysogaster species profile, https://rivers.dwer.wa.gov.au/species/hydromys-chrysogaster/, Accessed 15 August 2022. ERD, p319

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				of the already in place Hotham River buffer zone and avoiding mining streams zones, which will only minimally reduce broader scale impacts. <u>Hydrological changes</u> The potential to impact aquatic fauna such as Rakali from changes in the flow regime and water quality of creeks from activities associated with the Revised Proposal, including increased water use from 400ML/annum of ground and surface water in addition to the 500ML/annum already being used is profound. Details of this are discussed further under the Inland Waters factor. Reduced flows from water abstraction particularly during low flow periods has the potential to impact any groundwater fed pools, which form critical refugia for Rakali and food resources. Furthermore, impacts to water quality through sediment runoff from haul roads and broad scale clearing, causing high turbidity levels, particularly during high rainfall events are problematic for food resources (native fish, invertebrates crustaceans and mussels) and sight-based hunting methods. While the Proponent propose to mitigate these through erosion controls, these have been proven to be ineffective under high rainfall events. Refer to Section 5.2.8 (Inland Waters) for further information. The impact to water quality and quantity, monitoring of these and other bio-indicators area not discussed in relation to Rakali. No cumulative impacts of previous, current and forecast mining area considered. <u>Conclusions</u> In conclusion, the Proponent bases their narrow assessment of Rakali on limited data and fail to adequately address the potential impacts. Given species trends, lack of data to base assessments on and the range of potential impacts, the Precautionary Principle must apply. The proposal cannot meet the EPA objective for the species.	
3.2.17 Western false pipistrelle	*Not supported*	*Clearing of habitat including roosting trees will impact this (P4) bat species which is in decline* *Rehabilitation will not provide suitable habitat for this species until the trees are old enough to have hollows form*	*No clearing of Western False Pipistrelle habitat should be approved*	The Western false pipistrelle is species of bat living mainly in Karri, Jarrah and Tuart forests. They eat flying insects and are fast direct, high flyers that can fly over 8 m off the ground. Western false pipistrelle roost in hollows, branches and stumps in colonies of 5-30 bats. Priority 4 conservation dependant. • IUCN listing of near threatened. The species is declining in range and population size. It is assumed to be greater than 10,000 mature individuals, but no census has ever been undertaken. It occurs at relatively low density compared to other sympatric forest dwelling bats, which is relevant for a species that has an extent of occurrence approaching the limits for listing in a threatened category. • Priority 4 conservation dependant. • Threats to the western false pipistrelle include land clearing and competition from feral honey bees and Rainbow lorikeets. • Calculated reduction in extent of occurrence of 37% in 39 years. • Species only found in the South-Western corner of Western Australia. <u>Cumulative Impacts</u> • 5,946ha of Western false pipistrelle habitat is proposed to be cleared. • “Population level impacts are also unlikely given the species is highly mobile and is known to occur throughout the southwest region.” (ERD, p344-345) This is unfounded as no census has taken place. • “As the species has been recorded within rehabilitation areas, it is expected that progressive rehabilitation will in time provide suitable foraging habitat and habitat connectivity for the Western False Pipistrelle.’ (ERD, 345). As the Western false pipistrelle utilises hollows for nesting the benefits of rehabilitation for breeding purposes will be delayed until trees are of an age and size where hollows form. (ERD, 396) In Australia hollow formation takes more than 230 years to produce a small hollow (Cherriman, 2022). <u>Mitigation</u>	Australian Museum (2022) Armstrong et al, (2017) Cherriman (2022)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
				No Specific mitigation measure are addressed for this bat. It is important to know if this species is one of the 'other' species mentioned: 'Worsley will investigate the installation of artificial habitat or nest boxes for conservation significant species other than Black Cockatoos, in consultation with DBCA' (ERD, p386). <u>Offsets</u> No offsets proposed for Western false pipistrelle. <u>Conclusion</u> Clearing of habitat including roosting trees will impact this P4 bat species which is in decline. The rehabilitated area will not provide suitable habitat for this species until the trees are old enough form hollows.	
3.2.18 Quenda	Not supported	*Land clearing and fragmentation are threats to the quenda (P4).* *Disturbed areas leave quenda vulnerable to predation by predators include feral cats and foxes.* *Mining operations will also leave the species vulnerable to vehicle strikes.*	*All proposed clearing will impact this species as they are distributed throughout the area proposed to be cleared.* *The EPA should reject this proposal .*	Quenda *Isoodon fusciventer* are listed as conservation dependant Priority 4 species in Western Australia which means their survival is dependent on conservation. Quenda are small brown ground dwelling bandicoots. Quenda are omnivores and eat a variety of invertebrates, including earthworms, beetles and their larvae, as well as plant material, including fungi, tubers and bulbs, which they find while digging conical-shaped holes in the ground (DBCA, 2017). • As the presence of digging mammals is known to improve soil quality, the presence of Quenda has the potential to greatly impact their local ecological community, and these animals are therefore considered ecosystem engineers (Martin et al, 2019). • Approximately 5,499 ha (including 605 ha of rehabilitation) of potential habitat for Quenda is located in the Indicative Disturbance Footprint (ERD, p 345). The Proponent states that the Revised Proposal is not expected to significantly impact the Quenda (ERD, p345), stating that quenda have the ability to persist in disturbed environments, however this comes with increased threats including vehicles strikes (Martin et al, 2019). • Threat to Quenda include fragmentation, land clearing and predation by cats and foxes, particularly in open habitat (DEC, 2021). <u>Cumulative Impacts</u> Up to a total of 23,497 ha of native vegetation will collectively be cleared by Newmont, Worsley revised proposals. 5,435 ha by Newmont and Up to 4,399 ha of native vegetation will be cleared for the Revised Proposal, bringing the total approved clearing for Worsley Alumina operations, as a result of the Worsley Revised Proposal, to 9,662 ha and 8,400 ha in the Extended Mining Areas (ERD, p376). This clearing of native vegetation will impact quenda due to a reduction in habitat and increase in potential vehicle strikes. <u>Mitigation</u> Despite the level of impacts, no specific mitigation measures are proposed for the Quenda. <u>Offsets</u> No offset proposed for Quenda. No proposed offsets for Quenda. <u>Conclusions</u> This proposal assumes that Quenda will not be significantly impacted by the native vegetation clearing because they can persist in disturbed areas although DBCA list the main threats to the Quenda as fragmentation and loss of habitat, predation by foxes and cats (particularly in open habitat) (DEC, 2021).	DEC (2012)
3.2.19 Peregrine falcon	Not supported	*Land clearing and fragmentation are a known threat to peregrine falcons. Cumulative impacts are not acknowledged in*	*Specific pre-clearance surveys for peregrine falcons and 50m vegetation buffer around*	The Peregrine falcon *Falco peregrinus* is a large powerfully built rapture found in Europe, Asia, Africa, the Americas and Australia however it is not common anywhere and has a conservation status of Special Protection under the State's Biodiversity Conservation Act, 2016. The raptor feeds on birds and diurnal mammals and is one of the fastest birds of prey.	Australian Museum, 2022 Birdlife Australia Website

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		the ERD and no offsets are listed.	*nesting sites (hollow, tree ledges*)	• The Peregrine falcon is found in most habitats, from rainforests to the arid zone and at most altitudes. They require abundant prey and secure nest sites (Birdlife Australia). The revised proposal of 4,399 ha of native vegetation and cumulative impacts will impact the Peregrine Falcon by reducing the number of nesting hollows and potential prey. • Peregrine falcons have been recorded nesting in Wandoo tree hollow and on a ledge of a Jarrah tree (ERD, p319). <u>Cumulative Impacts</u> • There are no cumulative impacts listed specifically for the Peregrine falcon. • The persistence of presence at the BBM site would suggest that there is sufficient suitable habitat for the Peregrine falcon. (BIOSTAT, 2021) This statement was included in the ERD (p319), however the main threats listed in Appendix G1 is loss of habitat, especially suitable breeding habitat and habitat fragmentation (BIOSTAT, 2021). • Up to a total of 23,497 ha of native vegetation will collectively be cleared by Newmont, Worsley revised proposals. 5,435 ha by Newmont and Up to 4,399 ha of native vegetation will be cleared for the Revised Proposal, bringing the total approved clearing for Worsley Alumina operations as a result of the Worsley Revised Proposal to 9,662 ha and 8,400 ha in the Extended Mining Areas (ERD, p376). This clearing of native vegetation will impact Peregrine falcons due to a reduction in habitat and loss of suitable breeding habitat. <u>Mitigation</u> Confirmed Peregrine falcon nesting sites will be avoided (ERD, p388) however there is no mention of pre-clearing surveys specifically for Peregrine falcons. <u>Offsets</u> No offset proposed for peregrine falcon. <u>Conclusions</u> Even though the Peregrine falcon's distribution is wide spread it is not common anywhere in Australia. The cumulative impacts are significant but not recognised in the ERD. Mitigation does not seem to include pre-clearing surveys specific for peregrine falcons and there are no offsets for the species.	
3.2.20 Rehabilitation for Fauna	*Not supported*	*The Proponent's rehabilitation only partially mitigates, and offsets impacts of mining for the majority of terrestrial fauna and cannot mitigate or offset impacts for a certain set of taxa* *Rehabilitation cannot be reliably used to justify further large scale clearing within the PAA*	*Rehabilitation not be overvalued as a mitigation and offset measure* *The Proposal should be rejected.*	Detailed comments on the Proponent's proposed rehabilitation is provided in Section 9.1 Closure and Rehabilitation and specific fauna species' comments. • In terms of fauna values, the Proponent's operations and proposed expansion of 4,399 ha of clearing on the premise that rehabilitation post-mining mitigates the impact of most, if not all, loss of vegetation and topsoil post clearing and mining. However, evidence from research and practice show that post bauxite mining rehabilitation only partially mitigates, and offsets impacts of mining for the majority of terrestrial fauna and cannot mitigate or offset impacts for a certain set of taxa. The following outlines reasoning behind this and why rehabilitation cannot be reliably used to justify further large scale clearing within the PAA. • Even with the proposed replacement of a quantity of stumps and logs in rehabilitation areas, there are many important differences between intact forest and rehabilitated mine sites, particularly in value for terrestrial fauna. Altered vegetation structure affects the habitat and food resources for native fauna and changes the effects of both bushfire and prescribed fire. One difference between rehabilitated mine sites and intact forest is that fauna displaced by bauxite mining do not necessarily return to rehabilitated areas and use them in the same way they did before mining. Certain species that need very specialised habitat and are highly vulnerable to habitat clearance and fragmentation may not return to rehabilitated mine sites (WA Forest Alliance et al 2022, p 234). • Partial rehabilitation - A significant area of the Proponents previously disturbed or planned to be disturbed is not currently or planned to be rehabilitated in the long term. The Proponent states that "20-30% of land that has been previously disturbed; or planned for disturbance as part of the Revised Proposal will not undergo progressive rehabilitation as it will be required for use associated with long term infrastructure and will remain open long term" (ERD, p103). The result of this is that for at least 10 years no fauna habitat will be available, and no impacts mitigated. This is compounded by the lag period while other habitats are being progressively	WA Forest Alliance et al (2022)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		Previously disturbed or planned to be disturbed areas are not currently or planned to be rehabilitated in the long term *'Rehabilitation' needs differentiating from 'rehabilitated"* *Rehabilitation may be re-cleared*		rehabilitated. Furthermore, rehabilitation deficits result in lags between habitats being available for fauna. This is worsened by the Proponent's record of operating with a high rehabilitation deficit of 45% (ERD, p103). While the Proponent has forecast to reduce this over the next decade, with exemptions possible, this cannot be guaranteed. • Young rehabilitation - The Proponent states that "The rehabilitated areas form an important component of the landscape with approximately 3,180 ha currently rehabilitated within the WMDE and BTC" (ERD, p258). However, this area is in the process of rehabilitation and not rehabilitated, meaning it has not yet met completion criteria, thus cannot be considered as meeting needs of many significant fauna species, nor providing high quality fauna habitat, at least for many decades or in the case of black cockatoo breeding, a century or more. It should also be noted that observation of species within rehabilitation does not necessarily mean it is providing suitable or optimal habitat or sufficient quantity of food resources (e.g., Black cockatoos may be observed to return to rehabilitation areas within 6 years, but no detail is provided on adequate quantity of food available). • Re-clearing of rehabilitation areas – the Proponent states they will not re-clear designated areas of rehabilitation within the 10 year mine plan to ensure it is maintained and protected as an ecological resource supporting ecological values including State and federally listed values (i.e. Black cockatoo foraging habitat) for the time period it remains within the Proponents management and control (noting once areas are handed back to the original landowner the Proponent has no right to influence protection measures). However, no information is provided on size and location of designated areas, that non designated areas can be re-cleared either by the Proponent within 10 years or cleared post Worsley Alumina ownership.	

4. TERRESTRIAL ENVIRONMENTAL QUALITY

EPA Objective: To maintain quality of land and soils so that environmental values are protected.	
Relevant activities: Clearing of vegetation and disturbance to soils from increased mine and infrastructure footprints, and mining activities.	
Potential impacts and risks	• Erosion leading to loss of topsoil, poor soil structure, reduced water infiltration and loss of general soil health from clearing and excavation activities. • Salinisation of soils (dryland salinity) leading to vegetation deaths and decreased quality of water resources. • Contamination of land and soils from fuel and chemical storage leaks, waste products being released into the receiving environment and acid sulfate soils as a result of disturbance for river crossings. Additional identified by PHCC: • Removal of the soil for Bauxite extraction leaves the resulting landscape devoid of 3m –5m of growing media for the rehabilitated forest to utilise.

4.1 EPA REQUIRED WORK

Required work		**Have these been adequately addressed**	**PHCC comment/s**
1	Present a baseline soil quality assessment of the Primary Assessment Area (WMDE, BTC and CBME), with reference to the soil quality.	Partial	GHD undertook a Soil Characterisation Study (Appendix H1), however acknowledge that the information provided to GHD (from South 32 and including Government authorities) has not been independently verified or checked. The report also states that not all relevant site features and conditions may have been identified in their report (pp. 4-5). The soil analysis tests undertaken during drilling provide limited information for assessing environmental risk (p.5).
2	Include in the ERD, figures of the mapped soil units and soil profile.	Yes	The ERD should identify what proportion of the mine area is comprised of each soil unit in relation to the area of the unit across Western Australia, the IBRA region and the NRM region/Catchment. This will allow people to understand the real impact of soil units of the proposal.
3	Describe the proposed management, monitoring and mitigation methods to be implemented to address direct and indirect impact on soils/lands/receiving environment. This description is to include soil handling methods to mitigate erosion, compaction, contamination, and salinization of soils.	Partial	Some current management practices for protecting soil are not working (leading to erosion run-off from cleared areas into rivers) and there is no transparency in respect to the run-off being generated from cleared hillsides. Refer to Section 5.2 Inland Waters for further information with regards to waterways.
4	Outline the outcomes/objectives, trigger and contingency actions to ensure impacts (direct and indirect) are not greater than predicted.	Partial	Triggers should indicate an issue sooner, rather than after heavy rainfall. E.g., when it is predicted, rather than after it has arrived.
5	Demonstrate that the proposal has been designed to avoid and minimise impacts including the placement of any access roads and infrastructure within fauna habitat areas and that placement has had regard to utilising existing areas of disturbance.	No	Compared to removing whole parts of forest to mine, placement of roads seems inconsequential. However, the need for roads to be integrated into drainage systems to reduce overland and creek flows of water needs to be considered.
6	Demonstrate that the proposed management, monitoring and mitigation methods to be implemented addressed the mitigation hierarchy, and ensure residual impacts (direct and indirect) are not greater than predicted.	No	The contingency for managing erosion impacts in a climate that is becoming more prone to intense rainfall has not been undertaken with enough vigor.
7	Demonstrate and document in the ERD how the EPA's objective for these factors can be met.	No	The Proponent states it expects that the risks of significant potential environmental impacts for land and soils will not change from current mining and refining operations. However, it is expected that with expansion of the mining operation there would be increases in erosion, chemical spills, loss of carbon and a reduction in the overall soil health within the PAA.

Required work		Have these been adequately addressed	PHCC comment/s
			The assessment of impacts on soil health is especially thin, despite acknowledging its importance for biological and chemical processes and the resilience of flora and fauna ecosystems. Notably, there is no assessment of the environmental impacts in relation to carbon sequestration. The company's assessment on this factor is insufficient for the purposes of a Public Environmental Review. The proposal cannot meet the EPA's objective for this factor and should be rejected.

4.2 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
4.2.1 Soil Health	*Not supported*	*Measures to offset impacts are inadequate*	*Soil health should be better understood and a standard assessment applied for measuring it.* *Further studies on Soil Health should be undertaken to understand microbial communities in nearby remnant vegetation, and what soil health looks like in revegetated areas of different ages.* *Organic derived ameliorants should be applied across the rehabilitation sites.*	Maintaining soil values is one of the most important elements of sustainability since soil health underpins the health of the ecosystem. Potential risks to soil health associated with mining and disturbance activities include changes to soil structure; and loss of topsoil (soil erosion). Soil health is recognised by the Proponent as being 'important for biological and chemical processes and the resilience of flora and fauna ecosystems. It is largely controlled by microbial activity and soil carbon compositions' (ERD,443). However, the ERD states that, 'Most soils within the PAA are at 'high' risk of structural decline through subsurface soil compaction; in the CBME the risk is greater (Appendix H1: GHD 2020d, 37). There is no assessment of the environmental impacts in relation to carbon sequestration.	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
4.2.2 Erosion	*Not supported*	*Measures to offset impacts are currently inadequate and past performance is difficult to validate*	*The process for reporting and resolving erosion issues on and off site should be made more transparent.*	Erosion by wind and water leading to topsoil loss, poor soil structure, reduced water infiltration and loss of soil health. Erosion risks for different topographies and soil types are discussed but not the erosion record in current operations (ERD, p449-50). This is exacerbated by the time lag of over three years between the Proponent clearing and mining of large areas, evident in the PAA in the Marradong area at present), coupled with delays in rehabilitation (evident in the Proponents record of rehabilitation deficit of >45%).	
4.2.3 Compaction	*Not supported*	*Measures to offset impacts are currently inadequate*	*Compaction from machinery is reduced inside revegetation areas*	Compaction is said to be addressed by deep ripping prior to returning overburden and topsoil (ERD, p450) but this is a *post facto* measure and there is no research cited as to the impacts of deep ripping on soil structure and health. The assessment of mining impacts on social health cites unpublished research from the University of WA without providing the data on rehabilitated areas which were formerly forest (ERD, Page 443 and 450). The ERD claims that soil carbon will increase in forest rehabilitated areas over time but bases this on a comparison of mined and unmined *pasture* sites, not forests and rehabilitation sites (ERD, Page 450).	ERD, p 433, 450
4.2.4 Salinisation	*Not supported*	*Measures to offset impacts are currently inadequate*	*Transparent monitoring of run-off from the mine should occur so that an understanding of the recharge entering surrounding catchments can occur.*	Salinisation of soils leading to vegetation death and water quality decreases. This is assessed by the company as 'low' risk, 'based on published mapping and the recorded geological profile' (ERD, p450). Rises in water table levels may lead to salination of watercourses (ERD, Page 451,see Inland Waters Section 5).	ERD, p 450, 451
4.2.5 Recharge	*Not supported*	*Measures to offset impacts are currently inadequate*	*Additional native species are planted on non-productive agricultural lands to reduce recharge from run-off areas*	Additional native species plantings in non-productive agricultural lands to remove recharge water should be undertaken in the upper part of the catchment immediately adjacent to the mine.	
4.2.6 Contamination from litter, fuel/chemical storage and leaks	*Partially supported*	*Soil contamination remediation processes are not outlined*	*Require compulsory and transparent reporting of chemical spills and litter collection reporting*	The Proponent states contamination to soils it is 'not expected to increase' (ERD, p451). Provided Worsley's chemical and hydrocarbon storage practices and spills response continues and is effective, then no additional risk (above that already occurring) is anticipated, however the following gaps have been identified: • Spills and leaks are said to be monitored and managed however there is no data provided as to the record of this type of soil contamination. • Soil contamination remediation processes are not outlined (Appendix E05: BBM Closure Plan Appendix E, 182).	ERD, p451, 458 Appendix E05
4.2.7 Disturbance of acid sulphate soils	*Not supported*	*Alternatives should be considered that avoid ASS*	*More detail included regarding management of ASS, including*	Acid sulphate soil disturbance leading to land and soil contamination. The risk is assessed by the company as 'extremely low' and 'low' for mining areas but 'high' for watercourses – for example the Hotham River which will be subject to infrastructure crossings (ERD, Page 452, Appendix H1: GHD 2020d). Management plans to address this risk are on pages 456-58. Refer to Section 5 Inland Waters for further assessment of Acid Sulphate Soils with respect to surface ace and groundwater.	ERD, p452, Appendix H1

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
		Measures to offset impacts are currently inadequate	*alternatives presented that reduce ASS risk.*	• The risk posed by ASS is discussed in the ERD, as is the commitment to develop an ASS management plan in association with construction of bridges and installation of culverts (in association with bridges and haulroads) within the Hotham River and its tributaries. Alternatives should also be considered that do not disturb ASS. • Contamination of ground and/or surface water from potential acid sulphate material during removal of soils and sediment at river crossings is a high possibility. • In the instance that an ASS exposure risk is identified, no alternative actions are proposed to avoid this risk.	
4.2.8 Cumulative impacts	*Not supported*	*Measures to offset impacts are currently inadequate*		The cumulative impact of clearing and removing further topsoils and gravels from the immediate area surrounding the current mine will be significant. The remaining vegetation buffers the site from wind, the effects of heavy rain, direct sunlight and provide a visual buffer to operations. The soil in the surrounding area is a source for Soil Microbes, flora and fauna, and should be protected from damage. Refer to Section 1.1.13 for further information.	

5. INLAND WATERS

EPA Objective: To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	
Relevant activities: Clearing of native vegetation, disturbance of river banks for the construction of river crossings, water use for mining activities and construction from groundwater sources, and excavation for mining activities.	
Potential impacts and risks	• Riverbank erosion, sedimentation, scouring of streams or release of excessively turbid water as a result of clearing riparian vegetation. • Decline of aquatic fauna from changes in flow regime and water quality, potentially leading to impediment of upstream pre-spawning migrations of freshwater fishes. • Contamination of ground and/or surface water from potential acid sulphate material and contaminants during removal of soils and sediment at river crossings. • Contamination of surface water as a result of spills or stormwater run-off, and contamination of groundwater as a result of seepage of stored chemicals. • Deterioration or change in background water quality such as salinity due to indirect impact of mining activities. • Impacts to groundwater as a result of clearing, disturbance to soil profile and rehabilitation. • Potential impacts on surface water and groundwater values through increased water use.

5.1 EPA REQUIRED WORK

Required work		**Have these been adequately addressed**	**PHCC comment/s**
1	Characterise the surface water and groundwater systems in a local and regional context and describe recharge and discharge mechanisms, aquifer connectivity, surface water/groundwater interaction and water chemistry. This should include identifying and mapping groundwater and surface water dependent ecosystems. [ERD p465] EPA: “To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.”	No	• The main source of documentation for this Inland Water characterisation is Attachment I1, a report by consultants GHD. In this report (Appendix B), GHD have documented a summary of groundwater (GW) modelling which is what they appear to have used to make statements about current and future hydrologic changes. • The data from GW bores that GHD compiled (Attachment I1, Appendix B) only has a total 29 bores of which only 23 also have salinity data (and no other long term water quality data or flow data is reported in the documentation). This is a serious concern in that actual water level data is critical to be able to accurately calibrate hydrologic models; particularly long-term data. Attachment I1, p16 stated that there were 105 bores used for calibration, however, these were not deemed worthy of documentation by GHD and hence have been assumed to be short-term bores and difficult to put in context of changing hydrologic behaviour due to record length and location of adjacent abstraction bores. • Locations of all bores (Attachment I1, Fig A4), show the coverage of bores, but many are in close proximity to abstraction bores, so are not able to show the impact of mining on hydrologic behaviour of GW. What is even more concerning is that there are so few datasets to understand the long-term impacts on the bauxite mined area which currently covers 57km², with a mining envelop of 278km² and the model area in the order of 800km². In addition, only one documented monitoring bore is located in the mining area [M03], the mined area is covered with abstraction bores, and the period of GW monitoring only starts 10 years after mining commenced (with six bores constructed in 1994-96) and most bores only have data to 2016 (6 years ago). While mining has been in operation for over 35 years, the longest bore record is 22 years and many of the 23 key bores datasets have records of less than 10 years long. This is a serious failing for a mining operation that covers 38 years and casts doubt on the ability of consultants to accurately model the impacts of mining over the life-of-mine. • The inconsistent frequency of monitoring bore water levels and salinities makes it very hard to understand the impact of mining on hydrology. Bores are sometimes monitored for water level monthly, then are suddenly pushed out to twice yearly. This makes it very hard to determine the influence of abstraction on water in key bores like at M03 and M05. The monitoring of Salinity is even more variable, with M03 the only mining area bore only having 2 readings post 2010 and MP26 at a GDE with no readings after 2010; many others are not being regularly sampled for salinity. It is critical in any assessment of environmental impact that sampling frequency be regular and designed to detect impacts on systems. • GHD also note that there is not enough hydrological data in the vicinity of groundwater dependant ecosystems (GDE’s) to understand the impact of mining on them; this is particularly concerning as GW models usually struggle to be accurate near the surface and need specific monitoring in these locations. Refer to Table 5.2 (Table Item 5.5) for further detail. • There is good regional scale surface water (SW) data available from DWER (with salinity), which defines the receiving environment that mining may impact on. However, local SW data is lacking (without even an attempt to document streamflow when sampled for WQ) and the GHD report on surface water only documents min., max., mean water quality data (for an undefined period), with no attempt to define if the small number of shown parameters are getting worse or better or whether the flow regime has changed due to mining operations including water abstraction. DWER

Required work		Have these been adequately addressed	PHCC comment/s
			undertook flow monitoring at 4 gauging sites in the mining envelope area (before 1999), but records at all sites were all impacted by mining operations and there was no 'control' reference site included to compare flows and water quality data in an undisturbed catchment. There are significant tributaries of 34 Mile Brook, Wattle Hollow Brook and Marradong Brook in the mined area as well as 13 smaller tributaries with catchments in the mined areas. None of these were reported by GHD as having been monitored for a change in flow due to mining or climate and hence there is no way to determine if GW modelling truly replicates the hydrologic behaviour of these systems or the GDE's that lie along them. • GHD have identified GDE's and used the poorly calibrated GW model to determine which are at-risk. However, with so little GW and SW data available to calibrate the modelling, there is a huge risk to their health. There is also the issue of locating abstraction bores along streamlines and at GDE's (discussed below), which the extent of impact has not been addressed. • GHD have developed a GW model and have attempted to calibrate it to flows at the DWER gauging station (GS) [614224] to provide model relevance for SW flows. However, the catchment is 3870km² at the GS and the mined area only impacts from 4% of the catchment; hence the relevance of a large regional runoff system is minimal compared with the small tributaries that directly discharge from the mining area.
2	Undertake surveys to establish water and sediment quality, the biological data collected, and the environmental values identified. [p465-466]	No	• Minor superficial monitoring has been undertaken (Attachment I1) as discussed above. • The ERD summarises water quality and river discharge data available. • Given the high potential for sedimentation and TSS to impact the Hotham River and its tributaries, baseline and monitoring needs to include TSS. • Surveys for Carter's mussel (Stantec 2021) for the Freshwater Lake does seem sufficient for that system, however no surveys were conducted within the mining assessment area and mussels are assumed not to occur on the basis of a desktop study (GHD 2019). However, the potential for mussels to occur in smaller tributaries (particularly in forested areas) cannot be ruled out, at a minimum a field survey to screen waterways and tributaries for mussels needs to be conducted. • No targeted surveys for Rakali (P4 listed), with a desktop assessment comprising the only survey data from the assessment area (Rakali were recorded as bycatch from a 2017 fish survey in the Hotham River; WRM 2018). An estimated 2,964 ha of suitable Rakali habitat occurs across the area, with 1028 ha occurring in the primary assessment area, and it is assumed that only 135 ha will be impacted. However, without any formal assessment, these figures are just assumptions and do not substitute a targeted survey and actual data. As a minimum, this proposal should include a targeted survey of Rakali in the project area, to gain an understanding of population size and occurrence, and propose monitoring of the population henceforth. • Aside from the Carter's mussel survey (Stantec 2021), and fish passage studies related to NBG's water abstraction activities at Tullis Bridge (WRM 2019) there are no recent biological data gathered or presented. • There is no macroinvertebrate baseline study. This is a missed opportunity as macroinvertebrates are sensitive monitoring tools with which to measure environmental impact, as well as being an important diversity attribute for protection under Inland Waters. • A contemporary baseline dataset including vertebrate fauna (including Rakali, long necked turtles, and fish), crayfish, macroinvertebrates and microinvertebrates (zooplankton) should be included as a minimum, alongside a plan for ongoing monitoring of aquatic fauna. • The aquatic ecological values of the waterways within, and downstream of, the development area have not been adequately defined.
3	Characterise the hydrology of the Hotham River and describe the impacts from this proposal on the water and sediment quality of the Hotham River (and other relevant tributaries). This is to include a detailed description of the development of river crossings for access/haul roads.	Partially	• Hydrology of the Hotham River has been characterised in terms of flow regime, however only a higher-level assessment has been undertaken. Hydrology specific to areas likely to be impacted by abstraction bores, bridge construction, and groundwater mounding is not included (and relevant where bores may intercept gaining sections of streams, for instance). • Motherhood statements on impacts on Hotham River were included in Attachment I1, based on GW model results (GHD, Attachment I1, ii), however, as documented above, the lack of monitoring to calibrate the GW model makes these results suspect. There is no sediment/turbidity data presented by GHD that would show impacts of mining on streamflow. • Crossings planned on the Hotham River lack detail (ERD, p518-519). • The design criteria based on Heritage (p518) where "piers are not to be located in river flow paths" is ambiguous as large flood events are also to be expected in the river flow paths, especially in terms of potential climate change impacts like what has been experienced in NSW & Qld in 2021/22. The location of the main Nullaga Haul road (ERD, Fig 1.5) over the Hotham is located over the confluence of the 34 Mile Brook and Hotham River and would necessitate a much broader span than the 35m to stay out of the river and brook streamlines (ERD, p23).

