SIMCOA
Silicon Metal Company of Australia

Simcoa Operations Pty Ltd

North Kiaka Proposal

s40(2)(a) Environmental Review Document

Assessment number 2346

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Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on the environmental review for this proposal. SIMCOA is proposing to establish a new quartzite mine, referred to as North Kiaka Mine (the Project), immediately north of Moora Mine (with the mine pit located approximately 1.5 to 2 km north of Kiaka Road). The Environmental Review Document (ERD) has been prepared in accordance with the EPA's Procedures Manual. The ERD is the report by the proponent on their environmental review which describes this proposal and its likely effects on the environment.

The ERD is available for a public review period of 2 weeks from DATE, closing on DATE.

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

Why write a submission?

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

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

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

Why not join a group?

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

Developing a submission

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

When making comments on specific elements in the ERD:

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

What to include in your submission

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

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

The closing date for public submissions is: DATE

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

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

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

Executive summary

SIMCOA Operations Pty Ltd (the **Proponent, (SIMCOA)**) currently operates the Moora Quartzite Mine (Moora Mine), approximately 15 km north of Moora, in the Wheatbelt of Western Australia (WA). Moora Mine has been operating for 30 years and is located on tenements M70/191, G70/91, G70/92, G70/93 and M70/1292 (with activities on M70/1292 limited to mine dewater discharge to Kyaka Brook). Quartzite ore from Moora Mine is currently transported via covered truck to SIMCOA's Kemerton Smelter (Kemerton Smelter) located in Kemerton Strategic Industrial Area (KSIA), approximately 17 km north-east of Bunbury in the South-West of WA. Existing activities at Moora Mine and Kemerton Smelter (the Approved Proposal) are approved under Part IV of the *Environmental Protection Act 1986* (EP Act) and Ministerial Statement 813 (MS 813). The Approved Proposal has been operating since 1989.

SIMCOA is proposing to establish a new quartzite mine, referred to as North Kiaka Mine (the Project), immediately north of Moora Mine (with the mine pit located approximately 1.5 to 2 km north of Kiaka Road). The proposed development of the North Kiaka mine is located within tenement M70/1292.

SIMCOA referred the Project to the Western Australian Environmental Protection Authority (EPA) under section s. 38 of the EP Act on 03 November 2021. On the 10 May 2022 the EPA issued a notice requesting further information. The s38 Referral Supporting Document was revised to address the information request from the EPA and submitted on 22 June 2022, with a revised application form submitted on 28 July 2022. In July 2022, the EPA determined that the Project would be assessed under s. 40 AA of the EP Act, with consideration of impacts for the Approved Proposal (Kemerton Smelter and Moora Mine) in addition to those already submitted for the Project. Together the Project (North Kiaka Mine) and Approved Proposal (Moora Mine and Kemerton Smelter) make up the Revised Proposal (EPA reference CMS18097). The level of assessment was set as Assessment on Referral Information (ARI) with additional information and a two (2) week public review (EPA, 2022b). In July 2022, in accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of the Project (EPA, 2022b).

Information provided in the s 38 referral has been updated based on the EPA's additional information request (EPA 2022) and the notes from the meetings between SIMCOA, GHD and EPA (29 April 2022 and 16 September 2022).

In 2022 SIMCOA received advice from the Department of Mines, Industry Regulation and Safety (DMIRS) that construction of an abandonment bund for the Moora Mine pits would be required. The EPA advised via email on the 24 March 2023 that SIMCOA should submit a s43A application to amend the Revised Proposal (to reflect the construction of the abandonment bund). A s43A was submitted on 4 May 2023 and approved on 18 September 2023.

The draft ERD under s40(2)(a) was prepared to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request (EPA, 2023d)The Project was referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE, now Department of Climate Change, Environment, Energy and Water (DCCEEW)) in November 2021 and on 23 December 2021, it was determined to be a controlled action, requiring assessment and approval under the EPBC Act (EPBC Reference No. 2021/9089).

The impacts of the Project on MNES (listed Threatened species and communities) protected under the EPBC Act are being assessed under Accredited Assessment under the EP Act between the WA and the Commonwealth Government as determined in correspondence received on 10 October 2022 (see Appendix V). On 22 May 2023, the EPA advised that construction of abandonment bund would require a discussion with DCCEEW regarding the Revised Proposal potentially having 'new or increased impact on MNES'.

A meeting with DCCEEW (1 June 2023) discussed the Revised Proposal and any changes to the impacts to MNES following the submission of the s43A to the EPA. DCCEEW sent an email on 9 June 2023 confirming that the impacts of the Project on MNES could still be assessed through Accredited Assessment as part of the ERD for the Revised Proposal.

The Table ES0.1 provides a general description of the proposal. Table ES0.2 provides a summary of the elements of the Revised Proposal, including the approved and proposed physical and operational elements. A

summary of potential impacts, proposed mitigation measures and environmental outcomes for the identified environmental impacts of the Revised Proposal are provided in Table ES0.3

Table ES0.1 General proposal description

Proposal title	**North Kiaka Project**
Proponent name	SIMCOA Operations Pty Ltd
Short description	The Revised Proposal is for the development of a new quartzite mine at North Kiaka DE (the Project), approximately 15 km north of Moora, WA. The Project is approximately 1.5 to 2 km north northeast (NNE) of the existing Moora Quartzite Mine and is expected to generate up to 130,000 tpa of lump quartz for downstream processing at the Kemerton Silicon Smelter (Kemerton Smelter). Kemerton Smelter is located in the Kemerton Strategic Industrial Area (KSIA) 17 km north-east of Bunbury, WA. The Project will be open-cut mine operating above the water table and has a predicted Life of Mine of 18 years based on current resource estimates. Ore mined at the North Kiaka DE will be pre-processed (crushed and screened) using existing processing infrastructure at Moora Mine prior to transporting to Kemerton Smelter using the established network of power, water and roads at Moora Mine. The Revised Proposal also includes construction of an abandonment bund for the Moora Mine pits.

Table ES0.2 Proposal content elements

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
Physical elements				
Revised Proposal Development Envelopes (DE) Including a mine pit, waste rock landform (WRL), run of mine area (ROM), laydown and stockpile areas, access corridor and associated infrastructure and abandonment bund.	Figure 1.2	Clearing of no more than 25 ha of native vegetation within a disturbance footprint of not more than 93 ha within a development envelope of 239.10 ha	Disturbance footprint (DF) of up to 44.59 ha (including up to 17.12 ha of clearing) within a 216.42 ha North Kiaka DE. Increasing the Moora Mine DF from 93 ha to 96 ha (additional 3 ha). Clearing of 1 ha of native vegetation within the amended Moora DF.	Total combined DE of 455.52 ha including clearing of no more than 43.12 ha of native vegetation within a DF of 140.59 ha which consists of: – 26 ha clearing of native vegetation within a disturbance footprint of not more than 96 ha and DE of 239.10 ha – Moora Mine – 17.12 ha of native vegetation within a disturbance footprint of not more than 44.59 ha and DE of 216.42 ha - North Kiaka DE.
Construction elements				
Key construction elements for the Revised Proposal will include clearing for all identified physical and operational elements, installation of temporary offices/ ablutions, movement of topsoil, and bulk earthworks to support construction of ancillary facilities.				
Operational elements				
Mine pit	Figure 1.2	Moora Mine DE 239.10 ha Moora Mine pit footprint is 25.48 ha and is currently operational with approved clearing of no more than 25 ha of native vegetation within a disturbance footprint of not more than 93 ha in	Clearing of no more than 17.12 ha of native vegetation within a 44.59 ha disturbance footprint within 216.42 ha development envelope (North Kiaka DE) 26 ha of native vegetation within a disturbance footprint of not more than 96 ha (Moora Mine)	The Moora Mine pit footprint is 25.48 ha Total combined DE of 455.52 ha including clearing of no more than 43.12 ha of native vegetation within a DF of 140.59 ha which consists of: – 26 ha clearing of native vegetation within a disturbance footprint of

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
		the Moora Mine DE or 239.10 ha. Current production of up to 130,000 tpa of lump quartz within an approved extent of 160,000 tpa.	An estimated 236,000 tonne per annum (tpa) of ore will be processed (crushed and screened) to produce up to 130,000 tpa of lump quartz within a approved extent of 160,000 tpa.	not more than 96 ha – Moora Mine – 17.12 ha of native vegetation within a disturbance footprint of not more than 44.59 ha - North Kiaka DE An estimated 236,000 tonne per annum (tpa) of ore will be processed (crushed and screened) up to 130,000 tpa of lump quartz within a approved extent of 160,000 tpa.
Waste Rock Dump	Figure 1.2	Waste Rock dumps at Moora Mine are a total of 34.9 ha: – Main Waste Dump – 9.7 ha – North Dump – currently 6.0 ha with maximum approved of 19.0 ha – Old North Dump – 1.5 ha – South East Dump – 3.8 ha – West Pit Dump – 0.9 ha	Proposed WRD (Tonkin) with a footprint of 9.69 ha to be located approximately 0.5 km south of the mine pit, on farmland previously cleared of native vegetation. It Is estimated that up to 2.15 million m^3 of waste rock will be disposed to the Tonkin WRD, assuming a swell factor of 30%. The final height of the WRL is expected to be 21–- 45 m below the tallest landform in the North Kiaka DE (pre-development).	Total combined WRD is 44.59 ha – Moora Mine: 34.9 ha – North Kiaka DE: Tonkin WRD 9.69 ha footprint
ROM	Figure 1.2	Short-term ROM (1.22 ha, approximately 80 m x 100 m) allowing for up to 20 days per year to be stockpiled	No change	No change
Ancillary Facilities	Figure 1.2		Access corridor (connecting North Kiaka DE to the Moora Mine) (7.31 ha) and associated infrastructure (0.88 ha) including an administration building, car park, weighbridge, workshops, ablution facilities, laydown and stockpile areas, hydrocarbon storage, refuelling facility, and washdown bays	Access corridor (connecting North Kiaka DE to the Moora Mine) (7.31 ha) and associated infrastructure (0.88 ha) including an administration building, car park, weighbridge, workshops, ablution facilities, laydown and stockpile areas, hydrocarbon storage, refuelling facility, and washdown bays
Power	Figure 1.2	One onsite generator (noting that crushing and screening of ore will occur at the Moora Quartzite Mine)	No change	One onsite generator (noting that crushing and screening of ore will occur at the existing Moora Quartzite Mine)

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
Groundwater abstraction (water demand)		Moora Mine permitted abstraction of up to 250,000kL of groundwater within tenement	No dewatering or groundwater abstraction is currently proposed for the Project. If additional water is required, SIMCOA will seek the necessary approvals under the RiWI Act to abstract groundwater within M70/1292.	Moora Mine groundwater licence (GWL 104693(6)) to authorise the use of 250,000kL of abstracted water within tenement M70/1292. The groundwater abstraction volume approved in MS813 is expected to be sufficient for Moora Mine and North Kiaka DE. If additional water is required, SIMCOA will seek the necessary approvals under the RiWI Act to abstract groundwater within M70/1292.
Water Discharge		Discharge of up to 122,000 kL per annum of dewatered groundwater via Kiaka Creek to the Conderoo River wetlands (Moora Mine)	No change	Discharge of up to 122,000 kL per annum of dewatered groundwater via Kiaka Creek to the Conderoo River wetlands (Moora Mine)
Dewater discharge pipeline		Dewater discharge pipeline routed along an existing access road (Moora Mine)	No change	Dewater discharge pipeline routed along an existing access road (Moora Mine)
Area of rehabilitation		All disturbed areas (Moora Mine)	All disturbed areas (North Kiaka DE)	All disturbed areas (Moora Mine and North Kiaka DE) Excluding the Moora and North Kiaka pits, abandonment bund and roads to remain after closure
Kemerton Smelter	Figure 1.2	Ministerial Statement 813 – Silicon Production 64,000 tonnes per annum (approximately) – Quartzite Consumption 160,000 tonnes per annum (approximately) – Wood for Charcoal 110,000 tonnes per annum (approximately) – Charcoal Production 27,000 tonnes per annum (approximately) – Smelter Furnaces • 4 x submerged	Extend operating life of Kemerton Smelter from 2026 to 2042	As per authorised extent in MS 813

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
		electric arc furnaces – Off-gas Cleaning Plant (Baghouses) • One large baghouse with stacks • One large baghouse without stacks		
Revised Proposal elements with greenhouse gas emissions				
Construction (the Project and abandonment bund at Moora Mine – no new construction at Kemerton Smelter)				
Scope 1	2,168			tCO2-e
Scope 2	0			
Scope 3	3,653			tCO2-e
Operation elements (combined annual Moora Mine (processing) and the Project) Kemerton Smelter				
Scope 1	1,546 Moora Mine and the Project		123,454 Kemerton	tCO2-e
Scope 2	0		300,024 Kemerton	tCO2-e
Scope 3	11,761 Moora Mine and the Project		681,680 Kemerton	tCO2-e
Rehabilitation				
Rehabilitation of North Kiaka DE and Moora Mine will be undertaken in line with commitments in the s40(2)(a) Supporting Document, Ministerial Statement conditions (following approval of the Revised Proposal by the Minister), and the Mine Closure Plan (to be assessed and approved by Department of Mines, Industry Regulation and Safety (DMIRS)). Some key rehabilitation commitments are listed below: – Rehabilitation will be undertaken progressively. – Rehabilitated landforms (Tonkin WRD) will be stable and non-polluting (i.e. batter slope of 18°, placement of structurally stable soils at the surface, contoured/ ripped/ logs and rocks placed to reduce erosion risk). – The Tonkin WRD will be rehabilitated using local native species to meet post-closure goals and outcomes as specified in the Mine Closure Plan (MCP) – Waste rock that is stable and non-acid forming will be used as growth medium for rehabilitation of landforms, as this method is proven to successfully re-establish native provenance species at the existing Moora Mine. – Topsoil comprising sandy gravels will be collected, stockpiled (<2 m height) and used to rehabilitate areas previously used for agriculture that will be returned to their pre-mining land use. – Weed management will be undertaken for the first three years following rehabilitation. Any requirement for further weed control will be assessed after the three-year timeframe.				
Commissioning				
Limited commissioning works are required as all crushing activities will continue to be undertaken at Moora Mine. No commissioning is required for the construction of the abandonment bund. There will be no change to the volume of quartz being processed at Kemerton Smelter, so no commissioning will be required at that site.				

Decommissioning		
SIMCOA intends to enable regrowth of local native flora species on the WRD's, close the Moora Mine pit with an abandonment bund, and return all other disturbance footprints to pre-mining agricultural land use (including the removal of buildings and infrastructure). SIMCOA operate the Moora Mine under an approved MCP. They currently comply with the MCP for Moora Mine for post mining landuse and other requirements. SIMCOA will develop a MCP in accordance with the *Department of Mines, Industry, Regulation and Safety 2020 Guidelines for Mining Proposals in WA* (DMIRS, 2023b), to support the development of the Project under the *Mining Act 1978*. The MCP will be assessed and approved by DMIRS prior to commencement of activities.		
Other elements which affect extent of effects on the environment		
Proposal time*	Maximum project life	20 years
	Construction phase	1 year
	Operations phase	18 years
	Decommissioning phase	Approximately 1 year

Table ES0.3 Key Environmental Factors and Impacts against EPA objectives

Flora and vegetation: **EPA Objective: To protect flora and vegetation so that biological diversity and ecological integrity are maintained.**	
Potential impacts	Direct impacts Clearing of up to 17.12 ha of native vegetation within the North Kiaka DF (44.59 ha) including: – 16.45 ha of Coomberdale TEC (CR under the BC Act) – 0.67 ha of other vegetation – *Acacia aristulata* (EN, EN) – 6 populations (16 individuals) – *Daviesia dielsii* (EN, EN) – 4 populations (15 individuals) – *Diuris recurva* (Priority 4) – 10 populations (65 individuals) – *Regelia megacephala* (Priority 4) – 1 population (number of individuals unknown). Clearing of up to 1 ha of native vegetation within the Moora Mine amended DF including: – 0.60 ha of Coomberdale TEC (Core and Buffer) (CR under the BC Act) – 0.35 ha of other vegetation – *Acacia aristulata* (EN, EN) – 1 population (1 individuals). Indirect impacts: – Disturbance of the 'Eucalyptus Woodlands of the Western Wheatbelt' TEC – Potential impact to vegetation through introduction of weed / pathogens – Disturbance due to accidental bushfires – Dust emissions – Impact to vegetation through introduction of weed species.
Mitigation hierarchy	**Avoid**: – SIMCOA has located development footprints in areas of comparatively poor-quality vegetation (i.e.in existing cleared/disturbed areas) compared to alternative sites (e.g. Cairn Hill) to avoid unnecessary clearing. – SIMCOA will consider the location of identified Threatened *Acacia aristulata* and *Daviesia dielsii* when planning final infrastructure / landform locations and, where practicable, avoid them. – SIMCOA's procedures for clearing/land disturbance within the approved boundary of the North Kiaka DE include: – Compliance with "Permit to Take" under the *Biodiversity Conservation Regulations 2018* for the clearing of any Threatened Flora – Internal clearing permit to be granted prior to any clearing being undertaken – All clearing areas will be demarcated prior to clearing – All clearing areas will be surveyed after clearing to confirm compliance with clearing permits (internal and regulator issued).

	Minimise: – SIMCOA's Moora Mine SOP's will include procedures, management and mitigation measures which to be implemented to prevent and minimise impacts on native flora and vegetation – To prevent the spread and introduction of invasive pathogens and weeds SIMCOA will establish: – A vehicle hygiene and ground disturbance procedure – A Dieback Management Plan (Appendix J) – A weed control program. – Topsoil affected by dieback or heavily weed infested will be collected separately and buried with overburden within WRD's to avoid spread to rehabilitation areas – SIMCOA will undertake regular weed monitoring and control programs to limit the spread of invasive species. Weed management techniques may include, spraying with herbicides (to be undertaken in late winter or early spring), hand pulling and cutting; and seeding native species in cleared areas to be rehabilitated, at the earliest opportunity – Implement dust management controls including application of water/dust suppressants and managing haulage trucks to minimise loss of materials during transport – Implementation of Hot Works Permit system, and Emergency Management Procedures to minimise the risk of bushfires – Clearing activities will not be undertaken when the Fire Danger Rating is severe or higher. **Rehabilitate**: – Undertake rehabilitation activities on the waste dumps to achieve a percentage cover and species diversity of native vegetation in all Rehabilitation Areas comparable to that of undisturbed natural analogue sites. Rehabilitation across the Revised Proposal will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) for Moora Mine – Progressive rehabilitation of disturbed areas, where possible, will be undertaken for the duration of the LoM of the Project. Areas active for the duration the LoM will be rehabilitated at the end of mining activities. – Growth medium will be applied to rehabilitation areas to improve the likelihood of suitable vegetation establishment. Growth medium may comprise topsoil (if available) or weathered material that has proven suitable for rehabilitation of current mining landforms – The waste dump will be rehabilitated using local native species congruent with the Coomberdale TEC – The rehabilitated area will also act as a buffer to the existing Coomberdale TEC vegetation from weed invasion from surrounding agricultural areas – Ongoing weed management to be undertaken in rehabilitation areas during the first three growing seasons to minimise weeds and promote native vegetation growth. Weed spraying undertaken in late winter or early spring.
Residual impacts, including assessment of significance	After implementing the mitigation and management measures described above, the following residual impacts are expected in regard to flora and vegetation: – Clearing of up to 17.12 ha of native vegetation within the 44.59 ha North Kiaka DF includes the following: – Pre-European Vegetation Associations (Beard, 1979): – A reduction in Vegetation Association 1041 which represents 2.9% of the current extent remaining in the State. – A reduction Vegetation Association 142 which represents less than 0.0004% of the current extent remaining in the State. – Clearing of 16.45 of Coomberdale TEC (CR under the BC Act) vegetation alliances: – 16.03 ha of core vegetation associated with vegetation alliances 13, 15,16 and 17, which represents approximate 2.0% reduction of the total recorded Coomberdale TEC core vegetation associations. – 0.42 ha of buffer vegetation associated with vegetation alliances 9 and 11, which represents less than 0.1% reduction of the total recorded Coomberdale TEC buffer vegetation associations. – Threatened flora species listed under the Commonwealth EPBC Act and State BC Act: – *Acacia aristulata* (EN, EN) – 6 populations (16 individuals) which represents a 1.5 % reduction of individuals within the regional extent of the Coomberdale TEC – *Daviesia dielsii* (EN, EN) – 4 populations (15 individuals) which represents a 4.1 % reduction of individuals within the regional extent of the Coomberdale TEC.

	– DBCA Priority listed flora species: – Diuris recurva (Priority 4) – 10 populations (65 individuals) which represents a 32.5 % reduction in the number of stands of this species within the regional extent of the Coomberdale TEC. – Regelia megacephala (Priority 4) – 1 population (number of individuals unknown) which represents a 1.4 % reduction of number of stands of this species within the regional extent of the Coomberdale TEC. – Clearing of up to 1 ha of native vegetation within the Moora Mine amended DF including: • 0.60 ha of Coomberdale TEC (Core and Buffer) (CR under the BC Act) • 0.35 ha of other vegetation – *Acacia aristulata* (EN, EN) – 1 population (1 individual).
Proposed environmental outcomes	The North Kiaka DE and Moora Mine DE have been extensively disturbed over a long period of time due to historic agricultural activity. SIMCOA has, as far as practicable, located disturbance footprints within previously disturbed areas to minimise the potential impacts to native vegetation. The North Kiaka DF is however defined by the location of the mineral resource for the Project and the abandonment bund must be constructed around the existing pits at Moora Mine. While is considered that the residual impacts of the proposed clearing of native vegetation will not be significant, SIMCOA propose to offset the residual impacts to MNES from the Project. Given the proposed mitigation measures, including an offset of residual impacts to MNES it is considered that the Revised Proposal meets the EPA's objective for Flora and Vegetation.
Assessment of offsets (if relevant)	– 18 ha of vegetation was previously set aside within the Cairn Hill Reserve (Offset Site 1) to offset the residual impact of 5 ha of previously approved clearing for Moora Mine. – SIMCOA has enhanced the preservation of significant communities of Coomberdale TEC by ensuring the protection of two offset sites (Cairn Hill Reserve and Cairn Hill North offset sites). For more details on offsets, see Section 8.
Landforms **EPA Objectives: To maintain the variety and integrity of significant physical landforms so that environmental values are protected**	
Potential impacts	Moora Mine and the Project have the potential to result in impacts to landforms during construction and operations through: **Direct** – Construction of the abandonment bund (Moora Mine) impacting the following environmental values: • Coomberdale TEC vegetation alliances • Threatened Flora: *Acacia aristulata* • Carnaby's Black Cockatoo (*Zanda latirostris*) foraging habitat – Development of the mining pit altering the landform structure (the Project) • Clearing of native vegetation (present on the landform) for the development of the mining pit and access roads for the Project, impacting the following environmental values: • Coomberdale TEC vegetation alliances • Threatened Flora: *Acacia aristulata* and *Daviesia dielsii* • Priority Flora: *Diuris recurva* (P4) and *Regelia megacephala* (P4) • Carnaby's Black Cockatoo (*Zanda latirostris*) foraging habitat • Clearing of potential subterranean fauna habitat.
Mitigation hierarchy	The key mitigation measures for Moora Mine and the Project as they relate to impacts on the Noondine Chert and the environmental values which this landform supports are outlined below. **Avoid** SIMCOA has modified the North Kiaka disturbance footprint to avoid areas of the Coomberdale TEC associated with the Noondine Chert, which are in Very Good to Excellent or Excellent condition. **Minimise** SIMCOA has modified the disturbance footprint to minimise impact to the upper slopes of Noondine Chert ridgelines (highest elevation and most visible in the landscape), by locating the Tonkin WRD and other mine elements (i.e. ROM, workshop and administration area) in the adjacent valleys and lower slopes.

	Rehabilitate Rehabilitation of the North Kiaka DE will be undertaken in accordance with the Mine Closure Plan. The Mine Closure Plan will be submitted to DMIRS together with the Mining Proposal. Progressive rehabilitation of disturbed areas, where possible, will be undertaken for the duration of the Project life span. Areas active for the duration of the Project will be rehabilitated at the conclusion of mining operations. The final height of the constructed Tonkin WRD will not exceed the height of existing landforms (pre-development) and will be designed to reflect the topography of the surrounding landscape.
Residual impacts, including assessment of significance	The total mapped extent of the Noondine Chert formation is 14,586 ha, of which 92.53 ha (less than 1%) occurring within the North Kiaka DE. The proposed mine pit occurs on and follows the Noondine Chert ridgelines for 1.1 km. These elevated ridgelines extend across a 150 km stretch between Moora and Three Springs. Accordingly, the landform value of Noondine Chert ridges within the North Kiaka DE is not considered to be significant in the context of the regional distribution and expression of this formation. Nevertheless, the Tonkin WRD and the Administration Area have been positioned within valleys and other lower lying cleared areas to minimise impacts to this geological formation (Snowden, 2012). Development of the Project will directly affect 20.08 ha (<1%) of the Noondine Chert formation which hosts quartzite minerals (the proposed ore body) required to be mined for this Proposal. To minimise impacts to the structure and integrity of this landform, SIMCOA has located the Tonkin WRD and other mine elements (i.e. workshop and administration area) to avoid, where practicable, impacts to the Noondine Chert (Snowden, 2012). The mine will impact <1% of the Noondine Chert formation (restricted to the lower slopes) and therefore the mine is expected to have a negligible impact on this landform. However, direct impact to the upper ridgeline of the Noondine Chert formation from development of the proposed mine pit is unavoidable and would be permanent. Due to the skeletal soils and exposed rock which characterise the Noondine Chert ridges, past impacts on this landform have been limited to SIMCOA's existing mining operations at Moora Mine south of the North Kiaka DE, as these ridges are highly unsuitable for agriculture. Future impacts to this landform are expected to be limited to mining of quartzite minerals, as proposed in this ERD. Materials which comprise the Noondine Chert formation are considered robust, therefore, rock adjacent to the proposed mine pit is unlikely to be susceptible to degradation. Given the limited extent of impact proposed, minimal past disturbance to this landform, predicted limited impacts to this landform in the future, and the expected resilience of this landform to degradation; the Project is not expected to significantly impact Noondine Chert ridgelines. As the skeletal soils with exposed quartzite rock of the Noondine Chert ridgelines and hills are highly unsuitable for agriculture, native vegetation has been retained and represents the Coomberdale TEC and provides foraging habitat for Carnaby's Black Cockatoo. Impacts to environmental values of the Noondine Chert formation resulting from construction and development of the Project are assessed in other sections: Section 5.2.7.1 (Flora and Vegetation) Section 5.5.7.1 (Terrestrial Fauna) Section 6.1 (Subterranean Fauna)
Proposed environmental outcomes	The Revised Proposal will reduce the extent of Noondine Chert ridges present within the North Kiaka DE. However, given the limited extent of disturbance proposed (20.08 ha), the expected resilience of the landform to degradation, limited past disturbance to this landform, and predicted limited impacts to this landform in the future; The Project is not expected to significantly impact Noondine Chert landforms. Permanent impacts to the environmental values of the Noondine Chert landform will result from the clearing of remnant native vegetation isolated to hills and ridges within the North Kiaka DE, the Moora Mine DE and the surrounding landscape. However, the extent of impact to flora and vegetation (refer to Section 5.2.5) and terrestrial fauna (refer to Section 5.5.5) resulting from construction and development of the Project, is not expected to have a significant impact on the identified values. This is partly due to the limited disturbance of the Noondine Chert landforms within the region to date, and the predicted limited disturbance of this landform in the future, due to rocky hills and ridges being unsuitable for agriculture. Development and operation of the Revised Proposal is not expected to have a significant impact on subterranean fauna, given no known records of subterranean fauna. There is no dewatering or groundwater abstraction proposed for the Project; and the design of the disturbance area avoids impact to Noondine Chert (potential subterranean fauna habitat) where practicable.
Assessment of offsets (if relevant)	SIMCOA has protected two offset sites (the 152.01 ha Cairn Hill Reserve offset and 58.34 ha Cairn Hill North offset). For more details on offsets, see Section 7.

Terrestrial environmental quality **EPA objective: To maintain the quality of land and soils so that the environment values, both ecological and soils, are protected.**	
Potential impacts	Development of the Project and construction of the abandonment bund at Moora Mine have the potential to have direct and indirect impacts to terrestrial environmental quality during construction and operations. **Direct** – Soil erosion from vegetation clearing, earthworks, constructed landforms and stormwater release, impacting soil quality – Disturbance of ASS during mining, resulting in acidification of soils and potential leaching of metals to groundwater – AMD from the Tonkin WRD (North Kiaka DE), resulting in contamination of groundwater – Release of environmentally hazardous materials (hydrocarbons and chemicals) from storage or handling areas, resulting in contamination of soils (and potentially surface water or groundwater in proximity to the release) **Indirect** – Solid/ liquid waste discharge, resulting in contamination of soils (and potentially surface water or groundwater in proximity to the release).
Mitigation hierarchy	**Minimise** Soil erosion – Clearing undertaken in stages and limited to the extent required for construction of infrastructure and the undertaking of mine activities – Collection and stockpiling of topsoil immediately following vegetation clearing to prevent loss of topsoil from wind/water erosion – Where practicable, topsoil will be used to progressively rehabilitate the Tonkin WRD, in preference to stockpiling – Soil stockpiles maintained at a height not exceeding 2 m – Provision of erosion protection (i.e. rock armouring) where required, to prevent soil erosion at stormwater discharge locations. Release of environmentally hazardous materials: – Risk assessment developed for bulk hydrocarbon storage areas – Bulk hydrocarbon storage areas will provide: – Placarding on storage tanks including “combustible liquid C1”, “no ignition sources” and “maximum fill level” – Impact protective ARMCO railing or bollards – Dry powder fire extinguishers – Stormwater drainage system to be designed in accordance with DWER water quality protection note (WQPN) 52 Stormwater management at industrial sites (DoW, 2010), including capture of runoff from areas at risk of potential contamination (i.e. vehicle refuelling and wash-down areas), and the removal of hydrocarbons via a hydrocarbon/sediment trap prior to discharge – Hydrocarbon trap lined in accordance with WQPN 26 Liners for containing pollutants using synthetic membranes (DoW, 2013a) and WQPN 27 Liners for containing pollutants using engineered soils (DoW, 2013b) – Minor quantities of oils and greases will be stored in a workshop with a sealed floor – Liquid wastes (i.e. lubricants and hydraulic fluids) stored in holding tanks for recycling and disposal off-site. Spill contamination management: – Emergency management procedures and equipment for the recovery of contaminated soils in the event of accidental release – Daily inspection of machinery and equipment for integrity – Refuelling and repairs/servicing undertaken in a designated, bunded area – Spill kits readily available, and staff trained in the use of spill kits and appropriate disposal of contaminated material – Contaminated soil disposed of at an appropriately licensed waste disposal facility – In the event of extreme weather conditions (e.g. storm events) construction work will cease and the need for additional erosion and sediment control will be assessed and implemented where required Acid sulphate soils:

	– Though disturbance of ASS is considered highly unlikely, if ASS are detected these will be managed in accordance with the Department of Environment Regulation (2015b) Guidance: 'Treatment and management of soils and water in acid sulfate soil landscapes'. Solid/liquid waste discharge: – Septic system designed and located in accordance with the 'Health Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations 1974' and the 'Australian/New Zealand Standard 1547:2012 On-site domestic wastewater management' (Standards Australia, 2012), and as approved under the Health Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations 1974 – Septic system located in accordance with DWER WQPN70 Wastewater treatment and disposal – domestic systems (DoW, 2016), this includes locating the system at least 100 m from the Kyaka Brook (outside of the flood zone). Rehabilitate – Waste Rock Dumps (WRD) will be designed to be stable and non-polluting – designed with a batter slope of 18°, placement of structurally stable soils at the surface – contoured, ripped and logs/rocks placed to prevent sheet flow from landforms – progressively rehabilitated to slow surface water flows across the embankment surface, thereby minimising soil erosion – revegetation species selected for each part of the WRD with slope/top/berm with species most likely to thrive (i.e. soil depth and water holding capacity are appropriate to plant water demand), aiding in preventing runoff and erosion – rehabilitation of disturbed areas with ameliorated soil to return soils to a condition suitable for the agreed post-mining land use.
Residual impacts including assessment of significance	The Revised Proposal has the potential to result in impacts to terrestrial environmental quality during construction and operations through: – Soil erosion from vegetation clearing, earthworks, constructed landforms and stormwater release, impacting soil quality, – Disturbance of ASS during mining, resulting in acidification of soils and potential leaching of metals to groundwater – Acid Metalliferous Drainage (AMD) from the Tonkin WRD, resulting in contamination of groundwater – Exposure of dissolvable minerals during mining, resulting in saline drainage to groundwater
Proposed environmental outcomes	The Revised Proposal has the potential to affect soil or land quality, however, it is expected that potential impacts can be mitigated through the management and mitigation measures provided. The successful management of the Moora Mine including the design and management of the existing waste rock dumps is being supported by the building of the abandonment bund around the pits, planned for completion of mining activities. The most significant risks for the Project are associated with the potential erosion of the Tonkin WRD and the potential spills of hydrocarbons into the environment. The design and management of the Tonkin WRD will be regulated under the Mining Act 1984 (i.e. mining proposal and mine closure plan) and structures will bund hydrocarbons and any losses will be captured in bulk hydrocarbon traps. The mitigation and management measures proposed for construction and operation of the Project will not result in significant or lasting impacts to soil and land quality within or adjacent to the North Kiaka DE, therefore the EPA's objective is met.
Assessment of offsets (if relevant)	No offsets are required in relation to Terrestrial Environmental Quality as a result of the implementation of the Revised Proposal.
Terrestrial fauna **EPA objective: To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.**	
Potential impacts	Activities that have the potential to have direct impact on terrestrial fauna during construction of the Revised Proposal includes: – Clearing of 18.12 ha of native vegetation which includes: 16.51 ha (15.58 ha North Kiaka DF and 0.93 ha Moora Mine DF (amended) of high value Carnaby's Black Cockatoo foraging habitat. – 16.75 ha of potential habitat for SRE habitat. – Death, injury or displacement of native fauna species due to vehicle interactions or entrapment associated construction.

	Potential indirect impacts: – Disruption or disturbance to fauna as a result of noise, vibration, light and dust emissions from construction activities (i.e. clearing, blasting, mining, processing, ore handling/transport) – Bushfire caused accidentally by the operation of vehicles/plant/equipment, resulting in damage/ loss of surrounding fauna habitats – Attraction of feral fauna due to food/water availability on-site, increasing competition with, or predation on, native fauna species. – Activities that have the potential to have direct impact on terrestrial fauna during operations may include: – Death, injury or displacement of native fauna species due to vehicle interactions or entrapment associated with mining operations. Potential indirect impacts: – Disturbance of the 'Eucalyptus Woodlands of the Western Wheatbelt' TEC (potential Black Cockatoo habitat), the closest location is mapped within Midlands Road/ Rail reserve approximately 1 km to the west of the North Kiaka DE. – Disruption or disturbance to fauna as a result of noise, vibration, light and dust emissions from Proposal activities (i.e. clearing, blasting, mining, processing, ore handling/transport). – Bushfire caused accidentally by the operation of vehicles/plant/equipment, resulting in damage/ loss of surrounding fauna habitats. – Attraction of feral fauna due to food/water availability on-site, increasing competition with, or predation on, native fauna species. The Revised Proposal will not result in any change in the approved clearing extent, types of infrastructure or the location of the proposed clearing at the existing Kemerton Smelter.
Mitigation hierarchy	**Avoid** – The disturbance footprint has been designed to avoid clearing of native vegetation wherever possible by utilising the previously disturbed/cleared areas – Clearing will be undertaken outside of the Black Cockatoo breeding season. **Minimise** – SIMCOA's EMP will include procedures, management and mitigation measures which to be implemented to prevent and minimise impacts on native terrestrial fauna – Site induction will include information on significant fauna which may be encountered within the North Kiaka DE. – A suitably qualified environmental professional (fauna spotter) will be present during all land clearing activities. – Due to the North Kiaka DE being located within the mapped breeding area for Carnaby's Black Cockatoos, a detailed survey of the proposed clearing area will be undertaken by a suitably qualified consultant prior to clearing to identify any suitable potential breeding hollows. – Where practicable, land clearing will be undertaken on one front and in one direction, thereby allowing fauna an opportunity to escape the clearing area to surrounding habitat. – All native fauna injured or killed will be recorded and reported internally, and to appropriate regulatory agencies, where required. – In the event of trenches being established (i.e. pipelines or services), which native fauna may be unable to escape from, they will be inspected on a regular basis (e.g. dawn, midday, and prior to sunset). Any entrapped fauna will be removed and relocated to surrounding vegetation. If trenches are left open overnight, ramps will be established to permit native fauna to escape. – Traffic management rules will be implemented to reduce the likelihood of fauna injury or mortality due to vehicle interactions. Measures shall include: • Reduced speed limits on internal roads, and • No off-road driving (unless authorised for exploration and land clearing). – All putrescible wastes will be stored in lidded bins to prevent fauna entry and attracting feral animals – Implementation of dust management controls including, but not limited to, application of water/dust suppressants and covering of haulage trucks **Rehabilitate** – Where possible, progressive rehabilitation will be undertaken in accordance with the existing Moora Mine Closure Plan

	– Fauna habitat structures (e.g. logs, wood debris) will be incorporated into rehabilitated areas to encourage the return of native fauna, such as reptiles and small mammals.
Residual impacts including assessment of significance	The Revised Proposal will require the removal of up to 18.12 ha of native vegetation which includes removal of 16.51 ha (15.58 ha North Kiaka DF and 0.93 ha Moora Mine DF (amended)) of high value Carnaby's Black Cockatoo foraging habitat, and potential habitat for SRE species.
Proposed environmental outcomes	The development of the Revised Proposal will result in the vegetation clearing of: – Up to 18.12 ha including 17.12 ha at North Kiaka DE including the direct loss of 16.75 ha of fauna habitat, which includes: – 16.51 ha of potential high value foraging habitat, 0.17 ha of potential breeding and roosting habitat along Kyaka Brook and 0.24 ha of potential roosting habitat (along Kyaka Brook and in Mallee woodlands) for the Carnaby's Black Cockatoo (refer to Section 7 for further details) – 16.75 ha of potential habitat for SRE habitat. Fauna habitat is considered to be well represented in surrounding areas and within retained vegetation within both the Moora Mine DF (amended) and the North Kiaka DE and therefore, the loss is unlikely to result in an adverse impact on native fauna at a local or regional scale. The potential indirect impacts associated with noise, dust, vibration and light emissions are unlikely to be significant as the area has been previously disturbed by agricultural and mining activities, and terrestrial fauna in the area have adapted to these emission sources.
Assessment of offsets (if relevant)	18 ha of vegetation has been previously set aside within the Cairn Hill Reserve (Offset Site 1) to offset the residual impact of 5 ha of previously approved clearing for the Moora Mine. SIMCOA has protected two offset sites (Cairn Hill Reserve and Cairn Hill North offset sites) with a total of 85ha of offsets for the residual impacts of the clearing at Moora Mine for the abandonment bund and North Kiaka mine. For more details on offsets, see Section 8.
Inland waters **EPA objective: To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.**	
Potential impacts	The Project and Moora Mine have the potential to result in impacts to inland waters during construction and operations. **Direct** – Sedimentation of surface waters, resulting from erosion following ground disturbance (i.e. vegetation clearing and earthworks), or from constructed landforms/surfaces (i.e. the mine pit, Tonkin WRD and other raised areas including the abandonment bund at Moora Mine) **Indirect** – Contamination of groundwater and/or surface water due to accidental release/spillage of environmentally hazardous materials (diesel) from storage and handling areas. – Disturbance of ASS during mining, resulting in acidification of soils and potential leaching of metals to groundwater – AMD from the Tonkin WRD, resulting in contamination of groundwater – Exposure of dissolvable minerals during mining, resulting in saline drainage to groundwater.
Mitigation hierarchy	**Avoid** Hydrocarbon storage in accordance with: – AS 1940:2017 The Storage and Handling of Flammable and Combustible Liquids (Standards Australia, 2017) – WQPN 56 Tanks for fuel and chemical storage near sensitive water resources (DoW, 2018). – Other avoidance measures as detailed in the operating licence (GWL 104693 (6)) issued to SIMCOA for groundwater extraction at Moora Mine – Construction during heavy rainfall events will be avoided. **Minimise** – SIMCOA propose to implement management of surface and groundwater in accordance with the Environmental Management Plan (Appendix C) which will include constructing stormwater and diversion infrastructure to address: – Risk of inundation in pit – Diversion bund west of North Kiaka Pit to intercept direct rainfall and reduce pumping in North Kiaka Pit.

[redacted]	Pit dewatering – Management of dewatering to external environment to maintain integrity of surrounding environment. Appropriate water quality control measures and monitoring to be put in place to ensure appropriate regulation of mine site water release to the downstream environment. Road drainage – Culvert underneath southern access road to reduce road flooding and maintain site operations. – WRD runoff management – Additional channels may be required to divert water between WRD and main access road – Diversion channels around WRD and sedimentation pond may be required to manage sediment runoff. Scour protection: – Upstream and downstream of culverts – At all sections along WRD where high velocity runoff is expected to occur – Other management measures – Where appropriate drainage channels may need to be considered in the future to trap 'dirty' runoff from pads and other infrastructure on-site and prevent pollution of the surrounding environment. Sedimentation of surface waters has been minimised by: – Design of the Project to minimise the vegetation clearing, thus reducing the area of exposed soil prone to erosion. – Where practicable, progressive rehabilitation will be undertaken, thus reducing the area of exposed soil prone to erosion (Trudgen, 2023). – Construction of the easement across Kyaka Brook will be prioritised for commencement in the dry season to minimise impacts, noting that the waterway is ephemeral. – If construction takes place during wet weather conditions the need for additional erosion and sediment control will be assessed, and where required, implemented. SIMCOA will develop: – A SWMP should be developed to ensure the development of the mine does not impact downstream environments including Kyaka Brook and Coonderoo River. The SWMP will include: – A risk assessment for bulk hydrocarbon storage areas prior to construction. – Stormwater drainage system to be designed in accordance with DWER water quality protection note (WQPN) 52 Stormwater management at industrial sites (DoW, 2010), including capture of runoff from areas at risk of potential contamination (i.e. vehicle refuelling and wash-down areas), and the removal of hydrocarbons via a hydrocarbon/sediment trap prior to discharge. – Hydrocarbon trap lined in accordance with WQPN 26 and WQPN 27. Minor quantities of oils and greases stored in a workshop with a sealed floor. – Liquid wastes (i.e. lubricants and hydraulic fluids) stored in holding tanks for recycling and disposal off-site. Spill contamination management: – Emergency management procedures and equipment for the recovery of contaminated soils in the event of accidental release. – Daily inspection of machinery and equipment for integrity. – Refuelling and repairs/servicing undertaken in a designated, bunded area – Spill kits readily available, and staff trained in the use of spill kits and appropriate disposal of contaminated material – Contaminated soil disposed at an appropriately licensed waste disposal facility – Cessation of construction work in the event of extreme weather conditions (e.g. storm events) and the assessment of the need for the implementation of additional erosion and sediment controls where required **Rehabilitate** – Rehabilitation will be completed in accordance with a Mine Closure Plan to be approved by DMIRS. This will include: – The Tonkin WRD designed to be stable and non-polluting (i.e. batter slope of 18°, placement of structurally stable soils at the Tonkin WRD surface) – The Tonkin WRD contoured and ripped, and logs/rocks placed to prevent sheet flow and sediment transport from landforms

	– Progressively rehabilitate the Tonkin WRD to slow surface water flows across the embankment surface, thereby minimising soil erosion – Revegetation of the Tonkin WRD slope/top/berm with species most likely to thrive (i.e. soil depth and water holding capacity are appropriate to plant water demand), aiding in preventing runoff and erosion – Disturbed areas rehabilitated and soils ameliorated as required to return soils to a condition suitable for the agreed post-mining land use.
Residual impacts including assessment of significance	Residual impacts to inland waters: – Very low risk to surface water and groundwater from contamination during construction and operation of the Revised Proposal. Sedimentation of surface waters – No changes to impacts to surface water outside those already approved in MS813 are expected as a result of building the abandonment bund around the Moora Mine pits on closure. – Given the water flows in the Kyaka Brook are seasonal and episodic, it is not anticipated that the development of the Project will result in any residual impacts to surface water from sediment as all risks will be managed. Contamination of groundwater / surface water due to hydrocarbon release/spillage – There is a low residual risk of contamination of groundwater and/or surface water due to accidental release/spillage of hydrocarbons from storage and handling areas at Moora Mine and the Project. It is not anticipated that the development of the Revised Proposal will result in any significant impacts to groundwater as a result of hydrocarbon storage. AMD or ASS into groundwater – There is also a low residual risk of contamination of groundwater as a result of AMD from Tonkin WRD as metals concentrations are generally below the limits of reportin. The CSIRO ASS risk mapping indicates the North Kiaka DE and Moora Mine are within an area that has a low (6% – 70%) to extremely low (1%– 5%) probability of ASS occurrence. Saline drainage to groundwater – There is a low residual risk of exposure of dissolvable minerals during mining below the groundwater at Moora Mine. There is also low residual risk of contamination from the Moora Mine pit lake water interacting with groundwater following closure.
Proposed environmental outcomes	There are no Ramsar listed, Nationally Important wetlands or PDWSAs occurring within or near to the North Kiaka DE or Moora Mine DE. Therefore, it is considered unlikely that the development of the Project would result in any significant impacts to inland waters. SIMCOA will maintain the existing groundwater monitoring requirements for Moora Mine as outlined in the operating licence GWL 104693 (6), such that any changes to surface or groundwater, potentially attributed to the Project, can be investigated and addressed.
Assessment of offsets (if relevant)	No offsets are required in relation to Inland Waters as a result of the implementation of the Project
Social surroundings **EPA objective: To protect social surroundings from significant harm.**	
Potential impacts	There is the potential to impact social surroundings during both construction of the abandonment bund at Moora Mine and the Project, and operation of the Revised Proposal. The Revised Proposal has the potential to impact the following social values: – Aboriginal heritage – Noise – Dust – Odour – Vibration – Visual amenity.
Proposed environmental outcomes	The Revised Proposal is not anticipated to result in significant impacts to social surroundings given: – Both Moora Mine and the North Kiaka DE are situated in a rural area which is heavily cleared and zoned for agricultural uses – The closest DBCA managed land is 250m km south of the Moora Mine DE. – No European heritage sites occur within 10 km – The disturbance footprint avoids impact to Aboriginal heritage sites identified within the North Kiaka DE and Moora Mine DE

	– Activities are not expected to exceed assigned noise levels. – Vibrations from mining activities are expected to sufficiently attenuate before reaching nearby sensitive receptors, the closest being located 0.7 km from the proposed pits – Mitigation measures will be implemented to minimise dust emissions – The undulating topography and Tonkin WRD design and positioning minimises visual amenity impacts The haulage of ore between North Kiaka DE and Moora Mine will only have a minor increase in traffic movements along Kiaka Road. Truck movements between Moora Mine and Kemerton Smelter will be similar. Given the measures outlined above it is considered the EPA's objective to protect social surroundings from significant harm is achieved and there are no significant residual impacts on Social Surroundings as a result of the Revised Proposal.
Mitigation hierarchy	**Avoid** Aboriginal heritage – The disturbance footprint will avoid direct impact to known Registered Aboriginal Heritage Sites and Other Heritage Places identified within the North Kiaka DE. – The disturbance footprint will avoid, where practicable, direct impact to Moodjar trees. **Minimise** – SIMCOA propose to implement management of impact to social surroundings in accordance with the Environmental Management Plan (Appendix C) which will include addressing impacts to: – Aboriginal heritage – Engineering controls will be applied to minimise direct impact to the bed of Kyaka Brook during construction of the access road crossing. – SIMCOA will engage Heritage Monitors to monitor construction of the Kyaka Brook access road crossing. – Where direct impact to Moodjar trees cannot be avoided (i.e. within the mine pit), SIMCOA will engage Heritage Monitors to assess the Moodjar tree and surroundings for possible burials and approve for future clearing, or at request of the Heritage Monitors, a monitor will be present when disturbing ground around Moodjar trees. – Aboriginal heritage monitoring will be undertaken in accordance with Aboriginal Due Diligence Guidelines (2013) and the Guidelines for the Engagement of Aboriginal Heritage Monitors (2015), in conjunction with archaeological report recommendations. – Should any significant or substantial quantity of Aboriginal artefacts be discovered during construction, all work will cease within the immediate area, and an Aboriginal heritage consultant will be engaged by SIMCOA to record and report the material to the DPLH. – If skeletal material is uncovered during ground disturbing activities, work will cease in the immediate area and the discovery reported to the WA Police Force under the Coroners Act 1996. If the police determine that the remains are likely of Aboriginal origin, then the discovery will be reported to the Registrar at the DPLH. Noise and vibrations Construction will be preferentially undertaken during normal construction hours (7.00 am to 7.00 pm, Monday to Saturday). If construction occurs outside of normal construction hours the following measures apply: – Construction work carried out in accordance with Section 6 of AS 2436-2010 – Equipment used is the quietest reasonably available – All sensitive receptors notified of works at least 24 hours ahead – Preparation and approval of a construction noise management plan (internal) at least 7 days prior – Best available technology will be used to minimise noise and vibration emissions from plant and equipment – Where plant and equipment are housed in buildings (or under roofed structures), the design will incorporate sound insulation properties. – Operations will preferentially occur during daylight hours (7.00 am to 5 pm, Monday to Friday). – SIMCOA will maintain a register of complaints relating to noise and vibrations caused by blasting. – SIMCOA will commit to undertaking noise and vibration monitoring in accordance with operating licence conditions. Air quality (dust)

	– Access roads and other trafficked areas will be paved, sealed, or otherwise treated with water or dust suppressants. – Wetting down of areas will be undertaken ahead of drilling, blasting, and excavation. – Application of water or dust suppressants will be undertaken where materials are handled or stockpiled. – Cessation of handling of materials during adverse wind conditions, or if complaints are received from sensitive receptors. – Haulage trucks will be covered to minimise loss of materials along transport routes. – SIMCOA will commit to undertaking ambient dust monitoring in accordance with operating licence conditions. Visual amenity – Mine elements will be located east of rocky outcrops (to be retained) where practicable. – The Tonkin WRD will be positioned and designed to minimise visual impacts to the landscape. Rehabilitate Progressive revegetation of the Tonkin WRD will be undertaken where practicable and weed control (if required) as per the MCP.
Residual impacts including assessment of significance	There are 2 known Registered Aboriginal Heritage Sites and Other Heritage Places located within the North Kiaka DE. The North Kiaka DF is approximately 44.59 ha in size and has been located to avoid the identified sites (which includes a 0.2 km buffer around each site) thereby avoiding the potential for direct impact. The location of the abandonment bund does not impact any known Registered Aboriginal Heritage Sites and Other Heritage Places within the Moora Mine DE. The Revised Proposal will not result in impacts to any State Heritage sites listed under the *Heritage of Western Australia Act 1990*, as there are no sites within proximity of the North Kiaka DE or Moora Mine DE. The closest State Heritage listed sites are located within the Moora town site. Construction of the abandonment bund at Moora Mine and development of the Project have the potential to impact visual amenity through: – Removal of native vegetation – Disturbance of landforms (elevated rocky outcrops) – Construction of the abandonment bund – Construction of the Tonkin WRD. The Project layout has been designed to minimise visual amenity impacts as far as is practicable. Amenity impacts (i.e. noise) along the transport route is anticipated to be negligible, as per the existing operation.
Assessment of offsets (if relevant)	No offsets are required in relation to Social Surroundings as a result of the implementation of the Project.
Greenhouse gas emissions **EPA objective: To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable**	
Potential impacts	Development of the Revised Proposal will generate GHG emissions through the combustion of diesel for mobile and stationary purposes, clearing of native vegetation to build the Project and construct the abandonment bund at Moora Mine.
Mitigation hierarchy	**Avoid** SIMCOA aim to install an additional charcoal retort at the Kemerton site to replace coal feed to achieve approximately 90% reduction in Scope 1 emissions due to the avoidance of coal usage. **Minimise** SIMCOA are committed to implementing their GHGMP in accordance with the EPA's 'Environmental Factor Guideline – Greenhouse Gas Emissions' (EPA, 2023). The GHGMP has reduction targets which enable the Revised Proposal to achieve net zero emissions no later than 2050, and through a straight-line trajectory (at a minimum) from 2030. Utilisation of SWIS grid for 100% electricity required to power smelter operations provides confidence that SIMCOA can effectively decarbonise 100% of their Scope 2 operational emissions, in line with WA State targets.
Residual impacts including	Based on a quantitative assessment of emissions, the annual Scope 1 and Scope 2 GHG emissions resulting from the implementation of the Revised Proposal are estimated to be

assessment of significance	425,024 t CO2-e yr-1, which is anticipated to represent less than 0.5% of the WA 2020 total GHG emissions and up to 0.08% of Australian 2020 total GHG emissions. Development of a GHGMP (Appendix U) and implementation of the associated decarbonisation strategies will result in SIMCOA 's construction and operation of the Project, Moora Mine operations and Kemerton Smelter contributing less to both State and National emissions on an annual basis.
Proposed environmental outcomes	Development and operation of the Revised Proposal is not expected to result in significant contribution to GHG emissions. The estimated annual emissions are equivalent to 0.5 % of WA's total annual GHG emissions. SIMCOA are committed to: – Implementing a GHG MP (Appendix U) which achieves net zero emissions no later than 2050 and through a straight-line trajectory (at a minimum) from expected start of construction in accordance with the EPA's 'Environmental Factor Guideline – Greenhouse Gas Emissions' (EPA, 2023) – Reducing greenhouse gas emissions from the operation of the Kemerton Smelter as this contributes the majority of SIMCOA's Scope 1 and 2 emissions The volume of GHG emissions as a result of this Revised Proposal means that the EPA's objective to reduce net greenhouse gas emissions to minimise the risk of environmental harm associated with climate change, is considered to be achieved.
Assessment of offsets (if relevant)	Where net Scope 1 and Scope 2 greenhouse emissions cannot be avoided or reduced through feasible measures, emissions exceeding committed targets will be offset through acquisition of carbon offsets.
Air Quality **EPA objective: To maintain air quality and minimise emissions so that environmental values are protected.** **The EPA defines air quality as the chemical, physical, biological, and aesthetic characteristics of air, with 'air' referring to all the air above the ground up to and including the stratosphere.**	
Potential impacts	Activities that have the potential to have direct impact on air quality during construction include: – Dust generated from clearing of vegetation clearing, earthworks, vehicle/ equipment operation and construction activities – Gaseous and particulate emissions from construction vehicles, heavy equipment and temporary power combustion emissions. – Potential indirect impacts to air quality, as a result of construction works, may include: – Smoke from accidental bushfires – Impacts on sensitive receptors due to health, nuisance and visual amenity impact of visible dust (addressed in Section 5.7) – Changes to vegetation communities and native fauna habitat and movement due to smothering of vegetation by dust emissions (addressed in Section 5.2 and Section 5.5) – Increase in greenhouse gas emissions (addressed in Section 5.8). Activities that have the potential to have direct impact on air quality during operation of the Revised Proposal include: The vast majority of airborne particulates from the existing and proposed mine sites, during mining and process activities, are likely to be visible dust with a proportion of fine particulates as PM10 and PM2.5, from such activities as: – Materials handling operations – Cleared areas and stockpiles – Screening and crushing – Vehicle movement, earth movement and transport activities – Wind erosion to the local airsheds and sensitive receptors – Rehabilitation operations – Emissions of combustion products associated with earthmoving machinery and mining activities. – Potential indirect impacts as a result of operations, may include: – Smoke from accidental bushfires – Impacts on sensitive receptors due to health, nuisance and visual amenity impact of visible dust (addressed in Section 5.7) – Changes to vegetation communities and native fauna habitat and movement due to smothering of vegetation by dust emissions (addressed in Section 5.2 and Section 5.5) – Increase in greenhouse gas emissions (addressed in Section 5.8).

	Existing approved activities that have the potential to have direct impact on air quality during operation of Kemerton Smelter include: – Dust emissions through: – Handling of raw materials – Unsealed surfaces – Wood processing and charcoal screening operations. – Gaseous and particulate emissions from: – The submerged arc furnaces, which generate particulates in the form of amorphous silica fume which are entrained in the furnace off-gases (including PM, PM10, NOX, SO2 and CO) – Furnace off-gases (direct venting) – Furnace baghouse in the form of crystalline quartz in silica fume. – Potential indirect impacts, as a result of reduced air quality, may include: – Smoke from accidental bushfires – Impacts on sensitive receptors due to health, nuisance and visual amenity impact of visible dust (addressed in Section 5.7) – Changes to vegetation communities and native fauna habitat and movement due to smothering of vegetation by dust emissions (addressed in Section 5.2 and Section 5.5) – Increase in greenhouse gas emissions (addressed in Section 5.8).
Proposed environmental outcomes	Development and operation of the Revised Proposal is not expected to result in significant impacts to air quality given the following: – Modelling (without controls) predicts that dust levels will not exceed relevant criteria for PM10, PM2.5 and dust deposition, at any of the identified sensitive receptors. – Modelling predicts that maximum 24-hour TSP concentrations at all sensitive receptors comply with the NSW AMMAAP criteria (even though they exceed the Kwinana EPP criteria at R02). – SIMCOA are committed to ensuring dust mitigation measures are implemented in accordance with Moora Mine standard operating procedures, Kemerton Smelter EMMP and the Project EMP. – Air quality at both Moora Mine and Kemerton Smelter demonstrates that emissions are below licence conditions, and the operational emissions at these two sites will not change in response to the Revised Proposal The Revised Proposal can achieve the EPA's objective to maintain air quality and minimise emissions so that environmental values are protected.
Mitigation hierarchy	**Avoid** Employee (and contractor) inductions to include dust management information and instruction (in accordance with licence conditions and other approvals), including reporting requirements Review of daily weather forecasts to assist with dust management. Commitment to cease handling of materials during adverse wind conditions, or if complaints are received from sensitive receptors. Maintenance of a complaints register for the site, and a process to investigate all complaints with corrective actions implemented as appropriate. **Minimise** SIMCOA propose to implement dust and bushfire mitigation controls in accordance with the Project Environmental Management Plan (Appendix C) which will include the following measures: – Materials handling and storage facilities will be designed to minimise the loss of materials. – Dust suppression on haul roads will be carried out during mining season by a dedicated water truck. – Application of water via sprays at a minimum rate of 2 L/m2/hr to excavation areas, haul roads, and ahead of drilling and blasting. – Application of water via sprays as required to stockpiles and other cleared surfaces (i.e. the open mine pit area). – Undertake progressive rehabilitation of cleared areas where practicable – Implementation of Hot Works Permit system, and Emergency Management Procedures to minimise the risk of bushfires. Rehabilitate

	Undertake progressive rehabilitation as per Mine Rehabilitation/ Closure Plan to be prepared and approved by DMIRS.
Residual impacts including assessment of significance	After implementing the mitigation and management measures described above, the following residual impacts are expected in regard to air quality: Very low to negligible risk of workers and sensitive receptors being exposed to dust generated from construction and operational activities.
Assessment of offsets (if relevant)	No offsets are required in relation to Air Quality as a result of the implementation of the Revised Proposal.

Defined Terms

Term	Definition
SIMCOA	SIMCOA Operations Pty Ltd
Coomberdale TEC	Remnant vegetation of the Threatened Ecological Community (TEC): "Health dominated by one or more *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomberdale Floristic Region".
Moora Mine	SIMCOA's operational quartzite mine located approximately 15 km north of Moora, in the Wheatbelt of Western Australia. Moora Mine which is located on tenements M70/191, G70/91, G70/92 and G70/93, is governed under Ministerial Statement 813.
Moora Mine Development Envelope (DE)	Moora Mine is located within an existing DE of 239.10 ha including: – Disturbance Footprint of not more than 96 ha
The Project	The development of a new quartzite mine, North Kiaka, approximately 2 km north of Moora Mine. The proposed mine at the North Kiaka DE, is located within tenement M70/1292, and is anticipated to produce up to 130,000 tpa of lump quartz (approximately 2.34 million tonnes over the life of the mine).
North Kiaka DE	The North Kiaka DE is 216.42 ha, including: – Disturbance Footprint of up to 44.59 ha – Native vegetation clearing up to 17.12 ha.
Kemerton Smelter	SIMCOA's existing Smelter located in Kemerton Strategic Industrial Area (KSIA). Kemerton Smelter commenced operation in 1989 and is currently authorised to produce up to 53,000 tonnes per annum (tpa) of silicon from four (4) submerged electric arc furnaces. Kemerton Smelter is governed by Ministerial Statement 813.
Approved Proposal	The activities at Moora Mine and Kemerton Smelter which are described and approved under Ministerial Statement 813 (MS 813)
The Proposal	The Proposal as referred under s38 of the *Environmental Protection Act 1986* to the EPA for assessment.
The Revised Proposal	The Project and Approved Proposal under MS 813 (Moora Mine and Kemerton Smelter) and the abandonment bund.

Acronyms

Term	Definition
Al	Aluminium
AH Act	Aboriginal Heritage Act 1972
AMD	Acid Mine Drainage
AMMAAP	Approved Methods for the Modelling and Assessment of Air Pollutants
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standards
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
AVW	Avon Wheatbelt
BC Act	*Biodiversity Conservation Act 2016* (WA)
BGA	Brad Goode and Associates
BoM	Bureau of Meteorology
CALM	Conservation and Land Management (former)
CIA	Cumulative impact assessments

Term	Definition
Coomberdale TEC	Heath dominated by one or more Regelia megacephala, Kunzea praestans and Allocasuarina campestris on ridges and slopes of the chert hills of the Coomberdale Floristic Region”
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Department of Biodiversity, Conservation and Attractions
DBH >300mm	Diameter at breast height greater than 300 mm
DE	Development Envelope
DJTSI	Department of Jobs, Tourism, Science and Innovation (WA)
DMIRS	Department of Mines, Industry Regulation and Safety (WA)
DMP	Department of Mines and Petroleum (WA)
DAWE	Department of Agriculture, Water and the Environment (Commonwealth) (former)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DoW	Department of Water (WA)
DPAW	Department of Parks and Wildlife (WA)
DPLH	Department of Planning, Lands and Heritage (WA)
DSEWPAC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)
DWER	Department of Water, Environment and Regulation (WA)
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	Environmental Protection Regulations 1987 (WA)
EPA	Environmental Protection Authority (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPBC Regulations	Environmental Protection and Biodiversity Conservation Regulations (Commonwealth)
EPN Regulations	Environmental Protection (Noise) Regulations 1997 (WA)
EPP	Environmental Protection Policy (WA)
ERD	Environmental Referral Document
ESA	Environmentally Sensitive Area
Fe	Iron
GHG	Greenhouse Gas
GHGMP	Greenhouse Gas Management Plan
GoWA	Government of Western Australia
GSWA	Geological Survey of Western Australia
GWL	Groundwater licence
IBRA	Interim Biogeographic Regionalisation for Australia
K	Potassium
KSIA	Kemerton Strategic Industrial Area
LGA	Local Government Area
MCMPR	Ministerial Council on Mineral and Petroleum Resources
Mining Act	*Mining Act 1978* (WA)
Mn	Manganese
MNES	Matters of National Environmental Significance
MS	Ministerial Statement

Term	Definition
MS 813	Ministerial Statement 813
N	Nitrogen
n/a	Not applicable
NEPM	National Environment Protection Measure
NGER Act	*National Greenhouse and Energy Reporting Act 2007*
NOI	Notices of Intent
NR	Nature Reserve
NSW AMMAAP	New South Wales Approved Methods for the Modelling and Assessment of Air Pollutants
NTC	Native Title Claim
P	Phosphorus
P1, P2, P3, P4	Priority 1, Priority 2, Priority 3, Priority 4
PAF	Potentially Acid Forming
PCD	Proposal Content Document
PDWSA	Public Drinking Water Source Area
PM	Particulate Matter
PMST	Protected Matters Search Tool
R	Receptor
RiWI Act	*Rights in Water and Irrigation Act 1914* (WA)
ROM	Run of Mine
S	Sulphur
SMU	Soil Mapping Unit
SPP	State Planning Policy
SRE	Short Range Endemic
SWALSC	South West Aboriginal Land and Sea
TEC	Threatened Ecological Communities
TSP	Total suspended particulates
Tonkin WRD	Tonkin Waste Rock Dump
WA	Western Australia
WQPN	Water Quality Protection Note

Units of measure

Term	Definition
%	percentage
<	Less than
°C	Degrees Celsius
bgl	Below ground level
ha	hectare
km	Kilometre
L	Litres
L/day	Litres per day

Term	Definition
m	metres
m^3	Cubic metres
mm/year	Millimetres per year
mRL	Mean relative level
MT	Million tonnes
PM_{10}	Total suspended particulates with an aerodynamic diameter of 10 microns
$PM_{2.5}$	Total suspended particulates with an aerodynamic diameter of 2.5 microns
tpa	Tonnes per annum

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1. Proposal

1.1 Proposal content

1.1.1 Overview of the Revised Proposal

SIMCOA Operations Pty Ltd (**SIMCOA**) currently operate the Moora Quartzite Mine (Moora Mine), approximately 15 km north of Moora, in the Wheatbelt of Western Australia (WA) (Figure 1.1). The Moora Mine is located on tenements M70/191, G70/91, G70/92, G70/93, and M70/1292 [with activities on M70/1292 limited to mine dewater discharge into Kyaka Brook]. Quartzite ore from Moora Mine is currently transported via covered truck to SIMCOA's Kemerton Smelter (Kemerton Smelter) located in Kemerton Strategic Industrial Area (KSIA), approximately 17 km north-east of Bunbury in the South-West of WA (Figure 1.1). Existing activities at Moora Mine and Kemerton Smelter are approved under Part IV of the *Environmental Protection Act 1986* (EP Act) and Ministerial Statement 813 (MS 813) (Approved Proposal) (refer to Appendix A for the current MS 813 conditions).

SIMCOA is proposing to establish the North Kiaka Quartzite Mine, immediately north of Moora Mine (with the mine pit located approximately 1.5 to 2 km north of Kiaka Road and Moora Mine). The proposed development of the North Kiaka Mine (the Project) is located within tenement M70/1292. The North Kiaka Project is a significant amendment to the existing operations at Moora Mine. SIMCOA also intend to build an abandonment bund around the Moora Mine pits, to comply with closure requirements for the existing operations.

The Project and abandonment bund are being considered as a significant amendment to the Moora Mine (MS 813). Together the Project and the Approved Proposal (Moora Mine and Kemerton Smelter) comprise **the Revised Proposal**. The proposal content description and proposal content elements are provided in Table 1.1 and Table 1.2. The indicative layout of these elements for each site (North Kiaka DE, Moora Mine, and Kemerton Smelter) is shown Figure 1.2.

Table 1.1 General Revised Proposal description

Proposal title	**North Kiaka Project**
Proponent name	SIMCOA Operations Pty Ltd
Short description	The Revised Proposal is for the development of a new quartzite mine at North Kiaka DE (the Project), approximately 15 km north of Moora, WA. The Project is approximately 1.5 to 2 km north northeast (NNE) of the existing Moora Quartzite Mine and is expected to generate up to 130,000 tpa of lump quartz for downstream processing at the Kemerton Silicon Smelter (Kemerton Smelter). Kemerton Smelter is located in the Kemerton Strategic Industrial Area (KSIA) 17 km north-east of Bunbury, WA. The Project will be open-cut mine operating above the water table and has a predicted Life of Mine of 18 years based on current resource estimates. Ore mined at the North Kiaka DE will be pre-processed (crushed and screened) using existing processing infrastructure at Moora Mine prior to transporting to Kemerton Smelter using the established network of power, water and roads at Moora Mine. The Revised Proposal also includes construction of an abandonment bund for the Moora Mine pits.