Required work		Have these been adequately addressed	PHCC comment/s
			• The Hotham River reach in the vicinity of the Nullaga Haul & conveyor crossings has rich fringing vegetation (based on 2018 aerial imagery), and should not be disturbed, however it will require at least 60-70m bridge spans to protect the fringing vegetation from damage including construction activities and flood flow velocities. The Hotham West Haul Road (ERD, Fig 1.5) is located across a reach of the Hotham which at baseflow is over 45m and during normal winter flows is likely to be much wider.
4	Analyse, describe and assess surface water and groundwater impacts, including direct and indirect impacts, from the project. This should include, but not limited to: i. Changes to groundwater levels and surface water flows associated with the proposal; ii. Changes to water quality; iii. The nature, extent and duration of impacts; and iv. Impacts on environmental values of ground and surface water dependent ecosystems (Water Dependant Ecosystems (WDE's)).	No	It was expected that the Proponent would have provided key information in their ERD and attachments (GHD, 2020a) to justify expansion of the mining process. Instead, the lack of documented monitoring, the doubt that this lack of monitoring places on the water modelling undertaken and the abstraction of groundwater from WDE's, places serious doubt on the management and monitoring of processes in the current mining operation. These issues need to be addressed immediately and a significant amount of monitoring instigated and the damage to WDE's assessed and rectified before any further operations are undertaken. Impacts i to iv are addressed further below: **i. Changes to GW level and SW flows - (Refer to Table 5.2 (Table Section 5.2))** **ii. Changes in WQ and Salinity - (Refer to Table 5.2 (Table Section 5.4))** **iii. The nature, extent and duration of impacts** – With respect of Inland Waters, the impacts have been very poorly documented. The pre-mining hydrology (pre-1984) is not stated in the ERD documentation. None of the 'long-term' bores that could have been used to specify the pre-mine hydrology were drilled until 10 years after mine commissioning. Two of DWER's regional stream gauges and two local gauges were operational, however, there was only 8 years of monitoring pre-mine in the tiny Tunnel Road catchments (<2km²) making it hard to determine impact of mining across the whole mine that currently covers 57km². – The current operational period of the mine (1984-2022) is only covered by a documented 29 monitoring bores of which many are impacted by water abstraction and make it difficult to define impact of mine behaviour on hydrology. There is only 1 bore in the current mining area and while WDE's (see below) are critical, there are so few bores and no surface water monitoring sites that consultants GHD could not model the impacts accurately. In addition, the 'at risk' WDE's defined by GHD do not match where WDE's have abstraction bores beneath them. – Future impacts and extents have been modelled by GHD, but without bores and flow sites to calibrate the models with, there is a serious doubt as to the validity of this modelling. – There are two more issues with regard to potential 'impacts'. Salinity in the Hotham/Williams River is increasing and by 2050 is likely to be 50-100% higher (as calculated by extrapolating WQ measurement from DWER). This is likely to impact on fringing vegetation through the PPA area, and the Proponent needs to develop a process that can determine whether any changes to fringing vegetation is not from the Mining Operation and from the upper catchment. If the Proponent state the local GW is good, then they need to work-out how to protect fringing vegetation otherwise it could be considered as being responsible for its degradation. **iv. Water Dependant Ecosystems (WDE's) (Refer to Table 5.2 (Table Section 5.5)).** – There has not been adequate assessment of the impacts of groundwater level change on environmental values of surface water ecosystems. Lack of a contemporary baseline for aquatic fauna receptors would make robust assessment of future impacts impossible. Regarding groundwater dependent ecosystems, significant risks have been identified for GDE vegetation communities in low lying areas, however avoidance and mitigation measures have not been proposed (beyond site specific investigations to be conducted prior to clearing). – Indicative extent of groundwater mounding is modelled, as is potential drawdown extent from additional bores. The drawdown is dismissed as offsetting impacts of groundwater mounding, and in thus not presented as a concern for aquatic ecological values. However, timelines are not presented thus it is unclear whether pumping will occur outside of times where groundwater mounding is occurring in a particular area. – There has been no assessment as to how changes to water tables will actually affect water levels, other than asserting that this should not be a problem. Particularly regarding water abstraction, reduced depth over river features including riffles present barriers to fish migration (and already impacted by NBG's pumping at Tullis Bridge; WRM 2018). The EWR study (WRM 2011) defines critical parameters for fish movement and faunal diversity, including depth over riffles. Furthermore, drawdown of groundwater without recharge over summer would reduce or cease summer flows, and cause reduced water quality in permanent pools that are refuges for fauna (e.g., turtles, water rats, and fish). Only a small

Required work		Have these been adequately addressed	PHCC comment/s
			amount of baseflow in summer is sufficient to prevent stratification and maintain refuge pools. Should groundwater abstraction reduce this baseflow it has the potential to negatively impact aquatic fauna values. No mention of these parameters or a plan to monitor and maintain these water levels appear in this proposal.
5	Undertake appropriate investigations into the presence of acid forming materials in the Primary Assessment Area (WMDE, BTC and CBME), such as soils or rocks, in accordance with contemporary guidance.	Partial	Acid sulfate soils (ASS) risk has been identified along much of the Hotham River, including areas proposed for bridge construction (ERD Fig 5-42). The ERD states sites for bridge constructions will be assessed for ASS, and measures taken to avoid risk taken where practicable. An ASS Management Plan to be a part of the construction Environmental Management Plan. Monitoring during and post-construction water quality including pH (Table 5.59 p. 456). Refer to Section 5.2.7 below for more information.
6	Discuss the proposed management, monitoring and mitigation to ensure impacts on inland water quality and ecological values are not greater than predicted as a result of implementing the proposal. This is to include, but not be limited to, consideration of buffers between mining and related activities to protect waterways and wetland areas.	No	• The ERD has documented a large amount of management processes that might be followed in mining operations procedures. However, there is nothing there about management of abstraction bores and where they should NOT be placed (i.e. well away from WDEs). • With monitoring, the Proponents Water Management Plan (E07) lacks identifying key sites for long-term monitoring of groundwater and surface water that would trigger issues for the mining operation, determine the impact of mining and its use of water abstraction and allow water modelling to accurately model the impacts of mining. • In the WMP, GW bores are defined as having loggers to monitor water levels, however, all the data presented by GHD (2020a) only had discrete readings and almost all of the GW data was only current to 2016. The WMP (Table 1) also only identified annual WQ sampling, which is not nearly frequent enough based on the information from bore traces presented in GHD App B. Table 1 also included many other parameters which were not mentioned in GHD 2020a as to whether they impacted on local GW or SW. • The lack of monitoring of GW or SW in the mining area or proposed mining areas is a serious failing of the existing operation. GHD (2020a) indicated that there was minimal monitoring of GDE's, with not enough GW bores to assess the impacts of mining on GDE's. The proponent should have engaged their consultant to recommend a monitoring plan for these. • There does not appear to be any mitigation measures to address the impact of drawdown of GW beneath GDE's because of inappropriate location of abstraction bores. • There is no aquatic fauna monitoring plan proposed under this ERD, and there is no contemporary baseline survey of aquatic ecological values that covers the project area. Therefore, assessment as to effectiveness of management, monitoring and mitigation of potential impacts is not possible. • Size of riparian buffer zones are not defined anywhere in the ERD, WMP or Protect Areas Plan. The Forest Management Plan 2014-2023 (Conservation Commission of Western Australia 2013) prescribes the following thresholds for riparian buffer zones in forested streams; "A 60-metre wide corridor in the area of first, second and third order streams, with all boundaries being at least 20 metres from the bank of the stream. A 150-metre wide corridor in the area of fourth order streams, with all boundaries being at least 50 metres from the bank of the stream. A 400-metre wide corridor in the area of fifth order streams, and streams of any higher category, with all boundaries being at least 100 metres from the bank of the stream." • It is stated in the ERD that waterways within DBCA managed land will have riparian buffers in accordance with the Forest Management Plan, however it is unclear which waterways are covered by this. It might be assumed this framework will apply to all river and stream networks within the project area, however increased transparency as to which buffer sizes are applied where, and justification for these buffer sizes is needed. • The Hotham River is credited a particular importance in the landscape due to its status as a Regional Ecological Corridor (REL) as identified in the PHCC publication Binjareb Boodja Landscapes 2025. This status is a synthesis of the work of the South West Regional Ecological Linkages Project (Molloy et al, 2009), the Perth Biodiversity Project (WALGA & PBP, 2004) and the Peel-Harvey Regional Ecological Linkages Project (Greenskills 2007). Its protection is therefore all the more important, and this status is extended beyond the boundaries of the existing vegetation corridor to remnants in the vicinity of it. That is, the removal of remnant vegetation within 100m of a REL compromises its core value and should be avoided (Molloy *et al,* 2009).

Required work		Have these been adequately addressed	PHCC comment/s
7	Determine and quantify any significant residual impacts by applying the Residual Impact Significance Model (page 11) and WA Offset Template (Appendix 1) in the *WA Environmental Offsets Guidelines* (2014) and include reference to the Commonwealth Assessment Guide for any MNES.	No	The ERD states no residual impacts pertaining to Inland Waters are anticipated, however investigations into some impacts appears incomplete and opportunities to detect potential residual impacts are inadequate (i.e., no monitoring of fauna, no assessment or monitoring of sedimentation potential). Refer to Table 5.2 (Table Section 5.12)).
8	Where significant residual impacts remain, propose an appropriate offsets package that is consistent with the WA Environmental Offsets Policy and Guidelines. Spatial data defining the area of significant residual impacts should also be provided.	No	• No residual impacts are identified as relevant to Inland Waters, however investigations appear incomplete. ASS remains a potential residual impact, even though the revised proposal considers ASS risk to be dealt with. • With Inland Waters, the ERD Section 5.5.6 states that there is little impact of the mining operation under a series of criteria. Much of this statement hinges on the groundwater modelling (GHD, 2020a). One line states: "To manage this (GW influence on GDE structures), when accessing new mining areas, ... site specific investigations will determine applicable mitigation strategies and monitoring programs based on more accurate hydrogeological and existing GDE vegetation conditions." What is clear from the minimal long-term monitoring undertaken for the operation to calibrate the groundwater modelling (only 29 bores total, only 5 bores in GDE's and only 1 bore in the operational mining area), the abstraction at GW from streamlines and GDE's in 10 of the 25 production bores in the mine area (and a lack of any drawdown shown in any of the model outputs for these areas or in the assessed 'risk' to GDE's (I1, Fig A26)) and a statement by GHD in their report (GHD, 2020a) that "There is insufficient information with which to assess the impacts to the GDEs, given that the groundwater level changes at the GDEs are not well understood (monitoring bores generally absent)..." (Att I1, ii), there is a serious doubt about the accuracy of the groundwater modelling. As a consequence, there is no confidence that there is 'minimal' residual impact of the operation. • Another likely issue with the residual mining impacts is that currently, issues of rising groundwater beneath cleared and mined areas are masked by water abstraction and a lack of GW and SW monitoring. After the mine has ceased operations, the Closure Plan (E05) does not expect any impacts of Closure (Sect 7.5.4 to 7.5.6) based on a limited number of previous reports that do not assess the current lack of monitoring, the high abstraction rates and the poor quality of the water modelling currently being undertaken (due to lack of monitoring). It is clear that once abstraction bores are switched off, there will be a significant increase in GWLs and there is not enough work presented that would provide information on residual impacts post-mining.
9	Demonstrate how the mitigation hierarchy of avoid, minimise, mitigate has been applied during the mine planning and design stages of the Project.	Partial	The avoid, minimise and mitigate hierarchy has been used to structure proposed actions to protect inland waters. However, these actions mainly relate to the Carter's mussel population in the Freshwater Lake, with the use of this framework regarding the Hotham River and tributaries unclear. The Hotham River is a Key Environmental Value that should be adequately ***avoided.*** Avoidance is not achieved if there are exceptions, and relevant strategies should be downgraded to ***minimisation***: Examples: 1. Page xxxii of the ERD states "Mining footprint to avoid low-lying topographical areas in the vicinity of rivers and creeks (...with the exception of essential infrastructure crossings to access new mining areas)". This strategy is minimisation at best, not avoidance. Avoidance in reality would involve placing an adequate buffer (according to the ERD to the Forest Management Plan 2014-23 outlined in Required Work item 6 above) that provides a ***complete no-go zone for any mining operations without exception on the Hotham River and its tributaries***. The importance of avoiding the Hotham River ***without exception*** has been illustrated in the comments from PHCC on the Required Work/Themes for Inland Waters and Social Surroundings. 2. Avoidance of a specific season for construction of crossings on the Hotham River is not adequate, once again because of the possible exception that this avoidance will only occur "when practicable". What constitutes "when practicable"? What is the decision-making process to determine this? The ambiguous language does not give confidence that the "avoidance" strategy will be applied adequately.

Required work		Have these been adequately addressed	PHCC comment/s
10	Demonstrate and document in the ERD how the EPA's objective for this factor can be met.	No	Whilst several potential risks to aquatic ecosystem values have been identified and discussed in the ERD, these have been determined by the Proponent as unlikely to eventuate and thus not of concern. However, there are several areas needing more investigation to determine if there is indeed minimal risk to aquatic environmental values as a result of this project, and that future impacts will be detected and acted upon. Key areas of concern include: • Potential for substantial inputs of sediment and TSS from clearing, mining, and construction of haul road bridges, yet no monitoring of TSS proposed nor any avoidance or mitigation actions clearly defined. • Hydrological change, including unclear timelines regarding mounding and abstraction, which reduces confidence that these will "offset" each other and cause no net change to river water levels (such as fish passage over critical formations). • No avoidance or mitigation proposed for groundwater mounding impacts on riparian vegetation, and vegetation GDEs in low lying areas. • Riparian clearing buffer sizes not defined. It is unclear which waterways are covered by provisions in the Forest Management Plan (DBCA managed land) and which do not fall under this category. • No recent baseline aquatic fauna surveys, including Rakali, freshwater turtles and macroinvertebrates. Recent fish surveys only in proximity to Tullis Bridge (for purposes of detecting impacts of NBG operations). This precludes any meaningful assessment of potential future impacts on aquatic fauna values. • In addition, the potential for ASS exposure on the banks of the Hotham River associated with construction of bridges has potential to detrimentally impact downstream environments of the Hotham River, and should this eventuate it is very difficult to reverse (becoming a residual or legacy impact). More detailed assessment of ASS forming soils in the proposed areas would be required to increase confidence these impacts can be avoided, and alternatives proposed in the case ASS risk cannot be completely avoided. It is encouraging to see an ASS management plan has been proposed, however the absence of this in the ERD means the community is unable to review how impacts are proposed to be mitigated. Implementation of the below may form the basis of a monitoring plan to facilitate detection of impacts, which is essential to mitigation of such impacts. Sedimentation/TSS: • Development of site-specific guideline values (SSGVs) for TSS, TDS and turbidity to facilitate monitoring and management of sedimentation risk. SSGVs would be developed using historic data from the study region, alongside recent pre-development baseline measurements. • Monitoring of TSS to be incorporated into monthly water quality monitoring already set out under the WMP. • TDS, TSS and turbidity to also be monitored on an events basis, to capture pulses of sediment moving into the system with significant rainfall events. • Exceedance of SSGVs to trigger aquatic fauna surveys, to detect impacts on aquatic values by comparing against baseline data. Changes to groundwater hydrology: • In areas in close proximity to groundwater abstraction bores, monitoring points set up in nearby riffle areas and significant pools to capture changes to depth, which may obstruct fish migration, or affect viability of pool water quality in summer. • If effects are detected, then aquatic fauna monitoring to be implemented to assess potential impacts – fish passage (similar to WRM 2018) and macroinvertebrate richness.

5.2 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
5.2.1 Ground water level	*Not supported*	*Insufficient evidence of non-*	*Investigation as to affects of groundwater*	• With apparent gaps in understanding as to groundwater changes in mining and non-mining areas, including insufficient data (GHD 2020; PH comms) the impacts of groundwater changes on riverine habitats remain unclear.	PER Appendix I1, I2 WRM 2011 (Ecological water

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
changes due to clearing		*impact to river levels*	*mounding and drawdown at critical riverine zones (e.g. riffles)*	• No consideration of the impacts of climate change on groundwater levels, and no formal assessment of how that may alter expected mounding and drawdown.	requirements for the Hotham River) WRM 2019
			Improved transparency around timelines of clearing relative to pumping	• Further information is required to determine whether increased groundwater abstraction will indeed be offset by mounding, or if pumping will commence at different times to clearing, or continue beyond rehabilitation. • No attempt to quantify relationship between groundwater change and river levels, nor any plan for monitoring. • Several key factors are not addressed when considering avoidance and mitigation of impacts: – There has been no investigation into the impact of bores on river levels, including depth over riffles (an important ecological water requirement; see WRM 2011). – Timelines between the commencement of pumping from new bores (drawdown) and clearing in particular areas (mounding). If pumping occurs at times groundwater is not elevated (i.e. pre-clearing or post-rehabilitation) then the assertion that water abstraction will not impact river levels may be incorrect.	WRM, 2011
5.2.2 Impacts on surface and groundwater levels/flows due to increased water usage	*Not supported*	*Lack of transparency regarding timelines of clearing and abstraction. Groundwater modelling relies on insufficient data (see PM comms). No attempt to quantify risk of reduced water levels on the Hotham River and tributaries*	*Clear timelines of both clearing (mounding) and abstraction (drawdown), including expected duration and extent of changes to groundwater. Investigation as to the likely impact on river levels Monitoring plan to include depth over riffles and other obstacles in vicinity of pumping*	• GHD (2020; Appendix I1) identify likely changes to groundwater from clearing (causing groundwater mounding), and groundwater abstraction for consumptive use. This information is then used to dismiss concern of river level changes by stating that abstraction will be offset by mounding, however if pumping occurs prior to clearing, or after progressive rehabilitation then there is a real risk abstraction will lower water levels and reduce environmental values by obstructing fish passage, reducing inundation of riffles, and lowering discharge rates and adversely affecting pool water quality (aquatic fauna refuge areas) in summer. • Changes to river depth should be a part of a detailed aquatic ecosystem monitoring plan, including threshold levels to trigger fauna monitoring and corrective actions. This should continue post-rehabilitation in mined areas, for as long as groundwater abstraction occurs. • Sustainable yields testing of production bores is referred to as a mitigation measure (Table 5.72), however parameters and action criteria not defined. • GHD has used a MODFLOW GW model to determine the impacts of mining on GWLs, GDE's as well as SW flows. Attachment I1, App D, Sect 2.4.4, discusses the surface interactions of the GW model. It talks of advantages of using Modflow's SFR package including the ability of calibrating the model using 'streamflows'. However, none of the local surface water streamlines are currently being monitored for flow (according to GHD 2020a), and GHD also state (ES pii) that there was not enough monitoring in most GDE's to calibrate the model or determine behaviour. From PHCC's hydrologists experience, MODFLOW is only accurate near the topographic surface if there are many monitored bores defining the discharge zone of the GW. To quantify any surface water and WDE behaviour, and discharge from groundwater, at least spot-flow monitoring of surface water is required. None of this is documented by GHD for their modelling. • From the WDE mapping (Fig A17), almost all of the WDE are along streamlines. What was assumed to be the flows in the local streams to use in the SRF package, the adjacent GWLs and how were these determined? This is not clear in the ERD. • Presentation of the GW modelling only shows 'Maximum' expected GW levels. Why are there no 'Minimum' GW levels presented, particularly near abstraction bore are located adjacent to GDE's. There is also no modelling presented of the impact of mining and water abstraction on surface water flows. • The lack of monitoring casts significant doubt on the accuracy of the modelling (particularly on surface water and GDE's) and its prediction that there would be minimal impact on GW flows out to downstream environments.	Attachment I1 (GHD 2020a) **Appendix D Section 2.4.4**
5.2.3 Loss of aquatic fauna	*Not supported*	*No contemporary baseline aquatic fauna surveys*	*Conduct baseline aquatic surveys that are fit for purpose*	• The aquatic ecological values of the waterways within, and downstream of, the development area have not been adequately defined. • There is risk of loss of aquatic fauna due to water quality/flow changes and impacts to river flows and highly likely to impact on aquatic fauna during bridge construction.	ERD, Appendix E07 Morrongiello *et al* (2011)

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
		No monitoring plan, no way to assess impacts *No assessment of groundwater changes to river depth over obstacles including riffles. No proposed monitoring of water depth for fish passage, pool water quality or summer baseflows*	*Develop a monitoring plan which addresses key risks and aquatic values, including SSGVs for TSS and depth over riffles*	• The ERD makes reference to monitoring future impacts, yet currently there is no defined aquatic monitoring plan aside from limited monthly water quality sampling. • No contemporary aquatic fauna baseline surveys have been conducted. The information that is available is either 10+ years old, does not cover the PAA because it was collected for a different purpose (usually both). This precludes any attempt to quantify future impacts on aquatic ecosystem values. • The WMP outlines monthly monitoring of electrical conductivity (salinity), pH, DO, temperature and turbidity. In addition, total suspended solids (TSS) should be added to the monitoring program, including events based (i.e. rainfall/storm events) monitoring to capture pulses of sediments and TSS moving into the Hotham River and tributaries post-clearing. Should SSGVs be exceeded, aquatic fauna monitoring should commence and mitigation measures proceed. • No targeted surveys have occurred for Rakali (P4 listed), with a desktop assessment comprising the only survey data from the assessment area (Rakali were recorded as bycatch from a 2017 fish survey in the Hotham River; WRM 2018). An estimated 2,964 ha of suitable Rakali habitat occurs across the area, with 1028 ha occurring in the primary assessment area, and it is assumed that only 135 ha will be impacted. However, without any formal assessment, these figures are just assumptions and do not substitute a targeted survey and actual data. As a minimum, this proposal should include a targeted survey of Rakali in the project area, to gain an understanding of population size and occurrence, and propose monitoring of the population henceforth. • Aside from the Carter's mussel survey (Stantec 2021), and fish passage studies related to NBG's water abstraction activities at Tullis Bridge (WRM 2019) there are no recent biological data gathered or presented. • There is no macroinvertebrate baseline study. This is a missed opportunity as macroinvertebrates are sensitive monitoring tools with which to measure environmental impact, as well as being an important diversity attribute for protection under Inland Waters. • A contemporary baseline dataset including vertebrate fauna (including Rakali, long necked turtles, and fish), crayfish, macroinvertebrates and microinvertebrates (zooplankton) should be included as a minimum, alongside a plan for ongoing monitoring of aquatic fauna. • There is no aquatic fauna monitoring plan proposed under this ERD, and there is no contemporary baseline survey of aquatic ecological values that covers the project area. Therefore, assessment as to effectiveness of management, monitoring and mitigation of potential impacts is not possible. • Western Minow's are strong migratory fish therefore increasing barriers such as river/water crossings will aid in the population decline of this species (Morgan and Beatty, 2004). • The Hotham and Williams River catchment system is already under stress and the proposed activities will increase this stress further particularly through increases salinity. Many native fish species are already living to their salinity tolerance/limits (western minnow, pygmy perch, nightfish) (Morrongiello et al 2011). Salinity has already caused threat to the Carter's freshwater mussel therefore if the salinity increases, the downstream effect of this would decrease the range of the freshwater mussel as well as native freshwater fishes.	
		Avoid, minimise or mitigate actions for the remaining aquatic values are vague and inadequate		• Specific avoid, minimise and mitigate actions relate only to the Carter's mussel population within the Freshwater Lake. Although this is the only EPBC listed aquatic species known in the study area, this does not mean it is the only aquatic value to be protected. • Aside from a vague commitment not to clear the riparian zone unless necessary, no measures are defined to avoid, minimise or mitigate loss of aquatic values of the Hotham River of tributaries as a result of mining. • Any clearing will have impacts on native fish life cycles stages - "Many Australian freshwater fish species are adapted to variable or unpredictable flow conditions and, in some cases, this evolutionary history may confer resistance or resilience to the impacts of climate change. However, the rate and magnitude of projected change will outpace the adaptive capacities of many species. Climate change therefore seriously threatens the persistence of many of Australia's freshwater fish species, especially of those with limited ranges or specific habitat requirements, or of those that are already occurring close to physiological tolerance limits. Human responses to climate change should be proactive and focus on maintaining population resilience through the protection of habitat, mitigation of current anthropogenic stressors, adequate planning and provisioning of environmental flows...."(Morrongiello et al 2011).	Morrongiello et al 2011