Table 1.2 Revised Proposal content elements

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and Moora Mine abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
Physical elements				
Revised Proposal Development Envelopes (DE)	Figure 1.2	Clearing of no more than 25 ha of native vegetation within a disturbance	Disturbance footprint (DF) of up to 44.59 ha (including up to 17.12 ha of clearing)	Total combined DE of 455.52 ha including clearing of no more than 43.12 ha of native vegetation within a

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and Moora Mine abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
Including a mine pit, waste rock landform (WRL), run of mine area (ROM), laydown and stockpile areas, access corridor and associated infrastructure and abandonment bund.		footprint of not more than 93 ha within the Moora Mine development envelope of 239.10 ha	within a 216.42 ha North Kiaka DE. Increasing the Moora Mine DF from 93 ha to 96 ha (additional 3 ha). Clearing of 1 ha of native vegetation within the increased Moora DF.	DF of 140.59 ha which consists of: – 26 ha clearing of native vegetation within a disturbance footprint of not more than 96 ha and DE of 239.10 ha – Moora Mine – 17.12 ha of native vegetation within a disturbance footprint of not more than 44.59 ha and DE of 216.42 ha - North Kiaka DE.
Construction elements				
Key construction elements for the Revised Proposal will include clearing for all identified physical and operational elements, installation of temporary offices/ ablutions, movement of topsoil, and bulk earthworks to support construction of ancillary facilities.				
Operational elements				
Mine pit	Figure 1.2	Moora Mine DE 239.10 ha Moora Mine pit footprint is 25.48 ha and is currently operational with approved clearing of no more than 25 ha of native vegetation within a disturbance footprint of not more than 93 ha in the Moora Mine DE of 239.10 ha. Current production of up to 130,000 tpa of lump quartz within an approved extent of 160,000 tpa.	Clearing of no more than 17.12 ha of native vegetation within a 44.59 ha disturbance footprint within 216.42 ha development envelope (North Kiaka DE) 26 ha of native vegetation within a disturbance footprint of not more than 96 ha (Moora Mine) An estimated 236,000 tonne per annum (tpa) of ore will be processed (crushed and screened) to produce up to 130,000 tpa of lump quartz within a approved extent of 160,000 tpa.	The Moora Mine pit footprint is 25.48 ha Total combined DE of 455.52 ha including clearing of no more than 43.12 ha of native vegetation within a DF of 140.59 ha which consists of: – 26 ha clearing of native vegetation within a disturbance footprint of not more than 96 ha – Moora Mine – 17.12 ha of native vegetation within a disturbance footprint of not more than 44.59 ha - North Kiaka DE An estimated 236,000 tonne per annum (tpa) of ore will be processed (crushed and screened) up to 130,000 tpa of lump quartz within a approved extent of 160,000 tpa.
Waste Rock Dump	Figure 1.2	Waste Rock dumps at Moora Mine are a total of 34.9 ha: – Main Waste Dump – 9.7 ha – North Dump – currently 6.0 ha with maximum approved of 19.0 ha – Old North Dump – 1.5 ha – South East Dump – 3.8 ha	Proposed WRD (Tonkin) with a footprint of 9.69 ha to be located approximately 0.5 km south of the mine pit, on farmland previously cleared of native vegetation. It Is estimated that up to 2.15 million m^3 of waste rock will be disposed to the Tonkin WRD, assuming a swell factor of 30%. The final height of the WRL is expected to be 21–- 45 m below the	Total combined WRD is 44.59 ha – Moora Mine: 34.9 ha – North Kiaka DE: Tonkin WRD 9.69 ha footprint

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and Moora Mine abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
		– West Pit Dump – 0.9 ha	tallest landform in the North Kiaka DE (pre-development). The WRL is positioned in a valley to further reduce visibility of the landform from surrounding areas.	
ROM	Figure 1.2	Short-term ROM (1.22 ha, approximately 80 m x 100 m) allowing for up to 20 days per year to be stockpiled	No change	No change
Ancillary Facilities	Figure 1.2		Access corridor (connecting North Kiaka DE to the Moora Mine) (7.31 ha) and associated infrastructure (0.88 ha) including an administration building, car park, weighbridge, workshops, ablution facilities, laydown and stockpile areas, hydrocarbon storage, refuelling facility, and washdown bays	Access corridor (connecting North Kiaka DE to the Moora Mine) (7.31 ha) and associated infrastructure (0.88 ha) including an administration building, car park, weighbridge, workshops, ablution facilities, laydown and stockpile areas, hydrocarbon storage, refuelling facility, and washdown bays
Power	Figure 1.2	One onsite generator (noting that crushing and screening of ore will occur at the existing Moora Quartzite Mine)	No change	One onsite generator (noting that crushing and screening of ore will occur at the existing Moora Quartzite Mine)
Groundwater abstraction (water demand)		Moora Mine groundwater licence (GWL 104693(6)) to authorize the use of 250,000kL of abstracted water within tenement M70/1292.	No dewatering or groundwater abstraction is currently proposed for the Project. If additional water is required, SIMCOA will seek the necessary approvals under the RiWI Act to abstract groundwater within M70/1292.	Moora Mine groundwater licence (GWL 104693(6)) to authorise the use of 250,000kL of abstracted water within tenement M70/1292. The groundwater abstraction volume approved in Licence GWL 104693(6) is expected to be sufficient for Moora Mine and North Kiaka DE. If additional water is required, SIMCOA will seek the necessary approvals under the RiWI Act to abstract groundwater within M70/1292.
Water Discharge		Discharge of up to 122,000 kL per annum of dewatered groundwater via Kiaka Creek to the Conderoo River wetlands (Moora Mine)	No change	Discharge of up to 122,000 kL per annum of dewatered groundwater via Kiaka Creek to the Conderoo River wetlands (Moora Mine)

Proposal element	Location / description	Approved Proposal (MS 813) (Maximum extent, capacity or range)	North Kiaka Mine and Moora Mine abandonment bund (Maximum extent, capacity or range)	Revised Proposal - Combined Extent
Dewater discharge pipeline		Dewater discharge pipeline routed along an existing access road (Moora Mine)	No change	Dewater discharge pipeline routed along an existing access road (Moora Mine)
Area of rehabilitation		All disturbed areas (Moora Mine)	All disturbed areas (North Kiaka DE)	All disturbed areas (Moora Mine and North Kiaka DE)
Kemerton Smelter	Figure 1.2	Ministerial Statement 813 – Silicon Production 64,000 tonnes per annum (approximately) – Quartzite Consumption 160,000 tonnes per annum (approximately) – Wood for Charcoal 110,000 tonnes per annum (approximately) – Charcoal Production 27,000 tonnes per annum (approximately) – Smelter Furnaces • 4 x submerged electric arc furnaces – Off-gas Cleaning Plant (Baghouses) • One large baghouse with stacks • One large baghouse without stacks	Change – extend operating life of Kemerton Smelter from 2026 to 2042	As per authorised extent in MS 813

Revised Proposal elements with greenhouse gas emissions			
Construction (the Project and abandonment bund at Moora Mine – no new construction at Kemerton Smelter)			
Scope 1	2,168		tCO2-e
Scope 2	0		
Scope 3	3,653		tCO2-e
Operational elements (combined annual Moora Mine, Kemerton Smelter and the Project)			
Scope 1	1,546 Moora Mine and the Project	123,454 Kemerton	tCO2-e
Scope 2	0	300,024 Kemerton	tCO2-e
Scope 3	11,761 Moora Mine and the Project	681,680 Kemerton	tCO2-e
Rehabilitation			
Rehabilitation of North Kiaka DE and Moora Mine will be undertaken in line with commitments in the s.40(2)(a) Supporting Document, Ministerial Statement conditions (following approval of the Revised Proposal by the Minister), and the Mine Closure Plan (to be assessed and approved by Department of Mines, Industry Regulation and Safety (DMIRS)). Some key rehabilitation commitments are listed below: – Rehabilitation will be undertaken progressively. – Rehabilitated landforms (Tonkin WRD) will be stable and non-polluting (i.e. batter slope of 18°, placement of structurally stable soils at the surface, contoured/ ripped/ logs and rocks placed to reduce erosion risk). – The Tonkin WRD will be rehabilitated using local native species to meet post-closure goals and outcomes as specified in the Mine Closure Plan (MCP) – Waste rock that is stable and non-acid forming will be used as growth medium for rehabilitation of landforms, as this method is proven to successfully re-establish native provenance species at the existing Moora Mine. – Topsoil comprising sandy gravels will be collected, stockpiled (<2 m height) and used to rehabilitate areas previously used for agriculture that will be returned to their pre-mining land use. – Weed management will be undertaken for the first three years following rehabilitation. Any requirement for further weed control will be assessed after the three-year timeframe.			
Commissioning			
Limited commissioning works are required as all crushing activities will continue to be undertaken at Moora Mine. No commissioning required for the construction of the abandonment bund. There will be no change to the volume of quartz being processed at Kemerton Smelter, so no commissioning will be required at that site.			
Decommissioning			
SIMCOA intends to enable regrowth of local native flora species on the WRD's, close the Moora Mine pit with an abandonment bund, and return all other disturbance footprints to pre-mining agricultural land use (including the removal of buildings and infrastructure). SIMCOA operate the Moora Mine under an approved MCP. They currently comply with the MCP for Moora Mine for post mining land use and other requirements. SIMCOA will develop a MCP in accordance with the *Department of Mines, Industry, Regulation and Safety 2020 Guidelines for Mining Proposals in WA* (DMIRS, 2023b), to support the development of the Project under the *Mining Act 1978*. The MCP will be assessed and approved by DMIRS prior to commencement of activities.			
Other elements which affect extent of effects on the environment			
Proposal time*	Maximum project life		20 years
	Construction phase		1 year
	Operations phase		18 years
	Decommissioning phase		Approximately 1 year

1.1.1.1 History of the Revised Proposal

SIMCOA referred the **North Kiaka Mine** in November 2021 to the WA Environmental Protection Authority (EPA) under s38 of the *Environmental Protection Act 1986* (WA) (EP Act). Following referral of the Proposal to the EPA (CMS 18097), the decision to assess was determined on 29 July 2022, with the level of assessment set at *"referral information with additional information (required under s. 40(2)(a) of the Environmental Protection Act 1986) and public review (2 weeks)".*

The Project (proposed action) was referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE, now Department of Climate Change, Environment, Energy and Water (DCCEEW)) in November of 2021 and on 23 December 2021, it was determined to be a controlled action, requiring assessment and approval under the EPBC Act due to impacts on '*listed threatened species and communities'* (EPBC Reference No. 2021/9089). The Project will be assessed by way of an accredited assessment under the EP Act.

A Notice Requiring Information for Assessment (the Notice) was issued by the EPA on 15 August 2022 under Section 40(2)(a) of the EP Act. Development of the resource at the North Kiaka DE will extend the operational life of Moora Mine (with respect to crushing and screening) and Kemerton Smelter (with respect to processing), hence the EPA is considering the Proposal *"as an amendment to an existing approved proposal under s40AA of the EP Act"*.

Changes since referral

In 2022 SIMCOA received advice from the Department of Mines, Industry Regulation and Safety (DMIRS) that construction of an abandonment bund for the Moora Mine pits would be required prior to granting approval to mine below the water table. The EPA advised via email on the 24 March 2023 that SIMCOA should submit a s43A application to amend the Revised Proposal (to reflect the construction of the abandonment bund).

A s43A (submitted 04 May 2023) revised the Moora Mine Disturbance Footprint and the authorised extent of disturbance and clearing in the key characteristics table to enable an abandonment bund to be constructed at Moora Mine around the existing open pits at closure. The s43A was approved on 13 September 2023, allowing the assessment process to continue for the Revised Proposal.

A meeting with DCCEEW (1 June 2023) to discuss the Revised Proposal and any changes to the impacts to MNES following the submission of the s43A to the EPA resulted in an email on 9 June 2023 confirming that the impacts of the Project could still be assessed through accredited assessment as part of the ERD for the Revised Proposal.

The Draft ERD was submitted to the EPA for review on 6 July 2023, and was provided to the DMAs for review and comments. A meeting with the EPA was held on 8 December 2023, to discuss the comments and feedback received from the DMAs. Subsequently the EPA issued a formal EPA RFI and a meeting was held on 7 February 2024 to discuss SIMCOA's responses to the RFI.

Content of Environmental Review Document (ERD)

This ERD provides an update to Revision 2 of the draft ERD and includes information added to address matters raised in the EPA RFI and considers the impacts of the Approved Proposal (Moora Mine and Kemerton Smelter (approved under MS 813), the Project (referred to the EPA under s 38 on 03 November 2021) and the s43A amendment for the abandonment bund. The ERD also addresses EPA's additional information request (EPA 2022) and the notes from the meetings between SIMCOA, GHD and EPA (29 April 2022 and 16 September 2022). The ERD also includes information addressing the latest RFI from the EPA (EPA, 2023d) following the submission of the draft documentation to DMA's.

1.1.1.2 The Project – North Kiaka mine

The Project is located within the North Kiaka Development Envelope (DE) as shown in Figure 1.2. The DE is 216.42 ha, with a proposed disturbance footprint (DF) of up to 44.59 ha. This disturbance footprint is required to establish an open-cut mine pit, waste rock dump (WRD), support infrastructure, and connecting haul roads. Native vegetation clearing will be limited to 17.12 ha and is required to develop the mine pit and a small portion of the adjoining haul road and infrastructure area.

An estimated 236,000 tpa of ore will be mined at the Project to produce up to 160,000 tpa of lump quartz. Based on current resource estimates, the Project has a predicted Life of Mine (LoM) of 20 years (18 years of resource extraction). There may be a period of concurrent operation for the Project and Moora Mine as

SIMCOA transitions Moora Mine to closure. However, even when operating concurrently no more than 130,000 tpa of lump quartz will be produced.

1.1.1.3 Moora Mine

Moora Mine is an operational mine site which has been operating for over 30 years with an estimated remaining resource life of approximately seven (7) years, assuming approval is received from DMIRS to mine below the water table. All components at Moora Mine under MS 813 have been developed and no additional activities or clearing approved under MS 813 are outstanding.

DMIRS notified the SIMCOA that construction of an abandonment bund would be required around the Moora Mine pit prior to DMIRS granting approval for the mining below the water table.

As there is an existing crushing and screening plant at Moora Mine, and the resource in the North Kiaka DE is located in close proximity to the plant (<2 km), ore mined at the Project will be trucked to Moora Mine via designated haul roads, for crushing and screening prior to transport.

Abandonment bund

SIMCOA engaged CUBE Consulting (CUBE) to design the proposed abandonment bund in a manner which balances engineering, safety, and environmental requirements as shown in Diagram 1. In accordance with DMIRS requirements, the abandonment bund has been designed by CUBE (2020) to meet specifications detailed in the "*WA Department of Industry and Resources, Guideline for Safety Bund Walls Around Abandoned Open Pit Mine, December 1997, Document No ZMA048HA*". This includes maintaining minimum distances between pit walls and constructing the abandonment bund to ensure it remains outside the anticipated zone of pit instability. This has resulted in portions of the abandonment bund needing to be constructed outside the EPA approved Moora Mine Disturbance Footprint, hence the need for a s.43A Application to amend the EPA approved Disturbance Footprint at Moora Mine as part of the Revised Proposal.

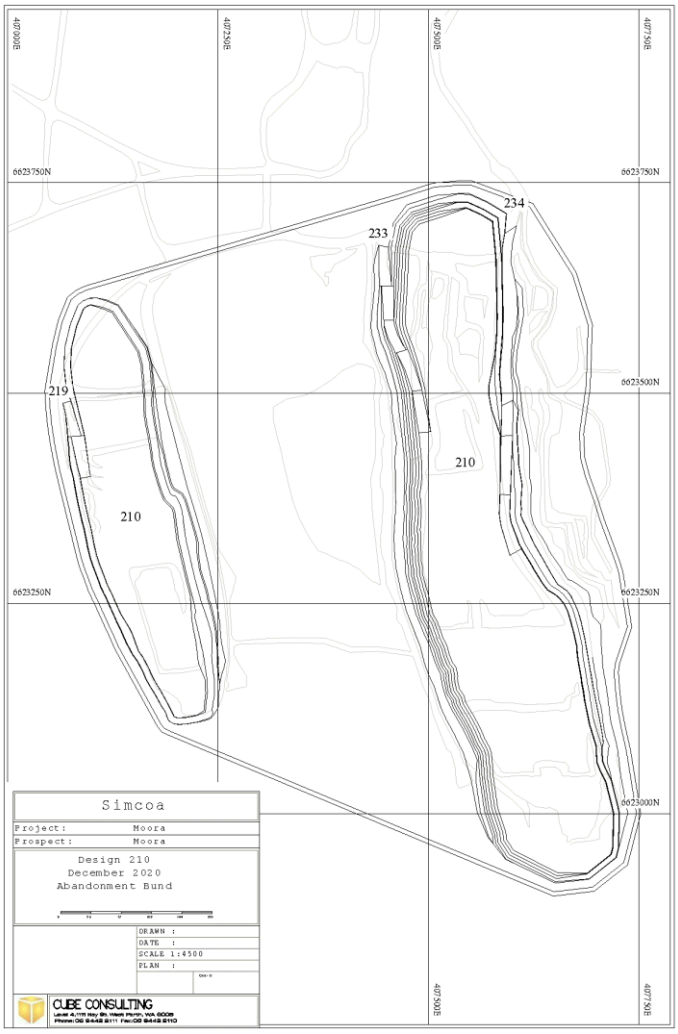
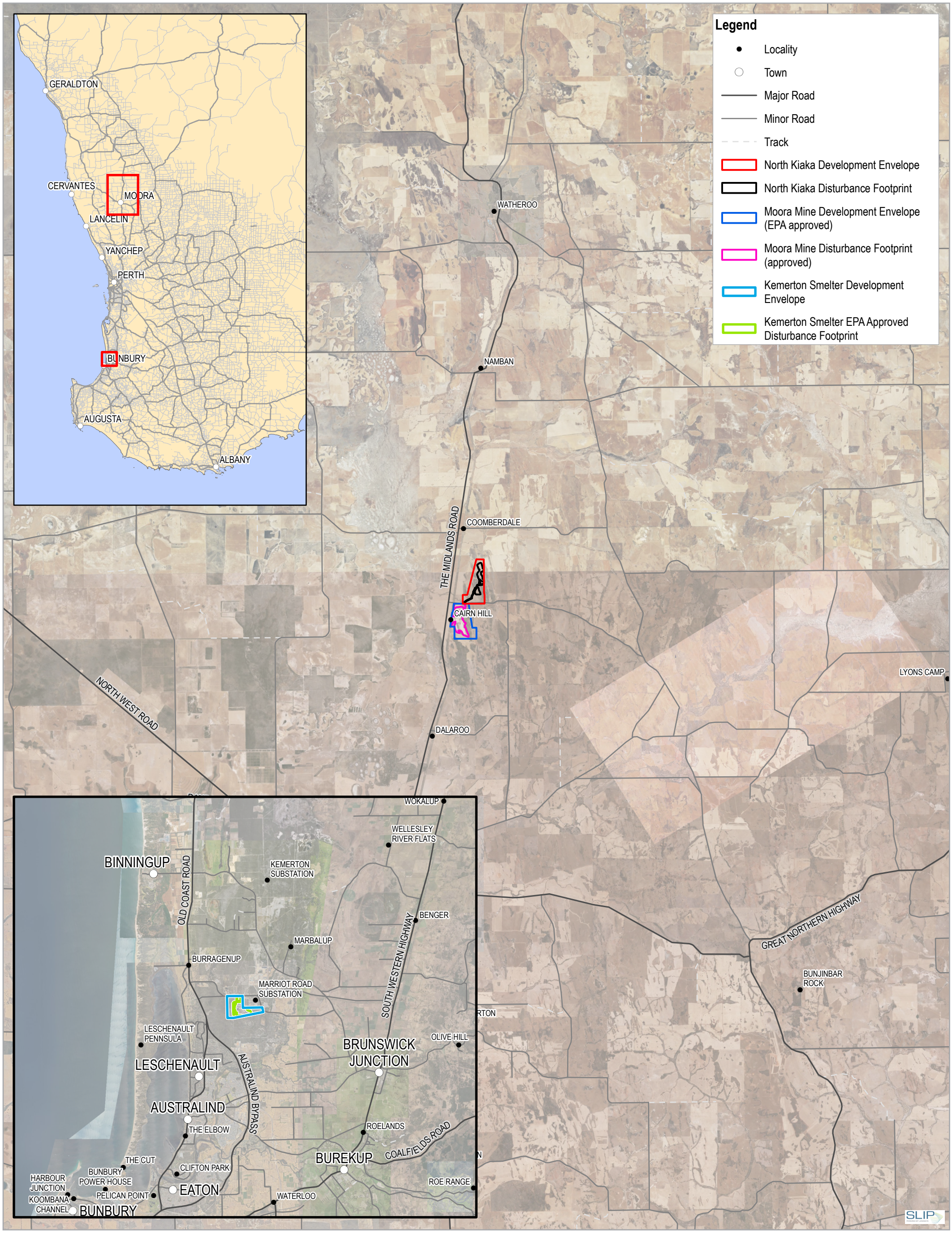


Diagram 1 Abandonment bund location (CUBE, 2020)

The additional disturbance and clearing proposed accounts for the bund footprint, plus potential disturbance that may occur within 10 m of the bund during construction. The revised areas are considered 'worst case' disturbance. Clearing of native vegetation will be minimised by constructing the bund from the inside where possible. It is likely that a light vehicle access road will be maintained around the bund perimeter (within the amended Moora Mine Disturbance Footprint) with the exception of where the bund crosses over existing waste rock dumps. The access road will facilitate long-term access to the bund for inspections/maintenance, with the added benefit of improving visibility of the bund (thereby minimising the risk of inadvertent access), and providing a buffer zone between the bund and adjacent native vegetation (i.e. for weed control).

1.1.1.4 Kemerton Smelter

Kemerton Smelter commenced operation in 1989 and is currently authorised under MS 813 to produce up to 64,000 tpa of silicon. Under Part V of the EP Act, the Kemerton Smelter is authorised by Department of Water, Environment and Regulation (DWER) Licence No. L6341/1988/10 to produce up to 53,000 tpa of silicon. The current licence is valid to 12 October 2026. Development of the resource within the North Kiaka DE will extend the operational life of this facility by approximately 18 years (assuming mining at North Kiaka were to commence in 2024). Should Ministerial approval of the Revised Proposal be granted, SIMCOA will apply to the DWER for a Works Approval to extend the Kemerton Smelter operating Licence L6341/1988/10 to match the LoM for the Project.



Paper Size ISO A3

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Kilometres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Project Location

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 1.1

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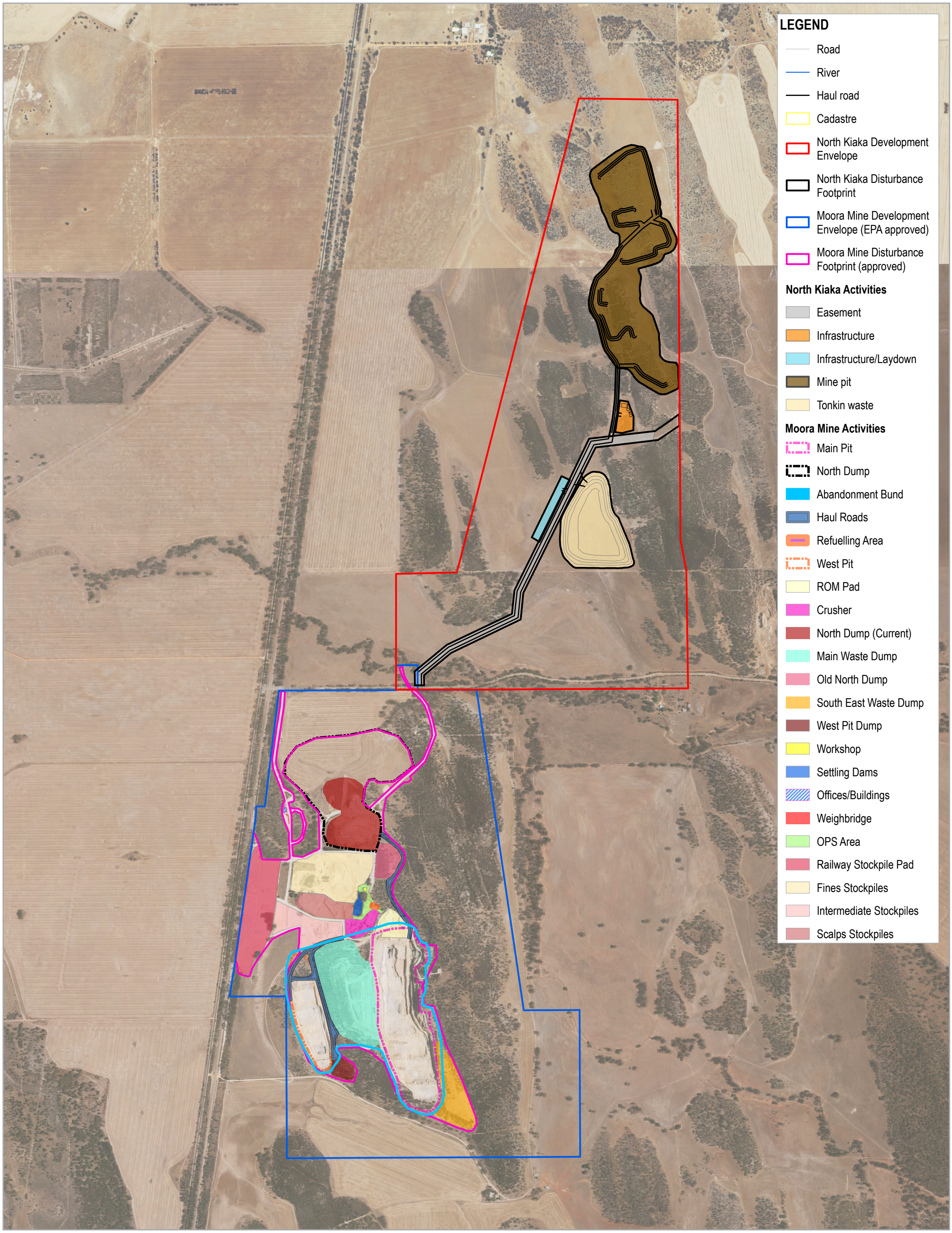
Print date: 22 Mar 2024 - 12:17

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, Road - 20180601; GA: Natmap Geodata Topo 250k Series 3. Created by: rbrown3



Paper Size ISO A3

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Metres

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

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GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Proposal Development Envelope and Disturbance Footprint

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 1.2

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Print date: 22 Mar 2024 - 12:17

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, Road - 20180601; DMIRS: Mining Tenements - 20180601; DoW: River - 201108. Created by: rbrown3

1.1.2 Revised Proposal description

1.1.2.1 Physical and operational elements

A description of the key physical and operational elements of the Project is provided in Table 1.3, all these elements are proposed to be developed (new development).

Moora Mine and Kemerton Smelter are approved (under MS 813 and other applicable legislation) and have been operational for over 30 years, a description of their elements are described in Table 1.4 and Table 1.5, respectively. The key aspects of this Revised Proposal for Moora Mine and Kemerton Smelter are the extension of their operational life and the addition of the abandonment bund at Moora Mine.

The indicative layout of the Revised Proposal is shown Figure 1.2.

Table 1.3 Operational elements for the Project (North Kiaka)

Operational element	Location	Extent (ha)	Clearing (ha)	Description
Mine pit	North Kiaka DE	25.48	17.12	Mining within North Kiaka DF will replicate methods undertaken at Moora Mine. The ore body will be mined via drill and blast methods to construct a single open pit above the water table, with a maximum depth of 46 m below ground level (bgl). SIMCOA will utilise a contractor for each blast and hence no explosive batching or magazine facility will be required for the Project. The quartz material will be removed using excavators and haul trucks, transporting the quartzite material from the mine pit to Moora Mine for crushing and screening prior to transport of quartzite ore to Kemerton Smelter at the KSIA. There are existing laydown areas (including a RoM) at Moora Mine that can be used (as required) for storage of ore prior to processing, and storage of quartzite following crushing and screening.
Tonkin Waste Rock Dump (Tonkin WRD)	North Kiaka DE	9.69	0	All waste rock from the Project will be deposited to the Tonkin WRD located within the North Kiaka DE. The Tonkin WRD has been strategically positioned on cleared farmland to avoid clearing native vegetation, and in a valley depression to minimise visibility of the landform within the broader landscape. The Tonkin WRD has been designed with the assumption that waste rock will have a swell factor of 30% following blasting.
Run-of-Mine	North Kiaka DE	1.22	0	The northern most infrastructure area in the North Kiaka DE will make provision for a short-term ROM (dimensions approximately 80 m x 100 m) with capacity to store ore mined over a period of approximately 20 days. The ROM will be located on already cleared land. The intention is to only use this short-term ROM only when material cannot be transported directly to Moora Mine.
Ancillary Facilities	North Kiaka DE	8.20	0	A Haul Road (7.31 ha) will be established between the mine pit and Kiaka Road to facilitate haulage of ore between the North Kiaka DE to Moora Mine. The easement will lead off from Kiaka Road, eliminating the requirement for trucks to use Midlands Road to access Moora Mine. The infrastructure will be located on already cleared land. An allowance has been made to have some associated infrastructure (0.89 ha) which may include an administration building, car park, weighbridge, workshops, ablution facilities, temporary equipment laydown and stockpile areas, hydrocarbon storage, refuelling facility, and washdown bays. Ablution facilities for onsite workers will be located in the administration area. Wastewater will be disposed in compliance with the approvals obtained from the Shire of

Operational element	Location	Extent (ha)	Clearing (ha)	Description
				Moora and Department of Health (septic tanks are anticipated at this stage).
Power	Moora Mine	not applicable	not applicable	Within the North Kiaka DE, power is only required for the administration building and workshop(s) (including weighbridge). Hence SIMCOA intend to use an onsite generator to supply power for these activities. More energy intensive activities (such as operation of the crushing and screening plant) will occur at Moora Mine where there is an existing power connection.
Groundwater abstraction (water demand)	Moora Mine	not applicable	not applicable	No dewatering or groundwater abstraction is currently proposed within the North Kiaka DE. Moora Mine has authorisation, under Groundwater Licence GWL 104693(6), to abstract groundwater from the fractured rock aquifer. The groundwater licence authorises SIMCOA to use this water on mining lease M70/191 (Moora Mine). SIMCOA will seek an amendment to this licence authorising the use of abstracted groundwater on tenement M70/1292 (the Project). The approved abstraction volume (250,000 kL/yr) is expected to provide sufficient water for dust suppression within the North Kiaka DE, as well as continuing dust suppression at Moora Mine. If additional water (or a more localised source of water) is required SIMCOA will seek the necessary approvals under the RiWI Act to construct a new bore within M70/1292 (North Kiaka DE) for the abstraction of groundwater.
	Total:	**44.59**	**17.12**	

Table 1.4 Operational elements for Moora Mine

Operational element	Location	Extent (ha)	Clearing (ha)	Description
Mine pit	Moora Mine	16.5 ha (above ground – Main pit) 6.1 ha (below ground – West pit)	Up to 26ha clearing permitted in the Development Footprint	Quartzite mining at the Moora Mine commenced in 1989. There are two existing open pits within the DE: West Pit and Main Pit, which have been mined for over 30 years. To continue extracting ore from these pits, dewatering is required to facilitate mining below the water table. SIMCOA proposes to progressively excavate materials from the Main and West pits to a final depth of approximately 202 mAHD and 200 mAHD respectively. Groundwater is likely to be encountered from 211 mAHD. Figure 1.2 shows the amended DF (additional approximately 3 ha with a clearing area of 1ha) to include the area required to construct an abandonment bund around the Moora Mine pits.
Waste Rock Dump x 4	Moora Mine	9.7 ha (Main) 19.0 ha (North) 1.5 ha (Old North) 0.9 ha (West) 3.8 ha (South-East		Waste rock from Moora Mine has historically been deposited at the following WRDs: – West WRD – Main WRD – South-East WRD – Old-North WRD – North WRD. The Main WRD is the largest of the landforms and has been used to store: waste rock from the Main and West pits; quartz sand (~5 mm) from the crushing and screening process; and silt collected from the settling ponds. The South East WRD was used to store waste rock from the Main pit and West WRD was used to store waste rock from the West pit. The North WRD is the newest landform

Operational element	Location	Extent (ha)	Clearing (ha)	Description
				(constructed in 2010) and rehabilitation commenced on this WRD in 2015. Waste rock resulting from mining at Moora Mine is deposited to the North WRD. The North WRD will have a final Disturbance Footprint of 19.0 ha.
Ore Crushing and Handling Plant	Moora Mine	1.2 ha		Within Moora Mine, SIMCOA owns, operates and maintains the crushing and screening plant (1.170 ha). The ore processing and handling domain consists of the crushing and screening plant, the wet screening plants, and the rail siding. Ore is fed from a hopper at the ROM pad to the crushing and screening plant. Process water is sourced from the settling ponds which are fed from a nearby water bore (BH1). Excess process water reports back to the settling ponds. Ore mined at the North Kiaka DE will be pre-processed (crushed and screened) at Moora Mine prior to transporting to Kemerton Smelter. Following closure of Moora Mine operations, the crushing and screening plant will remain at Moora Mine site and ore will continue to be transported from the North Kiaka DE to Moora Mine for crushing and screening.
Run-of-Mine (ROM)	Moora Mine	1.4 ha		The crushing and screening plant consists of: – 1 x primary 48 x 42 inch double toggle jaw crusher – 1 x secondary 1,500 mm cone crusher – 1 x tertiary 1,500 mm cone crusher – 3 x wet screening plant. Quartz is crushed to 25 - 75 mm particle size and stockpiled at the railway siding within tenements G70/91, G70/92 and G70/93 located adjacent to Midlands Road. From here the material is loaded into trucks and transported to Kemerton Smelter at the KSIA.
Ancillary Facilities	Moora Mine	n/a		Non-process infrastructure (0.9685 ha) includes offices and ablutions, workshops, the diesel-powered generator, fuel storage, communications infrastructure, mobile equipment and non-fixed assets. Two transportable office units and one transportable ablutions unit are located close to each other and have interconnecting concrete paths. The workshop incorporates a large shed on a concrete pad, storage sea containers, a bunded hydrocarbon storage area and a concrete wash down bay with a trafficable sediment sump and an oil-water separator. No change to existing ancillary facilities.
Power	Moora Mine	n/a		Energy intensive activities including operation of the crushing and screening plant will continue to occur at Moora Mine. Moora Mine is powered by two diesel generators located near the crusher and office. Project power is supplied by a diesel-powered generator and associated reticulation infrastructure. The generator is located within a concrete bund. Immediately adjacent to the generator is the fuel storage facility which consists of a horizontal diesel storage tank within a concrete bund and a refuelling bowser with a concrete apron.
Groundwater abstraction	Moora Mine	n/a		Moora Mine has authorisation under Groundwater Licence GWL 104693(6), to abstract groundwater from the fractured rock aquifer. The current

Operational element	Location	Extent (ha)	Clearing (ha)	Description
(water demand)				groundwater licence authorises SIMCOA to use this water on mining lease M70/191 (Moora Mine). The approved abstraction volume (250,000 kL/yr) provides water for dust suppression at Moora Mine. An amendment to the licence will be sought to use water for the Project.
Other Mine Activity Area (not including Key Mine Activities)	Moora Mine	20.5		
Total Tenement Activity Area	Moora Mine	77.6		
	Total:	85.2 ha **Not more than 96 ha (MS813)**		

Table 1.5 Operational elements for Kemerton Smelter

Operational element	Location	Extent (ha)	Clearing (ha)	Description
Kemerton Smelter	Kemerton Industrial Park (KIP)- Lot 5548	115.6 ha	n/a	Kemerton Smelter is licensed to produce 53,000 tpa under Part V or 64,000 tpa under Part IV of silicon from Quartz and carbon reductant. The quartz feed for Kemerton Smelter is sourced from the crushing plant at Moora Mine. The product from Kemerton Smelter is highly sought after by photovoltaic silicon manufacturers. Kemerton Smelter is licenced (L6341/1988) under Part V of the EP Act 1986. The Kemerton Smelter is a 'prescribed premises', Char Manufacturing (Category 37) and Metal Smelting or Refining (Category 44). The license is current to 2026. The project does not propose any changes to the Kemerton Smelter.
Water Consumption (Groundwater)				Kemerton Smelter is licensed to consume 312,000 kL per annum (Kemerton)
Raw materials storage	Kemerton Industrial Park (KIP) - Lot 5548		n/a	Raw materials are stored on site including wood, coal, quartzite and other inputs for Kemerton Smelter.
Waste Storage	Kemerton Industrial Park (KIP) - Lot 5548		n/a	Waste storage areas including dross
Offices	Kemerton Industrial Park (KIP) - Lot 5548		n/a	Located within Lot 5548 on Plan 188561
Ancillary Facilities	Kemerton Industrial Park (KIP) - Lot 5548		n/a	Located within Lot 5548 on Plan 188561
	Total:	**115.6 ha**	**n/a**	

1.1.2.2 The Revised Proposal extent

The Revised Proposal will mine the quartzite resource and disposal of waste rock within North Kiaka DE (M70/129). Following crushing and screening at Moora Mine (M70/191), quartzite ore will be transported by covered truck to SIMCOA's Kemerton Smelter located in the KSIA, approximately 17 km north-east of Bunbury in the south-west of WA. Table 1.6 provides the physical extent details for the Revised Proposal.