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
5.2.4 Change of water quality	*Not supported*	*No investigation as to the potential impacts of sedimentation* *Salinity risk determined to be low*	*Serious consideration to be given to the assessment of sedimentation risk, and a monitoring and action plan developed* *Improved groundwater investigations may reveal salinity risk to aquatic ecosystems* *Climate change impacts need to be investiaged and impacts of mining and climate change differentiated.*	• Sedimentation has been determined as a low risk, without formal investigation. • Sedimentation has the potential to severely impact aquatic values of the Hotham River and tributaries, through smothering fauna and fauna habitat, infilling pools, and reduced substrate heterogeneity. • There is no monitoring plan for TSS or sedimentation. This should involve set up of monitoring points at riffle and pool areas, with routine and events based monitoring. • Turbidity affects freshwater fish as majority of species are carnivorous therefore, rely on seeing their prey. Increased levels of turbidity would cause decline in population of freshwater fish as this would impact their feeding capacity (this includes mussel feeding capacity also) • Salinity risk to inland waters is determined to be low, however the probability of soil salinisation is acknowledged. “Avoid unnecessary clearing” is proposed as avoidance measure. This is really vague, considering that clearing is essential to mining bauxite. • GHD Attachment I1, p35 “Bauxite mining in the Saddleback area does not appear to be causing any additional observable salinity increase over and above that recognised as background response to regional rainfall decline." This may be a true conclusion from the modelling undertaken by GHD, but with only 23 documented monitoring bores measuring salinity change to cover an area of 57km² of mining and only 1 of these bores in an actual mining area (M03, which only has 2 EC readings post 2010), the statement has no validity. There may have been other bores used in modelling, but they are not documented and are likely to be short-term and/or impacted by abstraction. Even GHD (noted in section ‘i’ above) understands the issue with lack of data. • Other statements of the impact of mining in Saddleback and Marradong areas in this section also lack credibility due to the lack of monitoring bores and surfacewater flow monitoring. [PDM 27/07] • GHD Attach I1, Sect 4 documents info on surfacewater monitoring. DWER currently operate two regional flow gauges and prior to 1999, operated 4 local catchment gauges, however the 34MB gauges were variable due to mining operations and the Marradong gauges were in tiny catchments and heavily impacted by mining operations. None of the flows measured could be correlated to other local catchments to determine SW flow changes due to mining and none have data in the 23 years since they were closed. • GHD Attach I1, Sect 4.3 documents the available WQ information. Unfortunately, this is only documented in a series of tables that do not specify if WQ is changing; just a range of values with no monitoring period specified or the flow-rate during WQ monitoring. DWER sites on Hotham and Williams are of regional scale and their sensitivity to flow and WQ are such that local runoff (which is <5% of total flow) and GW discharge cannot be determined. The parameters shown in the tables only include EC/TDS, pH and Turbidity/TSS. No other parameters are documented and it is not apparent from documentation if there are contaminants from haul-roads or mining that may be an issue. • It is a key-criteria to determine if the mining operation is changing the groundwater and surface water levels, flows and water quality and by how much. With water quality measurement it is important that this is understood in relation to the quantity of water to determine a change over time. • The South Dandalup Dam catchment area Priority 1 (P1) and Priority 2 (P2) Public Drinking Water Supply Area is located along the northern boundary of the WMDE and may lead to impacts on Inland Waters.	GHD Attachment I1, p35
5.2.5 Water (Surface Water and Ground water) Dependant Ecosystems	*Not supported*	*Groundwater table rise causing waterlogging of vegetation GDEs identified as a likely impact, yet no avoidance or mitigation measures proposed*	*Avoidance and mitigation measures needed to ensure GDEs are protected.*	• A key point made in the ERD by consultant GHD (ERD, Appendix B) is that there is not enough hydrological data in the vicinity of groundwater dependant ecosystems (GDE’s) to understand the impact of mining on them; this is particularly concerning as GW models usually struggle to be accurate near the surface and need specific monitoring in these locations. • It is even more concerning with many GDE’s having operational GW abstraction bores beneath them; the EPA should instruct Worsley to shut down the abstraction bores located at GDE’s immediately and have Worsley propose more environmentally appropriate locations for abstraction bores across the whole minesite. The Proponents consultant GHD should have highlighted the issue with abstraction bores drawing down GW beneath GDE’s and it is a concern with the accuracy of their GW modelling and its conclusion that there is that little impact of mining on the Hotham River and catchments. This should also have been highlighted in their risk assessment of mining operations on GDE’s. • Changes to vegetation structure in Groundwater Dependant Ecosystems (GDEs) due to rising groundwater	ERD, Appendix B

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
				• Studies to investigate the specific tolerances of vegetation GDEs are proposed in the ERD, however there is no indication of how this information will be used – e.g. to increase clearing buffer zones, manage increasing groundwater tables, or offset? • Need to devise a management and mitigation plan to address potential negative impacts to vegetation GDEs. • Loss of riparian vegetation to waterlogging will destabilise river banks and reduce buffering capacity, having detrimental flow on effects to riverine ecosystems. Further investigation is required to determine the likelihood of negative impacts to riparian vegetation from groundwater mounding, and avoidance, minimisation and mitigation procedures outlined. • Existing abstraction bores have been identified by co-ordinates in Table A1 (Attch I1, Appendix A), Attch I1, App C Fig and ERD Fig 5-51) and Proposed abstraction bores from Attch I1 Table 1. While the draw from future bores is estimated, there are no details about existing bores as to: drawdown, operational period (start, end or seasonal period), abstraction rate or total abstraction. • The location of many abstraction bores is extremely concerning. Abstraction bores M01/11, M02/08, M02/18, K08, K07, T10, T08, T07A, T12 and T13 (that is 10 of the 25 bores in the current Bauxite mining area) are located on streamlines and at locations of mapped WDE's (from Attach I1, Fig A17). In the area north of the Hotham River, Attach I1, App C maps locations of an additional 11 abstraction bores, while ERD Fig 5-51 documents one additional bore at the BGM security gate. Of the abstraction bores north of the Hotham, 5 of the existing 12 are on mapped WDE's as well as all 6 proposed bores. Finally, one of the Hotham West abstraction bores is on a mapped WDE. • In total, 15 of the existing abstraction bores are on streamlines and WDE plus 7 proposed abstraction bores. It seems as these WDE are being targeted to minimise the likely increased water levels from clearing. However, the impact is actually a significant drying of the WDE's that will destroy their value. For instance, one of the few monitoring bores available (M05) is adjacent to abstraction bore M01/11 and it shows GWL fluctuations of 5-7m between 2012 and 2016 (which likely due to GW abstraction) with water level fall from a nominal 2m bgl to 9m bgl during the dust suppression season. However, none of this is documented by the Proponent in the ERD or by consultants GHD and hence casts doubt on the validity of the modelling. It would be expected that a drawdown would occur in the vicinity of abstraction bores and this critical issue has not been detailed in the ERD. • GHD (Att I1; Fig A26) only classifies the GDE's with abstraction bores as low to moderate risk. In fact, there is no mention of the impacts of locating abstraction bores below GDE's. This casts doubt as to the accuracy of the whole GDE assessment. Why does the groundwater modelling not pick this up? • At a minimum, these GDE's are at VERY High risk due to the pumping and this should have been documented in GHD's assessment. While bore M05 and MP26 show significant drawdown of groundwater at a GDE, there are no other monitoring bores located at GDE's nor those where abstraction bores are located. • In the Water Management Plan (E07), groundwater rise was assessed as a risk, however, groundwater level fall and changes to surface water flows due to it were not mentioned. The location of abstraction bores beneath surface water and WDE's shows that the proponent and their consultants do not understand how these systems work and do not have the correct procedures in place to manage them in the current mining operation. • This situation must be rectified immediately under the current mining licence, and no further mining extension permitted until the impact is clearly understood and GWLs at all GDE's return to what will sustain them. • Discussion of the cumulative impact of operations from BBM and BGM have only one single paragraph on ERD p228, which states that this may a potential exception. Yet, this area of influence covers 300km² and includes significant numbers of 'at High Risk' GDEs (GHD (2020a), many surface water tributaries and a 10km reach of the Hotham River. The Proponents need to work with BGM to determine the impact on these ecologies as well as the Flora and Fauna that use them to investigate how these cumulative and residual impacts may be mitigated. This will include modifying GW abstraction and monitoring GW and SW used by the WDE's. This work also needs to determine if the drawdown will contaminate local freshwater GW systems with Saline water from the Hotham River.	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
5.2.6 Riverbank erosion and sedimentat-ion	*Not supported*	*Insufficient evidence presented to dismiss sedimentation and erosion as a threat to aquatic ecosystem values* *Riparian buffer zones not adequately defined*	*Clearly defined riparian buffer zones for the whole project area* *Further investigation into the risk of sedimentation, development of a monitoring plan*	• Erosion of riverbank, increased sedimentation and rise in turbid water are high possible due to change in drainage patterns and riparian clearing. • Risk of sedimentation is not adequately addressed. • ERD p.525 states "All rivers and streams within DBCA managed lands of the PAA area will be subject to the criteria applicable to the informal reservation of river and stream zones under the Forest Management Plan 2014-2023 (Conservation Commission of Western Australia, 2013). These buffer zones are outlined in the Worsley Protected Areas Plan (Worsley, 2020a)." • However, the PAP only refers to buffer zones defined for the Freshwater Lake and downstream reach of the Augustus River (known Carter's mussel habitat). • It is unclear which waterways are referred to as DBCA managed lands – will all waterways in the PAA be considered to have the same minimum buffer zone? Or are there different criteria for waterways not within DBCA managed lands? This needs to be transparent. • It is assumed the other stream and river networks will be subject to the buffer sizes outlined in the Forest Management Plan, however these buffer sizes are supposedly outlined in the PAP (they are not).	
5.2.7 Acid Sulphate Soils	*Not supported*	*No actions are proposed to avoid ASS*	*More detail included regarding management of ASS, including alternatives presented that reduce ASS risk.*	• The risk posed by ASS is discussed in the ERD, as is the commitment to develop an ASS management plan in association with construction of bridges and installation of culverts (in association with bridges and haulroads) within the Hotham River and its tributaries. Alternatives should also be considered that do not disturb ASS. • Contamination of ground and/or surface water from potential acid sulphate material during removal of soils and sediment at river crossings is a high possibility. • In the instance that an ASS exposure risk is identified, no alternative actions are proposed to avoid this risk. • No attempt to measure potential impacts of construction and post-construction impacts (i.e. sedimentation) on aquatic fauna, and there is no contemporary baseline survey for fauna in the proposal against which to measure such impacts.	
5.2.8 Contaminat-ion of surface water	*Not supported*	*Concerns with management of current and future stormwater managed from haulroads and cleared areas*	*Further work is required to assure the community appropriate capital works is occurring with regards to current and future mining operations stormwater management, monitoring of surface water and aquatic fauna*	• Particular attention needs to be paid to the impacts of increased run-off from cleared areas and more information could be provided (as relates to sedimentation discussed above). • Water Management Plan Appendix E07 Section 3.1.5 states "Drainage in BBM areas disturbed for mining is managed by the control of storm water runoff to prevent environmental effects including erosion, sedimentation of streams, release of excessively turbid water and spread of forest disease." PHCC has concerns with current operational practices with respect to storm water runoff. • On 4th August 2022 PHCC reported a community concern with respect to high sediment load in the Marradong Brook as a result of rainfall events (See **Appendices)** The concern had been reported to PHCC by two local Boddington community members. During PHCC's investigations of the incident including photo monitoring upstream and downstream of the Marradong Brook crossing on Lower Hotham Road, PHCC were also made aware that a similar incident occurred in 2021 (through a community member) and was reported to the Department of Water and Environmental Regulation Pollution Watch Service in March 2021. This concern was requested to be added as an agenda item at the South32 Community Liaison Committee meeting on 8th August 2022 which PHCC is a member and the following information was requested: – Has the incident to been report to DWER? – To our knowledge South32 do not have a licence to discharge water into Marradong Brook. – What is the current operation surface water management plan, how drainage from the operations inc. haulroads is managed, is there a sump network, how are they monitored and maintained and what rainfall events are they designed for? – What is the routine monitoring upstream and downstream of the operations in terms of water quality including TSS and Turbidity as well as aquatic fauna and in particular to Marradong Brook? – Requested information regarding if TDS, TSS and turbidity are monitored on an events basis, to capture pulses of sediment moving into the system with significant rainfall events and if visual checks are made to sumps after these rainfall event as well. – Requested information on South32's immediate action and ongoing management to ensure this doesn't happen again.	 *Photo from 2/08/2022 showing impacts to Marradong Brook from South32 mining operations following rain events. See Appendices for further information.*

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				• At the meeting concern was expressed regarding the impact to river health, including water quality impacts and also risk to aquatic fauna. South32 advised that incident was a result of a haulroad sump breaching due to the recent rainfall events. The CLC were also advised by South32 that capital works were planned for this sump and the associated area to prevent these incidents, however this capital works was not conducted as planned. PHCC raised the concern that the community had raised the concern prior to any reports made by South32. At the time of the meeting, there had been no report made to the DWER by South32. At 25th August 2022, PHCC has not received a formal response to the email dated 4th August 2022 despite requesting this at the CLC meeting. It is also unknown if the incident has since been reported to DWER. • As a result of the incidents described above PHCC has concerns with current and future management of stormwater runoff from mining operations and the impacts to inland water including the Hotham River and its tributaries in terms of river health, including impacts to water quality and also aquatic fauna.	
5.2.9 Contaminat-ion of groundwater /surface water through hydrocarbon & chemical spills	*Supported*			Provided the Proponents chemical and hydrocarbon storage practices and spills response continues and is effective, then no additional risk (above that already occurring) is anticipated.	
5.2.10 Riparian Buffers	*Not supported*	*Riparian buffers for non-DBCA land is not defined.*	*Clearly define riparian buffers in private land areas.*	• Only 7% of the mapped water courses (total of 2,912 km) within the Hotham-Williams catchment are in good or near pristine condition (PHCC 2020) and it is of upmost importance this figure is increased and not further diminished. • It is stated in the ERD that waterways within DBCA managed land will have riparian buffers in accordance with the Forest Management Plan, however it is unclear which waterways are covered by this. It might be assumed this framework will apply to all river and stream networks within the project area, however increased transparency as to which buffer sizes are applied where, and justification for these buffer sizes is needed. • It is unclear what the width and nature of the buffer will be between the Hotham River (and its tributaries) and the mining/related activities. There is reference in the ERD to the Forest Management Plan 2014-23 (Conservation Commission of WA 2013) stating that riparian buffers within DBCA managed land will adhere to the criteria of the Management Plan. The majority of land parcels along the Hotham River are Crown Land surrounded by cleared agricultural land with scattered remnant patches of native vegetation. For consistency, and to maximise the effectiveness of a buffer, the riparian corridors that are not situated within DBCA managed forested areas should be attributed buffers that are significantly more than the width of existing riparian vegetation which is currently 100m in total including bed, banks and riparian vegetation. Furthermore, these buffers should not simply consist of unmined land, but should contain native vegetation. Where this does not exist naturally, the Proponent should be required to create vegetated buffers to bring them up to the same standard as the forested areas under DBCA management, which the Proponent has stated will be achieved according to the standards of Forest Management Plan 2014-2023. The Proponent should also be required to improve the health of the existing riparian vegetation along the Hotham River and tributaries corridors by investing in natural area restoration activities. This will boost its resilience against surrounding land use such as mining and improve the buffering function of the riparian area. This request has been previously requested of the Proponent by the PHCC, specifically in relation to land which the Proponent either owns or manages, and fencing and revegetation all riparian corridors with appropriate management (feral animal, weed control). • Buffers have been applied inconsistently and without clear reasoning behind this: The reaches of the Hotham River adjacent to Marradong and Saddleback, and the reaches of the Williams River to the southwest of Saddleback appear to have a different proposed applied buffer widths according to Figure E-S4. The Thirty Four Mile Brook and Marradong Brook (Hotham River	PHCC (2020) PHCC NRM Strategy, Gaia, Mandurah. Accessed on 25/08/2022. https://peel-harvey.org.au/nrm-strategy-2/hotham-and-williams/

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				tributaries) have the same narrower polygon attributed to them as the reaches of the Williams River. Visually, it appears the buffer will be narrower in these sections than the remainder of the Hotham River corridor. • The extent of buffers should be determined through a greater understanding of the Aboriginal heritage of the Hotham River and its tributaries, determined through Aboriginal Heritage surveys. • The location of the main Nullaga Haul road (ERD, Fig 1.5) over the Hotham is located over the confluence of the 34 Mile Brook and Hotham River and would necessitate a much broader span than the 35m to stay out of the river and brook streamlines (ERD, p23). The Hotham River reach in the vicinity of the Nullaga Haul & conveyor crossings has rich fringing vegetation (based on 2018 aerial imagery), and should not be disturbed, however it will require at least 60-70m bridge spans to protect the fringing vegetation from damage including construction activities and flood flow velocities.	
5.2.11 Ramsar Site 482	*Not supported*	*Wetlands of international importance (listed under the Ramsar Convention) have not been considered as an MNES*	*Assess direct and indirect impacts of the proposal on Ramsar Site 482*	• Direct and indirect impacts of the proposal to the Peel-Yalgorup System have not been assessed. • The Hotham-Williams-Murray river system drains into the Peel-Harvey Estuary, one of the components of the Peel-Yalgorup Ramsar Site (Ramsar Site 482). This system was designated as Wetlands of International Importance under the Ramsar Convention on Wetlands in 1990 as Global Ramsar Site 482. Based on the Ecological Character Description of the Peel-Yalgorup Ramsar Site (Hale and Butcher 2007) the system meets six criteria for listing as a wetland of international importance, including Criterion 1: The site includes the largest and most diverse estuarine complex in south-western Australia (i.e. the Peel-Harvey Estuary) and also particularly good examples of coastal saline lakes and freshwater marshes. • Ramsar wetlands of international importance are identified as one of the nine Matter of National Environmental Significance and subject to protection under the provisions of the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). • The proposed activities are located within the upstream catchment of the Peel-Yalgorup Wetland System. Through the National Landcare Program / Regional Land Partnership, the Australian Government has recognised the importance of abating threats both in the upstream catchment of the Peel-Harvey Estuary, as well as within the boundaries of the Ramsar Site itself to protecting the ecological character of the Site. For the Peel-Yalgorup Ramsar Site, the entire Peel-Harvey Catchment was designated as the Ramsar Upland Catchment (see the maps at http://erin.maps.arcgis.com/apps/MapSeries/index.html?appid=c2606f315ee74d899c4f7ae478c29ccc). The Peel-Harvey Estuary has already been identified as an at-risk estuary by the Western Australian State Government primarily due to nutrient enrichment of its waters and sediments from nutrient-rich water and sediment flowing down from the catchment – see https://www.water.wa.gov.au/water-topics/estuaries/regional-estuaries-initiative. • Scientific research has shown us that the estuary is already suffering under existing impacts and management issues of poor water and sediment quality, treatment and disposal of dredge spoil, declining groundwater quantities and quality, declining surface flows in streams and rivers due to climate change, physical disturbance of birds, loss of aquatic and terrestrial flora, loss of habitat for birds and aquatic fauna and pressures from recreational and commercial fishing. • PHCC therefore contends that, as a logical extension, adverse effects of mining operations on the environmental and ecological values of the Ramsar upstream catchments may also have adverse effects on the ecological character of the Ramsar Site itself. We also contend that as the bottom-of-catchment receptor, the Peel-Harvey Estuary is susceptible to the cumulative impacts of all threats in the catchment and that this must be considered in assessing this proposal. • The cumulative impacts on the values of the Peel-Yalgorup Ramsar Site, in particular the Peel-Harvey Estuary, from the afore-mentioned existing pressures, in combination with the additional impacts of the proposed expansion of the mining and refining operations must also be considered in this assessment.	
5.2.12 Residual Impacts	*Not supported*	*No residual impacts determined for Inland Waters*	*Residual impacts on inland waters to be considered*	• The Proponent has made an assessment that there will be no residual impacts and therefore proposes no offset package for Inland Waters. • The WA Environmental Offsets Guidelines (2014) states that offsets are not required if the residual impacts are reduced to an acceptable level by Avoidance/Minimisation/Mitigation. Review of Required Work items 1-7 & 9 indicate gaps in characterisation/analysis of surface and groundwater, baseline surveys, ASS investigations, management of impacts, identification	

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				of residual impacts, and application of the avoid, minimise, mitigate hierarchy. Collectively, these inadequacies in the ERD outlined in this review call for a comprehensive and appropriate offsets package and The Proponent should be required to develop and provide this for Public Review. • Likely residual impacts as a result of clearing native vegetation for crossings on the Hotham River include: – Interference with its Regional Ecological Linkage status (PHCC, 2007) by removal of native vegetation for the installation of crossings. – Weed invasion where the crossing easements are located on the Hotham River. – Ongoing erosion and sedimentation due to the lack of ground cover within the crossing easements. A cleared area will favour weed germination, which will not provide adequate stream stabilisation against erosion at the site and subsequent sedimentation downstream. – Contribution to reduced water quality due to reduced stream cover at the site of the crossings. • There is also risk associated with the presence of ASS along much of the Hotham River as outlined in Required Work item 5 (Table 5.1). The construction of haul roads will impact on these soils and even with a management plan in place, risk is high in the context of irreversible damage if appropriate measures are not implemented adequately. A previous example of mistakes made by operators on the ground can be seen in the historical accidental clearing of 40ha, which is stated in the EPA Environmental Scoping Document. • What is the confirmed number of crossings? The Fact Sheet for Social Surroundings (Aboriginal Heritage) indicates three crossings, and personal communication with a South32 employee at one of the Boddington Community Consultation sessions suggested that there would only be one major crossing. The ERD states ambiguously that 'other haul road crossings of minor tributaries are also planned over Thirty-four Mile Brook, Wattle Hollow Brook and other drainage lines..." This is very vague any number of crossings over the Hotham River and its tributaries is unacceptable due to the reasons outlined in PHCC comments on Required Work items 5-7 (Table 5.1) and the widely known fact that the River (*and its tributaries*) are an Aboriginal Heritage site of Mythological significance (see PHCC comments on Social Surroundings). • There is no information provided on the long-term maintenance of the crossing easements. • There is no information on what the nature of the bare ground over which water will flow within the easements. • It is not clear how wide the crossings will be and therefore the impact to native vegetation including riparian buffers. • It is not clear if vegetation will be permitted immediately adjacent to the crossings in terms of ongoing maintenance and fire mitigation. • It is not clear if there will there be rehabilitation of the area disturbed during crossing construction. • The assessment and measures outlined in section 5.5.4.2.3 of the ERD are inadequate to address fish passage at the site of the crossings. There have been no baseline studies carried out to support the broad assumptions made that "...significant impacts on aquatic fauna are not anticipated". There is a significant gap in biological data-gathering that is also relevant for measuring impacts on aquatic fauna post-crossing construction. The impacts of climate change and mining-related groundwater extraction on stream flow have not been considered in the brief discussion of the minimum depth requirements for "recorded" fish species and the broad claim that the crossing have been designed to 'minimise stream flow alterations'.	
5.2.13 Cumulative impacts	*Not supported*	*Potential impacts from this development on the Hotham River have not been adequately defined*	*Clearly define cumulative impacts on the Hotham River*	• The Hotham River and its tributaries are considered moderately degraded, due to a legacy of impacts associated with agricultural clearing. However, the proposed expansion of mining in the catchment has potential to exacerbate a number of environmental issues, and potentially introduce more impacts (ASS exposure, sedimentation). Without better investigation into these potential impacts, assessment of whether cumulative impacts are acceptable is difficult. • Discussion of the cumulative impact on GDEs of operations from BBM and BGM have only one single paragraph on ERD p228, which states that this may a potential exception. Yet this area of influence covers 300km² and includes significant numbers of 'at High Risk' GDEs (GHD (2020a), many surface water tributaries and a 10km reach of the Hotham River. The Proponent needs to work with BGM (Newmont) to determine the impact on these ecologies as well as the Flora and Fauna that use them to investigate how these cumulative and residual impacts may be mitigated. This will include modifying GW abstraction and monitoring GW and	

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				SW used by the WDE's. This work also needs to determine if the drawdown will contaminate local freshwater GW systems with Saline water from the Hotham River.	
5.2.14 Climate Change	*Not supported*	*Climate change impacts on Inland Waters has not been adequately addressed.*	*Clearly define climate change impacts on all components of EPA factor Inland Water*	• According to the 2021 State of the Environment Report, under a changing climate *"the environment will be subjected to greater stresses of longer periods of drought, which will reduce and degrade aquatic ecosystems. This will reduce habitats for flora and fauna, which will affect breeding and populations, as well as potentially reducing species refuges. Long periods of low streamflows will increase the risk of blue–green algal blooms and fish deaths.....The drying-out of wetlands and increase in area of acid sulfate soils will affect the quality of water and soil."* • The design criteria based on Heritage (p518) where "piers are not to be located in river flow paths" is ambiguous as large flood events are also to be expected in the river flow paths; especially in terms of potential climate change impacts like what has been experienced in NSW & Qld in 2021/22. The location of the main Nullaga Haul road (ERD, Fig 1.5) over the Hotham is located over the confluence of the 34 Mile Brook and Hotham River and would necessitate a much broader span than the 35m to stay out of the river and brook streamlines (ERD, p23).	2021 State of Environment Report

6. AIR QUALITY

EPA Objective: To maintain air quality and minimise emissions so that environmental values are protected.	
Relevant Activities: Clearing of vegetation and land disturbance for mining activities.	
Potential impacts and risks	• Dust generation from mining activities, haulage, and light vehicles on unsealed roads. • Exhaust emissions from light and heavy earthmoving vehicles and generators, and emissions from blasting activities. • Increased greenhouse gases (GHG) and particulate emissions to the Collie airshed.

6.1 EPA REQUIRED WORK

Required work		Have these been adequately addressed	PHCC comment/s
1	Compare predicted emissions and ground level concentrations with appropriate standards.	Partial	Toxics are not included in the Air Quality Monitoring. This is a significant shortcoming of the AQM given the known risks from mercury in crushed bauxite ore, the freshwater contamination of mercury at the mine site, and the range of other air toxics emitted in bauxite mining and refining. Uncontrolled dust could impact the environment by physically smothering vegetation and/or by introducing chemical risks, eg, from toxics (mercury and other contaminants) or other polluting compounds (NOx, SO2).
2	Describe how the chosen technology meets industry standards and compares to best practice.	Yes	
3	Characterise greenhouse gas emission sources from the proposal and estimate the expected Scope 1 (direct) and Scope 2 (energy indirect) greenhouse gas emissions, in accordance with the *National Greenhouse and Energy Reporting Act 2007*.	Yes	
4	Analyse greenhouse gas intensity (i.e. quantity of carbon dioxide equivalent - CO2-e generated per tonne of product produced) and compare with published current benchmarked world's best practice for bauxite mines, equipment and operations. Develop a Greenhouse Gas Management Plan and detail the management and mitigation measures that will be used to reduce greenhouse gas emissions and improve operational efficiency using the mitigation hierarchy, including the management and mitigation measures that can be implemented over time to achieve a long-term reduction in greenhouse gas emissions. Identify and justify the contemporary best practice management and mitigation measures that will be implemented.	Partial	See comments in **Section 8.1**

6.2 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
6.2.1 Air quality impacts	*Not supported*	*The Proponent downplays the impacts of its proposal on health, amenity and visibility issues for the local communities*	*An in-depth, transparent assessment of the risks to be conducted*	The air quality implications of the proposal are significant. Mining, transport and alumina refinery operations cause air borne emissions of dust, toxins and combustion products that have the potential to cause serious health impacts, including cancer and silicosis, as well as the amenity and visibility issues associated with dust. The following comments highlight the issues with the Proposal relating to these risks: • The Proponent downplays the impacts of its proposal on health, amenity and visibility issues for the local communities. While their website says that the 'potential health risks at our workplace include potential exposure to carcinogenic substances (silica, diesel particulate matter, nickel, and coal tar pitch volatiles), and other airborne contaminants (coal dust, fluoride, lead and manganese dust), the ERD does not address these issues and overlooks the potential impacts on surrounding communities. • Complaints from the local communities about visible dust and possible health effects are barely acknowledged. • The ERD outlines in general terms that particulate matter of varying sizes are 'associated with amenity or visibility issues;' 'can enter the respiratory tract and remain suspended for many days in the atmosphere,' and 'are potentially associated with human health impacts, and can remain suspended in the atmosphere for months to years' (ERD, 535) • Toxics are not included in the Air Quality Monitoring. This is a significant shortcoming of the AQM given the known risks from mercury in crushed bauxite ore, the freshwater contamination of mercury at the mine site, and the range of other air toxics emitted in bauxite mining and refining. Uncontrolled dust could impact the environment by physically smothering vegetation and/or by introducing chemical risks, eg, from toxics (mercury and other contaminants) or other polluting compounds (NOx, SO2). • The risks to the surrounding forest are not effectively measured through the air quality standards applied which are informed by human health criteria, and the risks to the environment from dust are downplayed and should take into account residual impacts, alongside any cumulative impacts. • The ERD outlines (on pages 535 - 536) the largest sources of dust resulting from the operations and provides a summary of emissions estimates from dust generating activities in Appendix J1 (ETA, 2020a). The potential impacts that may occur to air quality from implementing the Revised Proposal are: – Generation of particulates from mining activities, including material handling, vehicle and machinery movement and wind erosion to the local airsheds and sensitive receptors – Generation of particulates from refining activities, including the disposal of bauxite residue – Emissions of combustion products associated primarily with earthmoving and blasting activities' (ERD, 539). • The contribution of estimated PM10 emissions at the BBM shows that wind erosion is the single largest contributor (50%), followed by ore processing (28%), wheel-generated dust on haul roads (21%), mining activity (1.8%) and drilling/blasting (0.2%)' (ERD, 536). 'The results of the NOX and CO emissions estimates for the WMDE and BTC show that fuel (diesel) combustion emissions from haul trucks are the single largest contributor to NOX emissions (approximately 198 tpa), and blasting is the single largest contributor to CO emissions (approximately 126 tpa). A summary of the NOX and CO emissions estimates by source are provided in Appendix J1' (ERD, 538). 'The 2018 inventory showed that material air emissions from the Refinery include CO, SO2, NOX, particulates, odour and volatile organic compounds' (VOCs) (ENVALL, 2018) (ERD, 538)	
6.2.2 Environmental Impacts	*Not supported*	*Inadequate monitoring of surrounding forest areas*	*An in-depth, transparent assessment of the risks to be conducted*	The risks to the surrounding forest are not effectively measured through the air quality standards applied which are informed by human health criteria, and the risks to the environment from dust are downplayed and should take into account residual impacts, alongside any cumulative impacts.	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	References and Plates
6.2.3 Reliance on buffer zones	*Not supported*	*Reliance on buffer zones rather than active dust minimisation or control*	*An in-depth, transparent assessment of the risks to be conducted*	There is reliance on buffer zones for dust management (for dilution) rather than active dust minimisation or control. The processes of an alumina refinery are highly polluting with typical pollutants including mercury, VOCs, GHGs, fluoride, benzene, acetaldehyde, formaldehyde and SO2. The Worsley refinery is old and in need of technological upgrade, both to its fuel source and its emissions controls.	
6.2.4 Mitigation	*Not supported*	*Failures to meet leading practice at Saddleback area* *Numerous areas needing improvement with the Proponent considering not committing to these*	*An in-depth, transparent assessment of the risks to be conducted*	The Proponent engaged a consultant to conduct a 'benchmarking assessment' of its activities against 'current leading practices.' The consultant (ETA) found some 'notable points of departure from leading practice' at the 'Saddleback secondary crusher and stacking at Saddleback, where high dust emissions were observed on site' (ETA, 2020b)' (ERD, p550-51). It also found that there other mining processes where 'improvement is possible' include: • Land clearing/topsoil removal • Loading (front end loader) • Haul road dust suppression • Stacking at Marradong • Open areas across the mine (with the exception of Marradong) (ERD, p550). 'The improvements identified were related to minimising the time between clearing and rehabilitation (to reduce the large open cleared areas which present high risk of wind erosion), reducing water truck deadtime and water load loss, reducing drop heights and tramming of front end loaders.' The ERD finds as a result of this assessment that 'there are potential opportunities for improvement, including wind shields, water sprays or enclosures. Worsley Alumina will consider these recommendations for improvement in future maintenance planning of the crushing and stacking facilities' (ERD, p551).	
6.2.5 Cumulative Impacts	*Not supported*	*These emissions will contribute to cumulative impacts in the local and regional airsheds associated with the Primary Assessment Area*	*An in-depth, transparent assessment of the risks to be conducted*	The ERD acknowledges that, 'The release of combustion products associated with the continuation of mining activities relevant to this Revised Proposal will result in the continuation of pollutants being released into the atmosphere. These emissions will contribute to cumulative impacts in the local and regional airsheds associated with the Primary Assessment Area (i.e. Collie airshed, Boddington airshed and South West regional airshed). In high concentrations, combustion products also have the potential to cause human health effects, as reflected by the Air NEPM Human Health Criteria' (NEPC, 2016) (ERD, p546).	

7. SOCIAL SURROUNDINGS

EPA Objective: To protect social surroundings from significant harm.	
Relevant Activities: Clearing of vegetation and land disturbance for mining activities within proximity of residences, recreation and heritage sites.	
Potential impacts and risks	• Noise from construction and operational activities (including blasting and excavation, haulage, disposal activities, audible warning signals, and off-site transport activities). • Noise and dust impacts at nearby residences. • Dust deposition on native vegetation and agricultural crops. • Disturbance to heritage and tourism areas. • Changes to land use through acquisition arrangements. • Reduced visual amenity.

7.1 EPA REQUIRED WORK

Required work		Have these been adequately addressed?	PHCC comment/s
1	Characterise the surrounding land use and amenity values in, and adjacent to the Primary Assessment Area (WMDE, BTC and CBME), with a focus on the sensitive receptors and important areas for human use that could be affected by noise and dust emissions, visual amenity issues, and alterations to the land from mining. Include relevant maps to show the locations of the sensitive receptors likely to be affected by the proposal.	Partial	Surrounding land uses have been characterised in Table 5-77 (Page 563-564) and Figure 5-62, however issues are identified with Required Work Item 5 below. Amenity values have been broadly defined as natural, cultural, tourism, and heritage. Maps are provided for sensitive receptors in relation to Noise (Figure 5-66, 5-67), Blasting (Figure 5-68), Visual Impact (5-69, 5-70), Air Quality (5-60). There are issues with the determination of visual amenity issues, including stakeholder consultation as detailed in Table 7.2 below.
2	Characterise noise impacts on sensitive receptors via a noise assessment in accordance with EPA and contemporary guidance. Demonstrate that noise can be managed such that it complies the *Environmental Protection (Noise) Regulations 1997* at sensitive receptor locations.	Partial	The Proponent is clearly working to comply with noise regulations, however there are gaps with regards to planning and mitigation processes. Refer to Section 7.2.5 below for further details.
3	Characterise impacts on sensitive receptors from ground vibration due to activities including but not limited to blasting.	Partial	The Proposal states that “There is the potential for European heritage sites within the PAA to be indirectly impacted upon as a result of blast vibration. Management of these impacts are discussed in Section 5.5.5 and Section 5.7.5 but means of mitigation of indirect impacts are not discussed in these sections.
4	Characterise the environment by providing baseline data of dust emissions and identify diffuse sources of dust.	Yes	

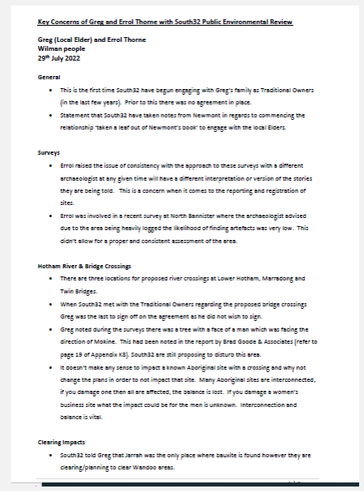
Required work		Have these been adequately addressed?	PHCC comment/s
5	Characterise the environment by providing a description and associated maps/figures of the visual landscape character and scenic quality values. This is to include, but not be limited to: landforms; vegetation; waterways (including wetlands) and can be undertaken by way of 3-dimensional modelling and/or photographs.	No	Figure 5-62 provides an inadequate representation of landscape units that will be impacted within the boundaries of the PAA. The intention of this map should be to characterise the landscape, and instead it is confusing and misleading: • Previously mined areas that are at different stages of rehabilitation are either mapped as 'Reserve and Parks' or 'Native Vegetation (Mixed Use)' - it is difficult to decipher which. • Only a tiny proportion of mining areas are depicted on the map and does not appear accurate. An aerial photograph would have been a more accurate depiction of this, given that there are significant areas that are devoid of vegetation throughout and adjacent to the WMBE. If there is a definition of 'Mining' that is known only to the Proponent in creating this map, it results in a misleading picture of the extent of current mining operations. At face value, Figure 5-62 implies that the majority of the mining area is within the RLA only. • The majority of the waterways are mapped as 'Native Vegetation (Mixed Use)' and should be mapped as 'Waterways' (see additional comments about this regarding Table 5-77 below). • Figure 5-62 is directly conflicts with Figure 3-2 of Appendix K1, which indicates there are no Parks and Reserves within the WMDE. These areas are mapped as 'Rehabilitation'. Again, this adds to the general confusion of the Landscape Unit information. Without an adequate picture of the landscape, how can the reader make an informed decision about true impacts of the proposed mining operations? • Table 5-77 is also misleading in terms of the impression it gives of the different types of vegetated landscapes. • The photo that is supposedly representative of Native Vegetation (Mixed Use) shows very degraded vegetation, and the implication of classifying the majority of Waterways as Native Vegetation (Mixed Use) is that vegetation along the waterways is degraded. This could cause the reader to disregard it in terms of an important landscape feature. Conversely, the 'Waterways' Landscape Unit has a photo of what appears to be good quality vegetation. • The 'Waterways' Landscape Unit's characteristic presence of native vegetation is diminished by the statement that "Views are often restricted by canopy vegetation, topography and shrubs". This is irrelevant in the context of a vegetated landscape, because the vegetation is the view, and this statement only serves the purpose of creating a negative slant on vegetated landscapes.
6	Discuss the impacts of noise, dust, alteration to landforms and alteration of waterways from the proposal, on sensitive receptors, native vegetation, agricultural crops and important areas for human use. This is to include, but not be limited to, a visual impact assessment (VIA) for before, during and after the proposed excavation activities, to assess the impacts of the proposal on visual amenity in accordance with the Western Australian Planning Commission (2007) *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design*, and in consultation with the Department of Biodiversity, Conservation and Attractions.	Partial	Visual impact assessment has been conducted however, the community has not been engaged in the Visual Impact Assessment and effects of cumulative impact on aesthetic value have not been given consideration. This is discussed further in **Section 7.2.4** below and in Required Work Item 7 below. Impacts on Aboriginal Heritage as a result of altered waterways discussed in the Social Surroundings **Section 7.2.1** below.
7	For the VIA described in work item 60, it is to identify and describe the aspects of the proposal which may potentially affect	No	It is difficult to understand the findings of the Landscape and Visual Impact Assessment that "...there will be no significant adverse impacts to visual amenity during any stage of the Revised Proposal", due to the nature of mining operations i.e., involving the removal of vegetation, and the presence of extraction areas, stockpiles and transport corridors. For example, Viewpoint L12 on the Lower Hotham Road has been assessed as minor and apart

Required work		Have these been adequately addressed?	PHCC comment/s
	the visual landscape character and scenic quality values, both temporarily and permanently, using agreed (by EPA, in consultation with the Department of Biodiversity, Conservation and Attractions) reference and vantage points of surrounding areas including: travel routes and use area's viewer positions and perceptions.		from the existing OBC, "...there are no other views of existing mining operations as the area is mostly screened by existing vegetation and topography". This is untrue from the perspective of a driver on the Lower Hotham Road when approaching the existing OBC and viewing the large area of land that has been modified in the vicinity of it, and new infrastructure installed. This viewpoint should have been assessed as having a moderate visual impact at best due to: • Dominant Magnitude of Change – there has been a major change in view at close distance, affecting a substantial part of the view. • Medium sensitivity rating due to the viewers having an interest in the surrounding landscape – the majority of those driving on the road would be locals who live in the area and therefore have a vested interest in the aesthetics of the landscape. Furthermore, these viewers are likely to drive on that road frequently and will therefore be frequently subjected to the altered view. Given the inaccurate assessment of the L12 viewpoint, there is low confidence that other sites are not being adequately assessed by the proponent, with the result of diminishing true visual impacts of mining operations.
8	Identify the types and sizes of trucks, the road upgrades required to accommodate operations and ensure the safety of other road users. Demonstrate how the road will be maintained to provide for the ongoing safety of road users.	Partial	The types and sizes of trucks are identified and discussed, however ongoing safety of road users is not clearly discussed.
9	Provide a detailed description of the cumulative impacts associated with this proposal on heritage, recreation and other important areas for human use in all approved areas in MS 719.	No	Refer to **Section 7.2.10** below. Page 595 and pages 709-710 of the PER document have a small section on cumulative impacts which focus on the cumulative visual impacts in the context of sequential and/or simultaneous viewpoints that are influenced by the mining operations. • This is not a 'detailed description' of cumulative impacts. Cumulative refers to aggregate/increasing/intensifying impacts that result from mining operations ***over time*** and this includes past and existing operational activities carried out by the Proponent. Cumulative noise and impacts on the Bibbulmun Track are also mentioned briefly with no discussion of the ongoing degradation of Aboriginal Heritage places. The document Archaeological Survey of the South32 Worsley Alumina Priority 1 Bridges and Transport Corridor Areas at Hotham and Marradong in the Shire of Boddington, Western Australia (Goode 2021) outlines that 81% of artefact scatters found within the study area (of the proposed crossings) have been degraded over time to the point that they are considered 'not a site'. • This is the very definition of cumulative impacts and should therefore be discussed at length in the ERD, including consideration of avoiding these sites due to their previous status and scattered artefacts that have since been removed. • The dismissal of these sites on legal grounds is contributing to ongoing (and therefore cumulative) degradation of the Heritage sites. • By proposing to impact sites still attributed a legal status of protection e.g. the Hotham River and its tributaries, this is continuing the same cycle of degradation over time which led to other sites being downgraded to 'not a site'. The Archaeological Survey also states that there is potential for further Aboriginal Heritage artifacts to be uncovered during ground disturbance in one of the proposed crossing areas - 'Area 5'. • This too suggests that there is a high likelihood of contributing to already-significant cumulative impacts. • The adoption of the Precautionary Principle would dictate the avoidance of the Heritage site. This should be applied to the Hotham River and its tributaries, given its mythological status and the concentration of Aboriginal activity around waterways through history (Goode 2021). The Hotham River and its tributaries are a Mythological site of Aboriginal Heritage which have been degraded over time in the context of ecosystem health and the condition of vegetation, channel form and water quality. These cumulative impacts should be discussed at length to weigh up the continued and compounding pressure that the proposed crossings will place on the Hotham River and its tributaries.

Required work		Have these been adequately addressed?	PHCC comment/s
			• The Hotham River should be a site of recovery/restoration, and assistance should be provided for that purpose, instead of proposing activities that will add to the accumulation of impacts into the future.
10	Predict the residual amenity impacts from the proposal on the sensitive receptors and important areas for human use after considering and applying avoidance and minimisation measures. Impact predictions are to include, but not be limited to: i. The likely extent, severity and duration of the impacts from noise, dust, light-spill, and alterations to the landscape, landform and to amenity; and ii. Simulations/modelling of the predicted residual impacts from the proposal, including changes to the landscape from the agreed reference and vantage points.	Partial	The residual amenity impacts have been predicted however the details around these are discussed in detail below in Sections 7.2.4 Aesthetic Value, 7.2.5 Amenity – Noise, 7.2.6 Amenity – Dust.
11	Identify management and mitigation measures for the proposal including closure and rehabilitation outcomes to ensure residual impacts are not greater than predicted. The ERD is to include: i. A description of the management and mitigation measures; ii. Management zones and strategies for managing visual landscape character relative to each stage of the proposed operation; and iii. Environmental management plans outlining the environmental outcomes/objectives, other key regulatory requirements; management actions, monitoring (including methodology, frequency, location and rational), trigger criteria, contingency actions, review, reporting and consultation.	Partial	Refer to Table 7.2 below further detail. The current 45% rehabilitation deficit noted in the proposal is particularly concerning given the threats to native wildlife and the well-documented impacts of poorly rehabilitated mine sites. Whilst there are management plans in place, the success of these is not clearly defined and issues with some of these plans is detailed within this submission.

Required work		Have these been adequately addressed?	PHCC comment/s
12	Demonstrate and document how the EPA's objective for this factor can be met.	No	The Proponent has not demonstrated that it will protect social surroundings from harm, refer to Section 7.2 for further details.

7.2 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
7.2.1 Aboriginal heritage and culture	*Partially Support*	*The proposal seems to comply with AHA requirements but does not adequately respond to locally identified Aboriginal cultural values*	*The Proponent work closely with a combined working group of the GKB traditional owners and a CLC - designated persons to ensure adequate protection of local sites of significance or where impact will occur negotiate with the GKB adequate social offset to protect local Aboriginal artefacts and support the preservation of local Aboriginal heritage initiatives.*	• PHCC believes that the proposal should be far more proactive in supporting previous and current interests of the local Aboriginal community. The proposal clearly notes the commitment to adhere to the Aboriginal Heritage Act 1972 and associated good cultural practices. The engagement with the GKB Traditional Owner Group is a positive albeit delayed process. • PHCC works closely with the local Aboriginal community and in consultation with them is not convinced that the proposal has taken sufficient consideration of the importance of the cultural significance of the impacted sites, particularly in relation to the proposed river crossing and associated works. (See **Appendices** for signed notes of meeting between Traditional Owners and PHCC representatives) • The proposal notes that the proponent will "Minimise physical impacts to known Aboriginal and European heritage locations" (page xxxvii), yet also is clear that there will be significant impacts. "it is known that three Aboriginal heritage sites will be impacted by the construction of the river crossings." (ERD, p595). This conflicts with the proposal statement on page 85 that "In line with Worsley Alumina's Community Investment Approach (which focuses on the areas of education, economic participation, health and social wellbeing, and natural resource resilience), Worsley Alumina will invest in initiatives to support Noongar People, such as promoting better access to country, reconciliation, conservation of cultural heritage and traditional livelihoods." Measures identified in the proposal to minimise impacts during works include "Traditional Owners monitoring excavation work during the initial ground disturbance (where it has been deemed appropriate for monitors to be present) have a 'stop work' procedure in place if heritage artefacts are uncovered." However, the proposal does not include mention of what will be "deemed appropriate" circumstances for monitors to be present. • Previous Aboriginal heritage studies discussed in Yates and Goode (2017) identified "that there were eight previously recorded Aboriginal heritage sites located within close proximity to the Tullis Bridge. None of the sites were reported to impinge directly on the Tullis Bridge Weir cable trench" (page 33) when it was under design. The Study infers that a haul road crossing at Tullis Bridge would restrict access for tourists and block off an existing walk trail located there. "Mrs Viti, (a local Aboriginal community member) advised that her ancestor Dilyan had camps at Bibby Springs and at Tullis Bridge in the 1800s" (page 43). She also noted at that time that there was a need to protect local heritage and requested support from the Proponent to have a cultural facility within Boddington. That support has not been forthcoming from the Proponent to date, despite the "consultation" with the local community. PHCC believes that given the impact on the Aboriginal heritage, the proposal should make a firm commitment to protect the inherent cultural heritage at the identified 8 sites and to assist Traditional Owners to be able to preserve their local heritage within the country, or close to the country, where the significant land sites are. Offset suggestions to maintain benefits for the local community include a Boddington Ranger Program and to establish a local cultural centre to display the rich indigenous heritage of the area. This has previously been raised with the Proponent.	Aboriginal Heritage Act 1972 (WA). Commonwealth of Australia with Department of Foreign Affairs and Trade, 2016, Working With Indigenous Communities https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-working-with-indigenous-communities-handbook-english.pdf Shire of Boddington https://www.boddington.wa.gov.au/things-to-see-and-do.aspx. Yates and Goode (2017, 33)  Key points from meeting with local Boddington Elder – Meeting

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
				• Some concerns have been raised by local traditional owners that the methodology used for surveys to identify cultural sites are not robust (see notes from discussion with local traditional owners attached). For example, there appears to be a need for physical evidence of a cultural site before it is appropriately managed, rather than acknowledging the cultural significance of the cultural connection between land and spirit • In addition, concerns have been raised regarding the buffer dimensions for significant trees. The proposal includes a buffer of 15m for significant trees. However, this does not reflect an adequate commitment or understanding of the cultural significance of these trees. The landscape surrounding these trees is also important and imposing an arbitrary and relatively small buffer around these trees will not protect the overall culture associated with the tree. • The potential loss of significant Aboriginal heritage adversely affects both the Aboriginal as well as the non-Aboriginal community- that strongly supports and values the Aboriginal heritage in their own neighbourhood. The Aboriginal importance of the rivers and stewardship of surrounding land is part of the joint Aboriginal and non-Aboriginal heritage and as such is of strong value to the local non-Aboriginal community in addition to the deep cultural ties of the Aboriginal community. For instance, see Shire of Boddington website that incorporates both Aboriginal and non-Aboriginal heritage on the same page promoting local tourism. PHCC works closely with both Aboriginal and non-Aboriginal community members that do not wish to see local Aboriginal heritage to be literally eroded and the important heritage and natural stewardship stories lost to the area. Note: the Proposal is inconsistent in the number of Aboriginal sites that will be impacted.	29/07/2022. See Appendices for further information.
7.2.2 Community relations	*Not supported* *The proposal complies with the provision of information to the community but does not demonstrate good practice in community engagement.*	*The proposal complies with the provision of information to the community but does not demonstrate good practice in community engagement.*	*The Proponent demonstrate productive community engagement with a transparent and agreed consultation, complaints and feedback system with the wider community, not only through the CLC and passive delivery of pre-determined information.*	• PHCC aims to protect local natural, landscape and heritage values. For this to occur effectively and in line with contemporary practice it is important for South32 “to ensure that concerns and issues are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision” (Commonwealth of Australia, 2016, pg. 4). • The Leading Practice Sustainable Development Program for the Mining Industry handbook on community engagement and development outlines good practice based on the International Association of Public Participation (IAP2) Spectrum. (Commonwealth of Australia, 2016). It highlights the importance of relationship building for successful community engagement, "establish and maintain regular engagements with a full range of stakeholders” (page 19). The South32 mechanisms outlined in the proposal fall at the lower end of the assessment process outlined in the handbook. There is little effort to build confidence that there are proactive effectors “to obtain public feedback on analysis, alternatives and/or decisions” (Commonwealth of Australia, 2016, pg. 4) through an approach which facilitates two-way information sharing such as focus groups and public meetings and documented feedback and follow-up on queries and agreed actions. • Language used in the proposal, as well as current mechanisms for community engagement, focus on a one-way delivery of information from the Proponent to the community rather than engagement in a productive dialogue that provides avenues for raising issues and joint problem solving. Many leading publications (referenced) affirm good practice as an active negotiation process rather than the passive information-based approach presented in the proposal. For instance, the Community Engagement Guidelines for Mining and Mineral Exploration in Victoria define community engagement as “interactions between identified groups of people and processes that are linked to problem solving or decision making where community input is used to make better decisions” (Victoria Department of Jobs, Precincts and Regions). Leading practice in mining community engagement demonstrates that all activities “should involve community members and other stakeholders whenever possible” (Commonwealth of Australia, 2016, page 25). • The Proponent engages through a Community Liaison Committee (CLC) which is a community representation group. This group is supposed to meet regularly with minutes made available to the public. The latest easily available Minutes in the Public domain are on the Shire of Boddington website and are dated 2015 and on	Commonwealth of Australia, 2016, Community Engagement and Development: Leading Practice Sustainable Development Program for the Mining Industry, https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-community-engagement-and-development-handbook-english.pdf" https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-community-engagement-and-development-handbook-english.pdf Department of Jobs, Precincts and Regions, Community Engagement Guidelines for Mining and Mineral Exploration, https://earthresources.vic.gov.au/legislation-and-regulations/guidelines-and-codes-of-practice/community-engagement-guidelines-for-mining-and-mineral-exploration#:~:text=A%20community%