Table 1.6 Extent of physical and operational elements of the revised proposal (Moora Mine, the Kemerton Smelter and North Kiaka)

Element	Authorised Extent	Change in extent	Combined Extent (Moora Mine, Kemerton Smelter and the Project)
DWER L6149/1988/9			
Quartzite Production (Category 5)	160,000 tpa	No change	160,000 tpa
DWER 6341/1988/10			
Charcoal Production (Category 37)	26,000 tpa	No change	26,000 tpa
Silicon Production (Category 44)	53,000 tpa	No change	53,000 tpa
Ministerial Statement 813			
Wood for Charcoal	110,000 tpa	No change	110,000 tpa
Kemerton Smelter Furnaces	4 x submerged electric arc furnaces	No change	4 x submerged electric arc furnaces
Off-gas Cleaning Plant (Baghouses)	One large baghouse with stacks One large baghouse without stacks	No change	One large baghouse with stacks One large baghouse without stacks
Water Consumption (Groundwater)	312,000 kL per annum (Kemerton Smelter)	No change	312,000 kL per annum (Kemerton Smelter)
Total area of disturbance	Clearing of no more than 25 ha of native vegetation within a disturbance footprint of not more than 93 ha (Moora Mine)	Clearing of no more than 17.12 ha of native vegetation within a 44.59 ha disturbance footprint within 216.42 ha development envelope (North Kiaka DE)	Total combined clearing of no more than 42.12 ha of native vegetation within DE's of 309.42 ha, which consists of: - 26 ha clearing of native vegetation within a disturbance footprint of not more than 96 ha – Moora Mine - 17.12 ha of native vegetation within a disturbance footprint of not more than 44.59 ha - North Kiaka DE
Area of rehabilitation	All disturbed areas (Moora Mine)	All disturbed areas (North Kiaka DE)	All disturbed areas (Moora Mine and North Kiaka DE) excluding the pits and some roads will be rehabilitated in accordance with approved MCP
Depth of pit (Moora Mine)	Not more than 165 m RL	No change	Not more than 165 m RL SIMCOA intends to mine Main and West pits to a final depth of approximately 202 mAHD and 200 mAHD respectively
Depth of pit (North Kiaka DE)	n/a	n/a	Not more than 165 m RL
Water requirements (Groundwater)	250,000 kL per annum (Moora Mine)	No change	250,000 kL per annum (Moora Mine and North Kiaka DE)
Water source	Fractured Rock Aquifer (Moora Mine)	No change	Fractured Rock Aquifer (Moora Mine)
Water discharge	Discharge of up to 122,000 kL per annum of dewatered groundwater via Kiaka Creek to	No change	Discharge of up to 122,000 kL per annum of dewatered groundwater via Kiaka Creek

Element	Authorised Extent	Change in extent	Combined Extent (Moora Mine, Kemerton Smelter and the Project)
	the Conderoo River wetlands (Moora Mine)		to the Conderoo River wetlands (Moora Mine)
Dewater discharge pipeline	Dewater discharge pipeline routed along an existing access road (Moora Mine)	No change	Dewater discharge pipeline routed along an existing access road (Moora Mine)

1.1.2.3 Revised Proposal greenhouse gas emissions

Kemerton Smelter commenced operation in 1989 following approval of mining at Moora Mine. Environmental approval to construct and operate Kemerton Smelter under Part IV of the EP Act is approved under Ministerial Statement 813 (MS 813). Kemerton Smelter is authorised under MS 813 to produce up to 64,000 tpa of silicon from four (4) submerged electric arc furnaces. Under Licence No. L6341/1988/10, the Smelter is authorised to produce up to 53,000 tonnes per annum (tpa) of silicon. The current licence is valid to 12 October 2026 and SIMCOA will seek to amend the operating licence to extend its operation once Ministerial approval of the Revised Proposal is granted.

Implementation of the Revised Proposal will not result in changes to:

– Crushing and screening (throughputs and outputs) (Plant located at Moora Mine)
– Smelter (throughputs and outputs) (Plant located within the KSIA)
– Quality of input and output materials (at either the crushing plant or Kemerton Smelter)
– No significant variation from current emissions of the discharges/emissions at Kemerton Smelter (which include saline water, air emissions [PM, PM^{10}, sulfur dioxide, NOx, carbon monoxide and CO_2])
– Impacts to the receiving environment from operation of the crushing plant and Kemerton Smelter, with the exception of the life of the facilities being extended.

In the absence of specific guidance on how to assess GHG emissions within cumulative impact assessments (CIA), the approach adopted in this ERD is in accordance with the EPA's *Environmental Factor Guideline for Greenhouse Gas Emissions* (EPA, 2023a). As per the amended GHG Factor Guideline, GHG emissions from a proposal are generally assessed where they exceed 100,000 tCO_2-e per annum Scope 1 emissions (as per the Safeguard Mechanism threshold). At the request of the EPA, estimates of Scope 1, 2 and 3 emissions directly attributable to all activities of the Revised Proposal are shown in Table 1.7 and have been included in the detailed assessment of greenhouse gas emissions for this ERD (Section 6.70).

The Revised Proposal is not expected to significantly contribute to Western Australia's GHG inventory, when compared to the existing emissions (largely generated by Kemerton Smelter).

Table 1.8 shows the construction emissions for the Project. Scope 1 operational emissions generated by the Project are estimated at 1,546 tCO_2-e as shown in Table 1.7, however the current combined GHG emissions exceed the minimum threshold and therefore will be assessed alongside the proposed emissions generated by the Project.

Table 1.7 The Revised Proposal operational GHG emissions (GHD, 2023a)

Parameter	The Project	Kemerton Smelter
Total Scope 1	**1,546**	**123,454**
Total Scope 2	**N/A**	**300,024**
Total Scope 3	**11,842**	**681,680**
Total Scope 1, 2 and 3	**13,388**	**1,105,157**

At the request of the EPA, estimates of Scope 1, 2 and 3 emissions directly attributable to all activities of the Revised Proposal are shown in Table 1.7 and have been included in the detailed assessment of greenhouse gas emissions for this ERD (Section 5.80).

The Revised Proposal is not expected to significantly contribute to Western Australia's GHG inventory, when compared to the existing emissions (largely generated by Kemerton Smelter).

Table 1.8 The Project Scope 1 and Scope 3 construction GHG emissions (GHD, 2023a)

Parameter	UoM	The Project (construction)
Scope 1		
Total Scope 1	**tCO2-e**	**2,168**
Scope 3		
Total Scope 3	**tCO2-e**	**3,653**
Total Scope 1 and 3	**tCO2-e**	**5,821**

Based on the above justification, the Cumulative Impact Assessment for the Revised Proposal (Section 5.9.9) has also considered GHG emissions generated from extending the operational life of the crushing plant and Kemerton Smelter through the construction and operation of the Project.

1.1.2.4 Land tenure and ownership

The Moora Mine and North Kiaka DE are located in the Shire of Moora approximately 15 km north of the town of Moora (Figure 1.2). North Kiaka DE is located entirely within tenement M70/1292, however ore will continue to be pre-processed at the crushing and screening plant operating within tenement M70/191 at the Moora Mine. SIMCOA is the registered tenure holder of M70/1292 and M70/191, the registered landowner of M70/191, and has land-owner agreements in place to undertake the proposed activities within M70/1292.

Mining Lease Agreements from the DMIRS Resource and Tenure Division, and the Land Access Agreement for M70/1292 are provided in Appendix B. Kemerton Smelter is located within KSIA in the Shire of Harvey. Table 1.9 and Table 1.10 provide a summary of land tenure and ownership for the SIMCOA'S sites within Western Australia.

Table 1.9 Land ownership (North Kiaka DE and Moora Mine)

Tenement	North Kiaka DE and Moora Mine	Lease holder	Landowner
M70/1292	North Kiaka DE	SIMCOA Pty Ltd	A.R. Tonkin; R.J. Tonkin, B.T. Tonkin (SIMCOA has a Land Inclusion Approval Letter)
M70/191	Moora Mine	SIMCOA Pty Ltd	SIMCOA Pty Ltd
G70/91	Moora Mine	SIMCOA Pty Ltd	SIMCOA Pty Ltd
G70/92	Moora Mine	SIMCOA Pty Ltd	SIMCOA Pty Ltd
G70/93	Moora Mine	SIMCOA Pty Ltd	SIMCOA Pty Ltd

Table 1.10 Land ownership (Kemerton Smelter)

Lot on Plan	Kemerton	Lease holder	Landowner
Lot 5548 on deposited plan 188561	Kemerton Smelter	SIMCOA Pty Ltd	SIMCOA Pty Ltd
Lot 5549 on deposited plan 188562	Non-operation areas (Bushland)	SIMCOA Pty Ltd	SIMCOA Pty Ltd

1.1.2.5 Revised Proposal timing

SIMCOA propose to commence development of the Revised Proposal with minor and preliminary works in late 2023, once all necessary approvals are issued. Initial works at North Kiaka DE include preliminary earthworks on cleared agricultural land to establish the easement (haul road) and laydown areas. Clearing of native vegetation in the North Kiaka DE will occur progressively as the resource is mined. The construction of the abandonment bund at Moora Mine is anticipated to commence once mining is complete and remain in place post operations in accordance with the Mine Closure Plan

The operational life of Moora Mine and Kemerton Smelter will be extended by approximately 18 years, depending on resource demand and availability.

Table 1.11 outlines indicative timing for development and operation of the Revised Proposal.

Table 1.11 The Revised Proposal timing

Phase	Anticipated Timing
North Kiaka Mine	
Construction	Dec 2023
Commissioning	2023-24
Operation to commence	2024
Period of operation	18 years
Decommissioning	2042
Moora Mine – Abandonment bund	
Construction	On completion of mining at Moora Mine
Moora Mine	
Operations	Extend from 2025 to 2042
Decommissioning	2042
Kemerton Smelter	
Operations	Extend from 2026 to 2042
Decommissioning	2042

1.1.2.6 Proponent information

SIMCOA Operations Pty Ltd is the proponent for the Revised Proposal. Details of the key proponent contact are provided in Table 1.12.

Table 1.12 Proponent details

CAN	009 064 653
ABN	42 009 064 653
Address	973 Marriott Road, Wellesley, WA, 6233
Primary contact	Anne Price Environmental Specialist Email: AnnePrice@simcoa.com.au

1.2 Proposal alternatives

1.2.1 No development alternative

SIMCOA is Australia's only silicon manufacturing company. A 'no development' alternative for the Project would require SIMCOA to cease operation of Kemerton Smelter once the quartzite resource at Moora Mine has been exhausted or would require quartzite to be purchased from other miners. SIMCOA estimates that approximately seven years of resource remains at Moora Mine, assuming all relevant approvals are granted for SIMCOA to mine below the water table (DMIRS approval pending).

Closure of Kemerton Smelter would result in a loss of associated economic, social and employment opportunities to the local area and WA more broadly, and a need to import silicon to support manufacturing in Australia. Geoscience Australia (2023) listed silicon as one of Australia's 26 critical minerals essential for modern technologies, economies or national security, with a supply chain at risk of disruption.

Development of the Revised Proposal will enable SIMCOA's operations to be extended a further 18 years.

1.2.2 Selection of proposed site

Quartzite mineral (the resource) is uniquely associated with the Noondine Chert geological formation. The Noondine Chert (previously Coomberdale Chert), outcrops are located across a 150 km stretch between

Moora and Three Springs in Western Australia, as north-north-west trending parallel ridges elevated approximately 75 m above the adjacent valleys.

Consequently, the North Kiaka DE location is restricted to the Noondine Chert geological formation and has been selected based on proximity to Moora Mine, to enable SIMCOA to continue to use the existing crushing and screening plant at Moora Mine, thereby minimising new (additional) disturbance.

1.2.3 Reduction in the size of the original footprint

SIMCOA originally intended to include additional mine pits east of the current North Kiaka DE, hence baseline surveys were undertaken of a larger area than the current DE and align with the original DE boundary. However, land access agreements could not be secured with landowners east of the North Kiaka DE, hence the DE boundary was reduced to exclude Lot on Plan P003006 M572. The North Kiaka DE (216.42 ha) and Disturbance Footprint (44.59 ha) have been considerably reduced in size from the original proposed area (518.18 ha aligning with tenure M70/1292).

The primary land use of the region is broad-acre agriculture; hence remnant vegetation is primarily restricted to rocky outcrops of the Noondine Chert geological formation and road reserves. Native vegetation established in association with Noondine Chert formation has been found to represent the Threatened Ecological Community (TEC) “Heath dominated by one or more *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomberdale Floristic Region”. The TEC has been confirmed within the North Kiaka DE. Due to the nature of this TEC and its unique association with the Noondine Chert formation, moving the North Kiaka DE to another location would not avoid impact to this TEC.

Development of the Revised Proposal will impact <1% of the Noondine Chert Formation and approximately 4.02% of the total recorded Coomberdale TEC [core and buffer vegetation associations]. An assessment of potential environmental impacts is provided in Section 5.

1.2.4 Site layout

The North Kiaka DE is 216.42 ha, and includes a disturbance footprint of up to 44.59 ha necessary to establish the:

– open-cut mine pit
– waste rock dump (WRD)
– support infrastructure, and
– connecting haul roads.

As far as practicable, the North Kiaka Disturbance Footprint (DF) has been designed to avoid direct impacts to vegetation, by locating associated infrastructure within existing cleared areas (Figure 1.2). Accordingly, native vegetation clearing will be up to 17.12 ha and is only required to develop the mine pit and a small portion of the adjoining haul road and infrastructure area. The disturbance footprint for the Project remains unchanged from the area proposed in the s38 referral. The construction of an abandonment bund at Moora Mine as described in the s43A amendment to the Revised Proposal requires a minor increase in both the development footprint and clearing area. This will result in an increase in the development footprint from 137.59 ha to 140.59 ha and an increase in the maximum permitted clearing area from 42.12 ha to 43.12 ha.

Further, the use of existing facilities at Moora Mine (i.e. crushing and screening plant, laydown areas and access roads) and existing infrastructure at Kemerton Smelter further minimises the requirement for disturbance within M70/1292.

1.3 Local and regional context

The Revised Proposal is located within the Shire of Moora (proposed North Kiaka mine and existing Moora Mine) and within Kemerton Strategic Industrial Area (KSIA) within the Shire of Harvey (existing Kemerton Smelter). The climate is characterised as Mediterranean, with cool wet winters and hot, drier summers. Approximately half of the observed rainfall occurs within the winter months. As the Revised Proposal only includes an extension of the operational life of Kemerton Smelter further studies on the biological and physical characteristics of this aspect have not been considered further. The section below provides a summary of the local and regional context for North Kiaka DE and Moora Mine.

The key landform is the Noondine Chert Formation, which outcrops as north-north-west trending parallel ridges, elevated approximately 75 m above the adjacent valleys. The Noondine Chert (previously Coomberdale Chert), outcrops across a 150 km stretch between Moora and Three Springs. SIMCOA currently and propose to mine the quartzite mineral resource present in the Noondine Chert, which occurs as unweathered and massive dolerite/quartzite intrusions.

North Kiaka and Moora Mine are located within the Moore River catchment and Coonderoo / Marchagee sub-catchment. The major drainage lines within the catchment include the Moore River, the Coonderoo River and Gingin Brook (Department of Agriculture 2002). Drainage occurs via Pyre Brook Creek (approximately 4 km north of the North Kiaka DE), Kyaka Brook (located on the southern boundary of the North Kiaka DE) and their tributaries into the clay pans and samphire flats of the Coonderoo River (Saprolite Environmental, 2012).

Kyaka Brook extends east and north of the North Kiaka DE, flowing in a north-west direction where it terminates in the Coonderoo River Wetlands. The Brook has a well-defined course with banks up to a meter deep. Water flows are seasonal and episodic, characterised by fast flowing water and short-lived pools (Actis, 2011).

There are no Ramsar listed or nationally important wetlands occur within or in close proximity to North Kiaka or Moora Mine. The Coonderoo River Wetlands is a historic saline wetland system located approximately 4.5 km north-west of the North Kiaka DE.

The main groundwater aquifer in the region is hosted by the Noondine Chert, which is extensively fractured and cavernous, typically providing high bore yields. Local groundwater is used to supply the townships of Moora and Watheroo.

Interim Biogeographic Regionalisation for Australia (IBRA) mapping confirms the North Kiaka DE and Moora Mine DE are in the Avon Botanical Subdistrict of the South-West Botanical Province. The area around North Kiaka and Moora Mine has been historically disturbed, with approximately 68.7% of the North Kiaka DE already cleared for agricultural purposes. Areas of remnant native vegetation are generally not fenced off from paddocks where stock, predominantly sheep, graze. The lower lying areas have been cleared, with native vegetation replaced with introduced grasses. Native vegetation has been retained on areas of rocky outcrops and the surrounding area supports agricultural land uses.

Where present the native vegetation communities are diverse, containing the Threatened Ecological Community (TEC) 'Heath dominated by one or more *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomberdale Floristic Region' (Coomberdale TEC - CR) and Threatened and Priority flora species. These areas also provide habitat for Threatened fauna species, such as Carnaby's Black Cockatoo and short-range endemic invertebrates.

2. Legislative context

2.1 Environmental Impact Assessment Process

2.1.1 *Environmental Protection Act 1986*, Part IV

Part IV of the EP Act is the primary legislation governing environmental protection and impact assessment in Western Australia (WA). Division 1 of Part IV of the EP Act provides for the referral and assessment of significant or strategic proposals. SIMCOA referred the North Kiaka Project in November 2021 to the WA Environmental Protection Authority (EPA) under s38 of the *Environmental Protection Act 1986* (WA) (EP Act). The purpose of that document was to provide information supporting the s38 referral application and is hereafter referred to as the Supporting Document. The Supporting Document was prepared in accordance with the EPA *Instructions: Referral of a proposal under section 38 of the Environmental Protection Act 1986* (EPA, 2021d). Assessment of impacts for North Kiaka were undertaken in accordance with the EPA *Statement of Environmental Principles, Factors, Objectives and Aims of EIA* (EPA, 2023b), and relevant technical guidance for identified preliminary environmental factors.

Following referral to the EPA Services (CMS 18097), the decision to assess was determined on 29 July 2022, with the level of assessment set at *"referral information with additional information (required under s. 40(2)(a) of the Environmental Protection Act 1986) and public review (2 weeks)".* A Notice Requiring Information for Assessment (the Notice) was issued by the EPA on 15 August 2022 under Section 40(2)(a) of the EP Act (EPA, 2022). As development of the resource at the North Kiaka will extend the operational life of Moora Mine (with respect to crushing and screening) and Kemerton Smelter (with respect to processing) (both currently approved under MS 813), the EPA is considering the referral as *"an amendment to an existing approved proposal under s40AA of the EP Act"*.

Accordingly, the EPA has requested the preparation of an Environmental Review Document (ERD, this document) in accordance with the following guidance:

– EPA Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual
– EPA Statement of environmental principles, factors, objectives and aims of EIA
– EPA Template: How to prepare an Environmental Review Document
– EPA Template: How to identify the content of a proposal
– EPA Instructions: Framework for environmental considerations in EIA
– EPA Interim Guidance: Environmental outcomes and outcomes-based conditions.

The EPA requested that the Revised Referral Information should consider potential impacts in the context of both the existing approved proposal as well as the referred proposal. This ERD has considered the potential impacts extending the life of mine may have at SIMCOA's Kemerton Silicon Smelter.

The revision of the Supporting Document and preparation of this ERD has been to address requirements of the Notice as well as requirements noted in subsequent correspondence with the EPA including:

– Additional information as requested in the Notice for two key environmental factors for the Proposal:
  - Flora and Vegetation; and
  - Terrestrial Fauna.
– Consideration of potential environmental impacts in the context of both the Approved Proposal (Moora Mine and Kemerton Smelter) as well as the Proposal (North Kiaka)
– Addition of Greenhouse Gas as a key environmental factor for the Revised Proposal (North Kiaka, Moora Mine and Kemerton Smelter)
– Addition of Air Quality as a key environmental factor for the Revised Proposal (North Kiaka, Moora Mine and Kemerton Smelter)
– Social Surroundings included as a Key Environmental Factor relevant to the Approved Proposal (Kemerton Smelter and Moora Mine) in addition to North Kiaka
– Review of approved MS 813 implementation conditions to assess adequacy and consideration of whether conditions need revising as part of the significant amendment application.

– Review of EPA Guidance and Procedures for further information regarding information requirements for '*significant amendments to an approved proposal'*.

In 2022, SIMCOA received advice from the Department of Mines, Industry Regulation and Safety (DMIRS) that construction of an abandonment bund for the Moora Mine pits would be required prior to granting approval to mine below the water table. At that time SIMCOA was advised by the EPA that the change to the approvals would be through the submission of a Section 45C (s.45C) application to the EPA. The s45C was submitted on the 22 Dec 2022 to amend the existing proposal and allow the abandonment bund to be built around Moora Mine pit. Subsequently, the EPA advised via email on the 24 March 2023 that SIMCOA should submit a s.43A application to amend the Revised Proposal (to reflect the construction of the abandonment bund). A s.43A (submitted 04 May 2023) revised the Moora Mine Disturbance Footprint and the authorised extent of disturbance and clearing in the key characteristics table to enable an abandonment bund to be constructed at Moora Mine around the existing open pits at closure.

The s43A was developed using EPA guidance including:

– *Request to amend a proposal during assessment under section 43A of the Environmental Protection Act 1986 – Instructions*
– *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual*.

The Revised Proposal assessed in this ERD considered the impacts of the Approved Proposal (Moora Mine and Kemerton Smelter (approved under MS 813), the Project (referred under s.38 on 03 November 2021) and the s.43 A amendment for the abandonment bund).

2.1.1.1 Pre-referral discussions with EPA

The s38 Referral and Supporting Document for the Proposal (GHD 2021, Rev-0) was submitted to the EPA on 03 November 2021. On 09 March 2022 the EPA requested that SIMCOA provide a Proposal Content Document (PCD) to enable the Proposal to be advertised. The PCD was issued to the EPA on 22 March 2022.

On the 10 May 2022 the EPA issued a notice requesting further information to assess the Proposal. The s38 Referral Supporting Document was revised to address the information request from the EPA and Rev-1 was submitted on 22 June 2022, with a revised application form submitted on 28 July 2022.

Following the EPA's decision on the level of assessment for the Proposal (dated 29 July 2022), and issue of a Notice requiring further information (dated 15 August 2022), GHD and SIMCOA met with the EPA on 16 September 2022. This meeting was intended to confirm the additional studies likely to be required to support the assessment of key environmental factors for the existing Approved Proposal (Kemerton Smelter and Moora Mine) in addition to those already submitted for the Proposal (hereafter referred to as the Project).

The advice from the EPA following this meeting was that a Greenhouse Gas Management Plan (GHGMP) was required for the Revised Proposal (the Project, Moora Mine and Kemerton Smelter) to enable the EPA to consider the combined environmental impacts the Revised Proposal may have on GHG emissions.

Following submission of the s.38 application to the EPA, SIMCOA received advice from the Department of Mines, Industry Regulation and Safety (DMIRS) that construction of an abandonment bund for the Moora Mine pits would be required.

It was then advised by the EPA that the change to the approvals would be through the submission of a Section 45C (s.45C) application to the EPA. The s45C was submitted on the 22 Dec 2022 to amend the existing proposal and allow the abandonment bund to be built around Moora Mine pit.

Subsequently, the EPA advised via email on the 24 March 2023 that SIMCOA should submit a s43A application to amend the Revised Proposal (CMS18097) to reflect the construction of the abandonment bund and withdraw the s.45C application. The s.43A was submitted on the 04 May 2023 with an updated set of spatial data and updated PCD provided on 11 and 23 May 2023 respectively.

The Draft ERD was submitted to the EPA for review on 6 July 2023 and was provided to the DMA's for review and comments. A meeting with the EPA was held on 8 December 2023 to discuss the RFI's received prior to the formal notification and 7 February 2024 to discuss the responses to the RFI.

2.1.1.2 Information request 2022

In July 2022, in accordance with s.40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of the Project (EPA, 2022b) .

Information provided in the s.38 referral has been updated based on the EPA's additional information request (EPA 2022) and the notes from the meetings between SIMCOA, GHD and the EPA (29 April 2022 and 16 September 2022) as referenced in Table 12.2 in Appendix A.

2.1.1.3 Information request 2023

In December 2023, in accordance with s.40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of the Project (EPA, 2023d) .

Information provided in the s.38 referral has been updated based on the EPA's additional information request (EPA 2022) and the notes from the meetings between SIMCOA, GHD and the EPA (29 April 2022 and 16 September 2022) as referenced in Table 12.1 in Appendix A. The ERD also includes information addressing the latest RFI from the EPA received on 8 December 2023 following the submission of the draft documentation to DMA's (EPA, 2023d).

Existing conditions of MS 813 have been reviewed to make sure they are contemporary and updated to include conditions specific to the Project as shown in

Table 12.3 in Appendix A. The amendments to the document will be progressed using the *EPA Guidance and Procedures* to guide the information requirements for 'significant amendments to an approved proposal'.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, actions that have, or are likely to have, a significant impact on MNES, require approval from the Australian Government Minister for Environment. The Minister will decide whether a proposal constitutes a 'controlled action' which requires assessment and approval under the EPBC Act.

The Project (proposed action) was referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE, now Department of Climate Change, Environment, Energy and Water (DCCEEW)) in November of 2021 and on 23 December 2021, it was determined to be a controlled action, requiring assessment and approval under the EPBC Act due to impacts on '*listed threatened species and communities'* (EPBC Reference No. 2021/9089). The proposed action is considered likely to have a significant impact on the following matters of national environmental significance (MNES): 'Listed threatened species and communities' protected under s18 and s18A of the EPBC Act (refer to Section 1.1.1). The Project will be assessed by way of an accredited assessment under the EP Act. Correspondence regarding this assessment process have been included in Appendix V.

The impacts related to the construction of the abandonment bund and continuation of activities at Moora Mine and Kemerton Smelter which are contained in the Revised Proposal will not impact on MNES. Consideration of the Project's impact on MNES is discussed further in Section 9.

2.2 Mining Act 1978

DMIRS regulates mining activity in WA and is responsible for administering the *Mining Act 1978* (Mining Act). The Mining Act requires proponents to submit a Mining Proposal (MP) and Mine Closure Plan (MCP) for assessment and approval before mining and related activities can commence.

Prior to the inception of MPs, Notices of Intent (NOI) were submitted to seek approval for mining related activities. Table 2.1 provides a summary of the NOI held by SIMCOA for Moora Mine.

A MCP was originally developed for the Project in 2012 to comply with conditions associated with mining tenement M70/191. This 2012 MCP is approved by DMIRS and is currently being complied with by SIMCOA at the Moora Mine. The 2012 MCP was subsequently updated in 2015 and submitted to DMIRS in February 2016. This MCP was rejected by DMIRS for a number of reasons.

SIMCOA subsequently submitted an updated MCP in 2018 which included addressing the DMIRS comments received on the 2015 report. Although DMIRS has did not formally approve or reject the 2018 MCP, they have reviewed it and provided feedback to Simcoa.

SIMCOA will submit an updated MCP in 2023 address the comments received from DMIRS from the 2018 MCP. This updated MCP will include the information required by DMIRS to approve mining below the water table, which is anticipated to extend the Life of the Moora Mine extraction by approximately seven years. Attachment 2 to Ministerial Statement 813 provides information on the EPA approval of mining to 165 mRL (below the water table) and dewatering and discharge of up to 122,000 kL per annum of dewatered groundwater via Kiaka Creek to the Conderoo River wetlands. This extension of the LOM of Moora Mine is to provide ore for processing whist the requisite approvals are being obtained to construct the Project.

The Project will need to be assessed and approved by DMIRS prior to SIMCOA commencing ground disturbing activities. Hence, SIMCOA intend to submit an amended MP and MCP to include operations for the Project to DMIRS for assessment, whilst the Revised Proposal is being assessed by the EPA. Once Ministerial approval has been issued, DMIRS can make their final decision on a combined MP and MCP for SIMCOA operations.

Table 2.1 Notices of Intent for the Moora Quartzite Mine

Time	1987	1992	2001
Tenure	M70/191	M70/191 (note G70/91, G70/92, G70/93 were granted prior to the NOI for use for stockpiling)	M70/191, G70/91, G70/92, G70/93
Scope	Proposed to develop separate small pits to access the resource. clearing area not specified.	Includes revised mine plan for a large open pit and new west waste dump (8.75 ha of pasture) and future development. 6 ha of native vegetation clearing was included.	5 ha of native vegetation clearing for Development of the West Pit. Additional haul roads to waste dumps and plant included utilising existing tracks where feasible. No clearing required for roads. Application noted 23 ha of native vegetation cleared since 1988.
	Extraction of approximately 100,000 tpa of ore.	Increased depth of pit to 165 mRL to access resources below the water table.	Extension of the West waste dump to the south. Final dump height of 265 mRL. Use of waste dumps to the south west and north of the West Pit also included within existing cleared area.
	Establishment of two groundwater abstraction bores to supply the operation	Increased ore production of 135,000 tpa	Mining above the water table (20 m depth) to 212 mRL
	Crushing and screening plant on site.	10 - 20 year resource	Pit resource of approximately 10 years above the water table.
		Disturbance of an Aboriginal Heritage Site (consent granted under Section 18 of the *Aboriginal Heritage Act 1972*	No additional support facilities required.

2.3 Silicon (Kemerton) State Agreement Act 1987

SIMCOA operates under the *Silicon (Kemerton) State Agreement Act 1987* (hereafter referred to as the State Agreement). The State Agreement ratifies the agreement between the State of WA and the proponent (SIMCOA) to establish a Smelter to manufacture silicon. Kemerton Smelter was defined as having charcoal production facilities, submerged arc electric furnaces and associated ancillary plant and buildings. The State Agreement also identified that Kemerton Smelter would be used for the conversion of silica or other silicon bearing material to chemical and/or metallurgical grade silicon with a production capacity of not less than 20,000 tpa of silicon.

While the State Agreement does not specifically identify the Moora Mine it does refer to the Mining Lease M70/191 and any mining lease or leases granted in respect of lands subject to Prospecting Licences. Where SIMCOA plans to significantly modify, expand or otherwise vary its activities, from those specified in approved proposals, notice shall be submitted to the Minister for State Development, Jobs and Trade.

The scope of current operations at Moora Mine and Kemerton Smelter has been detailed in previous proposals and notices to the Minister. However, Clause 8 (Additional Proposals) of the State Agreement identifies requirements in relation to changes to the approved operations:

> *"If the Company at any time during the continuance of this Agreement desires to significantly modify expand or otherwise vary its activities carried on pursuant to this Agreement beyond those specified in the approved proposals or to mine minerals from the Mining Lease or the Prospecting Licences in addition to silica or to mine silica for the project from other than the Mining Lease or Prospecting Licences it shall give notice of such desire to the Minister and if required by the Minister within two months of the giving of such notice shall submit to the Minister within such period as the Minister shall reasonably allow detailed proposals in respect of all matters covered by such notice and such of the other matters mentioned in paragraphs (a) to (i) of subclause (1) of Clause 5 and where minerals other than silica are the subject of the proposals specifying those other minerals and the proposed mining methods and other relevant information as the Minister may require."*

Therefore, to meet the requirements under the State Agreement the Minister must be notified of the proposed mine development within M70/1292. SIMCOA advised the Minister about the North Kiaka Project on 14 June 2023. In accordance with the State Agreement, the Minister may request that a detailed proposal is prepared for assessment.

2.4 Rights in Water and Irrigation Act 1914

DWER issues licences and permits under the *Rights in Water and Irrigation Act 1914* (RiWI Act) to take water (from a watercourse, well, and/or underground source), construct wells (commence, construct, enlarge, deepen or alter wells, bores and soaks) and interfere with the bed and banks of a watercourse or wetland.

Moora Mine has authorisation under GWL 104693(6), to abstract groundwater from the fractured rock aquifer located in the vicinity. The groundwater licence authorises SIMCOA to use this water on mining lease M70/191 (Moora Mine). SIMCOA will seek an amendment to this licence to also use the abstracted groundwater on tenement M70/1292 (the Project). The approved abstraction volume (250,000 kL/yr) is expected to provide sufficient water for dust suppression within the North Kiaka DE, as well as continuing dust suppression at Moora Mine.

If additional water (or a more localised source of water) is required in the future, SIMCOA will seek the necessary approvals under the RiWI Act to construct a new well within SIMCOA's Moora tenements for the abstraction of groundwater.

2.5 Environmental Protection Act 1986, Part V

Part V of the EP Act requires that the construction and operation of prescribed premises (described in Schedule 1 of the Environmental Protection Regulations 1987 (EP Regulations)) are authorised through Works Approvals and Licences. Works Approvals and Licences are the key statutory tools that DWER use to regulate industry in WA and are intended to prevent pollution during both the construction and operational phases.

The following DWER licences are currently approved for the Approved Proposal:

– Moora Mine is authorised to operate the wet crushing and screening plant in accordance with L6149/1988/8:
  - *Category 5*: *Processing or beneficiation of metallic or non-metallic ore*
    – Assessed production capacity: 160,000 tonnes per annual period
  - The licence was renewed in October 2021 and is valid until 2032.
– Moora Mine has a Works Approval (W6391/2020/1) to undertake mine dewatering:
  - *Category 6: Mine dewatering: premise on which water is extracted and discharged into the environment to allow mining of ore*
    – Assessed production capacity: 25,000 tonnes per year
  - The Works Approval is valid to August 2025
– The Kemerton Smelter is authorised undertake the following in accordance with L6341/1988/10:
  - *Category 37: Char manufacturing: premises on which wood, carbon material or coal is charred to produce a fuel or material of carbonaceous nature or of enriched carbon content*
    – Assessed production capacity: 26,000 tonnes per year
  - *Category 44: Metal smelting or refining: premises on which metal ore, metal ore concentrate, or metal waste is smelted, fused, roasted, refined or processed*
    – Assessed production capacity: 53,000 tonnes per year
  - This licence is valid until 2026.

The throughput of the wet crushing and screening plant will not increase as a result of the Revised Proposal (even during periods where Moora Mine and the Project are operating concurrently). Consequently, there is no requirement for SIMCOA to seek an amendment to the L6149/1988/8 licence, other than to extend the licence duration (assuming operations at the Project commence in 2024 with an 18 year LoM). Following closure of Moora Mine, the plant will remain at Moora Mine and ore will continue to be transported from North Kiaka DE to Moora Mine for crushing and screening.

2.6 Other legislation and regulations

Table 2.2 provides a summary of other approvals required to develop and operate the Revised Proposal, the relevant legislation, and the associated decision-making authorities (DMA's).

Table 2.2 Other approvals / decision making authorities (DMAs)

Decision-making authority	Legislation or Agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment
Minister for Environment	*Environmental Protection Act 1986* (WA) *Biodiversity Conservation Act 2016* (WA)	Part IV EP Act. State approval to impact EPA Environmental Factors Licence to take and modify.	Yes: Environmental impacts are considered through the assessment process to determine the acceptability of the Revised Proposal. Yes: The authority to issue a license to take (flora and fauna) under s40 of the BC Act and modify a TEC under s45 of the BC Act is assessed to determine whether the impact to the species or community will result in a significant impact.
Minister for Water	*Rights in Water and Irrigation Act 1914* (RiWI Act)	Licence to construction well (26D) and Licence to abstract water (5C).	Yes: Approved volume of water for abstraction will be monitored to prevent exceedances.
Minister for Aboriginal Affairs, DPLH	*Aboriginal Heritage Act 1972*	The Revised Proposal will not directly impact known Aboriginal heritage sites or places. If a potential new Aboriginal heritage site is uncovered during ground disturbing works	Yes: Potential impacts are managed under Section 18 of the AH Act. SIMCOA will develop a management plan (where required) describing the ongoing management of cultural heritage.

Decision-making authority	Legislation or Agreement regulating the activity	Approval required	Whether and how statutory decision-making process can mitigate impacts on the environment
		activities will be halted, advice sought, and a survey completed	
Commonwealth Minister for Climate Change, Environment, Energy and Water (DCCEEW)	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	EPBC Act. Commonwealth approval to impact MNES	Yes: Environmental impacts to Matters of National Environmental Significance are considered through the assessment process to determine the acceptability of the Revised Proposal.
Chief Executive Officer, DWER	*Environmental Protection Act 1986* (WA)	Part V EP Act. Works Approval (WA)	Yes: Environmental impacts are considered through the assessment process to determine the acceptability of the Revised Proposal.
DMIRS	*Mining Act 1978* (WA) *Mines Safety and Inspection Regulations 1995* (WA) *Dangerous Goods Safety Act 2004* (WA)	Mining lease under Section 71. Mining Proposal (MP) and Mine Closure Plan (MCP) under Section 82A(2). Approval of the Project Management Plan under Regulation 3.13.	Yes: Land use activities compliant with land tenure requirements under the *Mining Act 1978*. Environmental management and mine closure requirements will be compliant with the *Mining Act 1978*. Yes: Environmental impacts are considered through the assessment process to determine the acceptability of the Project. The MP and MCP are instrumental in managing potential environmental impacts associated with the Project. The MP and MCP are progressive documents which are revised and updated as required. This enables DMIRS to assess new information and for SIMCOA to implement process or design improvements. Further, SIMCOA is required to provide an Annual Environmental Report to DMIRS which includes details of clearing, disturbance and rehabilitation.
Shire of Moora	Local Planning Scheme	Development Application	Yes: Social and environmental impacts are considered through the assessment process to determine the acceptability of the Project.
DWER Shire of Moora Department of Health (DoH)	*Environmental Protection Act 1986* (WA) *Health Act 1911* *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974* *Code of Practice for Product Approval of Onsite Wastewater Systems 2013*	Approval for wastewater treatment and/or disposal (in-situ)	Yes: suitability of wastewater treatment and/or disposal design will be assessed in accordance with legislation, regulations, and code of practice / guidelines, giving regard to potential environmental impacts.
Minister for State Development, Jobs and Trade	*Silicon (Kemerton) State Agreement Act 1987*	Notice of Intention	Yes: The Revised Proposal and ongoing production of silicon in Australia will be considered by the State for alignment with State policies and objectives

3. Stakeholder consultation

3.1 Key Stakeholders

The key stakeholders identified for the Revised Proposal are:

- Shire of Moora
- Moora (and surrounding rural) community
- Neighbouring rural landholders
- Yued Native Title Group via the South West Aboriginal Land and Sea Council
- Department of Jobs, Tourism, Science and Innovation (DJTSI)
- Department of Biodiversity Conservation and Attractions (DBCA)
- DMIRS
- Department of Planning, Lands and Heritage (DPLH)
- DWER (EPA Services, Regulatory Services, Water Services Units)
- DCCEEW (Federal)
- Moora Catchment Council
- Friends of the Moora Woodlands.

3.2 Stakeholder engagement process

SIMCOA is committed to ongoing consultation with the key stakeholder listed above and has developed and implemented an external stakeholder consultation strategy for ongoing social engagement and community investment.

The stakeholder consultation strategy adopted the principles from the Ministerial Council on Mineral and Petroleum Resources (MCMPR) Principles for Engagement with Communities and Stakeholders (2005). This includes:

- Open and effective communication:
- Two-way communication
- Clear, accurate and relevant information
- Timeliness
- Transparency, requiring a process for communication and feedback
- Collaboration, working cooperatively to seek mutually beneficial outcomes
- Inclusiveness, with the aim of recognising, understanding and involving stakeholders early and throughout the process
- Integrity, with engagement undertaken in a manner that fosters mutual respect and trust.

The outcomes of the consultation strategy are recorded in a Stakeholder Consultation Register. To date, consultation has predominately comprised of meetings and correspondence with State and Commonwealth Departments and Agencies, Local Government Authorities, non-government organisation and interest groups.

SIMCOA is committed to ongoing stakeholder identification, communication, engagement and consultation through the planning, approvals, construction, operation, and closure phases of the Revised Proposal.

3.3 Stakeholder consultation

Table 3.1 summarises the key stakeholder engagement undertaken to date, with the most recent at the top of the table.

SIMCOA will maintain on-going consultation with the Shire of Moora to discuss the safety and operational requirements of trucks crossing Kiaka Road transporting ore from North Kiaka DE to Moora Mine.

Table 3.1 Summary of key stakeholder consultation

Stakeholder	Date	Issues / Topics	Outcome
DCCEEW	22/2/2024	Discussion of topics in the RFI and the proposed SIMCOA responses	Additional information provided in the ERD regarding MNES
EPA / DWER	7/2/2024	Discussion of topics covered in the RFI and the proposed SIMCOA responses	A further meeting with DCCEEW required prior to EPA assessing the revised ERD.
Community Members Shire of Moora	14/12/2023	Community information session with an update on the project Shire of Moora update on the project	Feedback received from the community and the Shire
EPA/DWER	8/12/2023	Request for further information to be included in the Draft ERD submitted	SIMCOA has amended the document and provided responses to the RFI.
EPA / DWER	18/09/2023	Approval of s43A received 18.9.2023. The Revised Proposal under assessment by EPA will include the increased Moora Mine DF (96ha) and clearing area (26ha) required to construct the abandonment bund within EPA approved DE.	EPA noted that the ERD report and appendices have been provided to DMA's.
DCCEEW	9/6/2023	Email from DCCEEW regarding assessment of the Revised Proposal	Impacts from the Project could still be assessed through accredited assessment as part of the ERD for the Revised Proposal
DCCEEW	1/6/2023	Meeting to discuss the information required for assessment of changes to the impacts to MNES	Meeting with DCCEEW to discuss the Revised Proposal and any changes to the impacts to MNES
EPA / DWER	11/5/2023	Email from EPA that the DCCEEW are required to be separately consulted with regarding the amendments outlined in the s43A	Meeting scheduled for 1/6/2023
EPA / DWER	24/03/2023	Email clarification of what level of detail is to be provided in the S43A and how to separate from detail required in the ERD	The s43A application will address the proposed impacts from this increase in clearing area and development footprint on the total impacts from the Revised Proposal
EPA / DWER	15/03/2023	Meeting to discuss ERD progress Update on the information required to be included in the ERD DWER update of assessment timeframes Abandonment Bund Clarification that the abandonment bund application should be provided using S43A instead of S45C	A s43A Application will be required to construct the abandonment bund outside of the EPA approved Disturbance Footprint (as shown in Attachment 2 of MS813 – Figure 2)
EPA	16/09/22	Meeting to discuss requirements for Amendment to Existing Approved Proposal (s.40AA) GHD provides overview of recent milestones, overview of Kemerton Smelter, and impact of the Project on Approved Proposal (Moora Mine, Kemerton Smelter)	Proponent will need to identify preliminary key environmental factors relevant to Kemerton Smelter and Moora Mine. EPA comments on level of information required: EPA can confirm that a Greenhouse Gas Management Plan will be required and should be prepared in accordance with EPA draft review of Greenhouse Gas Factor Guideline Environmental Factor Guideline – Greenhouse Gas Emissions | EPA Western Other feedback from EPA:

Stakeholder	Date	Issues / Topics	Outcome
		GHD seeks clarification on the level of information required to support EIA for Moora Mine and Kemerton. EPA is not able to comment on future studies required until the revised Referral Information is assessed	Existing conditions of MS 813 will be reviewed and updated to include conditions specific to North Kiaka Proponent should refer to EPA Guidance and Procedures for further information regarding information requirements for 'significant amendments to an approved proposal'.
EPA	28/07/22	Meeting to discuss how EPA will assess formally (ARI) with North Kiaka considered a significant amendment Consider conditions and adapt (MS 813) DAWE EPA combined assessment	Key environmental concerns EPA has for this Proposal: Flora and vegetation: TEC Need a targeted DBCA TEC/ PEC Terrestrial fauna: SRE 1 new snail species and millipede species Genetic analysis of spider Black cockatoo: Desktop survey breeding and nesting CBC (12km of site) Social surrounds: Air quality Noise Heritage GHG Emission: Cumulative assessment (Smelter) 100k scope 1, 400k scope 2 (Synergy) GHGMP likely needed
EPA	29/04/22	Meeting to discuss how disturbance is occurring outside of the EPA approved disturbance footprint. EPA considers minor disturbance and don't expect a more recent survey will be required 45C will be required to construction bund outside of EPA approved footprint	New process for 45C DE boundary can be adjusted but should be enough to say to DMIRS that SIMCOA is not permitted to disturb outside the EPA approved footprint (as per MS) without a 45C There are conditions in the MS about not disturbing the TEC (so would be a breach of approval to do so) Following amendment of the footprint to accommodate the bund, shouldn't be any further queries from DMIRS on this. RFI focus will be on: DMA's and how they will manage in line with EPA objectives (NB: there is a guidance document available to assist with this) Cumulative impact assessment Missing discussion of current mine for impacts. GHG emissions EPA need to decide if the Project will stand alone or be assessed as an expansion of Moora Mine (TBC)
DWER EPA SU	28/06/18	Meeting to present the Proposal and initial assessment of potentially relevant factor requiring assessment (flora and vegetation, terrestrial fauna). Additional work required to determine whether Inland waters, Subterranean fauna and Social Surroundings (Aboriginal heritage) require assessment. Proposed based on limited number of relevant environmental factors the	EPA SU stated it is the EPA Board and not the EPA SU that are responsible for considering which factors would be relevant and the appropriate level of assessment. Providing details on status of offsets would be important to the level of assessment. Recommended that DBCA is contacted to confirm their continued support for proposed offsets associated with North Kiaka (and correspondence to this effect is sought). This correspondence along with previous correspondence from EPA and DBCA (or its predecessors) should be provided to EPA SU to confirm whether areas previously offset

Stakeholder	Date	Issues / Topics	Outcome
		Project could potentially be assessed at an "Assessment on Referral Information" (ARI).	are also applicable as an offset for North Kiaka (in addition to further offset areas). Proposal should be referred under the EPBC Act (Commonwealth) prior to being referred under the EP Act.
Yued Native Title Group	13/12/18	Stakeholder consultation As detailed in the *Aboriginal heritage survey for SIMCOA Operations Pty Ltd for the proposed North Kiaka Quartzite* (Brad Goode and Associates 2019) (Appendix P) SIMCOA consulted with the Yued Native Title Group briefing them on the Exiting Mine and the intention of SIMCOA to expand their operations with the development of the Project.	Moodjar trees are culturally significant to Aboriginal people due to their association with spirts of the deceased. The trees generally do not meet the DPLH criteria to be registered as an Aboriginal site as they have no myth regarding their significance is applicable to the species as a whole and therefore cannot be defined as a place to which the AH Act applies. The Moodjar trees also provide a key marker in the Noongar calendar. SIMCOA has noted the cultural significance of the trees and will, where possible, avoid disturbance to the trees and will engage Heritage Monitors to be onsite should impacts to any Moodjar trees be unavoidable.
EPA	12/08/20	Email notification of change to location of dewater discharge through a s.45C application (submitted January 2021)	EPA has acknowledged receipt. SIMCOA provided additional information (17/02/2021) in response to the EPA's request. Outcome pending.
DPLH	1/07/20; 14/08/20; 10/09/20; 11/09/20	Stakeholder consultation SIMCOA consulted with DPLH regarding Aboriginal heritage site ID 4605 'Kiaka Road Scarred Tree' the buffer of which included the proposed haul road crossing of Kyaka Brook and Kiaka Road.	The Aborigine Cultural Materials Committee reassessed ID 4605 (Kiaka Road Scarred Tree) and determined the Place no longer meets section 5 of the *Aboriginal Heritage Act 1974* (AHA). Review of the Aboriginal Heritage Inquiry System indicates the status of the site has been changed to "Stored data/Not a Site".
DMIRS	2/07/20	Meeting to present an update on SIMCOA Moora Mine and proposed North Kiaka operations. SIMCOA outlined the approvals obtained for Moora Mine, detailing the previous approvals included mining below the groundwater level; to develop North Kiaka DE (a greenfield operation) is located about 2 km north of Moora Mine. SIMCOA outlined that ore from North Kiaka DE will be trucked to Moora Mine for processing. This will require trucks to cross one Shire Road. SIMCOA queried whether the MP needed to include approval from the Shire.	DMIRS highlighted the North Kiaka Mining Proposal (MP) and Mine Closure Plan (MCP) are to be aligned to the DMIRS 2020 MP and MCP Guidelines. DMIRS recommended the Moora Mine MP and MCP should be updated to include the proposed North Kiaka DE, as this will allow the entire Project (Moora and North Kiaka) to operate under a single Mining Proposal and Mine Closure Plan. DMIRS could assess the MP concurrently with s38 approval; however, DMIRS is constrained from approving the MP until the s38 assessment process has been completed. DMIRS confirmed the MP does not need to include evidence of approval from the Site. However, the stakeholder register needs to reflect the engagement with the Shire.
Neighbouring rural landholder	9/06/20	Public Meeting to present current Moora Mine and proposed expansion of current operations with the development of North Kiaka. Overview of potential environmental impacts and proposed mitigation measures for the key environmental factors (i.e. flora, fauna, inland waters, noise, Aboriginal	No concerns regarding information presented at the public meeting information session. Requested ongoing updates (meetings/email correspondence) on progress of the project and land access.
Moore Catchment Council/ Friends of			Pleased to see progress on reserve expansion. Keen for more involvement by SIMCOA in education regarding the TEC, especially in regard to increasing awareness of Cairn Hill.

Stakeholder	Date	Issues / Topics	Outcome
the Moora Woodlands		heritage and transport of ore to Kemerton).	Moore Catchment Council/Friends of the Moora Woodlands has been seeking assistance and funding for several small projects, such as additional signage and help with maintenance of Cairn Hill access trails. SIMCOA are supportive of this and noted these are commitments already given to DBCA as part of an overall conservation package. Post meeting R. Walmsley alerted SIMCOA to a group of local Yued workers who collect seed and perform rehabilitation. SIMCOA appreciative of this and may be looking to utilize this service for future rehabilitation works. At the invitation of Moore Catchment Council/Friends of the Moora Woodlands, SIMCOA has committed to contribute, as a sponsor, to the September 2021 symposium on wheatbelt native vegetation.

4. Object and principles of the EP Act and EPBC Act

4.1 EP Act

Section 4A of the EP Act establishes the object and environmental principles of the Act. In accordance with the EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2023b) (EPA, 2023b). The objective of the EP Act is to protect the environment of the State through the application of five principles. Table 4.1 describes how each of the five principles have been applied to the Revised Proposal.

SIMCOA has demonstrated consideration of the object and principles of the EP Act throughout the life of the Revised Proposal. This includes implementing the mitigation hierarchy in assessing and managing environmental and social impacts.

Table 4.1 EP Act Principles

Principle	Consideration
1. The precautionary principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. 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.	Technical and scientific investigations have been undertaken for the development of the Revised Proposal. Specific studies for flora, fauna, water, noise, air quality and waste characterisation have supported SIMCOA's understanding of the existing and receiving environment. The information from these investigations have supported the development of this ERD. SIMCOA has evaluated potential environmental impacts and where impacts where identified, mitigation measures have been applied and the precautionary approach taken when the risk is uncertain. The mitigation approach has followed the hierarchy of avoid, minimise, rehabilitate and offset. As SIMCOA have been operating the Moora Mine and Kemerton Smelter for over 30 years they have developed proven management measures to mitigate risk. Thereby, further reducing the uncertainty of the effectiveness of management measures.
2. The principle of intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	Having operated Moora Mine at the same locality for more than 30 years, SIMCOA has extensive experience working within the local environment and are confident that the Revised Proposal can be implemented with minimal environmental and social impacts. The Revised Proposal will not result in any significant or cumulative impacts, which would pose a threat to health, diversity and productivity of the existing environment. Development of the Revised Proposal will support the growing global demand for silicon, for use in metallurgical, silicones and semi-conductor industries. A generous offset package (refer to Section 7) was negotiated by SIMCOA to undertake further research and development of a nature conservation within the local area.
3. The principle of the conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Biological investigations for the Revised Proposal have been undertaken at the North Kiaka DE and historically for Moora Mine and Kemerton Smelter. These investigations have informed this referral to assess potential impacts to biological diversity. The Revised Proposal will not threaten biological diversity or ecological integrity. The negotiated offset aims to achieve a "net positive impact".
4. Principles relating to improved valuation, pricing and incentive mechanisms 1. Environmental factors should be included in the valuation of assets and services.	All costs associated with the environmental management have been considered into the feasibility studies for the Revised Proposal. SIMCOA currently operate both the Moore Mine and Kemerton Smelter

Principle	Consideration
2. The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. 3. The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. 4. Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	and have a sound understanding of the capital and operations funds for the Revised Proposal. While the Project will generate waste, SIMCOA accepts the responsibly and cost associated with containment, abatement and utilisation of the best available technology. SIMCOA recognises the 'polluter pays' principle and will safeguard sufficient funding to include appropriate environmental management measures which are implemented throughout the life of the Revised Proposal, including closure, rehabilitation and decommissioning.
5. The principle of waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment	SIMCOA will employ best practice to minimise waste and avoid discharge to the environment. SIMCOA is committed to waste minimisation. Where minimisation of waste is not possible, waste will be recycled.
Description of how the object of the EP Act has been considered The objective of the EP Act is to protect the environment of the State, having regard to the above mentioned principles. Through consideration of the principles of the Act, the Revised Proposal has applied the mitigation hierarchy across the relevant environmental factors, and considered living things, their physical, biological and social surroundings. Through this, it can be demonstrated that due consideration of the object of the EP Act has been applied such that best endeavours have been applied to protect the environment.	

4.2 EPBC Act

As the Revised Proposal is being assessed by the EPA through an accredited assessment under the Commonwealth EPBC Act, the principles and objectives of that EPBC Act are relevant to specific MNES. The following ecologically sustainable development principles outlined in Section 3A of the EPBC Act and are similar to the principles of the EP Act:

1. decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
2. if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
3. the principle of inter-generational equity--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;
4. the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;
5. improved valuation, pricing and incentive mechanisms should be promoted.

Table 4.1 provides consideration of the above principles, SIMCOA have considered the integration principle through the application of the holistic impact assessment and understanding how the interrelated factors are applicable to this Revised Proposal.

5. Environmental factors and objectives

5.1 Identification of Key Environmental Factors

The potential for the Revised Proposal to have a significant impact on one or more of the EPA's 14 Environmental Factors was considered in accordance with the EPA's *Statement of Environmental Principles, Factors, Objectives and Aims of EIA* (EPA, 2023b), and the EPA's *Environmental Factor Guidelines*.

– The Project was referred to the EPA (s 38 Version 1, June 2022) and identified the following as preliminary key environmental factors for the development of the Project:
  - Flora and Vegetation (refer to Section 5.2)
  - Landforms (refer to Section 5.3)
  - Terrestrial Environmental Quality (refer to Section 5.4)
  - Terrestrial Fauna (refer to Section 5.5)
  - Inland Waters (refer to Section 5.6)
  - Social Surroundings (refer to Section 5.7).
– The EPA's assessment of the Project (CMS 18097 dated 22 June 2022) requested further information for two of these factors (as they relate to the Project): flora and vegetation, terrestrial fauna (including SREs) and additional information on Greenhouse Gas and Air Quality (as they relate to the Revised Proposal) (refer to Table 12.2).
– As the Project is being considered as a significant amendment to an Approved Proposal under Section 40 AA of the EP Act, this ERD considers potential environmental impacts in the context of both the Approved Proposal (Moora Mine and Kemerton Smelter) as well as the Project.
– Subsequent consultation with the EPA Services (meeting dated 16/09/2022) confirmed that the Greenhouse Gas Emissions environmental factor, should be considered as a key environmental factor for the Revised Proposal, in addition to other key environmental factors identified for the Project to consider the emissions from the Approved Proposal (Moora Mine and Kemerton Smelter) when undertaking an environmental impact assessment.
– EPA updated key environmental factors for the Revised Proposal are summarised in Table 5.2 as they relate to each component.

5.1.1 Notice Requiring Information for Assessment –

The draft ERD under s40(2)(a) was prepared to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request from the 8 Dec 2023 as referenced in Table 5.1.

Table 5.1 2023 Additional information requested – ERD

Source	Additional Information	Section of the ERD
Other - DWER	Include the assessment number (2346) on the cover page.	Cover page updated to include the Assessment number
	Include an invitation for the public to make a submission in the ERD. The invitation should be printed on different coloured paper. The ERD template can be accessed via Invitation to make a submission - ERD.	Invitation page added before the Executive Summary

A detailed assessment, including Matters of National Environmental Significance, Holistic and Cumulative Impact Assessment, has been undertaken for the Key Environmental Factors listed in Table 5.4 and has been included in Sections 5 to 10.

Table 5.2 Key environmental factors

Key environmental factor	The Project	Moora Mine – abandonment bund	Moora Mine – extension of operations	Kemerton Smelter
Flora and vegetation	✓	✓	×	×
Landforms	✓	×	×	×
Terrestrial environmental quality	✓	×	×	×
Terrestrial fauna	✓	✓	×	×
Inland Waters	✓	×	✓	✓
Social surroundings	✓	×	✓	✓
Greenhouse gas emissions	✓	×	✓	✓
Air quality	✓	×	✓	✓

Table 5.3 Other environmental factors

Other environmental factor	The Project	Moora Mine – abandonment bund	Moora Mine – extension of operations (already approved under s45C)	Kemerton Smelter
Subterranean fauna	✓	×	✓	×

Table 5.4 Identification of environmental factors

Factor	Objective	Potential for impact	Potential environmental impacts identified	Further consideration
Sea				
Benthic communities and habitat	To protect benthic communities and habitats so that biological and ecological integrity are maintained.	The Project and Moora Mine are located approximately 94 km east of the marine environment, therefore there is no potential for impact to the marine environment. The extension of the operating life of the Kemerton Smelter will not have an impact on the marine environment.	Not applicable.	Not applicable.
Coastal Processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.			
Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected.			
Marine fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.			
Land				
Flora and vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	The Revised Proposal activities potentially impacting this factor: – Clearing of native vegetation – Movement of vehicles – Mine excavation and blasting	Direct loss of native vegetation and flora.	Section 5.2.7.1
			Introduction and/or spread of invasive weeds and pathogens.	Section 5.2.7.1.1.1
			Dust causing reduce vegetation health.	Section 5.2.7.2.1.1

Factor	Objective	Potential for impact	Potential environmental impacts identified	Further consideration
		– Ore handling, transport and processing.	Vegetation loss due to bushfire.	Section 5.2.7.2.1.2
Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	The Revised Proposal activities potentially impacting this factor: – Mining ridges of the Noondine Chert Formation (quartzite resource) – Clearing of remnant native vegetation (present on quartzite ridges).	Alteration to landform structure.	Section 5.3.4.1
			Impact to environmental values of the landform.	Section 5.3.4.2
Subterranean Fauna	Maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	The Revised Proposal will not impact any known records of subterranean fauna. However, there is potential for subterranean fauna habitat to occur within the Noondine Chert Formation (which hosts the quartzite resource). The Revised Proposal activities potentially impacting this factor: – Development of the mine pit – Establishment of constructed landforms and other raised areas – Storage and handling of hydrocarbons (diesel).	Destruction of potential subterranean fauna habitat.	Other environmental factors - Section 6
			Degradation of potential subterranean fauna habitat through the alteration of surface hydrology affecting groundwater recharge regimes, and/or the contamination of groundwater.	
Terrestrial Environmental Quality	To maintain the quality of land and soils so that environmental values are protected.	The Revised Proposal activities potentially impacting this factor: – Ground disturbance (vegetation clearing, earthworks, blasting) – Development of the mine pit and construction of Tonkin WRD – Storage and handling of hydrocarbons (diesel).	Soil erosion affecting soil quality	Section 5.4.4.1.1
			Exposure of ASS resulting in acidification of soils.	Section 5.4.4.1.2
			Acid Metalliferous Drainage (AMD).	Section 5.4.4.1.3
			Saline drainage.	Section 5.4.4.1.4
			Release of environmentally hazardous materials (diesel) to soils.	Section 5.4.4.1.5
			Solid/liquid waste discharge resulting in contamination of soils.	Section 5.4.4.1.6
Terrestrial Fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	The landscape is locally and regionally fragmented and consequently the islands of remnant vegetation present, are	Loss of fauna habitat	Section 5.5.7.1
			Loss of habitat suitable for Carnaby's Black Cockatoo (threatened fauna).	Section 5.5.7.1

Factor	Objective	Potential for impact	Potential environmental impacts identified	Further consideration
		most likely to be utilised by avian species. The Revised Proposal activities potentially impacting this factor: – Clearing of native vegetation (fauna habitat) – Construction of buildings/infrastructure – Movement of vehicles – Mine excavation and blasting – Ore handling, transport and processing.	Death, injury or displacement of native fauna species.	Section 5.5.7.1.3
			Disruption or disturbance to fauna as a result of noise, vibration, light and dust emissions.	Section 5.5.7.3
			Bushfire.	Section 5.5.7.4
			Increased competition or predation by introduced species.	Section 5.5.7.5
Water				
Inland Waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected	Mining at the Project will occur above the groundwater table and therefore, impact to groundwater hydrological processes is highly unlikely. Ongoing mining below the water table at Moora Mine may impact the groundwater hydrological processes with these impacts have previously approved under MS813. The Revised Proposal activities potentially impacting this factor: – Ground disturbance (vegetation clearing and earthworks) – Establishment of the mine pit, Tonkin WRD and other raised areas – Storage and handling of environmentally hazardous materials (diesel) on-site.	Sedimentation of surface waters.	Section 5.6.4.1
			Contamination of groundwater and/or surface water due to release/spillage of environmentally hazardous materials (diesel).	Section 5.6.4.2
			Exposure of ASS resulting in mobilisation of metals and metalloids groundwater	Section 5.6.4.3
			AMD	Section 5.6.4.3
			Saline drainage	Section 5.6.4.4
Air				
Air quality	To maintain air quality and minimise emissions so that environmental values are protected.	Development and operation of the Revised Proposal will release airborne particulates and air pollutants, which have the potential to impact air quality and nearby sensitive receptors (the closest, a rural residential dwelling located 0.7 km from the Project proposed mine pits). The ongoing operations will also extend the operations of Moora Mine (crushing and screening) and Kemerton Smelter which will result in continued release of	Release of pollutants/particulates to air.	Section 5.9

Factor	Objective	Potential for impact	Potential environmental impacts identified	Further consideration
		airborne particulates and air pollutants.		
Greenhouse gas emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	Greenhouse gas emissions resulting from the Revised Proposal will be generated through the combustion of hydrocarbons, clearing of native vegetation, and the use of explosives during blasting operations. The operation of the Project will also extend the operations of Moora Mine (crushing and screening) and Kemerton Smelter which will result in emissions of GHG being released into the atmosphere.	Release of CO_2 to the atmosphere.	Section 5.8
People				
Social Surroundings	To protect social surroundings from significant harm.	One Registered Aboriginal Heritage Sites and one Other Heritage Place are known to occur within the North Kiaka DE. The closest sensitive receptor is located approximately 0.7 km south of the proposed mine pit at 180 Kiaka Road. Revised Proposal activities potentially impacting this factor: – Ground disturbance (vegetation clearing and earthworks) – Operation of machinery/vehicles – Construction of buildings/infrastructure – Blasting – Mining of elevated ridges – Transport of quartz ore.	Direct impacts to Aboriginal heritage sites	Section 5.7.5.1.1
			Noise and vibration emissions impacting nearby sensitive receptors	Section 5.7.5.1.2
			Release of pollutants/particulates to air	Section 5.7.5.1.3
			Reduced visual amenity.	Section 5.7.5.1.4
			Amenity impact resulting from traffic movements.	Section 5.7.5.1.5
			Socio-economic benefits (positive impact).	Section 5.7.5.1.6
Human health	To protect human health from significant harm. Note that as consideration of other health hazards (such as air, noise, water quality) are considered through other factors and occupational health and safety is regulated by other agencies this factor provides the framework for human health impacts arising from the emission of radiation.	The Revised Proposal will not emit radiation emissions. Potential impacts to human health from discharges to soil (and subsequently groundwater and surface water), emission to air, and noise, are assessed in the Terrestrial Environmental Quality, Inland Waters, Air Quality and Social Surroundings sections.	Not applicable	Not applicable

5.2 Key Environmental Factor – Flora and Vegetation

This section discusses the direct and indirect impacts to flora and vegetation resulting from mining within the North Kiaka DE and construction of the abandonment bund at Moora Mine. The construction and operation of the Revised Proposal will not result in any new clearing at Kemerton Smelter and as such, only indirect impacts from the continued operation of Kemerton Smelter on flora and vegetation are considered.

5.2.1 EPA objective

The EPA's environmental objective of the factor 'Flora and Vegetation' (EPA, 2016b) is:

"To protect flora and vegetation so that biological diversity and ecological integrity are maintained".

For the purposes of environmental impact assessment, vegetation is defined by the EPA as groupings of different flora patterned across the landscape that occur in response to environmental conditions. In the context of the EPA objective, ecological integrity is defined as "the composition, structure, function and processes of ecosystems, and the natural variation of these elements" (EPA, 2016b).

5.2.2 Relevant policy and guidance

EPA Policy and guidance

- *Instructions on how to prepare an Environmental Review Document* (EPA, 2021b)
- *Statement of Environmental Principles, Factors and Objectives and Aims of EIA* (EPA, 2023b)
- *Environmental Factor Guideline: Flora and Vegetation* (EPA, 2016b)
- *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016e)
- *Guidance Statement No. 6 – Rehabilitation of Terrestrial Ecosystems* (EPA, 2006)
- *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2021c).

Other policy and guidance

- *WA Environmental Offsets Policy* (GoWA, 2011)
- *WA Environmental Offsets Guidelines* (GoWA, 2014)
- *Environment Protection and Biodiversity Conservation Act 1999, Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) (2012))
- *Environment Protection and Biodiversity Conservation Act 1999, Outcomes-based Conditions Policy* (Department of the Environment (DER) (2016))
- *Environmental Protection Act 1986, Environmental Protection (Clearing of Native Vegetation) Regulations 2004*
- *Guidelines for Preparing Mine Closure Plans* (DMIRS, 2023b)
- *Statutory Guidelines for Mine Closure Plans in Western Australia* (DMIRS, 2023a)
- *Biodiversity Conservation Act 2016*
- *Biodiversity Conservation Regulations 2018*.

Relevant recovery plans, conservation advice and/or threat abatement plans for conservation significant species that are known to occur, or a likely to occur within vicinity of North Kiaka DE are:

- *Interim Recovery Plan 2013 – 2018, Interim Recovery Plan No. 338 – Heath dominated by one or more of Regelia megacephala, Kunzea praestans and Allocasuarina campestris on ridges and slopes of the chert hills of the Coomberdale Floristic Region (update)* (Department of Parks and Wildlife (DPaW) (2013b)).

5.2.3 Notice Requiring Information for Assessment – Flora and Vegetation

Flora and vegetation is considered a key environmental factor for the Revised Proposal and is the focus of the assessment presented in this section.

In accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of this factor in December 2023 (EPA, 2023d) and previously, in July 2022 (EPA, 2022b). The two additional information requests have been responded to within this chapter, with Table 5.5and Table 5.6 providing the EPA's additional information requirements and the relevant section of this document that provides the requested information.

Table 5.5 2023 Additional information request – flora and vegetation

Source	Additional Information	Section of the ERD
Flora and Vegetation - Department of Water and Environmental Regulation (DWER) (also see comments from the Department of Biodiversity, Conservation and Attractions)	Provide information on the Priority flora targeted and whether "possibly occurring" significant flora species were targeted in the survey by Trudgen (2012, 2018).	Section 5.2 of the ERD updated to note that threatened flora were searched for.
	Where data are not available, conduct a survey targeting threatened and priority species, as well as other significant species noted in the draft ERD. The additional targeted survey for flora and vegetation should be undertaken in accordance with *EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment.*	Section 5.2 and Table 5.5 note how the 2018 surveys were undertaken and that they were in line with the 2016 Technical Guidelines
	Provide current data for significant flora and analysis of direct, indirect, and cumulative impacts to flora and vegetation in a local and regional context. Revise the cumulative impact assessment to include analysis of existing and historical impacts, using current data.	Section 10 of the ERD has been updated to further describe the potential cumulative impact
	Provide information on the occurrence or avoidance of Moodjar trees within the DE.	Section 5.2.4.5.7 in the ERD and described in the Project EMP in Appendix C
	The EPA requires biodiversity survey reports and their underlying data to be submitted to the Index of Biodiversity Surveys for Assessments (IBSA). Biodiversity survey reports and data should be submitted to IBSA via IBSA Submission Form and the instruction for IBSA can be accessed via: Instructions for preparing data packages for the Index of Biodiversity Surveys for Assessments (IBSA). IBSA package should be submitted, and reference number received on submission should be provided. Any survey report and data that are revised after their initial acceptance into IBSA should be updated in IBSA and ibsa@dwer.wa.gov.au should be contacted for assistance in such cases.	IBSA data packages will be submitted to accompany the revised flora and vegetation survey report (Trudgen M. E., 2024).
Flora and Vegetation - Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Provide an updated flora and vegetation survey for the proposed proposal area. Specifically, provide an updated targeted assessment regarding impacts on the following MNES: – Watheroo Wattle (*Acacia aristulata*) – Endangered – Diels' Daviesia (*Daviesia dielsii*) – Endangered	Section 5.2 will be updated to include any relevant information from the report (Trudgen M. E., 2024).
	Provide an updated flora and vegetation survey that is consistent with *EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (Western Australian EPA, 2016).	A targeted flora survey will be completed in April 2024 and undertaken in accordance with the 2016 guidance.
Threatened Ecological Community (Coomberdale Chert Hills) - DBCA	Undertake further steps to avoid, minimise and mitigate potential impacts (direct and indirect) of the proposal on the Coomberdale Chert Hills Threatened Ecological Community (TEC).	Section 5.2.6 describes the steps being undertaken to avoid, minimise and mitigate impacts to the TEC
	Provide further information in the draft documentation on the monitoring of potential indirect impacts of the proposal on the Coomberdale Chert Hills TEC	Section 5.2.5.2 has been amended to note the monitoring of indirect impacts to the Coomberdale Chert TEC

Source	Additional Information	Section of the ERD
	Update the draft ERD to reflect the conservation status /ranking of the Coomberdale Chert Hills TEC as critically endangered.	Section 5.2.4.5.4 have been amended to note the updated conservation status of the Coomberdale Chert TEC
	Update the draft ERD to note the requirement for the proponent to seek Ministerial authorisation under section 45 of the BC Act for the modification of an occurrence of a TEC. Contact DBCA's Species and Communities Program to discuss requirements under section 45 of the BC Act.	Section 5.2 and Table 2.2 have been amended to note this ministerial authorisation requirement
	Clarify/update the inconsistency in the total area of native vegetation proposed for clearing. Clarify the reasons behind the misalignment between the total fauna habitat and area of vegetation to be cleared.	No changes are required as this is explained in Section 5.2.5.1 and Section 5.5.5.1.
Threatened Flora - DBCA	Provide additional targeted threatened flora surveys to inform a clear assessment of potential impacts (direct, indirect and cumulative) on threatened flora, at a local and regional scale.	Section 5.2.5 has been describes potential impacts. Section 10 describes cumulative impacts.
	Provide additional information in the draft ERD on the management and monitoring of potential impacts of the proposal on threatened flora.	Section 5.2.6 has been amended to describe potential impacts
	Update draft ERD to note the requirement for the proponent to seek Ministerial authorisation under section 40 of the BC Act for the take of threatened flora.	Section 5.2 and Table 2.2 have been amended to note this ministerial authorisation requirement
	Contact DBCA's Species and Communities Program to discuss requirements under section 40 of the BC Act.	
Priority Flora - DBCA	Undertake additional targeted survey to inform a clear assessment of potential impacts (direct, indirect and cumulative) on all priority flora, including an assessment of the number of known individuals, at both a local and regional scale.	Section 5.2.5 has been describes potential impacts. Section 10 describes cumulative impacts. Figures 5.8 - 5.11
Phytophthora dieback	Amend the draft ERD to provide a comprehensive Phytophthora dieback assessment, map and updated management plan.	Section 5.2.4.5.8.1 has been updated to describe the assessment for dieback. The management plan is included in Appendix J. SIMCOA will review the assessment and management measures prior to breaking ground as per the guidance.