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
				South32 sites to only 2017. This is a lamentable lack of transparency. The community consultation envisaged as part of the proposal is largely through the CLC. While this is an important avenue for contact with key stakeholders there are no mechanisms articulated for how the information on key mine planning issues are then relayed to the wider community in the vicinity of the mine and for those who regularly recreate in the area. • The articulation in the proposal (and in other community relations approaches) on how the community can make input to decisions that have a direct impact on their well-being are not clearly presented. This is contrary to the DMIRS guidance that "encourages regular engagement between a mining company and the local community or communities throughout all stages of mine development in order to manage the potential socio-economic and environmental impacts of mine closure." (The Western Australian Biodiversity Science Institute, 2019, page 10) • Good practice in public relations builds trust and transparency in decision-making. See for example Northparkes Mines in New South Wales, the importance of ongoing community engagement to understand and address concerns was identified. "The open and transparent dialogue has built a high level of mutual trust between Council, Northparkes and the broader community" (Michell & McManus, 2013, pg. 10). Another mining project noted that the comprehensive community engagement undertaken based on best practice built a high level of trust and support within the local community for the Project (Prno, Pickard, Kaiyongana, 2021). The structured consultation approach for this proposal from South32 does not offer opportunities for dialogue with a preference for information provision. • The Leading Practice Sustainable Development Program for the Mining Industry Handbook for Community Engagement and Development (page 47) outlines the importance of maintaining "a constructive dialogue" for grievance and dispute resolution. The handbook notes that "mining companies can facilitate this by being transparent in their actions, engaging with all players, treating them with respect and sharing information openly with them." Transparency is one of the key principles of a non-judicial grievance process as is accessibility and legitimacy. It is imperative that "community members have an avenue for lodging complaints and an accessible and transparent system for resolving them" (page 47). Mining companies should "regularly report on progress and challenges to company management, project personnel, shareholders and a full range of local and other stakeholders. Report on complaints resolution data" (Commonwealth of Australia, 2016, page 19). The Proposal does affirm that a complaints procedure will be followed and that this will be reported to the CLC, but this information does not appear to be available to the public. This is important for the PHCC as a stakeholder to support citizen engagement in a productive approach to any exceedances to regulations or any other impacts that occur. "It is important that all stakeholders have their interests and concerns considered and where appropriate, addressed, and that the key stakeholders have an opportunity to provide feedback on the response or proposed action to address their interests and concerns, particularly when determining post-mining land-use and closure outcomes." (The Western Australian Biodiversity Science Institute, 2019, page 9)	20engagement%20plan%20is,of%20a%20mining%20work%20plan" https://earthresources.vic.gov.au/legislation-and-regulations/guidelines-and-codes-of-practice/community-engagement-guidelines-for-mining-and-mineral-exploration#:~:text=A%20community%20engagement%20plan%20is,of%20a%20mining%20work%20plan Commonwealth of Australia, 2016b, Mine Rehabilitation: Leading Practice Sustainable Development Program for the Mining Industry, https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-mine-rehabilitation-handbook-english.pdf" https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-mine-rehabilitation-handbook-english.pdf The Western Australian Biodiversity Science Institute, 2019, Technical Guidance – A Framework for Developing Mine-Site Completion Criteria in Western Australia, https://www.dmp.wa.gov.au/Documents/Environment/REC-EC-112D.pdf Michell, G, and McManus, P, 2013, Engaging Communities for Success: social impact assessment and social licence to operate at Northparkes Mines NSW, Australian Geographer, vol. 44, no. 4, https://www.tandfonline.com/doi/abs/10.1080/00049182.2013.852502 Prno, J, Pickard, M, and Kaiyogana, J, 2021, Effective Community Engagement during the Environmental Assessment of a Mining Project in the Canadian Arctic, Environmental Management, vol. 67, pgs. 100-1015,

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					https://link.springer.com/article/10.1007/s00267-021-01426-5#ref-CR3
7.2.3 Natural and historical heritage	*Partially supported*	*The proposal acknowledges the importance of protecting natural and historical heritage but does not give sufficient attention or commitment to addressing the expected heritage impact.* *The protection measures proposed for the Hotham Valley Railway are not sufficient and require additional consideration of the current and potential future uses.* *There is inconsistency in the proposal with regard to the impact on the Bibbulmun Track.*	*Specific plan for Tullis Bridge to be developed directly with affected community with a view to community offset to compensate for impact on the Tullis Bridge, particularly for Aboriginal community.* *Protection measures for the Hotham Valley Railway are strengthened to preserve railway heritage and economic opportunities.* *Bibbulmun Track 200m buffer throughout, including annual review directly with Bibbulmun Track.*	• The proposal states that "No European heritage sites will be directly impacted without due consultation with the appropriate regulatory authority or community group" (page 596). However, there is no mitigation measures proposed in the event that the consultation identifies concerns. (See previous section on Public Relations) The Proposal states that "There is the potential for European heritage sites within the PAA to be indirectly impacted upon as a result of altered surface water drainage, blast vibration and reduced amenity. Management of these impacts are discussed in Section 5.5.5 and Section 5.7.5" but means of mitigation of indirect impacts are not discussed in these sections. • Tullis Bridge which is highly valued by both the Aboriginal and non-Aboriginal community for heritage, as well as amenity reasons is within the IDF. (see above section on Aboriginal Heritage and Culture). The plans to address these impacts are inadequately covered. The importance of Tullis Bridge to the community is evidenced by its inclusion in Boddington's Tourism Guide. Tullis Bridge is located approximately 9 kms from Boddington. It was built in 1912 in the trestle style and was used to link the railway line from Pinjarra to Narrogin for use by the timber industry up until 1968. A walk trail links the town site of Boddington to Tullis Bridge along the Rail Reserve. At Tullis Bridge picnic tables and toilets have been installed for community use. A separate 3km walk trail has been created at Tullis Bridge that takes you around the bridge and surrounding river. The drive out to Tullis Bridge along Morts Road has magnificent vistas past Marradong Reserve, olive groves and orchards. This area is not only used by locals but also by visitors from other localities. Please see video of a walk through this area that reflects the natural and built heritage as well as amenity of the area. https://www.youtube.com/watch?v=MPPQClhzChM • The Hotham Valley Railway is an important tourist attraction in the Peel region (see http://www.hothamvalleyrailway.com.au/) that is not covered by adequate protection measures in the Proposal. The Proponent proposes to build an overpass, but the prospective extension of the heritage railway would be severely impacted by an overpass haulage route. There has been previous interest from both the Boddington community and local government to extend the current railway, which is a major tourist attraction for Dwellingup, through to Boddington. The overpass being proposed is noted to not be high enough to allow a train to pass underneath. This actively blocks the potential of an already identified option to further develop the Hotham Valley Railway to connect existing track and alignment (see video above that shows existing track in place). This proposal would prevent the preservation of important heritage values in the area and severely limits the future economic potential of a tourist rail route. (See Economic Section below) • The Bibbulmun Track is an important State heritage asset with environmental and social values. On page 38, the proposal states "There will be no disturbance to the Bibbulmun Track, with a 100 m buffer applied to protect visual amenity". Yet on page 39, the wording is "A 1.1 km section of the Bibbulmun Track may be indirectly impacted in the long term (more than 10 years). It is considered that through relevant consultation and planning, including the implementation of a buffer of at least 100 m, any potential impacts to the Bibbulmun Track can be adequately managed to maintain the values of the track. Page 151 states that South 32 will establish a buffer of at least 100 m around the 1.1 km section of the Bibbulmun Track that intersects the north-western extent of the Worsley Mine Development Envelope shown on the map in Figure 5 of the Protected Areas Plan. This commitment will apply if any part of the of this 1.1km section is relocated and remains within the Worsley Mine Development Envelope." This raises the possibility of realignment for the Bibbulman track. It is not clear if this may occur due to mining operations or other processes. However, this does not build confidence in the original	Environmental Protection Authority, 2005, Guidance for the Assessment of Environmental Factors" Separation Distances between Industrial and Sensitive Land Uses.

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				statement that there will be “no disturbance” to the Bibbulmun Track. (See also Amenity and Economic sections). • The neighbouring Newmont Gold Mine have a Bibbulman Track Management Plan that includes a 200m buffer for activities. However, the Proponent proposes a 100m buffer which is likely to mean increased opportunity for reduced amenity through noise and dust generation as well as vegetation clearing, although it does note “Following mining design in the area, increase the buffer to 200 m consistent with the DBCA’s Forest Management Plan.”	
7.2.4 Aesthetic value	*Not supported*	*The community has not been engaged in the Visual Impact Assessment and effects of cumulative impact on aesthetic value have not been given consideration.* *The current practices for removal of vegetation do not maintain buffers along major roads or sensitive interfaces.* *South32 is in substantial rehabilitation deficit that already seriously affects aesthetic value.*	*Community engagement is required to determine if the vantage points selected for the visual impact assessment and the importance placed on these vantage points (i.e., sensitivity) is correct.* *The Proponent should confirm details of and be held accountable for the retention of existing vegetation in sensitive areas.* *The Proponent should address the existing deficit in rehabilitation before this proposal for expansion is approved.*	• The proposal notes that the viewpoints selected for inclusion in the Visual Impact Assessment were selected “in consultation with DBCA and the EPA” (page 566). The community has not been included in this process. The visual sensitivity applied to the viewpoint at both Tullis Bridge and the Bibbulman Track is “medium, due to the viewers’ interest in the surrounding landscape.” This is not appropriate given the motivations for visiting and using these recreation sites. The attached Visual Impact Assessment (page 69) notes that “the proposal will result in some noticeable views of mining operations at the viewpoint (Tullis Bridge).” This is in direct contradiction to the current attraction of the site where community members go to feel close to and enjoy nature. (See previous section) The capacity of a landscape or view to accommodate change without losing valued attributes should include the value placed on a landscape or view by the community as part of sensitivity determinants. The community should be involved in decisions regarding what constitutes a sensitive interface and the avoidance and mitigation measures required to safeguard these. The Mine Rehabilitation Handbook (Commonwealth of Australia, 2016, page 7) states that “the development of rehabilitation success criteria must involve stakeholders (both community and government) in their development and assessment.” • The proposal notes that “where practicable, existing vegetation will be retained along sensitive interfaces, external boundaries and road frontages” However, details about what constitutes sensitive interfaces, what is considered practicable and what is not, or what will occur if it becomes unpracticable to maintain vegetation are not available. The proposal to maintain visual barriers along major roads has not occurred to date with clearing up to several roads. This decreases the aesthetic value of the area. This particularly impacts roads which are access routes to Tullis Bridge and the Bibbulman track as key natural sites. There does not seem to be clear accountability to the clause “where practicable”. These decisions should be made transparent and discussed with the community. (See section on Community Relations). Furthermore, current clearing practices do not reflect this practice. The view from public roads (Ashcroft Road) has significantly changed since the beginning of mining activities and visual buffers have not been maintained (see photo 1 and 2). Furthermore, despite the commitment in the proposal, clearing is continuing along public roads (see photo 3 and 4) • The current 45% rehabilitation deficit noted in the proposal is particularly concerning given the threats to native wildlife and the well-documented impacts of poorly rehabilitated mine sites. The Leading Practice Sustainable Development Program for the Mining Industry handbook on Mine Rehabilitation (2016) states that “poorly rehabilitated mines leave significant legacy problems for all elements of society— governments, communities and companies.” (pg. 5). The Proponent’s previous rehabilitation efforts do not demonstrate a high priority placed on successful rehabilitation and the current rehabilitation deficit is evidence of this. There is evidence of a less than satisfactory rehabilitation track record performance by the Proponent. The Department of Mines, Industry Regulation and Safety (DMIRS) have previously commented on South32’s 2016 Boddington Bauxite Mine Closure Plan that there is “a divergent trend between cumulative area cleared versus cumulative area rehabilitated. DMIRS strongly recommends that rehabilitation activities occur progressively to minimise where practicable the disturbed area open at any one time" (page 9). This suggests that the Proponent has not adequately been adopting the progressive rehabilitation approach outlined in the proposal and does not build confidence that the stated plan will be applied, resulting in significant impacts on the local native vegetation and associated value that the community places on both vistas and wildlife.	Environmental Protection Authority, 2019, EPA Advice: Carnaby’s Cockatoo in Environmental Impact Assessment in the Perth and Peel Region, https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Carnaby%27s%20cockatoo_new%20FINAL.pdf Commonwealth of Australia, 2016, Mine Rehabilitation: Leading Practice Sustainable Development Program for the Mining Industry, https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-mine-rehabilitation-handbook-english.pdf Cardno, 2020, Landscape and Visual Impact Assessment: Perdman Urea Project, https://www.epa.wa.gov.au/sites/default/files/PER_documentation2/Appendix%20G%20-%20Landscape%20and%20Visual%20Impact%20Assessment.pdf *Photo 1 (Ashcroft Road, west Boddignton)*

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				• For instance, identification of Carnaby's cockatoo in the area. Previous EPA research has identified that there are significant threats to Carnaby's Cockatoo because of loss of habitat and "the time lag between planting and maturation of habitat species. Carnaby's cockatoo has been observed feeding on Banksia at rehabilitated mine sites in the Jarrah Forest within eight years" (EPA, 2019, page 19). It is therefore imperative that the Proponent undertake rehabilitation activities as soon as possible to begin the maturation process. The Proponent proposes use of artificial hollows to offset the impacts. However, the EPA has noted that "habitat enhancement such as nest hollow repair, nest competitor control (e.g., feral bees), installation of artificial hollows, and improved access to water sources has the potential to increase habitat quality within a short timeframe and at less cost compared to revegetation, provided the existing habitat values in the area are maintained." (EPA, 2019, page 19). However, if there are large parcels of cleared land that are not being rehabilitated on schedule, there is a chance that these habitat values will be lost, making the artificial hollows offset less effective. Furthermore, the artificial hollows are most effective if they "are supported by adequate foraging resources nearby to enable the birds to breed." (EPA, 2019, page 19). This is another area of concern if there are large amount of land that are not rehabilitated. • The Mine Rehabilitation Handbook (page 5) also states "successful rehabilitation requires a continuous improvement focus, based on site-specific knowledge, research and monitoring. Opportunities and threats should be identified early so that mining operations do not reduce rehabilitation options." However, this focus on continuous improvement is not evident in the case of South32 and the lag in rehabilitation is likely to decrease the success of rehabilitation activities which in turn may result in longer term impacts on the aesthetic value for the community. This is in contrast to good practice that is "to begin rehabilitation trials as soon as possible." (Commonwealth of Australia, 2016, page 16). • The South32 Annual Report 2021 states that the "provisions for the cost of each closure and rehabilitation program are recognised at the time that environmental disturbance occurs" (ERD, p124). Yet, the environmental costs of delayed rehabilitation are not accounted for in terms of social impact on the community and the environment. The South32 Sustainable Development Report 2021 (ERD, p69) states that it is instituting "strengthened requirements for rehabilitation and biodiversity management in our updated internal environment standard. This includes working towards no net loss for all major expansions and new projects by implementing our new four-step mitigation hierarchy". Based on the preceding, this standard cannot be met with a rehabilitation deficit and therefore should not be viewed positively from a sustainability good practice perspective and requires action by the EPA to address the current deficit and the potential risks from this proposal.	 *Photo 2*  *Photo 3*  *Photo 4* 

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					Department of Mines, Industry Regulations and Safety, 2016, Comments on the Boddington Bauxite Mine Closure Plan South32, 2021, Annual Report 2021, https://www.south32.net/docs/default-source/all-financial-results/2021-annual-reporting-suite/annual-report-2021.pdf?sfvrsn=4a3abf1c_21 South32, 2021, Sustainable Development Report 2021, https://www.south32.net/docs/default-source/all-financial-results/fy21-annual-reporting-fix/sustainable-development-report-2021.pdf?sfvrsn=20ae5495_2
7.2.5 Amenity – Noise	*Partially Supported*	*The Proponent is clearly working to comply with noise regulations, however there are gaps with regard to planning and mitigation processes.*	*• The Chief Executive Officer of DWER should request a construction noise management plan.* *• Plan should include specifics of the actions required for exceedances. The plans should be communicated directly to the community at quarterly or 6 monthly community meetings.*	• The proximity of proposed construction areas (for haul roads and associated bridgeworks) to recreational and heritage site, Tullis Bridge, are likely to have significant impact on the community. This site is more likely to be used on weekends and outside of working hours. It is therefore important to understand the management measures South32 are proposing at these times. • The ERD includes mention of management procedures and practices in place if noise levels are identified as approaching thresholds. Noise limits are aligned with the Noise Regulations (1997). However, these are general guidelines and there is precedent for the Proponent to work towards lower targets to avoid exceedance of the legal thresholds. • The proposal states that corrective actions taken to minimise noise following exceedances will be reported but the documents including these processes are not included as part of the proposal nor available to the community. These measures are summarised, but additional detail is not available to confirm if these measures will be accurate or adequate. It is also not clear what level of noise would constitute action (i.e., how close to a threshold do noise levels have to be before mitigation action is undertaken?) It is not clear the measures that are in place if initial noise mitigation measures (e.g., reduced number of operating units, moves to alternative mining sectors, etc) are not successful. • In the proposal, the Propoent commits to “continued tracking and investigation of community noise complaints in accordance with the Worsley Community Complaints Procedure.” However, this procedure is not provided, and it is not clear what action would be taken to address the concerns of the community beyond investigation. Based on community feedback to PHCC, this procedure is long and cumbersome and does not result in rapid resolution of noise exceedances or of timely and direct feedback to the community. • There is a reporting burden on the community to report exceedances despite South32 having a sentinel system which monitors noise at all receptor points. There are concerns that the Proposal to continue current noise mitigation measures will not improve any of the challenges being experienced with the current system.	

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7.2.6 Amenity – dust	*Partially supported*	*PHCC notes the efforts to minimise and mitigate dust.* *A main source of dust is haul roads and the proposal is inconsistent on the likelihood, decision-making process or management for haul roads.*	*The proposal should include details about the extent to which new haul roads are expected to be required and if these routes would be sealed or unsealed or at least definite proposals to work with the community on these in a timely manner.*	• The proposal states that "It is likely that the majority of the haulage routes will utilise existing mine haul roads within the WMDE." (ERD, p 25). It is not clear what 'the majority' refers to and what length of new hauls roads are expected to be developed and the impact this will have on vegetation clearing, dust, noise etc. This response also notes that the BTC area is large considering the identification of two feasible haul roads routes already and a relatively small proposed site for the crusher. This vagueness about expected areas is in contradiction to the concrete plans for new haul roads presented in the proposal. • There are concerns arising from the deficit in rehabilitation with regard to the potential of higher dust loading than anticipated in the dust modelling. The proposal already identifies areas that of higher human health risk in page 543/4 "Predicted impacts of PM2.5 (maximum 24-hour average) generally indicate low risk of exceeding the human health criterion at the majority of sensitive receptors (131 receptors). There is a total of three sensitive receptors for which there is a high risk that the human health criterion may be exceeded, noting that some of these receptors are currently under an 'commercial agreement' with Worsley; Predicted impacts of dust deposition (average) generally indicate low risk of adverse amenity impacts at the majority of sensitive receptors (124 receptors). There is a total of 10 sensitive receptors for which there is a high risk that the amenity criterion may be exceeded, noting that one of these receptors is currently under an 'commercial agreement' with Worsley. All the sensitive receptors for which there is a high risk that the human health or amenity criterion may be exceeded are located within the WMDE or within very close proximity to it. The most significant increases in emissions to sensitive receptors from existing operations are predicted to occur in the maximum 24-hour average PM10 concentrations. The modelling shows that emissions increase at sensitive receptors near the Marradong mining area… are as a result of the increased wind erosion from the more extensive haul roads, together with mining pits likely to be developed closer to the boundary of the WMDE." If the expanded operations do include further haul roads and expanses of cleared, unrehabilitated land where local residents travel and recreate, this implies an increased health risk. This aspect has not been addressed satisfactorily and in a transparent manner in the proposal. • The extent of dust impact on local watercourses has not yet been adequately considered. With the delayed rehabilitation as well as higher than expected dust load, some of the dust and run-off will enter water sources and courses. This aspect has not been adequately covered in the proposal and how risks of further dust load, particularly in water and ambient for health and local water source concerns.	
7.2.7 Economic	*Partially supported*	*The mitigation measures proposed surrounding the Hotham Valley Railway are not suitable and preclude future development for economic gain for the local area.* *The impact of mining in the Boddington area is not adequately*	*The Proponent to work with local stakeholders to develop a plan for the Dwellingup-Boddington Rail extension and ensure no negative impact on the tourism potential.* *The Proponent to work with relevant stakeholders*	• South32 already supported "Projects that encourage economic diversification, with a particular focus on tourism products that attract visitors to town, consistent with the Shires of Boddington and Collie's desire to diversify their economies beyond mining and to grow their tourism potential" • The potential of the heritage railway has been largely ignored in the proposal and the proposed development of the Tullis Bridge precludes any future development of the rail due to the inability to allow railway tender to pass through. This act as a significant impediment to future tourism development that is already in the priority planning agenda of both the Boddington and Dwellingup Shires – see Photo 5 at the Tullis Bridge site. The experience of heritage rail in other countries and within Australia demonstrates that it is important to retain the original alignments and access points to allow for preservation of heritage values for both cultural and economic purposes. The proposal does not acknowledge this economic potential or address the potential impact and its mitigation. • The tourism value of the vistas and experience of local trails around the Tullis Bridge site has also not been given sufficient importance. Boddington attracts visitors to the river and surrounds. The installation of facilities at the sites likely to be impacted demonstrates existing investments in visitor attraction and community amenity. The impact of further mining activity in the vicinity of these assets is likely to have a negative impact on visitation, which while not a major contributor to the local economy, is important in the community and wider region. The proposal has not acknowledged this impact or how it will be mitigated.	*Photo 5*  Shire of Boddington, 2022, Minutes for the Ordinary Meeting of Council held

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		reflected in the rates paid, leading to potential undermining of the community rates base to subsidise mining impact.	*e.g., WALGA, relevant agencies and the Shire of Boddington to consider the findings of the review of rates paid and level of mining impact on local infrastructure and resources with a view to bringing rates paid in line with actual impact.*	• A review undertaken for the Shire of Boddington identified that "The GRV rate in the dollar for mining is significantly lower than the average of the benchmarked local governments," and that "The UV rate in the dollar for mining, is significantly lower than other local governments." Accordingly, the review recommends the following actions: "Consolidating UV differential rates to two categories, being mining, and rural." And "Increase the UV Mining rates to align with sector averages." These identified actions are suggested given the additional costs to the community of mining activities. These additional costs are identified in the minutes of the Shire of Boddington Ordinary Council Meeting on May 24th, 2022. These costs include "South32 operations have resource implications on other Shire services and assets including environmental health, emergency management, administration and roads. Examples of this include the haul road crossing on Morts Road, the proposed haul road crossing on Lower Hotham Road and the significant restoration works on Lower Hotham Road on three recent occasions when a dam burst on South32 property"	at 24 May 2022 at 5:38pm, https://www.boddington.wa.gov.au/documents/12413/minutes-draft-ordinary-council-meeting-24-may-2022
7.2.8 Separating industry and sensitive land uses	*Partially Supported*	*The Proponent has paid insufficient attention to the sensitivity of the proposed expansion to the community.*	*More proactive approach by the Proponent to recognise community and economic values of the expansion area and work with CLC and other community stakeholder to better understand the sensitivities.*	EPA guidance for separation of land uses, provide spaces for the identification of additional sensitive "land uses which require high levels of amenity or are sensitive to particular emissions." (EPA, 2005). Buffers for blasting and other activities associated with extractive industries are determined on a case-by-case basis but are identified as contributing noise, dust and risk impacts, all of which would have negative impacts on users of culturally sensitive, positive amenity and heritage sites such as Tullis Bridge and the Bibbulman Track.	Environmental Protection Authority, 2005, Guidance for the Assessment of Environmental Factors" Separation Distances between Industrial and Sensitive Land Uses.
7.2.9 Cumulative impact	*Not supported*	*There has been no consideration of cumulative impacts from a social and cultural perspective.* *The overall section is inadequate, analysis is weak and not well founded on evidence.* *The proposal to "consider a*	*South 32 needs to address potential cumulative assessment in a far more detailed and specific manner, to consider scenarios for both absolute as well as shifting baseline to consider the effects of*	• The proposal states that "contemporary baseline data provides detail on the cumulative pressures of existing activities in the region (mining and non-mining) and may be used to inform impact prediction and identify areas for mitigation and management (MCA, 2015). There is also a need to consider the concept of a 'shifting baseline'. The development of a baseline as a snapshot of a system at a particular point in time will in most cases represent an already impacted system that may include the effects of past activities. The analysis of background data needs to consider the extent to which past activities contribute to existing impacts, and whether those activities need to be considered in the assessment." (page 703). PHCC would be strongly concerned with the analytical basis for moving to a shifting baseline for any impact assessment. While a shifting baseline may be used to inform understanding of cumulative impact, the main basis for analysing impact should be from a natural pre-mining state for the locality, including recognition of pre-mining heritage and culture as well as community expectations of retaining that inherent value. • Studies have affirmed the importance of considering cumulative impacts, for example the following section drawn from Surrounded by Change – Collective Strategies for Managing the Cumulative Impacts of Multiple Mines (page 1) "the value of a social license to operate is increasingly recognised within the extractive resource industries (Kurlander, 2001). Consultations with industry and government representatives, by one of the authors, have revealed that in the past industry has been reluctant to assume the burden of remedying the	University of Queensland, Sustainable Mineral Institute, Franks, Brereton and Moran, 2009, Surrounded by Change – Collective Strategies for Managing the Cumulative Impacts of Multiple Mines Shire of Boddington Community Strategic Plan, 2019, https://www.boddington.wa.gov.au/documents/2154/attachment-863a-community-strategic-plan

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
		shifting baseline" for impact assessment is potentially counterproductive to effectively identifying and managing impacts in a sustainable manner.	*incremental impact from pre-mining operations on natural, social and cultural value.*	cumulative impacts of actions for which it may not be individually responsible and governments have been reluctant to make investments due to uncertainty about the scale of resource development boom and bust cycles. Communities and local governments are increasingly demanding greater attention to the assessment and management of cumulative impacts, particularly in the presence of multiple mining operations (URS, 2000; Freeleagus, 2006; Brereton et al, 2008, QLD DIP, 2008; CCAG, 2008) and a collaborative space is emerging to address these issues (Brereton et al, 2008)." • With regard to specific values, the points above regarding the rehabilitation deficit should be firmly assessed with regard to cumulative impact. The Shire of Boddington Community Strategic Plan, which is based on wide community consultation points to three pillars that inter-relate "1) A vibrant and connected community. 2) A thriving and diverse economy. 3) A healthy, clean, green and sustainable environment" (page 3); yet the Proposal only considers two objectives to be relevant to its proposal – (Section 1.5.3.1), Objective 1.2 "Work with local employers, especially mining, to encourage employees to live locally" and Objective 2.11 "Advocate for local mining operators to employ locals, particularly local young people" (page 40). Yet the cumulative impact of the Proposal impacts on many of the objectives of the Community Strategic Plan, for instance, 1.11 Celebrate the cultural diversity of the community, 1.14 Ensure all geographical areas and demographic segments within the Shire are equally acknowledged as being part of the community; 2.1 Develop a tourism marketing strategy for domestic and international visitors 2.2 Identify opportunities for new tourism businesses and tourism-friendly businesses 2.3 Launch new attractions such as Hotham Park foreshore development with statewide marketing 2.4 Progress trail infrastructure and market opportunities for trail-based holiday packages; Increase planting of native flora on public and private land 3.2 Streetscaping and tree planting on Shire land to enhance canopy cover, A natural environment that is attractive, sustainable and protected 3.3 Support sustainable natural resource management. Specific points raised include the CEO's comment that "the deaths this year of many of our iconic cockatoos is unprecedented, and a big wake-up call that our environment can't continue to endure the punishment the human race is subjecting it to." In this respect, the Proponent needs to place far stronger emphasis on the broader and cumulative impacts that it has on the surrounding community with a triple/quadruple bottom line perspective. • In consequence, without committed consideration of cumulative impacts, PHCC does not consider this proposal in line with Principle 2 Intergenerational Equity in the proposal page 87 that states "Where significant residual impacts were identified, offsets are proposed. Overall, the project aims to ensure there is no significant loss of biodiversity as a result of the implementation of this Revised Proposal. Fulfilment of this goal will assist in maintaining and enhancing health, diversity and productivity of the environment for the benefit of future generations."	 *Proximity of active mining to Boddington townsite. See Appendices for larger image.*

8. GHG EMISSIONS

EPA Objective: To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	
Potential impacts and risks	• GHG emissions will continue to be released to the atmosphere as part of the ongoing operations, continuing Worsley Alumina's contribution to GHG emissions and climate change

8.1 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
8.1 General comments	*Not supported*	*The proposal would cause the emission of 269.85 million tonnes of CO2e over 15 years* *The Proponent admits its emissions contribute to 'chronic and acute physical impacts in the southwest of Western Australia' that 'impact the health and resilience of ecosystems, habitats and species' and will 'affect the efficacy of existing and future mitigation activities* *The proposal would contribute to WA's struggle to meet Federal emissions reductions targets and the Paris agreement*	*The EPA should reject the proposal*	Alumina refining is WA's second most carbon polluting industry, emitting almost twice the volume of carbon dioxide than coal-fired power stations in the State. The ERD acknowledges that the proposal would cause the emission of 269.85 million tonnes of CO2e over 15 years. This would be made up of 43.35 Mt CO2e Scope 1 and 2 emissions (if planned emission reductions are achieved), and 226.5 Mt CO2e Scope 3 emissions. Use of renewables to produce steam is said to be challenging, requiring 'a fundamental change' to the refinery's infrastructure and 'a significant expansion of the south-west energy grid' (ERD, p616, **Appendices** E10, 19). Worsley has trialled the use of biomass from forestry operations as a fuel source in the multifuel cogeneration boilers since 2018. Volumes were expected to reach 'in the order of 200,000 bone dry metric tonnes per year.' While considered technically feasible, the company says that supply is an issue. Burning biomass for energy is highly carbon polluting, and when it comes from native forests, the broader climate and biodiversity impacts are profound. The ERD says that there will be no use of biomass if the boilers are converted to gas (Appendix E10, 19). If the company is not able to reach interim 5 yearly targets, it may resort to carbon offsets (of an unspecified nature) (ERD, p622). The South32 Worsley refinery has comparatively high GHG emissions intensity (emissions/t alumina): about 50% higher than the average for the Alcoa refineries in WA. The company claims that its GHG intensity is about 16% higher than other Australian refineries, however, this has not been able to be verified. According to the company, this is largely due to its use of coal rather than gas (ERD, p617, Appendix E10). South32's bauxite mining emissions intensity is comparable with Alcoa's Willowdale Mine and lower than the Australian average, but this reflects haul distances rather than fuel efficiencies (ERD, p618) The Proponent mentions its share of WA's total GHG emissions was about 4.5% in 2021 (ERD, p710), but not the cumulative amount from the bauxite/alumina industry - calculated at 11% (Climate Analytics, 2022). In nearly 15 years to 2019, the WA bauxite/ alumina industry emissions have been fairly constant and show little or no sign of decreasing. Hence it needs to greatly accelerate emissions reductions if it is to contribute to meeting the national target (Climate Analytics 2022). Unlike air pollutants under Air Quality, GHGs are not localised: they are regional and even global pollutants and have long-term atmospheric and environmental impacts. This means, while it is hard to attribute direct environmental impacts from Worsley's GHG emissions, it is essential the proposal be evaluated in terms of its contribution to State and national GHG abatement goals and, most importantly, in relation to achieving the Paris Agreement goal of limiting global warming to 1.5 degrees Celsius. The	https://www.abc.net.au/news/2022-06-16/closing-coal-plants-onlypart-of-the-answer-say-scientists/101149050 and https://www.cleanenergyregulator.gov.au/ Scope 1 emissions arise directly from the company's operations, Scope 2 emissions are from the associated consumption of nonrenewable energy sources, and Scope 3 arise from downstream activities, eg the processing of alumina into aluminium by another company. The source of these numbers is an unpublished, unavailable report.