Table 5.6 2021 Additional information request – flora and vegetation

Additional Information	Section of this ERD
The survey provided in the Flora and Vegetation Assessment - Appendix F submitted in June 2022, does not meet the EPA guidance for targeted flora surveys and vegetation assessment. Provide the report prepared in accordance with *EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment*. The vegetation classification and descriptions are comprehensive and suitable for assessment: however, the surveys were undertaken prior to the publication of the EPA's technical guidance, and as such, they do not meet the guideline requirements. The assumptions and conclusions derived from data representing the number of locations where species were recorded, rather than counts of individuals.	Refer to Table 5.7 which include information regarding survey timing and limitations. This information provides justification that the existing vegetation and flora surveys are consistent with EPA guidance.
A survey targeting DBCA threatened and priority species database search, other significant species described in the EPA's Technical Guidance, and those noted in the Flora and Vegetation Assessment (Appendix F, Table 5) is required.	
The extent of likely impacts on threatened flora is unclear. The conservation significant flora occurring outside the disturbance footprint should be documented and likely direct and indirect impacts to these species should be considered.	Refer to Figure 5-7 and Section 5.2.5 for comparison of direct and potential indirect impacts.
The Coomberdale TEC (Threatened Ecological Community) has been nominated for listing as Critically Endangered under the *Biodiversity Conservation Act 2016*	Refer to Section 5.2.5 for potential impacts, and Section

Additional Information	Section of this ERD
(BC Act), warranting in depth technical consideration and precautionary evaluation to evaluate impacts from the Project.	5.2.7, 5.2.6.3 for assessment and significance of residual impacts
If the above information is not provided, or if surveys determine risk of impact on significant flora and vegetation species, Environmental Management Plans detailing the management and mitigation of impacts on significant flora and vegetation should be prepared in accordance with *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* and submitted for assessment. This should include a commitment to avoid or minimise impacts to significant flora and vegetation species and consideration of offsets for any significant residual impacts to TEC and threatened flora.	The Environmental Management Plan is provided as Appendix C.
The presence of Eucalypt woodlands of the Western Australian Wheatbelt Priority Ecological Community (PEC) should be recognised and discussed in referral supporting document. EPA notes that PEC have been identified to occur within the DE.	Refer to Section 5.2.5
The assessment of the distribution and quality of, and potential impacts on the PEC should be undertaken.	Refer to Section 5.2.5

5.2.4 Receiving environment

5.2.4.1 Suitability of studies

The regional occurrence of native vegetation and flora within the North Kiaka DE and areas adjacent to the Moora Mine, has been extensively surveyed over a 30 year period by ME Trudgen and Associates (1985; 2006; 2012; Trudgen, 2018). Flora and vegetation assessments of the North Kiaka DE and Moora Mine are included in Appendix G and Appendix H, respectively.

A single season flora and vegetation survey has been previously undertaken for the Kemerton Smelter (Trudgen, 2008), however no clearing of native vegetation is required to extend the operational life of this existing facility. As such, no further assessment of vegetation and flora for the Kemerton Smelter has been completed.

The Trudgen (2012; 2018) flora and vegetation surveys of the North Kiaka DE and Moora Mine provide detailed information on flora and vegetation characteristics of remnant native vegetation. The vegetation and flora surveys were undertaken by M.E. Trudgen and Associates, who are suitably qualified and experienced botanists and have undertaken surveys for Moora Mine from 1985 to 2017. With rehabilitation surveys of the progress at Moora Mine occurring annually, with the most recent report from 2023. Malcolm Trudgen, who undertook the surveys and reported the findings, is regarded by the Department of Biodiversity, Conservation and Attractions as a technical authority in the assessment of flora and vegetation in the midlands. Trudgen's field surveys in this area extend back to 1985, and it is the body of evidence that has been drawn on for this assessment.

The collated survey results in the Trudgen 2012 and 2024 reports form a multi-year (seven-year), multi-season survey undertaken, from 2000 to 2017, over 111 field survey days during Summer (45 days), Autumn (3 days), Winter (13 days) and Spring (50 days) assessing 99 quadrats and 397 relevés. This longitudinal study has resulted in a high degree of confidence that there has been minimal change in the data over time. The majority of survey days were undertaken in Spring which is considered the most optimal time to undertake vegetation surveys in the bioregion. Targeted surveys were undertaken for the significant (Threatened and Priority Flora) species during the flowering periods of the various species as per the likelihood of occurrence post survey assessment (Appendix I).

A follow up survey of flora and vegetation within the North Kiaka DE (with a particular focus on the North Kiaka DF) was undertaken by Trudgen (2018) between July and September 2016, with additional targeted searches for significant flora completed in November 2017. The location of survey quadrats and relevés within the North Kiaka DE and DF is shown in Figure 5.2 and targeted searches (transects) for threatened and priority flora, undertaken in 2016) is shown in Figure 5.3. These reports have provided detailed vegetation mapping, a floristic analysis of the vegetation, the results of searches for significant flora and a flora inventory. All known Threatened and Priority Flora which were possibly found in the TEC were recorded during surveys of the area (Trudgen 2012 and 2018). Any flora observed in quadrats, relevés and transects, that was possibly of conservation significance was also recorded.

It is noted that previous reports did not reference or document all of the requirements of the current EPA's Technical Guidance '*Flora and Vegetation Surveys for Environmental Impact Assessment*' (EPA, 2016e). As such, the 2024 report from Trudgen has been revised to be a contemporary report and is included in Appendix G (Trudgen M. E., 2024). It is considered that the combined survey effort from the 2012 and 2016/2017 surveys would align with a Detailed and Targeted survey described in the current EPA guideline (EPA 2016f).

The location of Trudgen 2024 survey effort including quadrats, relevés and transects is shown in Table 5.7 and Figure 5.1.

Table 5.7 Field survey timing in the Moora Mine, proposed North Kiaka DE and proposed offset areas

Title	Survey extent	Survey year/ month		Season	Number of field survey days	Number of quadrats/ relevés
Comparison of the flora and vegetation of the proposed North Kiaka mine	North Kiaka DE, adjacent areas	2016	June	Winter	1	Targeted threatened and priority flora survey of proposed impact areas and
			July		4	
			August		4	

Title	Survey extent	Survey year/ month		Season	Number of field survey days	Number of quadrats/ relevés
area to other parts of the Coomberdale Chert Threatened Ecological Community (Trudgen, 2018) (Appendix G)			September	Spring	4	adjacent vegetation – 72 transects Conservation significant flora; and Conservation significant ecological communities (TEC/PEC). Threatened *Acacia aristulata* *Daviesia dielsii* *Eucalyptus pruiniramis* *Goodenia arthrotricha* *Synaphea quartzitica* ***Priority*** P3 *Austrostipa nunaginensis* P3 *Babingtonia cherticola* P2 *Bossiaea moylei* P4 *Diuris recurva* P1 *Eremaea* sp. Cairn Hill P2 *Grevillea amplexans* subsp. semivestita P3 *Guichenotia tuberculata* P4 *Hemigenia conferta* P3 *Melaleuca sclerophylla* P4 *Regelia megacephala* P2 *Stylidium glabrifolium* P2 *Stylidium* sp. Moora P2 *Tricoryne* sp. Wongan Hills (B.H. Smith 794)
		2017	July	Winter	2	Targeted threatened and priority flora survey of surrounding areas for Cairn Hill Reserve. Targeted *Banksia sphaerocarpa* form survey on the Gardiner property Assessment of haul road options for the proposed impact area
			November	Spring	3	
			December	Summer	1	

Title	Survey extent	Survey year/ month		Season	Number of field survey days	Number of quadrats/ relevés
						Conservation significant flora; and Conservation significant ecological communities (TEC/PEC).
Proposed Discharge Evaluation Conderoo River Wetlands (Actis, 2011)	Kyaka Brook	2011	November	Spring	1	Survey of vegetation fringing Kyaka Brook for Moora Mine
An extension of a flora survey, floristic analysis and vegetation survey of areas of the Coomberdale Chert TEC to include a further area (Trudgen et al, 2012) (Appendix H)	North Kiaka DE, Moora Mine DE, adjacent areas	2000	September	Spring	1	40 quadrats
			October		4	
			November		1	
			December	Summer	2	
		2002	October	Spring	9	40 quadrats
			November		1	
		2003	March	Autumn	1	8 quadrats and 185 relevés
			April		1	
			August	Winter	2	
			October	Spring	1	
			November		17	
			December	Summer	13	
		2004	January	Summer	14	169 relevés
			April	Autumn	1	
			November	Spring	4	
			December	Summer	7	
		2005	February	Summer	3	29 relevés
		2007	November	Spring	1	1 relevé
		2010	September	Spring	2	11 quadrats and 13 relevés
			October		2	
			November		5	
A vegetation and flora survey of two small areas on the SIMCOA smelter property at Kemerton (Trudgen, 2008)	Kemerton Smelter	2008	-	-	-	The survey included a single season survey of 10 quadrats at Kemerton Industrial Park (KIP)-Lot 5548 for the Kemerton Smelter. It is considered that due to the small size of the areas surveyed and the relative intensity of the survey, it is likely that more than 90% of the native flora that occurs in the areas was recorded (Trudgen, 2008).

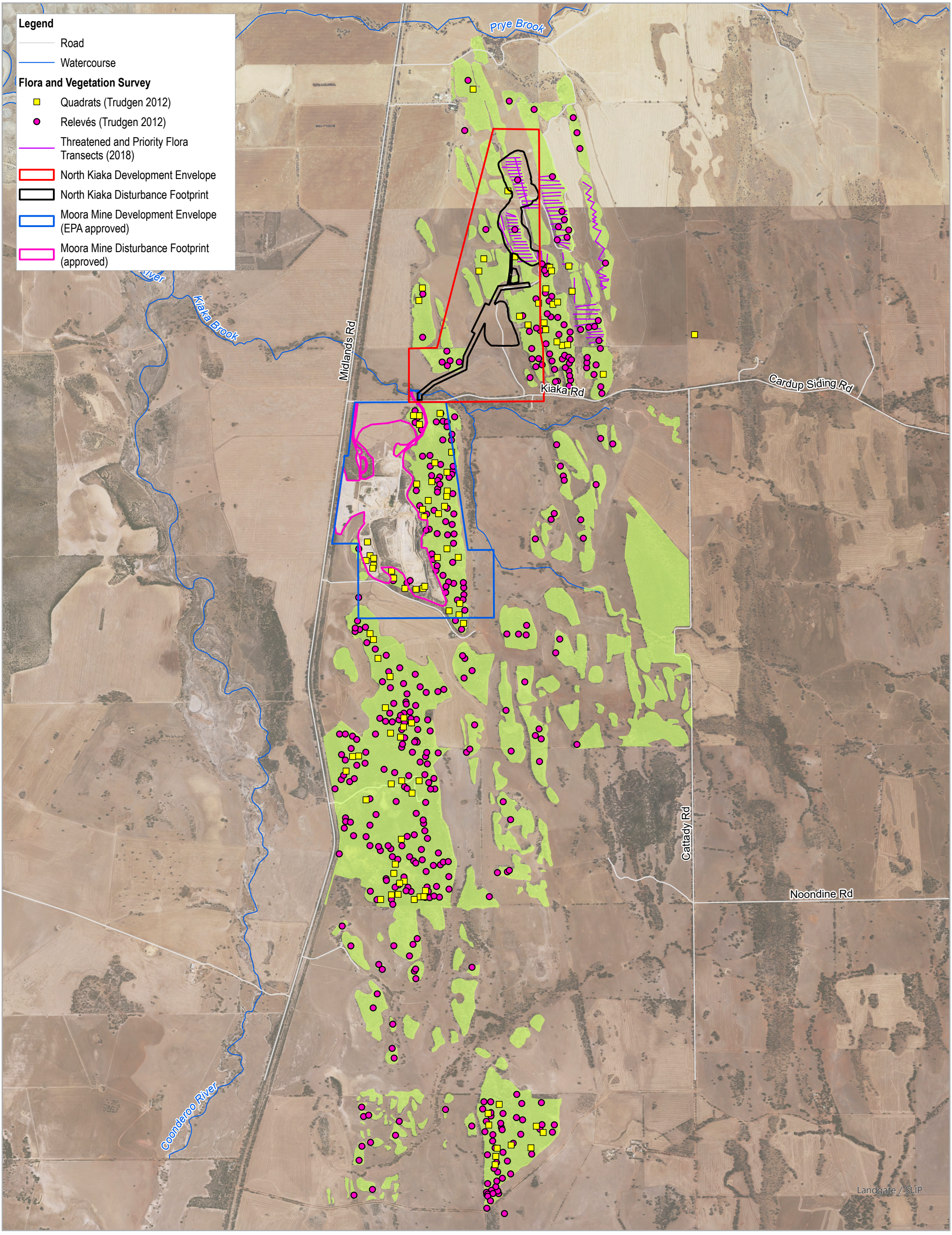
The EPA (2016e) Technical Guide states that flora survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with field surveys undertaken for SIMCOA by Trudgen (2012; 2018) at the Moora

Mine, the North Kiaka DE and offset sites (Cairn Hill and Cairn Hill North) are discussed in Trudgen's (2024) revised report and are consistent with *EPA Technical Guidance.*

5.2.4.2 Targeted significant flora surveys

The 2016 and 2017 surveys of priority flora and significant flora, species listed as "possibly occurring" were targeted by as shown in likelihood of occurrence assessment (Trudgen M. E., 2024). Trudgen confirmed that any flora observed of potential conservation significance were also recorded. Of the 69 species listed as potentially occurring within this table, five are listed as possibly occurring, 17 are known to occur and the remaining are listed are unlikely or highly unlikely (Trudgen M. E., 2024).

A targeted flora survey will be undertaken in April 2024 to update the database on the threatened and priority flora population in the North Kiaka DE. The updated information will be provided in the Flora and Vegetation Report and Final ERD.



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Metres

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

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Simcoa Environmental Approvals s40AA ERD

Survey Effort (Trudgen 2012 Flora and Vegetation Survey, Trudgen 2016 Targeted Threatened and Priority Transects)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.1

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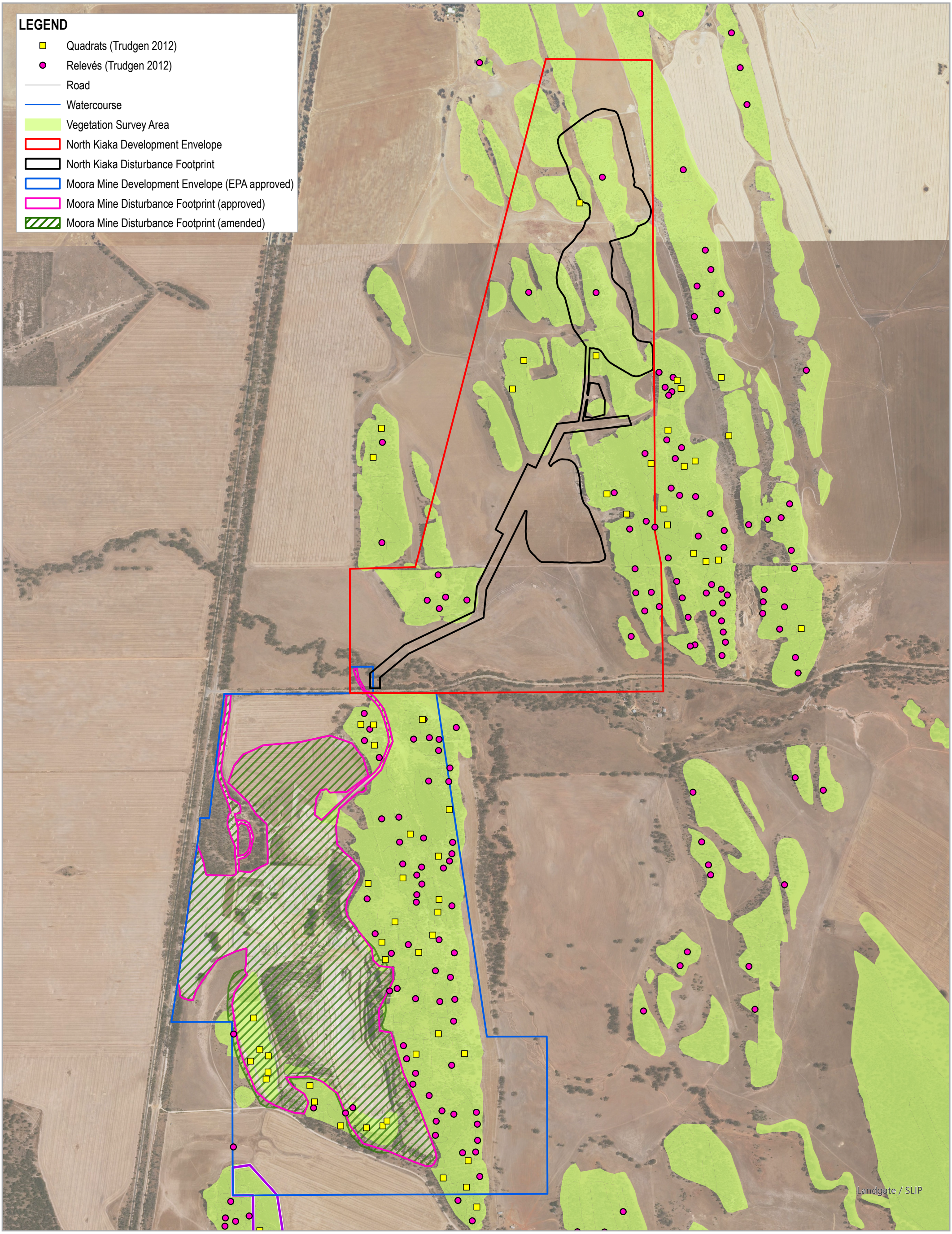

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Detailed Survey Quadrats and Releves within the Moora Mine and North Kiaka DE (Trudgen 2012)

Project No. **12518217**
Revision No. **0**
Date **01/03/2024**

FIGURE 5-2

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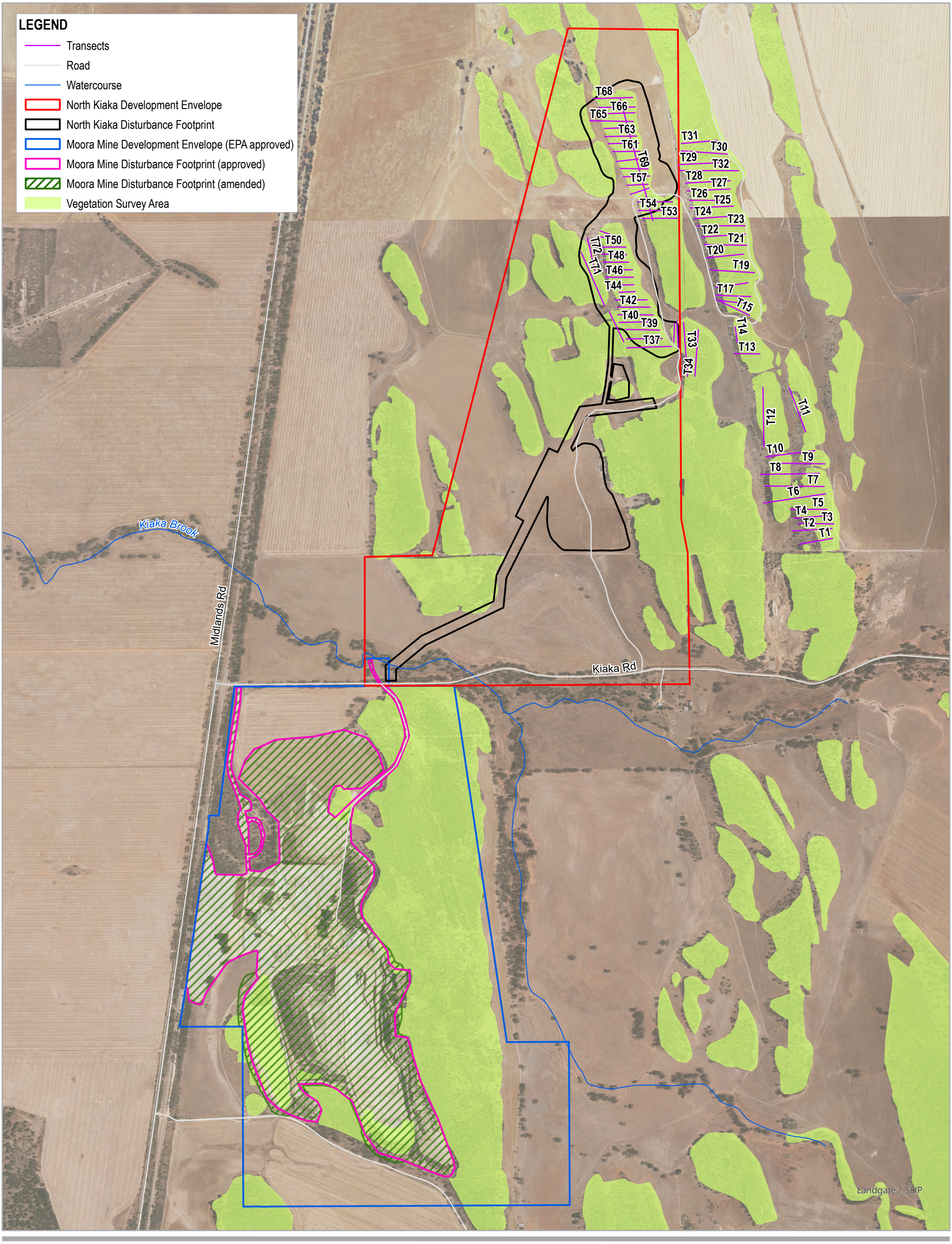
Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: dchan3



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Metres

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

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Simcoa Environmental Approvals s40AA ERD

Trudgen (2018) Targeted Searches for Threatened and Priority Flora (Conducted in 2016 and 2017)

Project No. **12518217**
Revision No. **0**
Date **01/03/2024**

FIGURE 5-3

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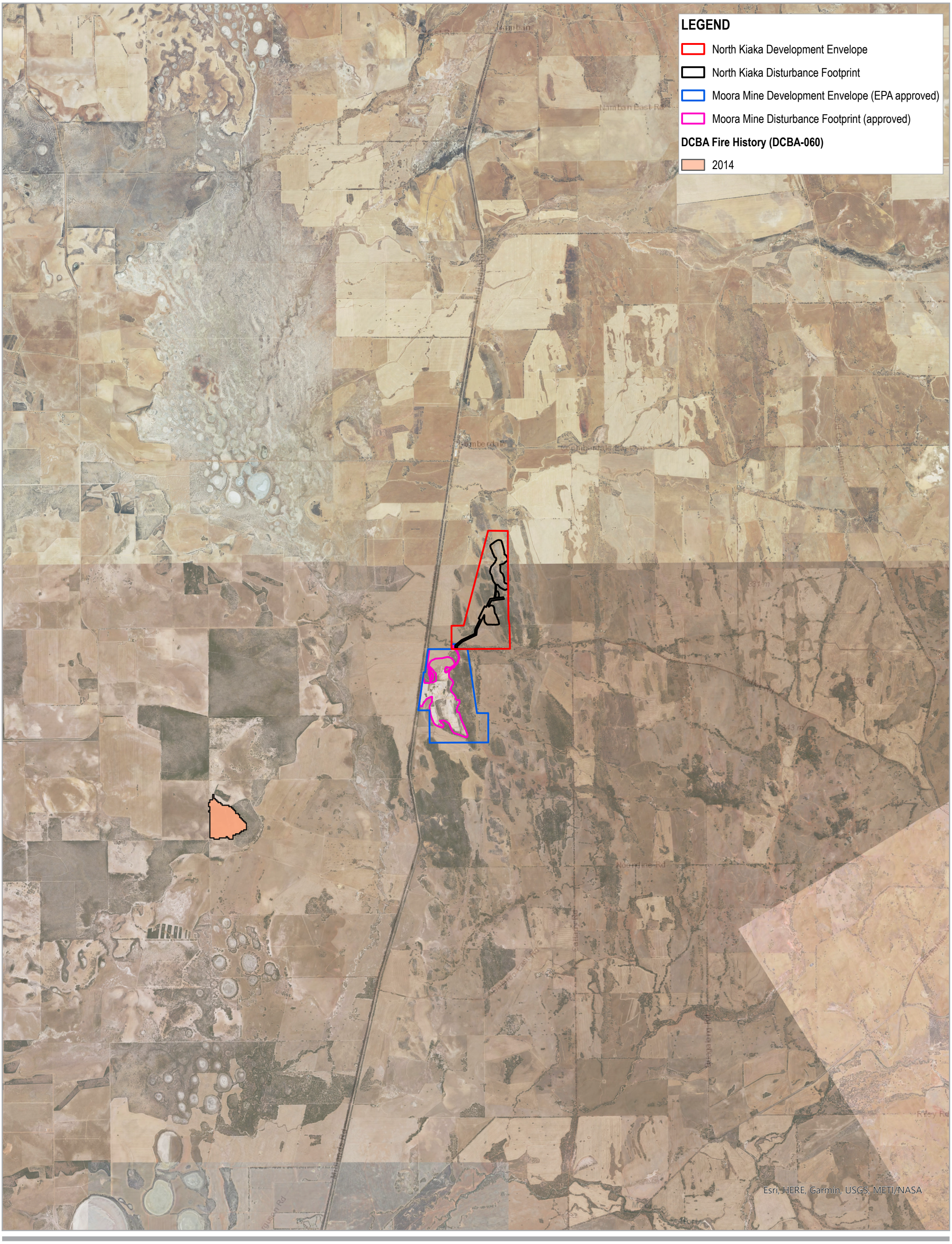

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Fire events in the area since 2014

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.4

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Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, Road - 20180601; DoW: River - 201108;. Created by: rbrown3

5.2.4.3 Land use

The North Kiaka DE and Moora Mine DE are located within the Moora Shire and have historically been used for agricultural purposes. Areas of remnant native vegetation within the survey area are generally not fenced off from paddocks where stock, predominantly sheep, graze. The lower lying areas have been cleared, with native vegetation replaced with introduced grasses. Native vegetation has been retained on areas of rocky outcrops and the surrounding area supports agricultural land uses.

5.2.4.4 Pre-European vegetation

Interim Biogeographic Regionalisation for Australia (IBRA) mapping confirms the North Kiaka DE and Moora Mine DE are in the Avon Botanical Subdistrict of the South-West Botanical Province (DCCEEW, 2023d).

Broad scale (1:250,000) vegetation mapping undertaken by Beard (1979) indicates two vegetation associations are located within the North Kiaka DE and Moora Mine DE. The majority would have comprised 201.30 ha of "*Low woodland; Allocasuarina huegeliana and Jam*" (association 1041) and 15.13 ha of "*Medium woodland; York gum and Salmon gum*" (association 142) in the south west of the North Kiaka DE (GoWA, 2019). Whereas the Moora Mine DE would have comprised 106.68 ha of "*Low woodland; Allocasuarina huegeliana and Jam*" (association 1041) and 132.99 ha of "*Medium woodland; York gum and Salmon gum*" (association 142) (GoWA, 2019)

The remaining extent of these vegetation associations (last update March 2019 (GoWA, 2019)) is presented in Table 5.8 (GoWA, 2023). As shown in Table 5.8 there is less than 10% remaining at a IBRA subregional and local government authority (LGA) level and less than 30% of at a State and IBRA regional level of the pre-European extent of vegetation association 142. There is less than 30% remaining at a IBRA subregional and LGA level for vegetation association 1041 (GoWA, 2019).

Table 5.8 Pre-European vegetation associations within the Moora Mine and North Kiaka DE (GoWA, 2019)

Scale	Pre-European Extent (ha)	Current Extent (ha)	Remaining (%)	Remaining within DBCA Managed Lands (%)
Association 1041				
State: WA	4,781.12	1,507.46	31.53	6.66
Bioregion: Avon Wheatbelt	4,781.12	1,507.46	31.53	6.66
Sub-region: Katanning (AVW02)	2,545.46	729.06	28.64	3.03
LGA: Shire of Moora	2,274.88	688.62	29.39	2.10
Association 142				
State: WA	787,948.47	208,347.17	26.44	1.04
Bioregion: Avon Wheatbelt	637,707.53	79,309.95	12.44	0.37
Sub-region: Katanning (AVW02)	224,265.61	16,054.80	7.16	0.16
LGA: Shire of Moora	164,556.36	12,666.00	7.70	0.11

Note: orange indicates that less than 30% and red less than 10% of pre-European extent remains before project impacts (EPA, 2000).

5.2.4.5 Local vegetation

5.2.4.5.1 North Kiaka vegetation types

The North Kiaka DE (216.42 ha) is located within agricultural land and 124.83 ha of the DE has historically been cleared. Remnant vegetation is found in small fragments, with 87.57 ha of native vegetation present, representing approximately 40% of the DE.

Remnant native vegetation that is localised to rocky outcrops within the North Kiaka DE was surveyed in 2012 and 2018 by Trudgen *et al*. Vegetation alliances mapped within the North Kiaka DE and Disturbance Footprint (DF) are described in Table 5.9 and shown in Figure 5.5.

Vegetation alliances were assessed to be representative of Threatened Ecological Community (TEC) 'Heath dominated by one or more *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomberdale Floristic Region' (DPAW, 2013b) (hereafter referred to as the Coomberdale TEC). Vegetation alliances 13, 15, 16 and 17 comprise core TEC alliances and 9 and 11 comprise buffer vegetation alliances. Further description of the Critically Endangered (CR) Coomberdale TEC is provided in subsequent sections.

Vegetation fringing the Kyaka Brook was surveyed by Actis (2011) and confirmed to consist of *Casuarina obesa* and *Eucalyptus loxophleba* subsp. *loxophleba* trees over a sparse understorey dominated by introduced grasses and herbs.

Table 5.9 Vegetation alliances, vegetation associations and plant communities recorded in the North Kiaka DE (Actis, 2011; Trudgen et al, 2012; 2018)

Vegetation alliance an vegetation association and plant communities of the alliances[1]	Extent North Kiaka DE (ha)	Extent North Kiaka DF (ha)
***Acacia acuminata* subsp. *acuminata* low woodlands [Alliance 11] - TEC Buffer alliance** Association Aa: *Acacia acuminata* low open forest over scattered grasses sedges and very open herbland. Community Aa.2: *Acacia acuminata* low open woodland over *Xanthorrhoea* sp. scattered tall shrubs over scattered sedges with *Gilberta tenuifolia*, *Panaetia lessonii*, *Waitzia nitida* open herbland and *Cheilanthes adiantoides* very open fernland. Association AaAc: *Acacia acuminata* low woodland over *Allocasuarina campestris* scattered tall shrubs to high open shrubland over very open herbland. Community AaAc.2: *Acacia acuminata* low woodland to low open forest over *Allocasuarina campestris* scattered tall shrubs to high open shrubland over scattered grasses with very open herbland and *Cheilanthes adiantoides* scattered ferns. Association AaDsKp: *Acacia acuminata* low woodland over *Banksia sessilis* var. *flabellifolia* (*Xanthorrhoea* sp.) scattered tall shrubs over *Kunzea praestans* scattered tall shrubs to high open shrubland over very open herbland. Community AaDsKp1: *Acacia acuminata*, *Nuytsia floribunda* scattered low trees over *Banksia sessilis* var. *flabellifolia* high open shrubland over *Xanthorrhoea* sp., *Kunzea praestans* high open shrubland over *Hibbertia subvaginata*, *Acacia restiacea* scattered low shrubs	7.69	0.22
***Allocasuarina campestris* high shrublands to open or closed scrub [Alliance 13] - TEC Core alliance** Association Ac: *Allocasuarina campestris* open to closed scrub over scattered sedges/grasses/herbs. Community Ac.1: *Allocasuarina campestris* open heath to closed heath over scattered sedges/grasses with *Borya sphaerocephala* scattered herbs and *Cheilanthes adiantoides* scattered ferns Community Ac.2: *Acacia acuminata* (3-5%) scattered low trees to low open woodland over *Allocasuarina campestris* (90%) closed scrub over scattered grasses/sedges with *Cheilanthes adiantoides* scattered ferns and *Borya sphaerocephala* scattered herbs. Community Ac.4: *Allocasuarina huegeliana* (*Acacia acuminata*) low open woodland over *Allocasuarina campestris* closed scrub over *Neurachne alopecuroidea* scattered grasses with scattered herbs and *Cheilanthes adiantoides* scattered ferns. Community Ac.7: *Allocasuarina campestris* open to closed heath over *Melaleuca leuropoma* scattered shrubs over *Calytrix* sp. scattered low shrubs over *Stylidium septentrionale* very open herbland.	35.74	5.66

Vegetation alliance an vegetation association and plant communities of the alliances[1]	Extent North Kiaka DE (ha)	Extent North Kiaka DF (ha)
Association AcAh: *Allocasuarina huegeliana* (*Acacia acuminata*) low open woodland to low open forest over *Allocasuarina campestris* high open shrubland to open to closed scrub. Community AcAh.2: *Allocasuarina huegeliana* (*Acacia acuminata*) low open woodland to low woodland over *Allocasuarina campestris* high shrubland to open and closed scrub over open sedgeland/grassland/herbland. Association AcCq: *Allocasuarina campestris*, *Calothamnus aff quadrifidus* var. Moora-Watheroo open to closed scrub. Community AcCq.1: *Acacia acuminata* (*Allocasuarina huegeliana*) scattered low trees to low open woodland over *Allocasuarina campestris* (*Calothamnus aff. quadrifidus* Moora-Watheroo) open to closed scrub over scattered grasses/sedges/herbs. Association AcDs: *Allocasuarina huegeliana* (*Acacia acuminata* subsp. *acuminata*) scattered low trees to low open woodland over *Dryandra sessilis* var. *flabellifolia* scattered tall shrubs to high open shrubland over *Allocasuarina campestris* open to closed scrub. Community: AcDs.4: *Acacia acuminata*, *Allocasuarina huegeliana* scattered low trees to low open woodland over *Banksia sessilis* var. *flabellifolia* scattered tall shrubs to high open shrubland over *Allocasuarina campestris*, *Xanthorrhoea* sp. high open shrubland to high shrubland over scattered sedges/grasses with scattered ferns (and annual grassland/herbland).		
***Allocasuarina huegeliana* low woodlands to low open forests [Alliance 9] - TEC Buffer alliance** Association Ah: *Allocasuarina huegeliana* low woodland to low open forest over scattered shrubs Community Ah.3/(AhKp1):[description of Ah.3] *Allocasuarina huegeliana*, *Acacia acuminata* low woodland to low open forest over *Allocasuarina campestris* [*Kunzea praestans*] scattered tall shrubs to high open shrubland over *Panaetia lessonii*, *Trachymene ornata* open annual herbland. Association AhDs: *Allocasuarina huegeliana* low woodland to low open forest over *Banksia sessilis* var. *flabellifolia* scattered tall shrubs to high open shrubland. Community AhDs.1: *Allocasuarina huegeliana*, *Acacia acuminata* low open forest over *Banksia sessilis* var. *flabellifolia* scattered tall shrubs over *Xanthorrhoea* sp. (*Allocasuarina campestris*) scattered tall shrubs. Association AhDsKp: *Allocasuarina huegeliana* low woodland to low open forest over *Banksia sessilis* var. f*labellifolia* scattered tall shrubs to high shrubland over *Kunzea praestans* scattered tall shrubs to high open shrubland. Community AhDsKp.2: *Allocasuarina huegeliana* low woodland to low open forest over *Banksia sessilis* var. *flabellifolia* scattered tall shrubs to high shrubland over *Kunzea praestans* scattered tall shrubs to high open shrubland over *Hibbertia subvaginata* scattered low shrubs to low open shrubland. Association AhKp: *Allocasuarina huegeliana* low woodland to low open forest over *Kunzea praestans* scattered tall shrubs to high open shrubland. Community AhKp.2: *Allocasuarina huegeliana* (*Acacia acuminata*) low woodland to low open forest over *Kunzea praestans*, *Xanthorrhoea* sp. scattered tall shrubs to high open shrubland over (*Hibbertia subvaginata*, *Calytrix* sp.) open shrubland over scattered sedges/grasses/herbs/ferns.	14.34	0.20
***Kunzea praestans* high shrubland to open and closed scrub [Alliance 16] - TEC Core alliance** Association KpAhDs: *Allocasuarina huegeliana* (*Acacia acuminata*) scattered low trees to low open woodland over *Banksia sessilis* var. *flabellifolia* scattered tall shrubs over *Kunzea praestans* (*Xanthorrhoea* sp.) high shrubland to open scrub over *Hibbertia subvaginata* low open shrubland. Community KpAhDs.1: (*Allocasuarina huegeliana*, *Acacia acuminata*) scattered low trees over *Banksia sessilis* var*. flabellifolia* scattered tall shrubs to high open shrubland over *Kunzea praestans* (*Xanthorrhoea* sp.) high shrubland to open scrub over *Hibbertia subvaginata* (*Calytrix* sp.) (low) open shrubland over Desmocladus as*per*, *Neurachne alopecuroidea* very open sedgeland/grassland with *Cheilanthes adiantoides* very open fernland. Association KpDsMc: *Banksia sessilis* var. *flabellifolia* scattered tall shrubs to high open shrubland over *Kunzea praestans* high shrubland to open scrub over *Melaleuca leuropoma* scattered shrubs to shrubland over *Hibbertia subvaginata* scattered low shrubs to low open shrubland.	14.99	7.74

Vegetation alliance an vegetation association and plant communities of the alliances[1]	Extent North Kiaka DE (ha)	Extent North Kiaka DF (ha)
Community KpDsMc.1: *Allocasuarina huegeliana* (*Acacia acuminata*) scattered low trees to low open woodland over *Dryandra sessilis* var. *flabellifolia* scattered tall shrubs over Kunzea praestans (*Allocasuarina campestris*, *Xanthorrhoea* sp.) high open shrubland to open scrub over *Melaleuca leuropoma* scattered shrubs to open shrubland over (*Hibbertia subvaginata*), *Calytrix* sp. low open shrubland over scattered sedges/grasses with *Borya sphaerocephala* very open herbland and annual grassland. Community KpDsMc.2: *Banksia sessilis* var. *flabellifolia* scattered tall shrubs over *Kunzea praestans* (*Xanthorrhoea* sp.) high shrubland over *Melaleuca leuropoma* scattered shrubs to open shrubland over *Hibbertia subvaginata* (*Calytrix* sp.) low shrubland over *Desmocladus asper*, *Stylidium septentrionale* scattered sedges and herbs. Association KpHs: *Kunzea praestans* high shrubland to open scrub over *Hibbertia subvaginata* (low) open shrubland to (low) open heath over scattered to very open sedgeland/grassland/herbland. Community KpHs.1: *Kunzea praestans* high shrubland to open scrub over *Hibbertia subvaginata* open shrubland to open heath over very open herb/fernland.		
***Melaleuca leuropoma* open to closed heath [Alliance 17] - TEC Core alliance** Association Mc: *Kunzea praestans* high open shrubland over *Melaleuca leuropoma* open to closed heath over *Hibbertia subvaginata*, *Calytrix* sp. scattered low shrubs to low open shrubland. Community Mc.1: *Kunzea praestans* high open shrubland over *Melaleuca leuropoma* open to closed heath over *Hibbertia subvaginata*, *Calytrix* sp. low open shrubland over *Desmocladus asper* scattered sedges/grasses with *Stylidium septentrionale*, *Borya sphaerocephala* scattered herbs.	0.80	0.49
***Regelia megacephala* high shrubland to open and closed scrub [Alliance 15] - TEC Core alliance** Association RmKp: *Regelia megacephala* high shrubland to open scrub over *Kunzea praestans* high open shrubland to open scrub over *Hibbertia subvaginata* scattered shrubs to low open shrubland. Community RmKp.3: *Regelia megacephala*, *Kunzea praestans* open scrub over *Hibbertia subvaginata*, *Calytrix* sp. low scattered shrubs over **Avena barbata*, very open grassland with **Ursinia anthemoides* very open herbland. Association RmKpMc: *Regelia megacephala* open to closed scrub and *Kunzea praestans* high open shrubland to open scrub over *Melaleuca leuropoma* open shrubland to shrubland over *Hibbertia subvaginata* low open shrubland. Community RmKpMc.2: (*Allocasuarina huegeliana* scattered low trees over) *Regelia megacephala* tall shrubland to open or closed scrub over *Kunzea praestans*, *Melaleuca leuropoma* open shrubland to shrubland over *Calytrix* sp. scattered low shrubs over *Borya sphaerocephala* low open herbland and scattered annual herbs.	4.94	2.14
***Eucalyptus loxophleba* subsp. *loxophleba* low woodlands to low open forests [Alliance 3]** Association El: *Eucalyptus loxophleba* subsp. *loxophleba* low woodlands to low open forests Community Elo.3: *Eucalyptus loxophleba* subsp. *loxophleba* low open forest over very open herbland	4.32	0.57
***Casuarina obesa* open forest [Alliance 10]** Association Co1: *Casuarina obesa* open forest	1.09	0.10
***Ricinocarpos muricatus* shrubland to open heath [Alliance 20/9]** Association Rmu1: *Ricinocarpos muricatus* shrubland to open heath.	2.03	0.00
Completely Degraded (D) Mapped as Completely Degraded within areas of remnant vegetation	1.63	0.00
Total extent native vegetation	**87.57**	**17.12**
Total Cleared (agricultural land)	**124.83**	**27.47**
Rocky outcrops	**4.02**	**0.00**
Total extent	**216.42**	**44.59**
Notes: *[1] The vegetation association and plant communities can share the same names, with the plant communities having the addition of a number to the codes, or for more variation from the vegetation association name by additional letters. Where*		

Vegetation alliance an vegetation association and plant communities of the alliances[1]	Extent North Kiaka DE (ha)	Extent North Kiaka DF (ha)
there is more than one community in an association the association is not repeated in the table. The vegetation alliance code is also used for the first association described for it, others having additional letters (Trudgen, 2018).		
[Plant names in the table above have been updated to reflect their current nomenclature under Florabase (WA Herbarium 1997-)]		

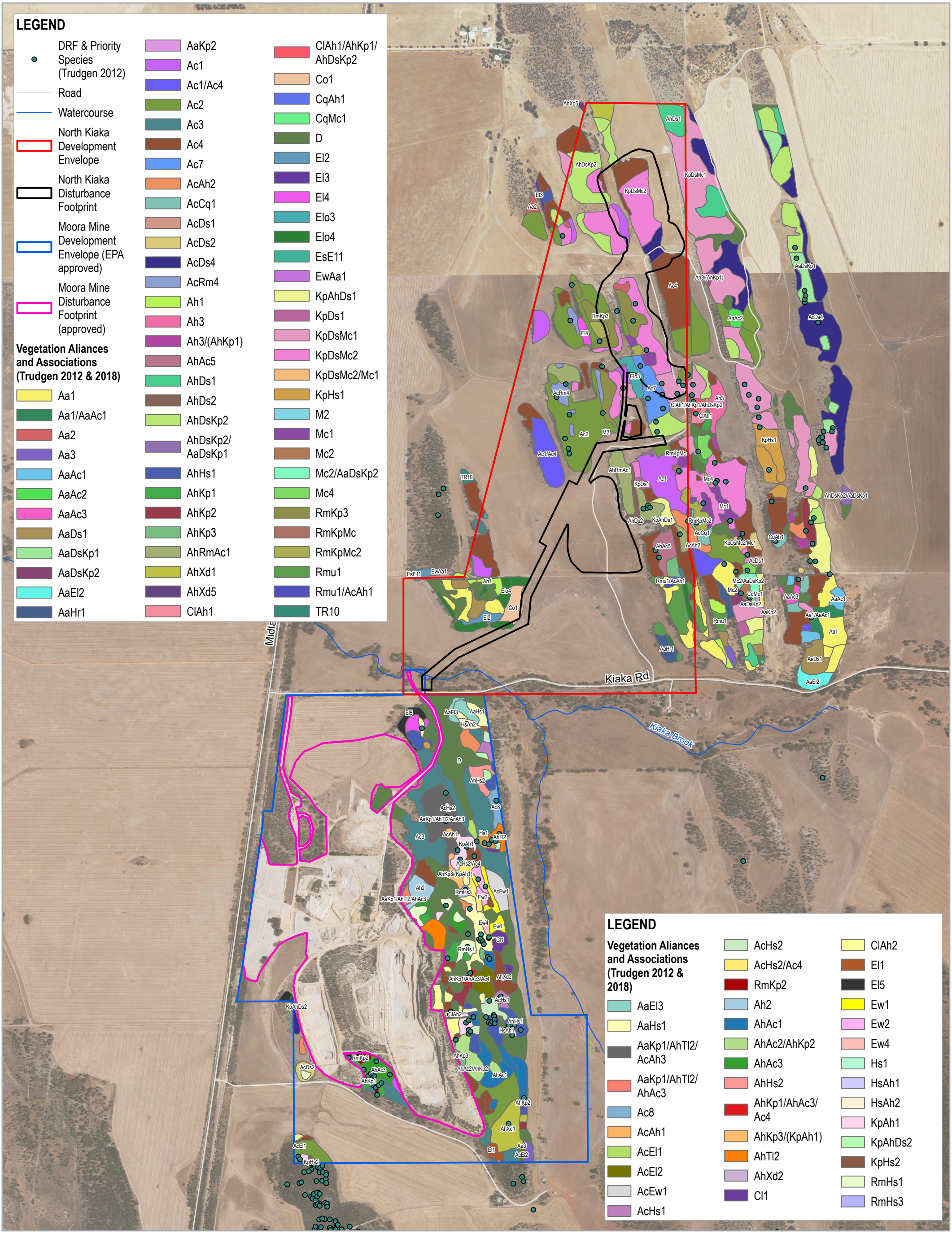
5.2.4.5.2 Moora Mine vegetation types

Trudgen (2012) mapped areas of native vegetation within the Moora Mine DE as shown in Table 5.10 and Figure 5.5. Construction of the abandonment bund will require an additional 0.95 ha of native vegetation. This additional clearing represents approximately 1% of the native vegetation retained within the Moora Mine DE.

Table 5.10 Vegetation alliances, vegetation associations and plant communities recorded in the Moora Mine DE and amended DF (Actis, 2011; Trudgen et al, 2012)

Vegetation Association	Total Area Moora Mine DE (ha)	Area to be cleared within Moora Mine DF (amended) (ha)
Acacia acuminata low woodlands [Alliance 11] - TEC Buffer Alliance Associations*:* Aa3, AaEl3, AaHs1	3.86	0.00
Allocasuarina campestris high shrublands to open and closed scrub [Alliance 13] - TEC Core alliance Associations: Ac1, Ac2, Ac3, Ac4, Ac8, AcAh1, AcAh2, AcDs2, AcDs4, AcEl1, AcEl2, AcEw1, AcHs1, AcHs2, AcHs2/Ac4	24.11	0.40
Allocasuarina huegeliana low woodlands to low open forests [Alliance 9] - TEC Buffer alliance Associations: AaKp1/AhTl2/AcAh3, AaKp1/AhTl2/AhAc3, Ah2, AhAc1, AhAc2/AhKp2, AhAc3, AhHs1, AhHs2, AhKp1, AhKp1/AhAc3/Ac4, AhKp2, AhKp3, AhKp3/(KpAh1), AhTl2, AhXd1, AhXd2	21.31	0.12
Calytrix leschenaultii open heath [Alliance 20/6] Association Cl1: *Allocasuarina campestris*, *Kunzea praestans* scattered tall shrubs over *Calytrix leschenaultii*, (*Hibbertia subvaginata*) open heath. Association ClAh2: *Allocasuarina huegeliana*, (*Acacia acuminata*) low open woodland to low woodland over *Kunzea praestans*, *Xanthorrhoea drummondii* high open shrubland over *Calytrix leschenaultii* open heath.	1.98	0.10
Eucalyptus loxophleba subsp. *loxophleba* low woodlands to low open forests [Alliance 3] Associations: El1, El4, El5	1.78	0.02
Eucalyptus wandoo subsp. *wandoo* woodlands and open forests [Alliance 2] Association Ew: *Eucalyptus wandoo* subsp. *wandoo* low woodland or open forest over open herb/grassland that included *Opercularia vaginata*, *Lomandra effusa*, *Orthrosanthus laxus*, *Crassula colorata* var. *colorata*, *Trachymene pilosa* and *Waitzia nitida* herbs and *Rytidosperma setaceum* and *Austrostipa exilis* grasses. Community Ew1: *Eucalyptus wandoo* subsp. *wandoo* woodland over scattered herbs. Community Ew2: *Eucalyptus wandoo* subsp. *wandoo* woodland over *Allocasuarina campestris* high shrubland. Community Ew4: *Eucalyptus wandoo* subsp. *wandoo* woodland over *Olearia dampieri* subsp. *eremicola*, *Hibbertia subvaginata* open (low) shrubland.	1.77	0.00
Hibbertia subvaginata low shrublands to low open heath [Alliance 18] Association Hs: *Hibbertia subvaginata* open heath. Community Hs1: *Hibbertia subvaginata*, (*Calytrix leschenaultii*) (low) open heath over scattered sedges with very open herbland and very open annual grassland. Association HsAh: *Allocasuarina huegeliana* scattered trees over *Hibbertia subvaginata* (low open shrubland) to open heath. Community HsAh1: *Allocasuarina huegeliana* low open woodland over *Hibbertia subvaginata* open heath over *Quoya dilatata* low shrubland over scattered grasses and scattered annual grasses.	0.66	0.00

Vegetation Association	Total Area Moora Mine DE (ha)	Area to be cleared within Moora Mine DF (amended) (ha)
Community HsAh2: *Allocasuarina huegeliana*, *Acacia acuminata*, *Eucalyptus loxophleba* subsp. *loxophleba* scattered low trees over *Allocasuarina campestris* high open shrubland, over *Hibbertia subvaginata* open heath over very open herbland/ sedgeland/ grassland.		
Kunzea praestans high shrubland to open and closed scrub [Alliance 16] - TEC Core alliance Associations: KpAh1, KpAhDs1, KpAhDs2, KpHs1, KpHs2	2.59	0.04
Regelia megacephala high shrubland to open and closed scrub [Alliance 15] - TEC Core alliance Associations: RmHs1, RmHs3, RmKp2	2.16	0.04
Mapped as Completely Degraded within areas of remnant vegetation	16.97	0.23
Total extent native vegetation	**77.19**	**0.95**
Previously cleared	**161.91**	**95.05**
Total extent	**239.10**	**96.00**



Paper Size ISO A3

0 100 200 300 400 500

Metres

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

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Vegetation Mapping within the Moora Mine and North Kiaka DE (Trudgen 2012 & 2018)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.5

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Print date: 22 Mar 2024 - 12:18

Data source: Simcoa: Mining Development Shape Areas is derived from client received 2020; Trudgen: Vegetation mapping - 2012 and 2018; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Road - 20180601. Created by: rbrown3

5.2.4.5.3 Vegetation condition

The vegetation condition was assessed, based on aerial imagery and information collected from the quadrat and relevés during the Trudgen (2012, 2016) surveys, in accordance with the vegetation Condition scale of Trudgen (1988) and this information was used in conjunction with aerial photograph interpretation to produce a condition map of the remnant vegetation in the survey area (Trudgen M. E., 2024).

A comparison of the Trudgen (1988) scale is made with the South West and Interzone Botanical Provinces devised by Keighery (1994) and the scale adapted by EPA (2016e) in Table 5.11. It is considered the Trudgen (1988) is equivalent to the EPA (2016e) scale as it recognises the intactness of vegetation and consists of six rating levels. Areas devoid of vegetation have been mapped as cleared (e.g. paddocks, roads, infrastructure) based on aerial imagery.

Table 5.11 Comparison of Trudgen (1988) and EPA (2016) condition scales

Trudgen (1988)	EPA (2016e)
E = Excellent. *Pristine or nearly so, no obvious signs of damage caused by the activities of European man.*	***Pristine*** *– Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.*
VG = Very good. *Some relatively slight signs of damage caused by the activities of European man. E.g. some signs of damage to tree trunks caused by repeated fire and the presence of some relatively non-aggressive weeds such as Ursinia anthemoides or Briza spp., or occasional vehicle tracks.*	***Excellent*** *– Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.*
G = Good. *More obvious signs of damage caused by the activities of European man, including some obvious impact on the vegetation structure such as caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones.*	***Very Good*** *– Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.*
P = Poor. *Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man such as grazing or partial clearing (chaining) or very frequent fires. Weeds as above, probably plus some more aggressive ones such as Ehrharta spp.*	***Good*** *– Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.*
VP = Very poor. *Severely impacted by grazing, fire, clearing or a combination of these activities. Scope for some regeneration but, not to a state approaching good condition without intensive management. Usually with a number of weed species including aggressive species.*	***Degraded*** *– Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.*
D = Completely degraded. *Areas that are completely or almost completely without native species in the structure of their vegetation. I.e. areas that are cleared or "parkland cleared" with their flora comprising weed or crop species with isolated native trees or shrubs.*	***Completely Degraded*** *– The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.*

5.2.4.5.3.1.1 North Kiaka DE Vegetation condition

The condition of mapped vegetation within the North Kiaka DE is summarised in Table 5.12 and shown in Figure 5.6.

Areas of native vegetation, within the North Kiaka DE range in condition (using the EPA (2016f) scale) from Very Good to Degraded, with 56.89 ha (65 %) mapped as Poor - Good or better condition, and 30.68 ha (35%) mapped as Poor to Degraded condition. Degradation has resulted from weed spread, from adjacent cleared farmland, and grazing by livestock, rabbits and kangaroos.

Areas of native vegetation, within North Kiaka DF range in condition (using the EPA (2016f) scale) from Very Good to Degraded, with 7.29 ha (43%) mapped as Poor-Good or better condition, and 9.83 ha (57%) mapped as Poor to Degraded condition.

124.83 ha (58%) of the North Kiaka DE has been previously cleared for the purpose of agriculture.

Table 5.12 Vegetation condition for native vegetation recorded in the North Kiaka DE and DF (as mapped by Trudgen 2012)

Vegetation condition rating	Extent within North Kiaka DE (ha)	Extent within North Kiaka DF (ha)
Very Good	4.90	1.10
Good – Very Good	13.04	0.22
Good	28.05	5.33
Poor – Good	10.90	0.64
Poor	14.28	5.31
Very Poor – Poor	7.81	4.28
Very Poor	4.90	0.14
Degraded – Very Poor	1.13	0.10
Degraded	2.55	0.00
Total native vegetation	**87.57**	**17.12**
Total Cleared	**124.83**	**27.47**
Rocky outcrops	**4.02**	**0.00**
Total Extent	**216.42**	**44.59**

5.2.4.5.3.1.2 Moora Mine Vegetation Condition

The condition of mapped vegetation within the Moora Mine DE is summarised and amended DF is provided in Table 5.13 and shown in Figure 5.6.

Areas of native vegetation, within the North Kiaka DE range in condition (using the EPA (2016f) scale) from Very Good – Excellent to Degraded, with 56.08 ha (73%) mapped as Poor - Good or better condition, and 21.11 ha (27%) mapped as Poor to Degraded condition. Native vegetation within the amended Moora Mine DF ranges in condition from Good-Very Good to Degraded, with 0.7 ha in Good to Very Good condition and the remaining vegetation in Very Poor – Poor or worse condition.

Table 5.13 Impact of the proposed clearing to build Moora Mine abandonment bund by vegetation condition[1] (as mapped by Trudgen 2012)

Vegetation condition rating	Total Area Moora Mine DE	Area to be cleared within Moora Mine DF (amended)
Very Good - Excellent	2.03	0.00
Very Good	20.85	0.00
Good – Very Good	26.98	0.66
Good	4.24	0.04
Poor – Good	1.98	0.00
Poor	0.00	0.00
Very Poor – Poor	2.14	0.02
Very Poor	0.49	0.00
Degraded – Very Poor	0.78	0.00
Degraded	17.70	0.23
Total native vegetation	**77.19**	**0.95**
Previously cleared	**161.91**	**95.05**
Total Extent	**239.10**	**96.00**

[1] With vegetation condition mapping completed in 2012 and operations at Moora Mine ongoing, it is possible that vegetation adjacent to the current disturbance footprint (i.e. mine pits) has further degraded since 2012.

LEGEND

- Road
- Watercourse
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)

Vegetation Condition (Trudgen 2018)

- Excellent
- Very Good to Excellent
- Very Good
- Good to Very Good
- Good
- Poor to Good
- Poor
- Poor to Very Poor
- Very Poor
- Degraded to Very Poor
- Very Poor to Degraded
- Degraded

Midlands Rd

Kiaka Rd

Landgate / SLIP

Cattady Rd

Paper Size ISO A3

0 100 200 300 400 500

Metres

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

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Vegetation Condition Mapping within the Moora Mine and North Kiaka DE (Trudgen 2018)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.6

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Print date: 22 Mar 2024 - 12:18

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

5.2.4.5.4 Threatened and Priority ecological communities

Desktop assessment of EPBC PSMT (DCCEEW, 2023c) and DBCA TEC and PEC dataset identified the following communities listed under the EPBC Act and/ or BC Act and DBCA priority listed TEC/ PECs as potential, within 10 km buffer of the Moora Mine and North Kiaka DE:

– 'Banksia Woodlands of the Swan Coastal Plain Community' TEC/ PEC (EN under the EPBC Act, Priority 3 State listed PEC)
– 'Eucalyptus Woodlands of the Western Australian Wheatbelt' TEC/ PEC (CR under the EPBC Act, Priority 3 State listed PEC)
– 'Salmon Gum Woodlands of the wheatbelt' (CR under the EPBC Act, Priority 3 State listed PEC)
– 'Vegetation alliances on ridges and slopes of the chert hills of the Coomberdale Floristic Region' (CR under the BC Act).

5.2.4.5.4.1.1 Threatened Ecological Communities

'Eucalyptus Woodlands of the Western Australian Wheatbelt' TEC

DCCEEW (then DAWE) conducted their initial assessment of North Kiaka DE (EPBC 2021/9089) and requested further information on the potential presence / absence of TECs occurring within 2 km of the North Kiaka DE, these included:

– 'Eucalyptus Woodlands of the Western Australian Wheatbelt' TEC (also a WA State-listed PEC)
– 'Banksia Woodlands of the Swan Coastal Plain Community' TEC/ PEC (EN under the EPBC Act, Priority 3 State listed PEC)
– 'Vegetation alliances on ridges and slopes of the chert hills of the Coomberdale Floristic Region' (CR under the BC Act).

The EPA's Notice requiring further information (Table 5.6, EPA 2022) requested that the potential presence of 'Eucalypt Woodlands of the Western Australian Wheatbelt' TEC/ PEC be considered and discussed in the Revised Referral Document. If a potential for impact is identified, the EPA require the distribution and quality of the TEC/ PEC and potential impacts to be assessed.

SIMCOA sought further information from Trudgen at this time regarding the potential presence of 'Eucalyptus Woodlands of the Western Wheatbelt' TEC/ PEC. Trudgen's response (dated 10 December 2021) is provided as an attachment to Appendix V.

The assessment by Trudgen (2021) confirms isolated patches of Eucalypts such as *Eucalyptus salmonophloia, Eucalyptus loxophleba* and *Eucalyptus wandoo* persist within the regional mapped distribution of Coomberdale TEC, particularly where non-chert geologies are present within the region.

Eucalyptus loxophleba is associated with the following vegetation communities in the North Kiaka DE and Moora Mine DF:

– The North Kiaka DF will impact 0.57 ha of plant community Elo3 of Poor condition (Figure 5.6).
– The area to be cleared within Moora Mine DF (amended) will impact 0.02 ha of plant community El5 of Very Poor to Poor condition (Figure 5.6).

The Commonwealth of Australia (2016) Guidance[2] '*Eucalypt Woodlands of the Western Australian Wheatbelt: a nationally protected ecological community'* includes criteria that would exclude a patch of Eucalyptus woodlands from being classified as 'Eucalypt Woodlands of the Western Australian Wheatbelt' TEC:

– *Non-eucalypt woodlands, e.g. with jam, sheoak, banksia*
– *Woodlands limited to granite or rock outcrops and higher elevations*
– *Vegetation with a sparse tree canopy cover, under 10%.*
– *Isolated paddock trees, very small remnants and patches that are degraded and in poor low condition*
– *Minimum patch size of 2 ha where vegetation understorey comprises <30% invasive species (i.e. high quality)*

[2] Commonwealth of Australia (2016). Guidance: Eucalypt Woodlands of the Western Australian Wheatbelt: a nationally protected ecological community. Available online: **https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/guide-eucalypt-woodlands-wa-wheatbelt**

– *Minimum patch size of 5 ha where vegetation understorey comprises >30% invasive species (i.e. low quality).*

Based on the above listed criteria, it is unlikely that plant communities Elo3 and El5 would represent 'Eucalypt Woodlands of the Western Australian Wheatbelt' PEC/ TEC particularly the given the community occurs on the chert outcrop (high elevation) and is in Poor condition.

Trudgen (2021) reported that the closest native vegetation with potential to represent 'Eucalyptus Woodlands of the Western Wheatbelt' TEC is a linear corridor of vegetation within the Midlands Road/ Rail reserve approximately 1 km west of the North Kiaka DE. Consequently, SIMCOA believes that there is low potential impact from the Project, as described in earlier information.

'*Vegetation alliances on ridges and slopes of the chert hills of the Coomberdale Floristic Region'* (Coomberdale Chert Hills TEC - CR)

Trudgen (2012; 2018) considered vegetation within the DE to be representative of the 'Vegetation alliances on ridges and slopes of the chert hills of the Coomberdale Floristic Region*'* (Coomberdale TEC), which is listed as Critically Endangered under the BC Act (DBCA, 2022).

The Coomberdale TEC Interim Recovery Plan (DPAW, 2013b) indicates the Coomberdale TEC habitat is "*restricted to the exposed quartzite ridges of the Noondine chert formations in the Coomberdale region from Jingemia to Moora*" and "*particular floristic composition of the heath community is assumed to relate to the soil/substrate types and depths*". The soil depth of the chert ridges varies from skeletal on chert outcrops, to gravelly loamy sands on the lower slopes. Typically, the surface soils are commonly pale grey, silty, fine sand (DPAW, 2013b).

Research undertaken by Mr Trudgen during the years to 2006 (Trudgen, Morgan, & Griffin, 2006) was referenced by DBCA when developing both the fact sheet for the TEC (DBCA, 2013) and the Interim Recovery Plan (IRP 338) for the vegetation in the TEC (DPAW, 2013b). Surveys undertaken by ME Trudgen and Associates (1985; 2006; 2012; Trudgen, 2018) followed those originally defined by Griffin (1992; 1994) recognised the distinctiveness of these vegetation types both within the Coomberdale Floristic Region and when compared to other floristic regions. The original description of the Coomberdale Chert TEC was based on limited information and was updated by Trudgen et al. (Trudgen, Morgan, & Griffin, 2006) when they surveyed plant communities occupying the outcropping areas of the Noondine Chert (Coomberdale Chert). Based on the work (Trudgen, Morgan, & Griffin, 2006), the Coomberdale Chert TEC was reviewed by the Western Australian Threatened Ecological Community Scientific Committee (TECSC), which recommended that the Coomberdale Chert TEC be renamed and the interim recovery plan be updated. This was further updated in 2022 when the TEC was changed to critically endangered under the BC Act.

The Coomberdale TEC was first defined by Griffin (1992; 1994) as encompassing three closely related vegetation sub-types occurring on exposed chert ridges and gravelly slopes of the chert hills. The three vegetation sub-types included (DPAW, 2013b):

– Dense heath dominated by *Regelia megacephala* and *Allocasuarina campestris* on exposed chert ridges
– Dense heath or open low woodland over dense to mid-dense heath dominated by *Kunzea praestans*
– *Allocasuarina campestris* on shallow loamy rocky soil over chert on the slopes and ridges.

Flora species common to all three sub-types included (DPAW, 2013b):

– *Banksia fraseri var. fraseri*
– *Banksia sessilis*
– *Hibbertia subvaginata*
– *Xanthorrhoea drummondii* (now undescribed *Xanthorrhoea* sp. Coomberdale)
– *Calothamnus quadrifidus*
– *Calytrix leschenaultia* (now undescribed *Calytrix* sp. Coomberdale).

Trudgen (2012; 2018) identified and mapped 101 vegetation associations, which were then grouped into 30 alliances that reflect soil depth and location on slopes. On the basis of the work completed by Trudgen, seven of the vegetation alliances (13 – 19) were identified as 'core' units of the Coomberdale TEC (Table 5.14), and a further three vegetation alliances (4, 9, 11) were identified as 'buffer' or peripheral units of the Coomberdale TEC (Figure 5.6) (DPAW, 2013b).

As detailed in the Coomberdale TEC Interim Recovery Plan the location of the approximately 785 ha of Coomberdale TEC (65 occurrences) has been recorded within a variety of landholdings (DPAW, 2013b):

– 192 ha (~ 24%) on land managed for conservation (National Park or Nature Reserve)
– 382.6 ha (~ 49%) on private land covered by mineral tenements
– 183 ha (~ 23%) on private freehold land not within mineral tenements
– 15.6 ha (~ 2%) on a water reserve
– 11.8 ha (~ 1.5%) on Unallocated Crown Land, currently under pastoral / grazing lease.

Trudgen (2018) confirmed the presence of the following:

– 16.03 ha of core vegetation alliances and 0.42 ha of buffer vegetation alliances associated with the Coomberdale TEC within the North Kiaka DE (Table 5.14).

0.48 ha of core vegetation alliances and 0.12 ha of buffer vegetation alliances associated with the Coomberdale TEC within the Moora Mine amended DF (

– Table 5.15).

Table 5.14 Vegetation alliances identified as 'core' units of the Coomberdale TEC within the North Kiaka DE and DF (DPAW, 2013b)

Vegetation Alliance	Description	Present within North Kiaka DE (ha)	Present within North Kiaka DF (ha)	% of 785 ha Coomberdale TEC occurrence present within North Kiaka DF
Core vegetation alliances				
13	*Allocasuarina campestris* high shrublands to open and closed scrub	35.74	5.66	0.7
14	*Allocasuarina microstachya* open scrub	0.00	0.00	0.0
15	*Regelia megacephala* high shrubland to open and closed scrub	4.94	2.14	0.3
16	*Kunzea praestans* high shrubland to open and closed scrub	14.99	7.74	1.0
17	*Melaleuca leuropoma* open to closed heath	0.80	0.49	<0.1
18	*Hibbertia subvaginata* low shrublands to low open heath	0.00	0.00	0.0
19	*Xanthorrhoea drummondii* shrubland	0.00	0.00	0.0
Buffer vegetation alliances				
4	*Eucalyptus eudesmioides* mallee	0.00	0.00	0.0
9	*Allocasuarina huegeliana* woodlands	14.34	0.20	<0.1
11	*Acacia acuminata* low woodlands	7.69	0.22	<0.1
Total TEC core vegetation alliances		56.47	16.03	2.0
Total buffer vegetation alliances		22.03	0.42	<0.1
Total other vegetation		9.07	0.67	-
Rocky		4.02	0.00	-
Cleared		124.83	27.47	-
Total		**216.42**	**44.59**	**2.1**

Table 5.15 Vegetation alliances identified as 'core' units of the Coomberdale TEC within the Moora Mine DE and DF (amended) (DPAW, 2013b)

Vegetation Alliance	Description	Present within Moora Mine DE (ha)	Present within Moora Mine DF (ha) (amended)	% of 785 ha Coomberdale TEC occurrence present within North Kiaka DF
Core vegetation alliances				
13	*Allocasuarina campestris* high shrublands to open and closed scrub	31.23	0.40	<0.1
15	*Regelia megacephala* high shrubland to open and closed scrub	2.20	0.04	<0.1
16	*Kunzea praestans* high shrubland to open and closed scrub	3.10	0.04	<0.1
Buffer vegetation alliances				
9	*Allocasuarina huegeliana* woodlands	22.18	0.12	<0.1
11	*Acacia acuminata* low woodlands	4.09	0.00	0.0
Total TEC core vegetation alliances		36.53	0.48	<0.1
Total buffer vegetation alliances		26.27	0.12	<0.1
Total other vegetation		18.57	0.35	-
Cleared		6.89	0.05	-
Total		**88.26**	**1.00**	<0.1

The field surveys (Trudgen et al, 2012; 2018) did not identify the following TECs, identified in the desktop assessment, within the Moora Mine and North Kiaka DE:

– 'Banksia Woodlands of the Swan Coastal Plain Community' TEC (EN under the EPBC Act)
– 'Eucalyptus Woodlands of the Western Australian Wheatbelt' TEC (CR under the EPBC Act)
– 'Salmon Gum Woodlands of the wheatbelt' TEC (CR under the EPBC Act).