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment/s	Reference/s
				company admits its emissions contribute to 'chronic and acute physical impacts in the southwest of Western Australia' that 'impact the health and resilience of ecosystems, habitats and species' and will 'affect the efficacy of existing and future mitigation activities' (ERD, 618-19). WA has a serious problem, with carbon emissions continuing to rise and a lack of action by Government or regulators to prevent private industry from developing climate-wrecking projects.	
8.2 Context and comparis-ons		*The proposal would cause the emission of 269.85 million tonnes of CO2e over 15 years*	*The EPA should reject the proposal*	The South32 Worsley refinery has comparatively high GHG emissions intensity (emissions/t alumina): about 50% higher than the average for the Alcoa refineries in WA. The company claims that its GHG intensity is about 16% higher than other Australian refineries, however, this has not been able to be verified. According to the company, this is largely due to its use of coal rather than gas (ERD, p617, Appendix E10).	
8.3 Renewables		*The proposal would cause the emission of 269.85 million tonnes of CO2e over 15 years*	*The EPA should reject the proposal*	Worsley has trialled the use of biomass from forestry operations as a fuel source in the multifuel cogeneration boilers since 2018. Volumes were expected to reach 'in the order of 200,000 bone dry metric tonnes per year.' While considered technically feasible, the company says that supply is an issue. Burning biomass for energy is highly carbon polluting, and when it comes from native forests, the broader climate and biodiversity impacts are profound. The ERD says that there will be no use of biomass if the boilers are converted to gas (Appendix E10, 19). While coal consumption in WA decreased over the last decade by about 10%, coal use by Worsley refinery has remained steady, and over the last 5 years accounts for about 25% of the State's coal use (Climate Analytics, 2022). With the announced retirement of coal power stations by 2030, the fraction of the state coal use consumed by the Worsley refinery will continue to increase. In other words, the Worsley refinery will become a major drag on State efforts to move away from coal and will continue to rely on burning fossil fuel gas into the future. The company says that using renewables in refining will be 'a challenge.'	
8.4 Emissions targets and commit-ments		*The proposal would cause the emission of 269.85 million tonnes of CO2e over 15 years*	*The EPA should reject the proposal*	WA's GHG emissions already exceed the level required to support the Paris Agreement. Hence, WA must cut its emissions more steeply than other States in the future. If the proposal is approved, Australia will not be heeding the science and meeting its international climate commitments, and the recognised environmental impacts from climate change will be severe. The EPA should reject this proposal.	

9. CLOSURE AND REHABILITATION

Potential impacts and risks (PHCC identified)	• Spread of dieback disease with potential to decimate entire forest systems. • Failure of revegetation due to reduced rainfall and rising temperatures. • Loss of forest resilience to fire, climate change, cumulative clearing and disturbances. • Loss of resprouter species in rehabilitation areas, reducing resilience to fire and drought. • Low fauna recolonisation of rehabilitated mine sites leading to localised extinctions. • Overall loss of plant diversity in the eastern NJF.

9.1 PHCC COMMENTS

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
9.1 Forest Disease	*Not supported*	*Evidence that current hygiene practices prevent P. cinnamomi from spreading into uninfested forest not provided.*	*Provide evidence that the proponent has effectively prevented P. cinnamomi from spreading into uninfested forest.* *Provide detailed procedures for soil and hygiene management.* *Provide evidence that water diversion strategies are legitimate, particularly during heavy rainfall events.*	*Phytophthora cinnamomi* is considered to be one of the most significant threats to biodiversity in the south-west of WA (DBCA, 2022). In WA's south-west bioregion, more than 40% of native plant species are considered susceptible to the disease including many from the *Proteaceae* (banksias and hakeas), *Ericaceae* (snottygobble), *Myrtaceae* (Eucalypts, primarily Jarrah) and *Xanthorrhoeaceae* (grass-trees) families (DBCA, 2022). Threatened flora are at even greater risk with around 56% being considered susceptible (DBCA, 2022). The PAA contains high numbers of Phytophthora susceptible species with limited current occurrences of the disease based on mapping providing in the ERD. The Proponents objective for disease management is that "No new introduction of forest disease as a result of Worsley Alumina's activities to areas surrounding Worsley Alumina's mining operations". Given the large scale and high risk activities for disease spread, disease management is critical to protect remaining vegetation and habitats. There are numerous issues with the Proponent's Forest disease management that make this difficult to evaluate and ability to achieve this questionable. Appendix E05 – BBM Closure Plan Section 5.3.1 states the objective that there will be "no new introduction of forest disease as a result of Worsley Alumina's activities to areas surrounding Worsley Alumina's mining operations". There is insufficient information provided to assess the capacity for the Proponent to meet this objective given the absence of hazard dispersal mapping (or agent-based modelling of the movement of soil-borne pathogens such as Phytophthora spp.), complemented by a susceptibility assessment of potential receiving environments. It is noted that approaches such as these have been used in the development of the State Phytophthora Dieback Management and Investment Framework and are considered best-practice for managing the containment of dieback and for mitigating its impact on uninfested areas. Table 6 (ERD, p28) details the design of drainage and water management structures to minimise the risk of soil borne diseases from entering uninfested areas. The criteria should include the location of pits within areas of low topography that are not at a higher elevation that is within a catchment that includes disease-free areas. Furthermore, all drainage and ponding areas should be designed to contain an amount of rainfall no less than 150% of what has been recorded in a 1:100 year rainfall event. The requirement for vegetation monitoring should be implemented annually or biennially, noting that the most recent survey that has informed the proposed management responses is currently 4 years old. Section 7.8.6 should require that all areas under rehabilitation with known infestations of dieback are subject to hazard dispersal mapping (or agent-based modelling for the movement of soil-borne pathogens), complemented by a susceptibility assessment of potential receiving environments, prior to any work planning occurring. This is particularly pertinent for the recontouring of rehabilitation areas.	Phytophthora Dieback | Department of Biodiversity, Conservation and Attractions (dbca.wa.gov.au) All reference relate to Appendix E05 - BBM Closure Plan

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
				Section 7.8.7 should recognise the data gaps that exist in regard to the susceptibility analysis of uninfested landscapes complemented by hazard dispersal (or agent based modelling) data that demonstrates the threats to potential receiving environments under different scenarios. This should be detailed in Table 16 (page 85) as an area of proposed research. Section 3.5.1 references the use of Working Arrangements (see section 3.3) agreed to with DBCA to manage the impacts of dieback. This document is not listed in the appendices to the PER and as such cannot be properly reviewed to determine if the management actions within the working arrangement are sufficient to manage the risk associated with dieback. Section 3.5.1 references the use of internal procedures for soil and hygiene management, which are also not made available for the PER, which makes it hard to adequately comment. Evidence to support the efficacy of current hygiene practices in achieving the closure objective that "no new introduction of forest disease as a result of Worsley Alumina's activities to areas surrounding Worsley Alumina's mining operations" is not provided. Furthermore, the statement that "pit and rehabilitation drainage will be designed so that no water can flow from infested areas into uninfested areas" is unrealistic as it would be impossible to control water flow during heavy rainfall events (BBM Closure Plan, pg 98).	
9.2 Regenerate a stable forest ecosystem	*Not supported*	*Climate change will adversely impact the survival and structure of future revegetation; resprouting species have proven unsuccessful in revegetated mine sites reducing species richness, vegetation structure and resilience to fire; increased water use and reduced water retention in revegetated mine sites compared with intact jarrah forest*		One of the Proponents aims in rehabilitation is to "Regenerate in the long term, floral characteristics compatible with the eastern jarrah forest". A closure objective is "to regenerate a stable forest ecosystem planned to maintain recreation, conservation and other nominated forest values" and "to regenerate in the long term, floral and faunal characteristics compatible with the Eastern Jarrah Forest" are unrealistic due to the following key factors: • Southwest of WA has been drying steadily since the 1970's with area-averaged rainfall decreasing by 15-20% between 1970 and 2020 (Australian Government 2021). • Climate change (declining rainfall, rising temperatures) coupled with reduced moisture storage in rehabilitated mine sites due to the removal of lateritic soils and higher water use by young trees* reduces the likelihood that revegetation objectives will be achieved (BBM Closure Plan, p 35, 43)(WA Forest Alliance et al 2022, p42). • Current rehabilitation completion criteria require rehabilitated sites to have >200 resprouter species per hectare, however resprouter species have proven very difficult to re-establish in rehabilitation sites, negatively impacting resilience to fire and drought (Koch 2007) (WA Forest Alliance *et al* 2022). • Rehabilitated bauxite mine sites have significantly reduced soil microbial diversity and functionality compared with unmined sites (Lewis, White and Wafula, 2010). • Reduced capacity to retain water and nutrients due to dramatically altered soil profile, microbial activity and coarse woody debris (WA Forest Alliance *et al* 2022). *Study published in 2010 illustrated that annual water use by overstorey trees was ~230mm/year for old stands and ~500ml/year for the regrowth stands, or 20% and 44% of annual rainfall respectively, in northern jarrah forest in SW of Western Australia (Macfarlane et al 2010). There is insufficient information pertaining to the rehabilitation, if any, of wandoo woodland in the closure plan, despite there being 2686 hectares within the PAA. Wandoo is of significant importance to small mammals, particularly the numbat. In a study looking at the correlation between wandoo health and small mammal assemblages, wandoo in the region is already undergoing decline found	E05_BBM Closure Plan pg 23 Australia state of the environment 2021 (dcceew.gov.au) E05_BBM Closure Plan pg 35, 43 Koch (2007) Lewis *et al* (2010) Macfarlane *et al* (2010) Moore et al 2014 E05_BBM Closure Plan pg 23

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
				subsequent changes in micro habitat were correlated with small mammal community losses (Moore et al, 2014). Therefore, clearing wandoo woodland remnants is likely to have a negative impact on small mammal species within the region.	
9.3 Regenerating faunal characteristics	*Not supported*	*Despite observations that fauna have returned, to what extent? Community composition known to be lacking in rehab sites. Absence of nesting tree hollows for >150 years. Delay in habitat resources such as hollows and low course woody debris with high stem volumes in rehab sites.*		The closure objective "to recreate fauna habitat to encourage fauna re-colonisation" is not achievable due to the following key issues: • The removal of critical nesting tree hollows* for threatened species, in particular black cockatoo, brushtail possum and brushtail phascogale, • The lack of old rotting wood and low course woody debris needed by some fauna (particularly reptiles) and fungi**, • The delay in forest structural complexity restoration for many decades or longer, • The distinct differences between invertebrate species composition of rehabilitated mine sites and that of intact forest, which is of major concern due to the pivotal role invertebrates play in many ecosystem functions and processes (Koch, Grigg, Gordon and Major, 2009). *Nesting hollows take at least 150 years to develop and not all species are known to use artificial nests, for example Red-tailed Black Cockatoo" (WA Forest alliance *et al* 2022, p37.) **In a 2008 study of 72 revegetated sites in Victoria ranging in age from 5 to 130 years, the development of tree hollows and fallen timber loads was shown to be delayed in revegetated sites with high stem densities (Vesk, Nolan, Thomson, Durrough and MacNally, 2008). With the high rate of species extinction in Australia, we simple can't afford this time lag in key habitat resources. Furthermore, observing an animal in a rehabilitated mine site does not necessarily mean it's needs are being met to the same extent as intact forest and it have recolonised (WA Forest Alliance et al 2022). In a 2012 review of 71 publications on fauna recolonisation of rehabilitated mine sites, *community composition* was the criteria least satisfied (Cristescu *et al* 2012).	E05_BBM Closure Plan p 23 WA Forest Alliance et al (2022) p39 Koch et al (2009) Vesk et al, (2008) Cristescu et al (2012)
9.4 Water	*Not supported*	*Proposed significant increase in water extraction, large areas of rehabilitation and declining rainfall will unacceptably impact groundwater and surface water levels, remaining vegetation and conservation significant flora and fauna.* *Many knowledge gaps.*		The Proposal objective to "maintain surface and groundwater water quantities and qualities to levels consistent with those generated by equivalent unmined areas" is impossible to achieve given the proposed significant increase in water extraction* and high water use in large areas of rehabilitation. The Proponent proposes to use 400ML/annum of ground and surface water in addition to the 500ML/annum already being used. Rehabilitated mine sites use twice as much water as intact jarrah forest. In 2018 the Institute of Foresters of Australia calculated, using research data from Alcoa, that the amount of water being lost to rehabilitated mine sites instead of going to adjacent intact forest and streams was 500,000 litres per hectare or 60 billion litres overall (WA Forest Alliance *et al* 2022). Sections **7.5.5**, **7.5.6** and **7.5.7** and the table in Appendix E titled "South32 Boddington Bauxite Mine Closure Plan Knowledge Gap Register and Forward Works Plan - Closure Planning and Implementation" highlights multiple knowledge gaps and, therefore, potential barriers to achieving the objective to 'maintain surface and groundwater water quantities and qualities to levels consistent with those generated by equivalent unmined areas'. The long term impacts of rehabilitation on groundwater levels are unknown, and won't be clear until the Saddleback paired catchment study has been completed. This uncertainty is unacceptable and impacts on groundwater should be determined before further clearing of native vegetation is permitted (BBM Closure Plan, pg 50, 51) (BBM Closure Plan, Appendix E). Knowledge of surface water quantities and qualities, and impact to surface water flows are also identified as existing knowledge gaps (BBM Closure Plan, p59). The proposed controls/investigative tasks in response to these knowledge gaps should be implemented BEFORE further clearing of native vegetation is permitted, and permission should only be provided if these actions conclusively show that the proposed mine expansion has no impact on surface water quantities, qualities and flows.	E05_BBM Closure Plan Appendix E E05_BBM pg 50, 51 WA Forest Alliance *et al (*2022) p33. E05_BBM Closure Plan Appendix E E05_BBM pg 59 E05_BBM pg50

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
				Studies of lower rainfall catchments have reported that there is likely to be a time lag in the region of 30 years between rehabilitation and recovery of stream yields and groundwater levels (BBM Closure Plan, pg 50). This is unacceptable given the changing climate and stress many ground and surface water dependent ecosystems are currently facing. Climate change is a significant factor in relation to the success rehabilitation has on mitigating the impacts of mining on ground and surface water. As stated on page 35 of the closure plan, “Criteria that may be impacted (by climate change) include those related to the re-establishment of vegetation communities and groundwater / surface water conditions since the vegetation has an influence on catchment hydrology” (BBM Closure Plan, p 35). Once again, in light of the changing climate further clearing of vegetation for mining should not be allowed to proceed. Refer to Inland Waters **Section 5** for further information.	
9.5 Completion Criteria	*Not supported*		*Provide methods for monitoring the impacts of clearing on forest resilience (including fires).*	• Completion criteria should be developed and refined prior to approval. • Completion criteria for State Forest & Other Crown Land Forest must be developed prior to approval. One of the principles of the completion criteria is ‘the vegetation is as resilient as Jarrah Forest’ (E05 p24) yet no details have been provided regarding methods for measuring and monitoring forest resilience. • Currently trajectory criteria are limited to criteria for rehabilitation establishment at nine months (BBM Closure plan, p25). Trajectory criteria of early and mid-stages of rehabilitation should be developed, and made publicly available, prior to approval. Successful and/or late rehabilitation trajectory criteria should be developed as soon as possible, because it is impossible to measure rehabilitation success (and apply adaptive management principles) without understanding the long-term trajectory criteria and targets. • The objective of ‘equivalent remnant vegetation’ is that the ‘ecological value of the rehabilitated areas will be approximately equal to or, if agreed, greater, than that which existed prior to mining. What has been ‘agreed’? In some areas, the ecological value of rehabilitated areas should be greater than before mining. The long-term objective of ‘improved remnant vegetation’ should be included for areas that are currently degraded, and should apply to all bushland areas cleared, regardless of land ownership. • Completion criteria “The vegetation is as resilient as Jarrah Forest” and “The capacity to retain water and nutrient resources is equivalent to target ecosystems” are both unachievable, for reasons mentioned above. • Given the trend of reduced understorey diversity with time since rehabilitation and the importance of understorey species for ecosystem function and habitat, the closure plan must outline clear trajectory criteria for understorey diversity and methods for improving recruitment of understory species. If plant diversity continues to decline steadily with time since rehabilitation, it is not a sustainable ecosystem, how lower ecological value and is less resilient as the existing Jarrah Forest (thus contradicting all principles of the completion criteria).	E05 _BBM Closure plan p24
9.6 Monitoring Environmental Quality	*Not supported*		*Increase survey effort in the NJF.* *Increase survey effort in rehabilitation areas during years 1-3.* *Commit to long-term groundwater recharge studies.*	• In terms of ensuring that the ecological values of the rehabilitated areas are approximately equal to, or greater than, that which existed prior to mining (P31 – E05), the measure/indicators of vegetation monitoring should include the assessment of ‘vegetation condition’ (including weed cover). • Much of the flora data for the NJF appears to have been collected 3-4 decades ago and, over this time, new taxa have been described and species limits in others better defined (see response to ‘Flora and Vegetation, Flora Lists’ for more information and examples of this problem. • Low survey effort of the NJF makes it difficult to assess rehabilitation success and the quality of the data collected, particularly considering the lack of suitable point data for floristic analysis (see Flora and Vegetation, Flora Lists’). The potential under-reporting of site vegetation types and flora of the NJF, the diversity deficit in rehabilitation area is likely far greater than estimated/reported. • Rehabilitation establishment monitoring should occur at year 1, as well as years 2, 5, 10 15 and 20 as outlined in Table 20 (P106 – BBM Closure Plan). This may provide insights about the timeframes of major recruitment losses for some species, particularly understorey species (i.e., are species failing to germinate and develop into seedlings, or are most recruitment failures related to	

THEME	PHCC Position	Rationale	Proposed outcomes	PHCC comment (Summarise key messages)	Reference/s
			Either reduce slopes to >18°, or monitor erosion on slopes <18° more frequently.	unusually hot summers and/or predation during juvenile stages). The first year after seedling is generally the most critical period for a plant, and monitoring recruitment in the first year enables more informed approaches to management. • Considering 'there is currently insufficient information to quantify the long-term increase in recharge which may result from this reduced unsaturated storage (P51 – BBM Closure Plan), commitment to long-term studies (>10 years) on soil-moisture/groundwater recharge conditions pre and post-mining should be included in the closure plan. • Closure plan (p38 – BBM Closure Plan) states that 'slopes are typically less than 20° except for the ridge systems where slopes are generally 20–40°', however, DMIRS notes that maximum slope angles for rehabilitated mine area should not exceed 18° (page xiii – BBM Closure Plan). • Rehabilitated areas with slopes >18° should be carefully monitored for erosion potential, with clear erosion management plans developed prior to mining. • No clear monitoring plan for all features mentioned above.	
9.7 Rehabilitation as a mitigation strategy	*Not supported*		*Given the failure to restore both vegetation structure and plant diversity, rehabilitation cannot be considered an acceptable mitigation strategy.*	• The understorey assessment for 1987, 1992, 1997, 2002, 2007, 2010, 2013 and 2016 rehabilitation (Table 14, P78 - E05) show that native species richness generally declines with time since rehabilitation, yet no attempt has been made to address this decline throughout the closure plan. Although decline in native species diversity is expected with time since rehabilitation, according to data provided in Table 14, in 30 years the rehabilitation areas will have less than half of the native species richness recorded in forest plots. This downward trend of native understorey diversity in rehabilitated areas is likely to continue beyond 30 years and, in 60 years, we can expect an understorey with only a small fraction of understorey species present before mining. • The deficit in native understorey diversity will have major impacts for long-term ecosystem functions and persistence. Low diversity of understorey species will alter soil hydrology and plant water availability, reduce critical habitat for ground dwelling species and disrupt pollination and reproduction processes for flora and fauna. • Visual inspections of the Proponent's rehabilitation in the Marradong and Refinery areas highlight some of the deficits, concerns and inadequacies in relying on rehabilitation as a mitigation strategy at least for the short to medium term (see images right, of Acacia dominated rehabilitation, lack of overstory and understory species diversity and Eucalypt deaths, with larger versions and detail provided in **Appendices**).	 *Worsley Alumina Collie rehabilitation site showing lack of tree regeneration 12th August 2022 (-33.255615, 116.024498), See Appendices for large version*  *Worsley Alumina Marradong rehabilitation area 12/08/2022, showing sapling tree deaths in foreground even in winter, and Acacia dominant regrowth in background (-32.865110, 116.442755)*

10. REFERENCES

Bain, K., Halley, M., Barton, B., Wayne, A., McGilvray, A., Wilson, I. and Wayne, J. (2016). Survival of quokkas in the 2015 Northcliffe bush fire: understanding the impact of intense and broadscale fire on an important population of quokkas in the southern forest of Western Australia. WWF-Australia. Retrieved from: http://www.wwf.org.au/what-we-do/species/quokka

Bergstrom, D., Wienecke, B., van den Hoff, J., Hughes, L., Lindenmayer, D., Ainsworth, T., Baker, C., Bland, L., Bowman, D., Brooks, S., Canadell, J., Constable, A., Dafforn, K., Depledge, M., Dickson, C., Duke, N., Helmstedt, K., Holz, A., Johnson, C., McGeoch, M., Melbourne-Thomas, J., Morgain, R., Nicholson, E., Prober, S., Raymond, B., Ritchie, E., Robinson, S., Ruthrof, K., Setterfield, S., Sgrò, C., Stark, J., Travers, T., Trebilco, R., Ward, D., Wardle, G., Williams, K., Zylstra, P. and Shaw, J. (2021) Combating ecosystem collapse from the tropics to the Antarctic. *Glob. Change Biol.*, 27: 1692-1703. https://doi.org/10.1111/gcb.15539

BIOSTAT (2021a) cited in Worley Alumina Environmental Review Document, 2021.

Black Cockatoo Conservation Centre (2016) "Forest Red-tailed Black Cockatoo, Factsheet". Available online Fact-sheet-Forest-Red-tails.pdf (blackcockatoorecovery.com).

Bourke, K. (2022) *WA is the state with the most work to do to meet the federal government's emissions reduction target*, ABC News. Accessed on 25/08/2022. https://www.abc.net.au/news/2022-08-20/wa-43-per-cent-reduction-carbon-emissions-can-it-be-done/101310862

Bowen, K., Ebi, K., Friel, S and McMichael, A.J (2013) A multi-layered governance framework for incorporating social science insights into adapting to the health impacts of climate change, Global Health Action, 6:1, DOI: 10.3402/gha.v6i0.21820

Burrows, N., Dell, B., Neyland, M. & Ruprecht, J. (2011) Review of silviculture in forests of south-west Western Australia, Accessed on 25/08/2022. https://www.dbca.wa.gov.au/sites/default/files/2021-12/Review%20of%20silviculture%20in%20forests%20of%20south-west%20Western%20Australia.pdf

Cristescu, R.H., Frère, C. and Banks, P.B. 2012. "A review of fauna in mine rehabilitation in Australia: current state and future directions." *Biological Conservation* 149, no. 1: 60-72.

Conservation Commission of Western Australia, 2013, *Forest Management Plan 2014-2023*, Conservation Commission of Western Australia, Perth. https://www.dpaw.wa.gov.au/images/documents/conservation-management/forests/FMP/20130282_WEB_FOREST_MGT_PLAN_WEB.pdf

Craig, M.D., Hardy, G.E., Fontaine, J.B., Garkakalis, M.J., Grigg, A.H., Grant, C.D., Fleming, P.A. and Hobbs, R.J. 2012. "Identifying unidirectional and dynamic habitat filters to faunal recolonisation in restored mine-pits." *Journal of Applied Ecology*, 49, no. 4: 919-928.
https://doi.org/10.1111/j.1365-2664.2012.02152.x

DAWE (2020) Referrals, Assessments and Approvals of Controlled Actions under the Environment Protection and Biodiversity Conservation Act 1999, Department of Agriculture, Water and the Environment, Australian National Audit Office, Commonwealth of Australia. https://www.anao.gov.au/sites/default/files/Auditor-General_Report_2019-2020_47.pdf

Daws, M., Grigg, A., Tibbett, M., & Standish, R. (2019) Enduring effects of large legumes and phosphorus fertiliser on Jarrah Forest restoration 15 years after bauxite mining. *For. Ecol. Manag*. 438, 204–214. doi: 10.116/j.foreco.2019.02.029.

DAWE (2020) Independent Review of the EPBC Act - Interim Report, Chapter 8 – Restoration, Dept. Of Agriculture, Water and the Environment, Accessed on 25/08/2022. https://epbcactreview.environment.gov.au/resources/interim-report/chapter-8-restoration

DAWE (2022) *Threatened Species Strategy Action Plan 2021-2026*, Canberra, https://www.agriculture.gov.au/sites/default/files/documents/threatened-species-strategy-action-plan-2021-2026.pdf,

Daws, M., Walters, S., Harris, R., Tibbett, M., Grigg, A., Morald, T., Hobbs, R., & Standish R. (2021) Nutrient enrichment diminishes plant diversity and density, and alters long-term ecological trajectories, in a biodiverse forest restoration. *Ecol. Engineering,* 165. doi: 10.1016/j.ecoleng.2021.106222

DBCA (2017) *Woylie* Bettongia penicillata ogilbyi,, Dept. Of Biodiversity and Conservation. Accessed on 25/08/2022. https://www.dpaw.wa.gov.au/images/documents/plants-animals/animals/animal_profiles/woylie_fauna_profile.pdf

DEC (2012) *Quenda* Isoodon obesulus (Shaw, 1797) *Fauna Profile* https://www.dpaw.wa.gov.au/images/documents/conservation-management/pests-diseases/quenda_2012.pdf

DEC (2012). *Chuditch (Dasyurus geoffroii) Recovery Plan.* Wildlife Management Program No. 54. Department of Environment and Conservation, Perth, Western Australia.

Department of Conservation and Land Management (2004) *Silvicultural Practice In Wandoo Forest and Woodland*, Department of Conservation and Land Management, Sustainable Forest Management Series, SFM Guideline No. 2. https://www.dpaw.wa.gov.au/images/documents/conservation-management/forests/FMP/preparing_FMP_2014-23/silvic_guideline_2_2004_wandoo.pdf

Department of Environment and Conservation (2013). *Quokka* (Setonix brachyurus) *Recovery Plan - Wildlife Management Program* No. 56. Perth, WA: DEC. Retrieved from: http://www.environment.gov.au/resource/quokka-setonix-brachyurus-recovery-plan.

Department of the Environment and Energy. (2016). SPRAT Profile: Setonix brachyurus – Quokka. Retrieved from http://www.environment.gov.au/sprat

Department of Planning, Lands and Heritage, Department of the Premier and Cabinet (2013) *Aboriginal Heritage Due Diligence Guidelines, Government of Western Australia, Perth.*

Department of Parks and Wildlife (2017*) Numbat (*Myrmecobius fasciatus*) Recovery Plan,* Wildlife Management Program No. 60 Western Australia Department of Parks and Wildlife February 2017https://www.dcceew.gov.au/sites/default/files/documents/numbat-recovery-plan.pdf

Department of Planning Lands and Heritage (2021) Aboriginal Cultural Heritage Act 2021 Fact Sheet 9 – Protected Area Order Guidelines, Government of Western Australia, Perth.

Department of Parks and Wildlife (2017) Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan, https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/western-ringtail-possum-recovery-plan#:~:text=The%20Recovery%20Plan%20for%20the,recovery%20plan%20for%20this%20species.

Department of the Environment, Water, Heritage and the Arts (DEWHA) *Guidelines for Section 516A reporting – Environment Protection and Biodiversity Conservation Act 1999*.

Department of Biodiversity, Conservation and Attractions. (2017). *Fauna Notes – Living with Quenda.* Retrieved from http://www.dbca.wa.gov.au/ .

Department of Environment and Conservation WA (2012) *National Recovery Plan for the Woylie* Bettongia penicillata ogilbyi, Western Australian Government Department of Environment and Conservation (DEC) Perth.

DPAW (2004) *Silvicultural Practice in Wandoo Forest and Woodland*
https://www.dpaw.wa.gov.au/images/documents/conservation-management/forests/FMP/preparing_FMP_2014-23/silvic_guideline_2_2004_wandoo.pdf

DWER (2019) Review of the WA environmental offsets framework, Final report, Department of Water and Environmental Regulation October 2019. Government of WA. Accessed on 25/08/2022. https://www.wa.gov.au/system/files/2021-10/Review_of_the_WA_environmental_offsets-framework.pdf

Environmental Protection Act 1986 (EP Act) ENVIRONMENTAL PROTECTION ACT 1986 - SECT 4A (austlii.edu.au)

EPA (2011) *WA Environmental Offsets Policy DRAFT*, epa.wa.gov.au

EPA (2014) WA Environmental Offsets Guidelines, August 2014 WA Environmental Offsets Guidelines (epa.wa.gov.au)

EPA (2021) *Statement of Environmental Principles, Factors and Objectives*, EPA, Western Australia.

EPA (2021) *Instruction and template: How to prepare an Environmental Review Document.* Environmental Protection Authority, WA. Accessed on 25/08/2022. https://www.epa.wa.gov.au/forms-templates/instructions-how-prepare-environmental-review-document

EPA (2019) *Strategic Plan 2019-2022*, Environmental Protection Agency, Joondalup WA. Accessed on 25/08/2022. https://www.epa.wa.gov.au/sites/default/files/EPA%20Strategic%20Plan%202019-2022.pdf

EPA (2021) Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans, https://www.epa.wa.gov.au/sites/default/files/Forms_and_Templates/Instructions%20-%20Preparing%20Environmental%20Protection%20Act%201986%20PIV%20Environmental%20Management%20Plans.pdf

EPBC (2018) *Conservation Advice for Caladenia hopperiana, Quindanning spider orchid,* Threatened Species Scientific Committee, Environment Protection and Biodiversity Conservation Act 1999. Accessed on 14/07/2022. http://www.environment.gov.au/biodiversity/threatened/species/pubs/88195-conservation-advice-15022018.pdf

Gibbons, P. Macintosh, A., Constable, A.L and Hayashi, K. (2018) Outcomes from 10 years of biodiversity offsetting, *Global Change Biology*, 07 November 2017 https://doi.org/10.1111/gcb.13977

Gibbons, P. and Lindenmayer, D.B.(2007). Offsets for land clearing: No net loss or the tail wagging the dog. Ecological Management & Restoration,8(1), 26-31

Greening Australia (2018) *Return of the Red-tailed Phascogale*, https://www.greeningaustralia.org.au/projects/return-of-the-red-tailed-phascogale/, Accessed 20 August 2022.

Government of Western Australia (2022) Western Australian Native Vegetation Policy, https://www.wa.gov.au/system/files/2022-05/WANativeVegPol2022.pdf

Government of Australia (1999) Environment and Biodiversity Conservation Act (legislation).

Goode, B, and L Huxtable. 2015. “An Ethnographic Aboriginal Heritage Survey of Mt Saddleback (Mokine) in the Shire of Boddington, Western Australia.” a report prepared for South32 Worsley Alumina Pty Ltd.

Hearn, R., Stoneman, G., Keighery, G., Burrows, N., Yates, C. (2011) *Protection of significant flora in the South-West Forests and Associated Ecosystems*. CALM

Hearn, R., Stoneman, G., Keighery, G., Burrows, N., Yates, C., Hopper, S. (2003) *Management of significant flora in the South-West Forests and Associated Ecosystems*. CALM

IPBES (2019) Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673

Intergovernmental Panel on Climate Change (IPCC) (2022) *Working Group II contribution to Sixth Assessment Report of the Intergovernmental Panel on Climate Change Final Draft* https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_FinalDraft_FullReport. pdf at Chapter 11 p, 24 citing Wardell-Johnson et al., 2015), Accessed 4/08/2022.

Keulemans, G. (2021) *We've smelted a billion tonnes of recyclable aluminium. Do we need to make more?* The Conversation Media Group Ltd. Accessed on 25/08/2022. https://theconversation.com/weve-smelted-a-billion-tonnes-of-recyclable-aluminium-do-we-need-to-make-more-166784#:~:text=In%20Australia%2C%20recycling%20rates%20for,across%20industrial%20and%20consumer%20products

Koch, J. M., Grigg, A.H., Gordon, R.K. and Majer, J.D (2012) Arthropods in coarse woody debris in jarrah forest and rehabilitated bauxite mines in Western Australia, *Annals of Forest Science* 67, no. 1: 106.

Koch, J. M. (2007) Restoring a Jarrah Forest understorey vegetation after bauxite mining in Western Australiam, *Restoration Ecology*,15, S26-S39

Lewis, D.E., White, J.R., Wafula, D. *et al. 2010.* "Soil functional diversity analysis of a bauxite-mined restoration chronosequence." *Microbial Ecology,* **59,** 710–723. https://doi.org/10.1007/s00248-009-9621-x

Luxton, S. (2020) *Modelling refugia for improved conservation outcomes in the northern jarrah forest. Southwestern Australia*. PhD thesis, Curtin University.

Macfarlane, C., Bond, C., White, D.A., Grigg, A.H., Ogden, G. and Silberstein, R. (2010) "Transpiration and hydraulic traits of old and regrowth eucalypt forest in southwestern Australia." *Forest Ecology and Management,* 260, no.1: 96-105. https://doi.org/10.1016/j.foreco.2010.04.005.

Mattiske Consulting Pty Ltd (2021) *Assessment of Flora and Vegetation on Worsley Mine Expansion Primary Assessment Area*, Prepared for South32 Worsley Alumina Pty Ltd, Mattiske Consulting Pty Ltd, Kalamunda WA.

May, J., Hobbs, R.J. and Valentine, L.E.(2017). Are offsets effective? An evaluation of recent environmental offsets in Western Australia. Biological Conservation,206, 249-257

Maron, M., Hobbs, R.J., Moilanen, A., Matthews, J.W., Christie, K., Gardner, T.A., Keith, D.A., Lindenmayer, D. and McAlpine, C.A.(2012). Faustian bargains? Restoration realities in the context of biodiversity offset policies. Biological Conservation,155, 141-148

Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. (2009) *South West Regional Ecological Linkages Technical Report*, Western Australian Local Government Association and Department of Environment and Conservation, Perth.

Moore, T.L., Valentine, L.E., Craig, M.D., Hardy, G.E.St.J. and Fleming, P.A. 2014. "Does woodland condition influence the diversity and abundance of small mammal communities?" *Australian Mammalogy*, 36, no. 1: 35-44.

Morgan, D. and Beatty, S. (2004). Monitoring the Lion's Weir Fishway Hotham River, Western Australia.

Morrongiello *et al.* (2011) Climate change and its implications for Australia's freshwater fish.

Miles (2021) Fauna Report Form Red-tailed phascogale, 2021, submitted to DBCA.

Minerals Council of Australia (2015) *Cumulative Environmental Impact Assessment Industry Guide, Adaptive Strategies,* Eco Logical Australia Pty Ltd, ACT. Accessed on 25/08/2022. https://www.minerals.org.au/sites/default/files/Cumulative_Environmental_Impact_Assessment_Industry_Guide_FINAL_0.pdf

Olsson (2021) Fauna Report Form Red-tailed phascogale, 2021, submitted to DBCA.

Peel-Harvey Catchment Council (2015) *Binjareb Boodja Landscapes 2025 Strategy*, Mandurah, Western Australia.

Sanchez, L., Souza, B., Siqueira-Gay, J., Valetich, R., Rosa, J. (2022) Pathways to achieve net positive impact on biodiversity and ecosystem services in mining. Brazil, São Paulo: *Fundação para Desenvolvimento Tecnológico da Engenharia*. https://www.researchgate.net/profile/Luis-Sanchez-73/publication/361429255_Pathways_to_achieve_net_positive_impact_on_biodiversity_and_ecosystem_services_in_mining/links/62b10dd71010dc02cc4f14a1/Pathways-to-achieve-net-positive-impact-on-biodiversity-and-ecosystem-services-in-mining.pdf?origin=publication_detail

Samuel, G. (2020) *Independent Review of the EPBC Act—Interim Report, Chapter 8 – Restoration*, Department of Agriculture, Water and the Environment, Canberra. Accessed on 25/08/2022. https://epbcactreview.environment.gov.au/resources/interim-report/chapter-8-restoration

Saunders, D.A *et al.* (2022), "Artificial nesting hollows for the conservation of Carnaby's Cockatoo *Calyptorhynchus latirostris*: definitely not a case or erect and forget". *Pacific Conservation Biology* https://doi.org/10.1071/PC21061

Seidlitz, A. et al. (2020) Optimising camera trap height and model increases detection and individual identification rates for a small mammal, the numbat (*Myrmecobius fasciatus*) 2021 Volume 43 No.3, published online 13 July 2020.

Seidlitz, A. Bryant, K., Armstrong, N., Calver, M., & Wayne, A. (2021) Sign surveys can be more efficient and cost effective than driven transects and camera trapping: a comparison of detection methods for a small elusive mammal, the numbat *(Myrmecobius fasciatus)*, *Wildlife Research*, 48, 491 – 500. https://www.publish.csiro.au/wr/pdf/WR20020

Short, J. and Hide, A. (2012) Distribution and status of the red-tailed phascogale (Phascogale calura)

Australian Mammalogy 34(1) 88-99 https://doi.org/10.1071/AM11017.

Threatened Species Scientific Committee (2016) *Conservation Advice* Phascogale calura *red-tailed phascogale*, http://www.environment.gov.au/biodiversity/threatened/species/pubs/316-conservation-advice-07122016.pdf

Travouillon, K. Martin, M.L (2018) Mechanical similarity across ontogeny of digging muscles in an Australian marsupial (Isoodon fusciventer), *Journal of Morphology*, 2018

UNESCO World Commission on the Ethics of Scientific Knowledge and Technology (2005) The Precautionary Principle, March 2005.

United Nations (2015) The Paris Agreement United Nations https://www.un.org/en/climatechange/paris-agreement

Vesk, P.A., Nolan, R., Thomson, J.R., Durrough, J.W. and MacNally, R. (2008) "Time lags in provision of habitat resources through vegetation." *Biological Conservation,* 141, no. 1: 174-186. https://doi.org/10.1016/j.biocon.2007.09.010

Vieira, E., Finlayson, G., & Dickman, C. (2007) Habitat use and density of numbats *(Myrmecobius fasciatus)* reintroduced in an area of mallee vegetation, New South Wales, *Australian Mammalogy* 29(1):17-24.

WADPW (2017) *Numbat (Myrmecobius fasciatus) Recovery Plan*, WA Dept. Of Parks and Wildlife, Aust. Govt. Accessed on 25/08/2022. https://www.dcceew.gov.au/sites/default/files/documents/numbat-recovery-plan.pdf

WAFCWG (20220) WA Feral Cat Working Group (website) https://wafcwg.org.au

WA Forest Alliance (2022) *A Thousand Cuts – Mining in the Northern Jarrah Forests*, WA Forest Alliance, The Wilderness Society WA, Conservation Council of WA.

WA Govt. (2014) *WA Environmental Offsets Guidelines, August 2014*. Accessed on 25/08/2022.
https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/WA%20Environmental%20Offsets%20Guideline%20August%202014.pdf

Water and Environmental Consultants (2004) *Streamflow and Salinity Behaviour of the Bee Farm and Tunnel Road Catchments,* Wetlands Research and Management, Perth.

Water Corporation (2022) Climate and Southern WA (website) https://www.watercorporation.com.au/Our-water/Climate-change-and-WA/Climate-and-Southern-WA, Accessed August 2022.

Winton, V. (2021) Archaeological Survey of the South32 Worsley Alumina Priority 1 Bridges and Transport Corridor Areas At Hotham and Marradong in the Shire of Boddington, Western Australia, Brad Goode and Associates, Dunsborough.

WRM (2011) Hotham River - Ecological Water Requirements and Ecological Sustainable Yield Downstream of Tullis Bridge. Unpublished report by Wetland Research & Management to Newmont Boddington Gold. January 2011.

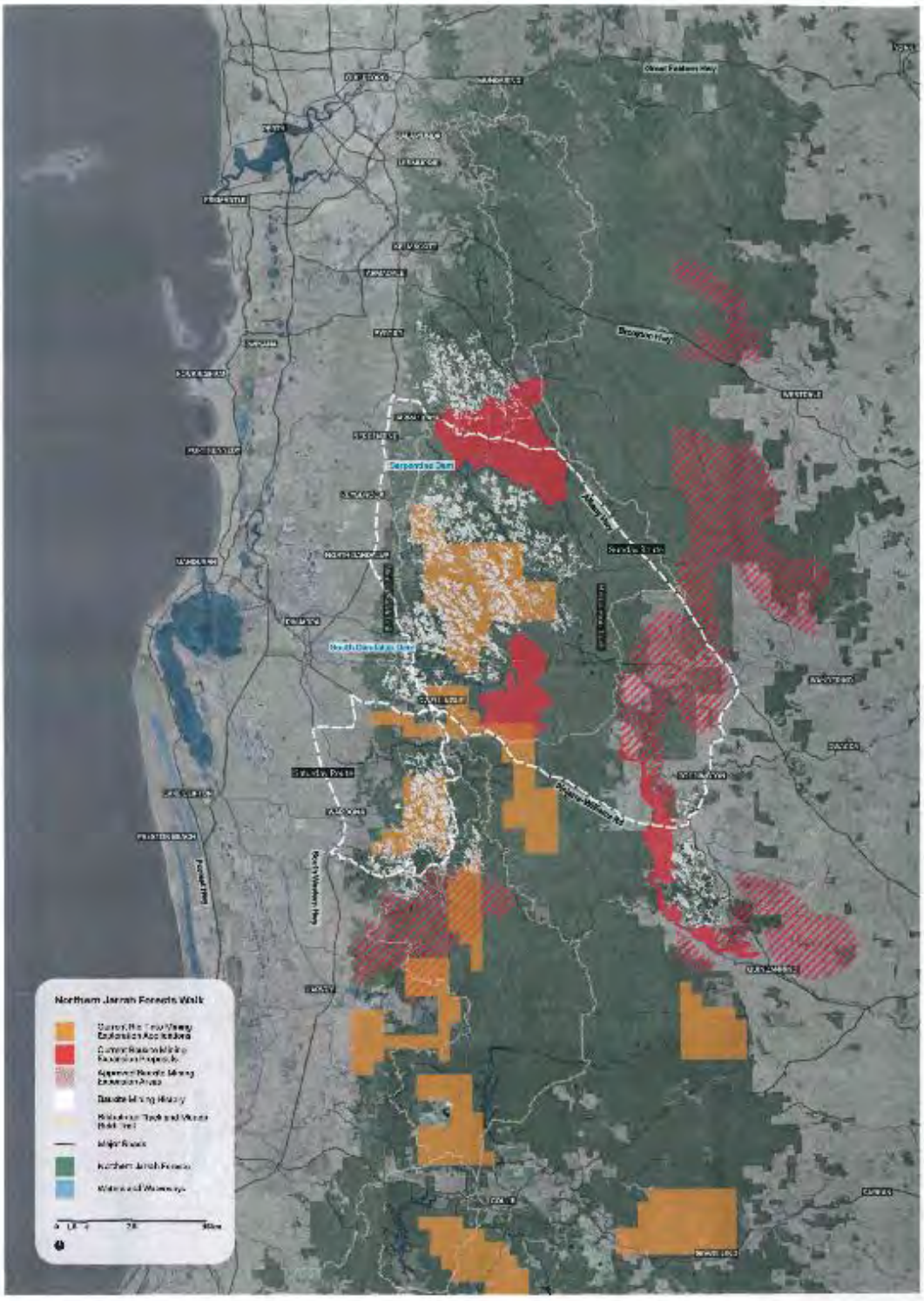
WRM (2018) Hotham River: monitoring fish populations under increased abstraction, November 2017 survey. Unpublished report to Newmont Boddington Gold by Wetland Research & Management. Final Report, September 2018.

Yates and Goode (2017) Report of an Aboriginal Heritage Study of Boddington Bauxite Mine 2017 (2017: p33)

APPENDICES

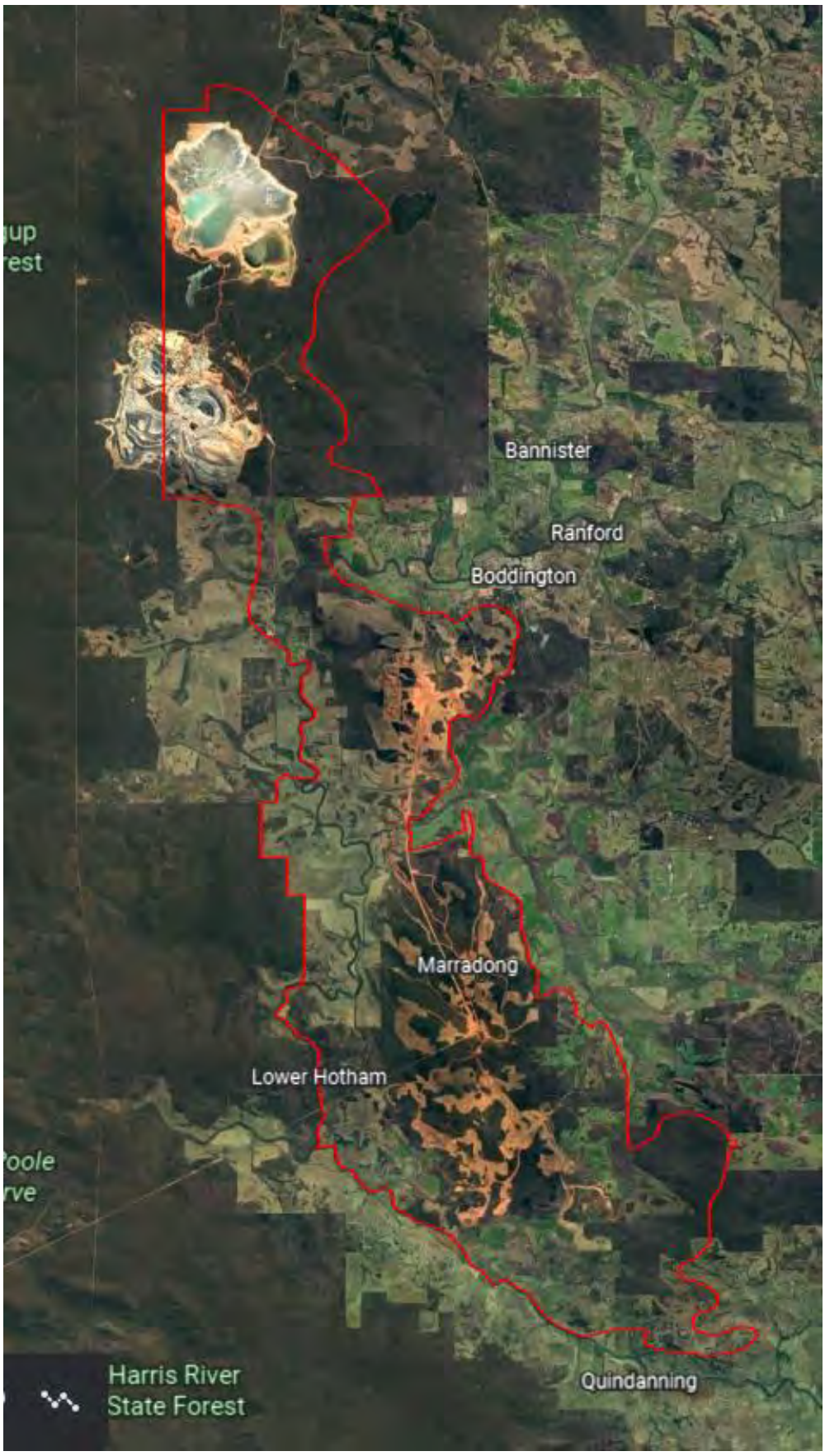
SUMMARY

Section 1.2 Recommendations

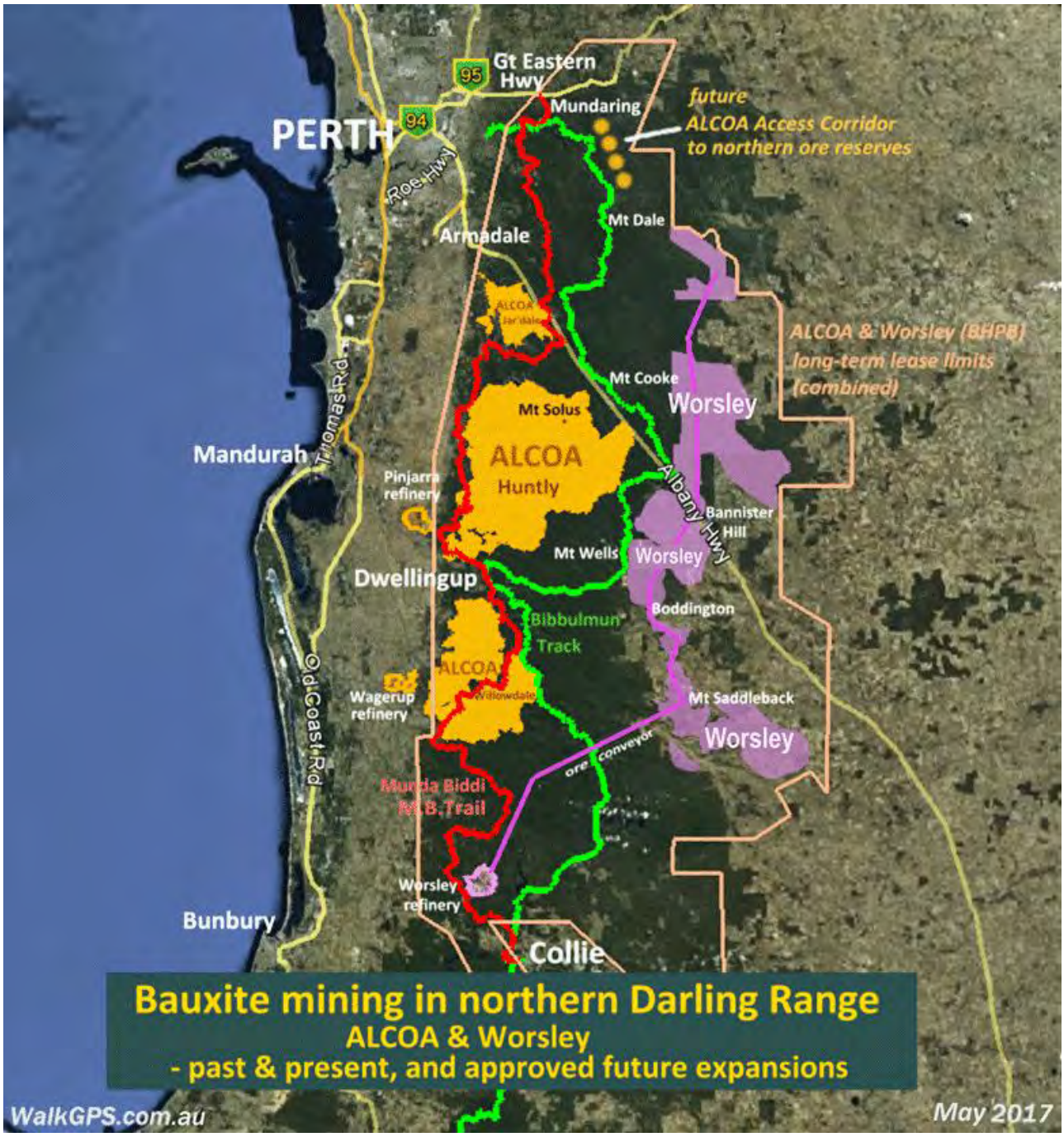


WA Forest Alliance (2022) – Historical, Current and Proposed Bauxite Mining in the Northern Jarrah Forest. Note Red hatched area (east) showing the 8,400 ha conditional approval area under MS719

Section 1.13 Cumulative Impacts



View of PAA using satellite imagery 11/19/2020 (Google Earth)



Cumulative bauxite mining in the Northern Darling Range WalkGPS [DarlingRange-Perth-to-Collie-bauxite-mining-WalkGPS-revMay2017-lge.gif (778×830)] *Accessed August 2022.*

2. FLORA AND VEGETATION

2.2.4 Site Vegetation Types & Section 2.2.5 Threatened Ecological Communities

Description of State listed Priority Community

	Mount Saddleback heath communities Mount Saddleback (including Tunnell Road) heath communities are variants of site-vegetation type G (as defined by Havel, J.J. 1975. Site-vegetation mapping in the Northern Jarrah Forest (Darling Range). I. Definition of site-vegetation types. Bull. For. Dept. West. Aust. 86.) and areas associated with shallow soils and granite outcrops (Mattiske Consulting Pty Ltd 2019 Assessment of Flora and Vegetation within Expansion Survey Areas. Unpublished report prepared for South32 Worsley Alumina, 2018). The heath types include (but are not limited to): "Site-vegetation Type G: Open Heath of *Grevillea bipinnatifida, Hakea undulata, Banksia squarrosa* subsp. *squarrosa, Hakea incrassata, Hakea undulata,* and *Petrophile serruriae* over *Borya sphaerocephala* on shallow soils and outcrops; Site-vegetation Type G1: Mosaic of open heath of Proteaceae – Myrtaceae species, with emergent patches of *Eucalyptus drummondii* on shallow soils on slopes; Site-vegetation Type G3: Open heath of *Banksia squarrosa* subsp. *squarrosa*, *Hakea incrassata*, *Hakea undulata, Petrophile heterophylla* and *Petrophile serruriae* on shallow soils over granite outcrops on slopes with occasional emergent *Eucalyptus drummondii;* and Site-vegetation Type G4: Open scrub and tall shrubland of *Hakea trifurcata* and *Hakea undulata* with admixtures of mallee species including *Eucalyptus latens* and *Eucalyptus aspersa* on clay to clay-loam soils over outcrops on slopes" (from Mattiske Consulting Pty Ltd 2019). Threats: clearing for mining, hydrological change	Priority 1	

Section 2.2.4 Site Vegetation Types

Whicher Scarp Report
This report is an example of a comprehensive treatment of areas mapped in the Jarrah Forest Bioregion. On the basis of the report a Whicher Scarp Forest Region was described and mapped and a number of TECs were recognised. The report is accompanied by the full dataset.

A Floristic Survey of the Whicher Scarp
BJ Keighery[1], GJ Keighery[1], A Webb[1], VM Longman[1] and EA Griffin[2]
[1] Department of Environment and Conservation
[2] EA Griffin and Associates
A report for the Department of Environment and Conservation as part of the Swan Bioplan Project April 2008

SUMMARY

The Whicher Scarp forms a sickle shaped landform unit that extends from near Burekup in the north where it meets the Darling Scarp, to the south-west of Dunsborough where it meets the granites of the Leeuwin-Naturaliste ridge.

A survey of the Whicher Scarp was undertaken by the Departments of Environmental Protection and Conservation and Land Management together with the Wildflower Society of Western Australia (Inc.) over a period of more than 10 years. This work was completed as part of the Swan Bioplan Project to provide a more detailed knowledge of the conservation status of species and communities that occur in this area.

Work for the study has involved remnant vegetation mapping of the Whicher Scarp, analysis of a set of 124 quadrats of which 80 have not been analysed previously, detailed flora survey of three forest blocks (Dardanup, Boyanup and Whicher Forest Blocks) and general flora survey of the Whicher Scarp. The sets of data prepared for this study are presented in the report and Appendices in a written and/or digital format.

The natural values of the Whicher Scarp in relation to landforms, vegetation and flora are diverse and varied. These can be summarised as follows.

- A distinct landform
  Three major subdivisions are evident in the Whicher Scarp, these being the West, Central and North Whicher Scarp; these subdivisions are reflected in the flora.

- A naturally restricted landform
  - 0.7% (approx 21,000 ha) of the Southern Jarrah Forest Biogeographic Sub-region.
  - 46% (approx 9,200 ha) remains naturally vegetated.
  - Over 50% the public lands are DEC lands located in nine forest areas.

- Ecological linkages maintained
  Within the Central and North Whicher Scarp effective ecological linkage is maintained; however, the West Whicher is mainly private land and is heavily cleared.

- Six unique vegetation complexes, of which two are highly restricted and three have in effect less than 30% of their area remaining.

- A diverse suite of woodland floristic assemblages
  - Four strong regional floristic community patterns are distinguished in the Whicher Scarp.
  - The communities are distinct from the communities of the Darling Scarp.
  - A set of communities centred on sands of the Whicher Scarp slopes are effectively confined to the Whicher Scarp.
  - A group of communities associated with laterites that are shared with and/or intergrade with those of the adjacent Blackwood Plateau
  - A group of communities on grey sands that are shared with those of the Swan Coastal Plain.
  - A highly restricted floristic community is found in the Dardanup Forest Block.

- Restricted and rare wetland communities
  The Whicher Scarp is associated with a series of distinctive wetlands including occurrences of the Busselton Ironstone communities which are a threatened ecological community.

- A diverse and rich flora
  More than 900 native species reflecting flora of the Jarrah Forest, south coast sands and wetlands and Swan Coastal Plain sands as well as a large number of Whicher Scarp centred species. The Whicher Scarp is a local centre of species richness in the species rich south-west.

- A centre of speciation
  More than 40 species having been recently described in the Whicher Scarp and about a further 25 species are expected to be able to be differentiated genetically and/or morphologically.

- A highly endemic flora
  The Whicher Scarp flora shows high levels of endemism at a national, regional and local scale. The Whicher Scarp is a local centre of species endemism in the species rich South-West.

- More than 60 rare species
  More than 60 species are State listed species, eight being Declared Rare and 53 Priority Species. Nine species are Commonwealth Listed. Based on this study it is recommended that ten species be listed as Priority 1 and two currently listed species be listed as Declared Rare Flora.

- Ninety species at the end of their range
  Of these, 49 species are at the northern end of their range and 32 species at the southern end of their range.

- More than 100 species with disjunct populations
  More than 100 species have population/s in the Whicher Scarp representing disjunctions from other populations of the taxon. Some of these species illustrate remarkable disjunctions.

- A diversity of unusual and possibly relictual habitats

- High degree of intactness of native vegetation
  Large areas of native vegetation on the Whicher Scarp are in Excellent condition and less than 8% of the flora of the Whicher Scarp is weeds.

- A biodiversity hotspot
  Based on these studies (species richness, endemism, geographically distinct species), the Whicher Scarp deserves recognition as a local biodiversity hotspot in the species rich south-west.

  A series of recommendations are made in regard to better protecting the exceptional values of the Whicher Scarp landforms, vegetation and flora.

Section 3 Terrestrial Fauna
Section 3.2.1 Cumulative Impacts

Central PAA using satellite imagery 11/19/2020 (Google Earth)

Section 3.2.2 Secondary Impacts

Southern PAA showing broad scale clearing and fragmentation, clearing and roads as barriers to fauna movement (Imagery from 11/19/202) Google Earth.

Section 3.2.3 Protection Areas

Image from PAA showing extent of fragmentation and isolation of remnants (Imagery from 11/19/202) Google Earth.

Section 3.2.12 Numbat

Peel-Harvey Catchment Council
18 May 2021

We have some amazing (and unexpected!) news to share...there has been a confirmed numbat sighting in the Boddington area!

A Boddington local spotted what they thought to be a numbat and reported this to PHCC and South32 Worsley Alumina for follow up.

Worsley Alumina then set up monitoring cameras which captured these amazing images and there was no doubt at all that it was a numbat.
Worsley Alumina have advised the Parks and Wildlife Service, Western Australia and they will now work together to carry out monitoring in the Boddington area to further confirm the presence of numbats and the dynamics of the individuals/population.

PHCC will work with the Boddington community to protect the numbats sighted by raising awareness of the impacts of feral and domestic predators on threatened species, as well as potential support which can be provided to the community to support conservation efforts, including support to landholders to control feral cats and foxes.

DBCA, PHCC and Worsley Alumina are working together, as well as with the Shire of Boddington and the local community, to further assess the situation and plan accordingly.

Keep an eye out for details on a future workshop to help raise awareness of this endangered species and to find out how you can help protect it.
National Landcare Program #numbatneighbourhood

Facebook post 18 May 2021 – Report of Numbat discovery in Boddington

Facebook post 17 December 2021 – Report of Numbat Discovery on private landholding near Boddington town site

Section 5 INLAND WATERS
Section 5.2.8 Contamination of Surface Water

[redacted]

From: [redacted]
Sent: Thursday, 4 August 2022 9:58 PM
To: [redacted]
Cc:
Subject: CLC Agenda Item Request - Report of High Sediment Load in Marradong Brook
Attachments: 2022_08_02_Impact to Marradong Brook following Rain Events.pdf

Importance: High

Hi [redacted] (and through [redacted] as the CLC Chair)

I am requesting the information below is included as an agenda item for discussion and further information provided at the CLC meeting on Monday 8th August. I also formally request the information below is documented as a concern raised by PHCC.

It was reported to me by two community members that there was a high sediment load in Marradong Brook, at the crossing on Lower Hotham Road, assumed to be from the mining operations haulroads and other surface water runoff following recent rainfall events. Below are details in relation to the issue reported:

- Following being informed of the high sediment load and sent photos, I went and took photos over 1/8/22 and 2/8/22. See attached document for reference points where photos were taken and a copy of the photos.
- There is clearly impact to Marradong Brook from sediment at the location of the crossing on Lower Hotham Road.
- Comparison photos were taken upstream on Pinjarra-Williams Road at the crossing (just south of the Marradong Church) which showed no TSS or Turbidity impacts.
- Further downstream of the Lower Hotham Road Crossing, looking towards the Hotham River there was evidence of an "orange" colouring to the Hotham River.
- As a CLC rep PHCC would like clarification on:
  - Reporting this to DWER as to our knowledge South32 do not have a licence to discharge water into Marradong Brook.
  - The current operation surface water management plan, how drainage from the operations inc. haulroads is managed, is there a sump network, how are they monitored and maintained and what rainfall events are they designed for?
  - What is the routine monitoring upstream and downstream of the operations in terms of water quality including TSS and Turbidity as well as aquatic fauna and in particular to Marradong Brook.
  - Information regarding if TDS, TSS and turbidity are monitored on an events basis, to capture pulses of sediment moving into the system with significant rainfall events and if visual checks are made to sumps after these rainfall event as well.
  - Understand South32's immediate action and ongoing management to ensure this doesn't happen again.
- PHCC has concerns with River (and tributary) Health as increased suspended solids and sedimentation to the Hotham River and tributaries as a result of erosion and runoff from mining operations is a risk to aquatic environmental values with the Hotham River Catchment.
- PHCC has recently been made aware of a similar issue which occurred last year (through a community member). We are unsure if this was formally reported to South32, but have been made aware this was reported to DWER (Pollution Watch Service) by a community member in March 2021.

Kind regards
[redacted]

[redacted]
Peel-Harvey Catchment Council

Impact to Marradong Brook – Total Suspended Solids & Turbidity August 2022

Downstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Lower Hotham Road

1/08/2022 5:56pm

Downstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Lower Hotham Road

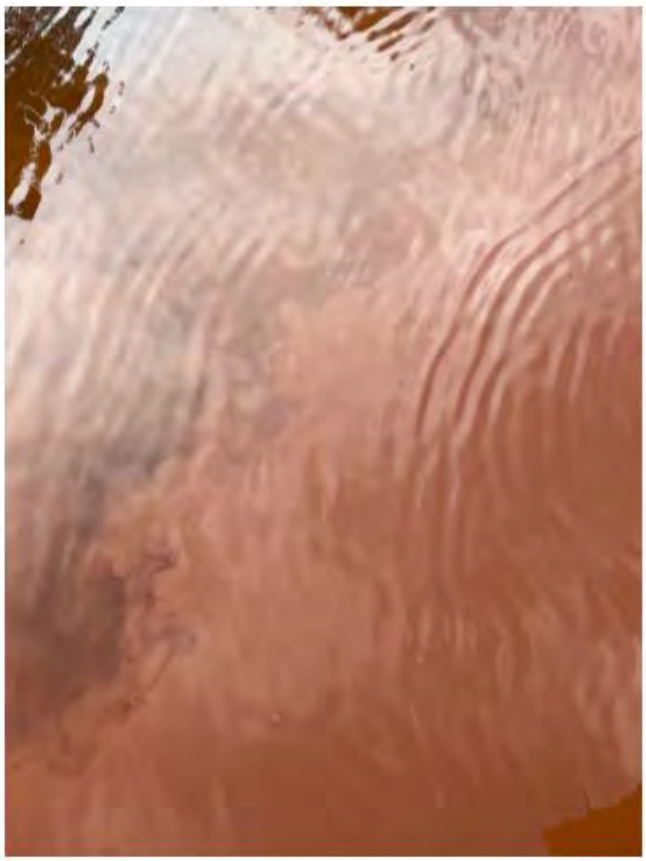
2/08/2022 8:09am

Downstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Lower Hotham Road

2/08/2022 8:09am

Downstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Lower Hotham Road

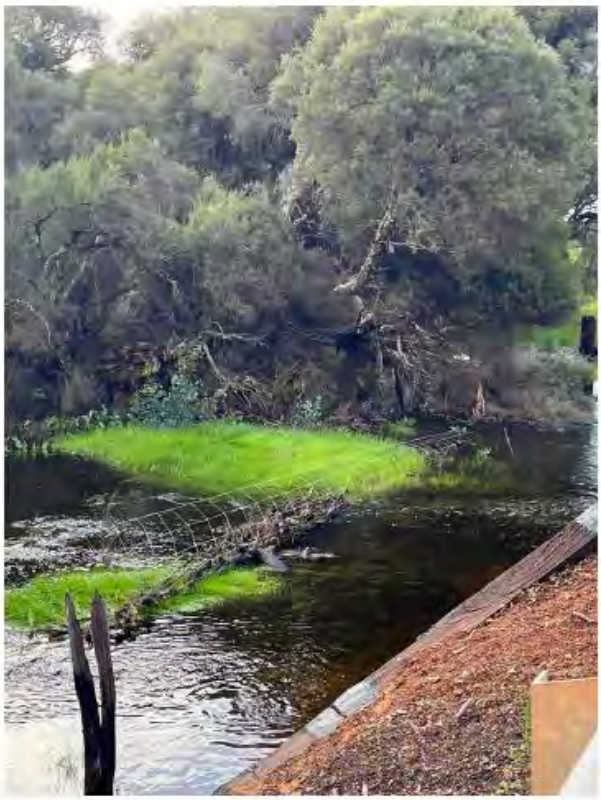
2/08/2022 8:09am



Upstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Pinjarra-Williams Road

2/08/2022 8:15am

Upstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Pinjarra-Williams Road 2/08/2022 8:15am

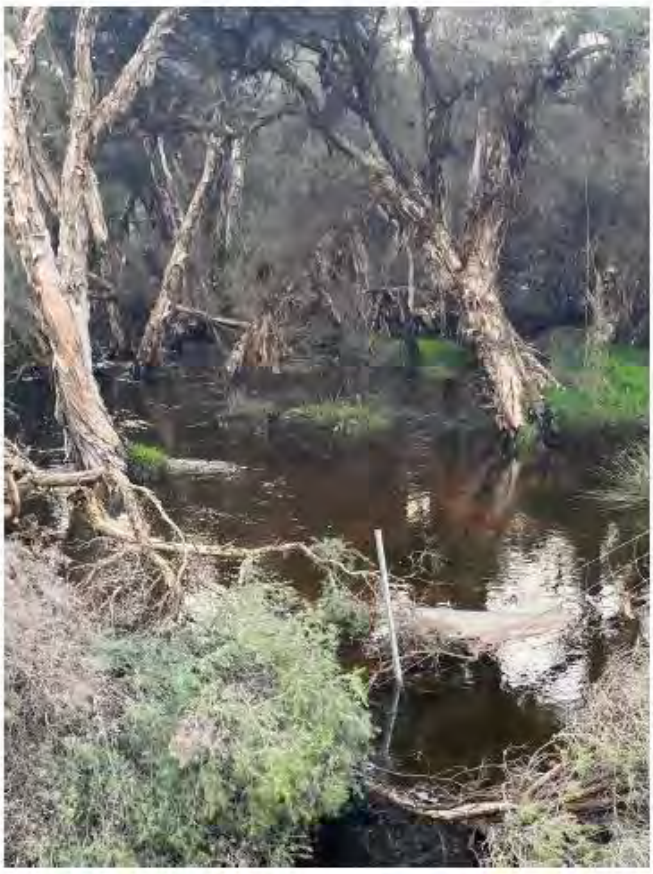


Upstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Pinjarra-Williams Road

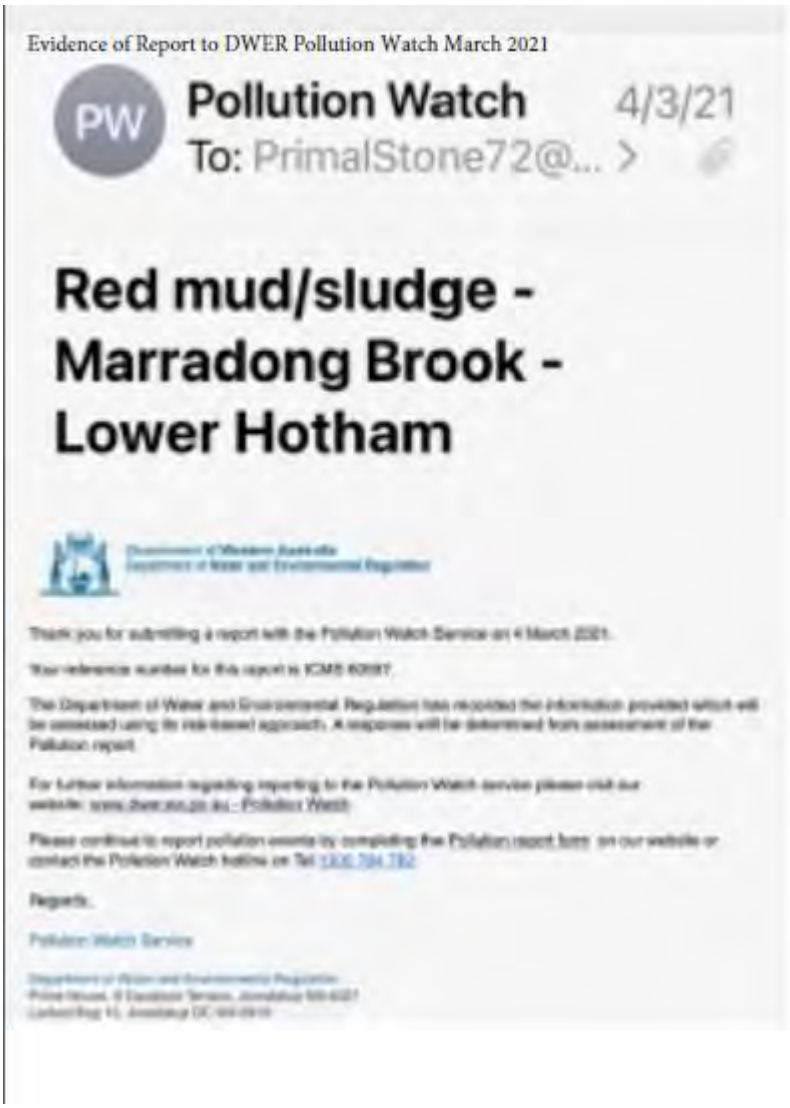
2/08/2022 8:15am

Upstream of Mining Operations - Photo Taken at Marradong Brook Crossing on Pinjarra-Williams Road

2/08/2022 8:15am



Evidence of Report to DWER Pollution Watch March 2021



PW **Pollution Watch** 4/3/21
To: PrimalStone72@... >

Red mud/sludge - Marradong Brook - Lower Hotham

Thank you for submitting a report with the Pollution Watch Service on 4 March 2021.

Your reference number for this report is [redacted].

The Department of Water and Environmental Regulation has recorded the information provided which will be assessed using its risk-based approach. A response will be determined from assessment of the Pollution report.

For further information regarding reporting to the Pollution Watch service please visit our website: www.dwer.wa.gov.au - Pollution Watch

Please continue to report pollution events by completing the Pollution report form on our website or contact the Pollution Watch hotline on Tel [redacted]

Regards,

Pollution Watch Service

[redacted]

Section 7 Social Surroundings

Section 7.2.12 Aboriginal Heritage and Culture

Key Concerns of Greg and Errol Thorne with South32 Public Environmental Review

Greg (Local Elder) and Errol Thorne
Wilman people
29th July 2022

General

- This is the first time South32 have begun engaging with Greg's family as Traditional Owners (in the last few years). Prior to this there was no agreement in place.
- Statement that South32 have taken notes from Newmont in regards to commencing the relationship 'taken a leaf out of Newmont's book' to engage with the local Elders.

Surveys

- Errol raised the issue of consistency with the approach to these surveys with a different archaeologist at any given time will have a different interpretation or version of the stories they are being told. This is a concern when it comes to the reporting and registration of sites.
- Errol was involved in a recent survey at North Bannister where the archaeologist advised due to the area being heavily logged the likelihood of finding artefacts was very low. This didn't allow for a proper and consistent assessment of the area.

Hotham River & Bridge Crossings

- There are three locations for proposed river crossings at Lower Hotham, Marradong and Twin Bridges.
- When South32 met with the Traditional Owners regarding the proposed bridge crossings Greg was the last to sign off on the agreement as he did not wish to sign.
- Greg noted during the surveys there was a tree with a face of a man which was facing the direction of Mokine. This had been noted in the report by Brad Goode & Associates (refer to page 19 of Appendix K8). South32 are still proposing to disturb this area.
- It doesn't make any sense to impact a known Aboriginal site with a crossing and why not change the plans in order to not impact that site. Many Aboriginal sites are interconnected, if you damage one then all are affected, the balance is lost. If you damage a women's business site what the impact could be for the men is unknown. Interconnection and balance is vital.

Clearing Impacts

- South32 told Greg that Jarrah was the only place where bauxite is found however they are clearing/planning to clear Wandoo areas.

- Errol and Greg said their Dad took them into the forest to hunt. They did it sustainably and didn't return to the same location so they didn't cull all the Kangaroos of that specific area. These sites (the forest etc) don't have to be considered sacred and are still sites of significance. So where do you go when this is all gone? Where do the animals go?
- It was noted that Newmont have a 200m buffer on the Bibbulmun track where South32 advise they will keep a 100m buffer.
- Errol advised there was minimal buffer at the Boddington cemetery which was a huge visual and noise impact when visiting loved ones who have passed.
- There is no screening on Ashcroft road. Greg mentioned that at both locations there was a lot of bush berries which are now gone. Errol said that they were not just clearing near Ashcroft Road they were mining, digging into the ground. He took photos of this.

Scar Trees & Other Sites

- The buffer of scar trees is 15m but this should be bigger.
- Hume Tank Road has about 15 or so scar trees.
- Tullis Bridge has both men and women's business locations. Bibbulmun track, old railway reserve and walkway trails are all at risk of disturbance.
- Errol and Greg said they can no longer access the river corridor to Castle Rock which is important to them. It is now all fenced off. There should be access available for them, a possible walkway along the river corridor. He wished for Traditional Owners to have access and to setup a group application for a ranger type program.
- In reference to natural and historical heritage/ European sites there is no current process to work through disturbances as they are not heritage listed. Errol suggested the Historical Association would provide information on where the places of European significance are.

Local Fauna/Threatened Fauna

- Greg discussed a Numbat sighting in the local area within the last 10 years; Lower Hotham Road near the Conveyor (a family of numbats), near the Bannister Road House (one numbat). It was noted to assist with a fauna report form to DBCA in the furture.

Offsets / Cultural Centre

- Greg raised with South32 the concept for a site in town (Boddington) to store artefacts and make a cultural centre. South32 have since retracted this offer as it is planned on being established elsewhere (Bunbury) which will not support the local community of Boddington.

Local Employment

- Greg mentioned that South32 employed external people for the revegetation work previously done and said it should of been locals doing this.
- Greg said South32 were going to Rowlands mission for Ranger training and not the local community.

The above is the record of key points and concerns raised by Greg and Errol Thorne.

Greg and Errol Thorne give permission for Peel-Harvey Catchment Council to use this information as part of the South32 Public Environmental Review Submission.

Signed:

Greg Thorne

Date: 26.8.2022

Section 7.2.4 Aesthetic Values

Photo 1 from Section 7.2.4 - View from Ashcroft Road, Marradong 6/07/2022

Photo 2 from Section 7.2.4 - View from Ashcroft Road, Marradong 6/07/2022

Photo 3 from Section 7.2.4 - View from Ashcroft Road, Marradong 6/07/2022

Photo 4 from Section 7.2.4 - View from Ashcroft Road, Marradong 6/07/2022

Photo 5 from Section 7.2.4 - View from Ashcroft Road, Marradong 6/07/2022

Section 7.2.4 Aesthetic Values

Satellite image showing proximity of active mining to Boddington townsite (Imagery from 11/19/202) Google Earth.

Section 9 Closure and Rehabilitation

Section 9.7 Rehabilitation as Mitigation Strategy

Worsley Alumina Collie rehabilitation site showing lack of tree regeneration 12th August 2022 (Location: -33.255615, 116.024498)

Worsley Alumina Marradong rehabilitation area 12th August 2022, showing sapling tree deaths in foreground even in winter and Acacia dominant regrowth in background (Location: -32.865110, 116.442755