5.2.4.5.4.1.2 Priority Ecological Communities

The field surveys (Trudgen et al, 2012; 2018) did not identify the following PECs, identified in the desktop assessment, within the Moora Mine and North Kiaka DE:

– 'Banksia Woodlands of the Swan Coastal Plain Community' PEC (Priority 3 State listed PEC)
– 'Eucalyptus Woodlands of the Western Australian Wheatbelt' PEC (Priority 3 State listed PEC)
– 'Salmon Gum Woodlands of the wheatbelt' PEC (Priority 3 State listed PEC).

LEGEND

- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)
- Road
- Watercourse
- 10km Buffer

Threatened and Priority Flora

- *Acacia aristulata*
- *Daviesia dielsii*
- *Baeckea sp.* Moora (R.Bone 1993/1)
- *Regelia megacephala*
- *Gastrolobium acutum*
- *Caesia sp. Moora*
- *Goodenia arthrotricha*
- *Diuris recurva*
- *Cryptandra glabriflora*
- *Tricoryne sp.* Wongan Hills
- *Stylidium glabrifolium*
- *Cyrtostylis luegelii*
- *Melaleuca sclerophylla*
- *Eucalyptus pruiniramis*
- *Pterostylus aff. rufa*
- *Grevillea amplexans ssp. semivestita*
- *Wurmbea drummondii*
- *Leptospermum aff. erubescens*
- *Hemigenia sp.*
- *Guichenotia tuberculata*
- *Hypoxis aff. glabella*
- *Eremaea sp.* Cairn Hill
- *Pityrodia sp.*
- *Stenanthemum tridentatum*
- *Stylidium sp.* Moora
- *Synaphea quartzitica*
- *Austrostipa sp.* Cairn Hill
- *Austrostipa exilis*
- *Amblysperma sp.*

Threatened and Priority Ecological Communities (DBCA)

- Banksia Woodlands of the Swan Coastal Plain ecological community
- Eucalypt woodlands of the Western Australian Wheatbelt
- Vegetation alliances on ridges and slopes of the chert hills of the Coomberdale Floristic Region

Namban East Rd
Carino Rd
Coomberdale West Rd
Coomberdale East Rd
Old Geraldton Rd
Miling West Rd
Kiaka Rd
Prices Rd
Noondine Rd
Berkshire Valley Rd
Dalaroo East Rd
Bungalong Rd
Cattady Rd
Miling-Moora Rd
Riley Rd
Reid Rd
Dandaragan Rd
Landgate / SLIP

Paper Size ISO A3

0 1,000 2,000 3,000 4,000

Meters

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Threatened and Priority Flora and Vegetation Communities within the Moora Mine and North Kiaka DE (DBCA)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.7

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Print date: 22 Mar 2024 - 12:16

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

5.2.4.5.5 Significant flora

A desktop assessment of NatureMap (DBCA, 2023a), EPBC Protected Matters Search Tool (PMST) (DCCEEW, 2023c) and DBCA WA Herbarium datasets (DBCA, 2023b) identified 27 Threatened species listed under the EPBC Act and BC Act and 40 DBCA priority listed species as potentially within a 10 km buffer of the Moora Mine and North Kiaka DE.

5.2.4.5.5.1.1 Threatened flora – North Kiaka DE

A post survey likelihood of occurrence assessment (Appendix I) of the 27 potential Threatened species, listed under the EPBC Act and BC Act, identified that seven threatened flora species which could possibly occur within the North Kiaka DE based on habitat. Of these, two are highly unlikely to occur within the North Kiaka DE, with one unlikely to occur due to habitat differences and three known to occur in the survey area (Trudgen M. E., 2024).

Table 5.16 Commonwealth and State listed Threatened flora species which possibly occur in the North Kiaka DE

Species	EPBC Act status	BC Act status	Survey efficacy	Likelihood of occurrence (post survey)	Flowering period
Acacia aristulata	EN	EN	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and Rare/Priority search transects.	Known to occur, population well defined. After fire or disturbance may appear from soil stored seed at additional locations to those already known.	September to December
Daviesia dielsii	EN	EN	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects. Population well defined.	Known to occur in 2012 survey area; population well defined. After fire or disturbance may appear from soil stored seed at additional locations to those already known.	July
Gastrolobium appressum	VU	EN	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Highly unlikely to occur. Outside known range, soil, habitat not suitable.f	August to December
Gastrolobium hamulosum	EN	CR	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Highly unlikely to occur, due to survey intensity and size of the species.	August to October
Goodenia arthrotricha	EN	EN	High coverage of 2012 survey area with 99 quadrats, numerous releves and transects.	Known to occur in survey area. After fire or disturbance may appear from soil stored seed at additional locations to those already known.	October to November
Hemiandra gardneri	EN	CR	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Highly unlikely to occur. due to survey intensity. Apart from one old record in the Moora area known occurrences are more than 25 km away. Soil types in TEC remnants not suitable.	August to October
Synaphea quartzitica	EN	EN	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	The occurrence in the TEC survey area is localised. Additional localities possible but unlikely. Unlikely to occur in TEC north of Kiaka Road due to habitat differences.	July to August

EN: Endangered, CR: Critically Endangered, VU: Vulnerable

Targeted surveys were undertaken during the key flowering period of each of these species, which confirmed the presence of two threatened flora species, *Acacia aristulata* and *Daviesia dielsii,* within the North Kiaka DE and DF (Table 5.17). Both species are listed as Endangered under the EPBC Act and BC

Act. The distribution of recorded populations is shown in Figure 5.9 (*Acacia aristulata*) and Figure 5.10 (*Daviesia dielsii*).

Table 5.17 Threatened flora recorded within the North Kiaka DE (Trudgen 2018)

Species	No. locations recorded in mapped regional extent of Coomberdale TEC	No. populations (individuals) recorded in the North Kiaka DE	No. populations (individuals) recorded in the North Kiaka DF	Comments
Acacia aristulata (EN)	220 locations with an estimated 1,100 plants	15 populations (39 individuals)	6 populations (16 individuals)	Given the pyrosere strategy of these species (i.e seed germination is triggered following a bushfire event) the population could potentially be larger than initially recorded. However, the germination of dormant seed banks will only be triggered by a bush fire event (Trudgen, 2018). The DCBA Fire History (DBCA-060) (see Figure 5.4) shows that there have been no fire events through the Proposal area in the past 12 years (DBCA 2024). This has been confirmed with the landowner of the North Kiaka DE.
Daviesia dielsii (EN)	111 locations with an estimated 365 plants	17 populations (>91 individuals)	4 populations (15 individuals)	

Acacia aristulata

Listed as Endangered under the EPBC Act and the WA BC Act, *Acacia aristulata* is an erect or scrambling shrub, which is confined to the Moora-Watheroo area of south-west WA. The species is associated with outcrops on low rocky ridges and hills, in brown sandy clay loam over granite and chert (DCCEEW, 2023a). The species appeared to be most common in vegetation dominated by *Kunzea praestans* and is also often found with *Regelia megacephala* and was often observed to have been grazed (Trudgen 2018).

While the species is considered to have a very restricted distribution, within the area of the Coomberdale TEC, it is almost certainly a pyrosere species (i.e. seeds lie dormant in the soil layers and germination is triggered by a bushfire event).

Construction of the Project will require clearing of up to 16 individual *Acacia aristulata* plants (six populations) recorded within the North Kiaka DF.

A targeted flora survey has been planned for April 2024 to collect information on the threatened and priority flora in the North Kiaka DE. Although this is outside of flowering season, botanists have confirmed that the threatened and priority species can be readily identified at this time.

Daviesia dielsii

Listed as Endangered under the EPBC Act and the WA BC Act, *Daviesia dielsii* is a low shrub with spreading branches, it is generally inconspicuous but noticeable during flowering, with small bright orange-red flowers. This species is endemic to WA, known from 15 populations in the Moora and Watheroo areas. It tends to occur in scattered patches of remnant vegetation in landscapes highly modified for agricultural purposes and degraded roadside reserves. *Daviesia dielsii* grows on flat or elevated areas on a variety of sandy/gravelly loam soils (DCCEEW, 2023b).

While this species has a wider geographic distribution than *Acacia aristulata*, it is still geographically restricted. The species was most commonly found by Trudgen (2018) between *Kunzea* and *Allocasuarina campestris* communities.

Construction of the Project will require clearing of up to 15 individual *Daviesia dielsii* plants (five populations) recorded within the North Kiaka DF.

A targeted flora survey has been planned for April 2024 to collect information on the threatened and priority flora in the North Kiaka DE. Although this is outside of flowering season, botanists have confirmed that the threatened and priority species can be readily identified at this time.

5.2.4.5.5.1.2 Priority flora

Based on the findings of a post survey likelihood of occurrence assessment (Appendix I) of the 40 potential priority listed species, based on availability of suitable habitat, 15 species are considered to possibly occur within the North Kiaka DE and six are unlikely or highly unlikely to occur (Trudgen M. E., 2024).

Nine of these priority flora species have been recorded within the regional mapped extent of Coomberdale TEC (Trudgen, 2018).

Table 5.18 DBCA Priority listed flora species which possibly occur in the North Kiaka DE

DBCA Priority listing	Possible species	Survey efficacy	Post survey updated likelihood	Flowering period
Priority 1	*Acacia congesta* subsp. *cliftoniana*	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and Rare/Priority search transects.	Highly unlikely to occur.. The putative record at Cairn Hill is likely to be mis-determined. All other records of Acacia congesta from Cairn Hill or the TEC area (including 4 determined by B. Maslin) are considered to be subspecies congesta.	August to September
Priority 2	*Bossiaea moylei*	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Known to occur in 2012 survey area, population well defined. *Bossiaea moylei* has a sporadic distribution in the TEC south of Kiaka Road. It has not been recorded north of Kiaka Road in any quadrat, releve, or any rare flora search transect.	September
	Stylidium glabrifolium	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Known to occur in 2012 survey area. Not recorded north of Kiaka Road. Weed levels in the proposed mine area reduce the likelihood of occurrence there.	October to November
	Stylidium milleri	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Highly unlikely to occur as soil types and vegetation types are not suitable.	September to October
	Stylidium sp. Moora (J.A.Wege 713)	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Occurs north of Kiaka Road, including in the proposed mine footprint.	
	Tricoryne sp. Wongan Hills (B.H. Smith 794)	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Known to occur in survey area. Population well defined, although some plants not in flower during surveys may be present in areas where not recorded.	October and November
	Eremaea sp. Cairn Hill (B. Morgan 532)	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Occurs at one location in 2012 survey area. A distinctive medium sized shrub, unlikely to occur at other locations there. Suitable habitat does not occur north of Kiaka Road.	October to November
Priority 3	*Acacia flabellifolia*	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and Rare/Priority search transects.	Highly unlikely. The closest records for this species to the proposed North Kiaka Mine are from ca. 20 km to the north (near Watheroo). One collection from near Watheroo was collected on quartzite, but others were collected from Wandoo woodland. Acacia flabellifolia has not been	August

DBCA Priority listing	Possible species	Survey efficacy	Post survey updated likelihood	Flowering period
			collected in the 2012 survey area. Acacia ericksoniae, has been recorded, but is clearly different to Acacia flabellifolia.	
	Austrostipa nunaginensis	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Given the small size of this taxon and the frequency of other Austrostipa of similar size in the TEC, it is possible that a small number of additional occurrences may occur. Weed levels in the proposed mine area reduce the likelihood of occurrence there.	Late Spring
	Babingtonia urbana	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Highly unlikely to occur. The lack of wetland habitat excludes any reasonable chance of this taxon occurring in the TEC survey area.	October to February
	Guichenotia tuberculata	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	The occurrence in the TEC survey area is localised. Additional localities possible but unlikely. Unlikely to occur in TEC north of Kiaka Road	August to October
	Hemigenia conferta	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	The occurrence in the TEC survey area is localised. Additional localities possible but unlikely. Unlikely to occur in TEC north of Kiaka Road due to habitat differences.	September to October
	Melaleuca sclerophylla	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Known to occur in southern part of 2012 survey area. No suitable habitat north of Kiaka Road.	June to September
	Petrophile biternata	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Highly unlikely to occur.	August to October
Priority 4	*Diuris recurva*	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Known to occur. The small size of this taxon and flowering necessary for identification it is likely that a small increase in occurrences would be found if the whole TEC survey area was more intensively searched.	July to August
	Regelia megacephala	High coverage of all habitats in 2012 survey area with 99 quadrats, 398 releves and DRF/Priority transects.	Forms numerous stands in the 2012 survey area. Given the size of this taxon, it is likely all stands in the TEC survey area have been recorded.	October to December

Field surveys were undertaken during the flowering period of each of these species by Trudgen (2012, 2018). The field surveys recorded two Priority 4 flora species, *Diuris recurva* and *Regelia megacephala,* within the North Kiaka DE and DF (Table 5.19). The distribution of recorded populations is shown in Figure 5.11 (*Diuris recurva*) and Figure 5.12 (*Regelia megacephala*).

Table 5.19 Priority flora recorded within the North Kiaka DE (Trudgen 2018)

Species	No. locations recorded in mapped regional extent of Coomberdale TEC	No. populations (individuals) recorded in the North Kiaka DE	No. populations (individuals) recorded in the North Kiaka DF	Comments
Diuris recurva (P4)	31 stands	10 populations (65 individuals)	10 populations (65 individuals)	Data is mostly from occurrence at vegetation recording sites (from 2016 and 2017 surveys) updated to show counts of individuals (Trudgen M. E., 2024).
Regelia megacephala (P4)	71 stands	7 populations (unknown)	1 population (unknown)	

***Diuris recurva* (Priority 4)**

Diuris recurva, an orchid species, occurs sporadically in the Coomberdale TEC and is generally found as scattered individuals or small clusters of a few plants.

Construction of the Project will require clearing of up to 65 individual *Diuris recurva* plants (10 populations) recorded within the North Kiaka DF.

***Regelia megacephala* (Priority 4)**

Regelia megacephala is a large shrub that dominates areas of tall shrubland and is found in moderately large patches, where it is locally abundant. It is considered one of the defining species of some of the vegetation types of the Coomberdale TEC, as it is known to be restricted in distribution to the Coomberdale Chert. This species is very geographically restricted, with all records of the vegetation (but one), between Moora and Coomberdale (the other one is from south of Moora).

Construction of the Project will require clearing of one (1) population of *Regelia megacephala* (number of individuals unknown) recorded within the North Kiaka DF.

5.2.4.5.5.1.3 Threatened flora – Moora Mine DF (amended)

The proposed abandonment bund is positioned as close as possible to the perimeter of the existing open pits (Main Pit and West Pit) to optimise use of existing disturbed or degraded areas, minimising disturbance to adjacent native vegetation representing Coomberdale TEC, thereby ensuring the proposed amendment will not result in a significant negative impact to flora and vegetation.

Three threatened flora species were recorded by Trudgen (2012) within M70/191:

– *Acacia aristulata* (listed Endangered under the EPBC Act and BC Act)
– *Daviesia dielsii* (listed Endangered under the EPBC Act and BC Act)
– *Goodenia arthrotricha* (listed Endangered under the EPBC Act and BC Act).

Three priority flora species (as listed by DBCA) were recorded by Trudgen (2012) within M70/191:

– *Tricoryne arenicola* [now Tricoryne sp. Wongan Hills (B.H. Smith 794)] (DBCA-listed P2)
– *Cryptandra glabriflora* (DBCA-listed P2) [Vouchers redetermined as C. myriantha]
– Regelia megacephala (DBCA-listed P4).

Only one (1) threatened flora will be impacted by the proposed amendment; it is a single *Acacia aristulata* recorded within the waste dump. This has been shown in Figure 5.9.

5.2.4.5.6 Other flora of conservation interest

Trudgen (2018) noted the presence of ten other flora species of 'conservation interest' as per EPA (2016b) factor guideline for flora and vegetation (refer to Section 3.8 of Trudgen (2018), Appendix G), however these species are not EPBC Act or State listed threatened or priority flora. Flora of conservation interest within the North Kiaka DE are outlined in Table 5.20.

Table 5.20 Other flora of conservation significance within the North Kiaka DE (Trudgen, 2018)

Taxon	Significance of taxon or TEC population of taxon	Number of occurrences for North Kiaka DE
Banksia sphaerocarpa var. aff. *caesia*	Range edge, atypical habit and habitat for var. *sphaerocarpa*. Range extension and atypical habitat for var. *caesia*.	2 (6 individuals)
Calothamnus aff. *quadrifidus* (Moora - Watheroo)	Moderately geographically restricted, edaphically restricted not very common.	2
Calytrix sp. Coomberdale (M.E. Trudgen MET 21184)	Geographically restricted, common in some habitats in the TEC. Not recognised as distinct in earlier surveys of the TEC. Previously recorded by Trudgen (2012) as *Calytrix leschenaultii*.	7 (Sample underestimates the large population in the North Kiaka DE)
Cristonia stenophylla	TEC population outlying from main population by 60 km. Possibly locally extinct or may be a pyrosere species. The most recent DCBA Fire History data (DBCA-060) (Figure 5.4) shows that there have been no fire events through this area in the past 12 years, and the last fire to impact the North Kiaka DE was back in 1981 (DBCA 2024). This has been confirmed with the landowner.	1
Gastrolobium acutum (previously State listed P3 species)	Near northern limit, has disjunctions that may indicate unrecognised subspecies.	1
Kunzea praestans (previously a State listed P3 species)	More restricted than herbarium collections show (due to identification errors). May have unrecognised subspecies.	10 (Underestimates the large population in the North Kiaka DE)
Pterostylis exserta	Known from less than ten locations.	1
Quoya (Pityrodia) dilatata	Has three centres of occurrence (may indicate subspecies), the southern one disjunct on current knowledge.	3 (Sporadic in the North Kiaka DE, data underestimates population)
Wurmbea drummondii (previously a State listed P4 species)	No longer a priority species, but not very common.	2
Xanthorrhoea sp. Coomberdale (M.E. Trudgen MET 25047)	Quite geographically restricted, only observed on the Coomberdale Chert south of Coomberdale and one location near Moora. Not recognised as distinct in earlier surveys of the TEC. Previously recorded by Trudgen (2012) as *Xanthorrhoea drummondii.*	9 (Locally common; sample underestimates the population)

5.2.4.5.7 Other species of interest

Nutsia Floribunda (Moodjar Tree) are considered sacred to the Noongar people. These trees are found in several IBRA Regions: Avon Wheatbelt, Esperance Plains, Geraldton Sandplains, Jarrah Forest, Mallee, Swan Coastal Plain, Warren. They are known to grow in white, grey or yellow sand, sandy loams, brown sandy gravel over clay, granite, laterite, limestone on sandplains, slopes and base of rock outcrops *(WA Herbarium 1997-)*

The 2012 surveys identified the presence of five Moodjar trees within the Proposal area as a minor component within quadrats (Trudgen et al, 2012).

While the Moodjar trees are not registered as culturally significant sites within the Revised Proposal, however SIMCOA consulted with the Traditional Owners and has committed to mitigate impacts through the following:

– the location of Moodjar trees will be identified and mapped using aerial photography (acquired in January 2024). This will be used to avoid these trees, where possible within the North Kiaka DE when the site is developed (EPA, 2023)
– SIMCOA will engage heritage monitors during construction of the Proposal where any clearing is to directly impact the of Moodjar trees (DPLH, 2015)
– The Moodjar trees are managed through the measures described in SIMCOA's EMP (GHD, 2023g) (see Appendix C).

5.2.4.5.8 Introduced species

The Trudgen (2018) flora and vegetation survey report did not provide detail regarding on the presence or absence of weeds in the North Kiaka DE, however, it is noted in the Trudgen (2023) rehabilitation report that weeds are common in the Moora Mine area and they are likely to be present in the North Kiaka DE as it's been heavily disturbed and grazed over time.

5.2.4.5.8.1 Pathogens - Dieback

Phytophthora cinnamomi is a soil fungus which kills susceptible plants by attacking their root systems preventing the plant from absorbing water and nutrients. Dieback is the term commonly used when referring to this fungus due to its effect on vegetation. The fungus is found throughout the southern extent of WA in areas with susceptible plant species that receive rainfall in excess of 400 mm/year (Dieback Working Group, 2008). Review of the DPAW *Phytophthora* Dieback Map (DBCA, 2019) indicates the North Kiaka DE is located in an area of potential dieback. A Phytophthora dieback survey, assessment and management plan was completed in 2022 (Great Southern Bio Logic, 2022). A Broad Area survey was undertaken across vegetated areas within the Revised Proposal to identify assessable vegetation, susceptible vegetation, and evidence of Phytophthora Dieback within the vegetation. The survey results were used to determine protectability of the vegetation (Great Southern Bio Logic, 2022). As defined in in Section 3.2 of the PDMM (pg14) DBCA's strategy for protecting areas from Dieback requires application of hygiene management rules, including clean on entry, across all areas that meet the DBCA protectability criteria including areas that:

– Receive greater than 600mm of annual rainfall or areas with annual rainfall above 400mm but with water gaining sites (creek, soak, drain etc). or
– Are determined to be free of dieback by a registered Phytophthora Dieback Interpreter.

Areas meeting this definition are termed 'Protectable' and these are the areas where hygiene strategies, informed by a Risk Assessment and Phytophthora Dieback Management Plan are required. The Broad Area survey method is defined in *Phytophthora Dieback Interpreters Manual for Land* managed by the department (DBCA, 2015) and the survey complied with the Phytophthora Dieback Management Manual (DBCA, 2020). The survey was undertaken by a DBCA registered interpreter, registered to undertake assessments in low rainfall areas.

A Dieback management plan has been prepared for Moora Mine and the Project to address the potential impacts of operations on the risk of dieback ((Great Southern Bio Logic, 2022) Appendix J). The Phytophthora Dieback Management Plan (PDMP) acknowledges the site is within the vulnerable zone but identifies that the vegetation is not protectable as it fails to meet the various protectability criteria as defined in both the PDMM and the Dieback Interpreters Manual (Great Southern Bio Logic, 2022).

The reasons given are the location of vegetation on upslope quartzite ridges that cannot be classified as water gaining sites in an area receiving less than 600mm.

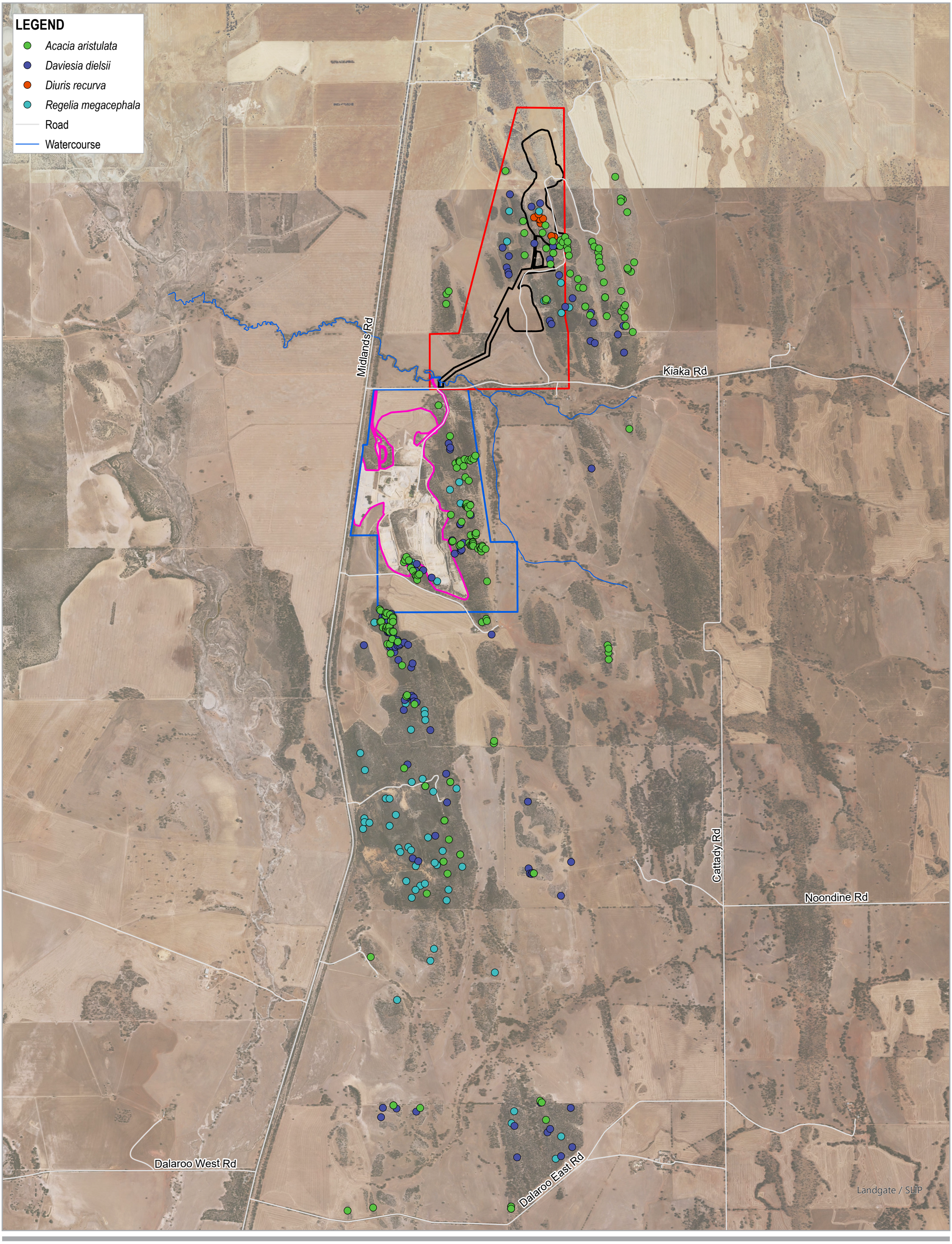
The PDMP Risk assessment follows the process defined in the PDMM and is summarised below

– Soil moisture during the proposal operations may be dry through to wet (Step1 PDMM pg 33)
– The Likelihood of Introducing the disease must be considered Very Likely (Step 2 PDMM pg 33)

The Consequence of introducing the disease will be INSIGNIFICANT as there are no protectable areas (Step 3 page 34 PDMM) This is because there is insufficient annual rainfall for the pathogen to exist away from water gaining sites and the only water gaining sites contain unsusceptible vegetation.

The overall Risk is LOW in all soil moisture conditions (Step 4 PDMM Page 35)

Low risk activities may proceed under Basic Dieback Management (DBCA decision tree, PDMM Appendix 1). SIMCOA will review the assessment and management measures prior to breaking ground (Great Southern Bio Logic, 2022). SIMCOA has committed to managing dieback risk through several procedures as described in the EMP (GHD, 2023g) (see Appendix C)



Paper Size ISO A3

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Metres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Conservation significant flora locations with Core and Buffer TEC vegetation alliances

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.8

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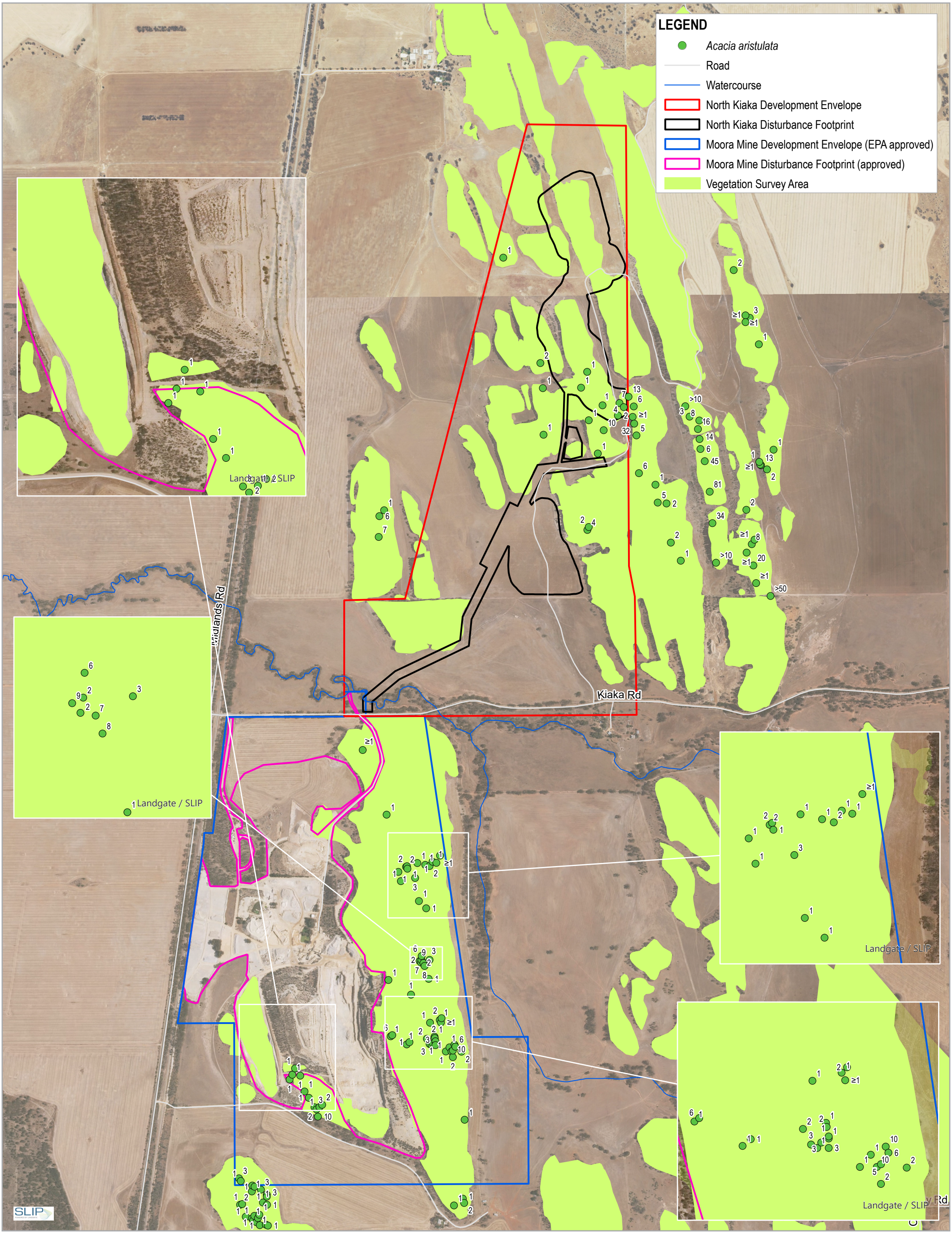
Print date: 22 Mar 2024 - 12:19

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3



Paper Size ISO A3

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Metres

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

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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Acacia aristulata
Population Counts (Trudgen 2018)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.9

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Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

LEGEND

- Daviesia dielsii
- Road
- Watercourse
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)
- Vegetation Survey Area

Midlands Rd

Kiaka Rd

Landgate / SLIP

Landgate / SLIP

SLIP

Paper Size ISO A3

0 100 200 300 400 500

Metres

N

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

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Daviesia dielsii
Population Counts (Trudgen 2018)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.10

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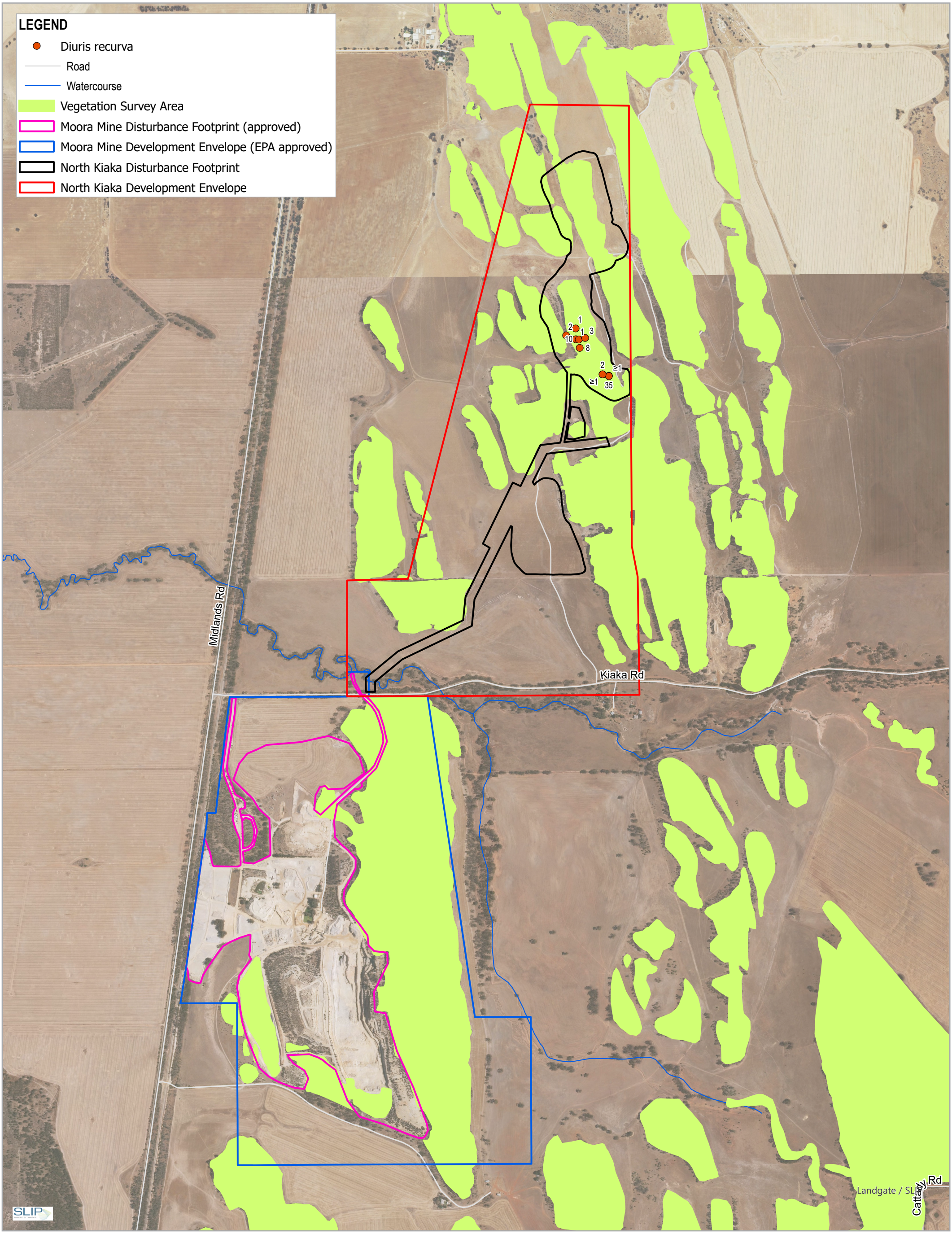
Print date: 22 Mar 2024 - 12:15

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, River, Road - 20180601; DMIRS: Mining Tenements - 20180601; DoW: River - 201108. Created by: rbrown3



Paper Size ISO A3

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Metres

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

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GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Diuris recurva
Population Counts (Trudgen 2018)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.11

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Print date: 22 Mar 2024 - 12:16

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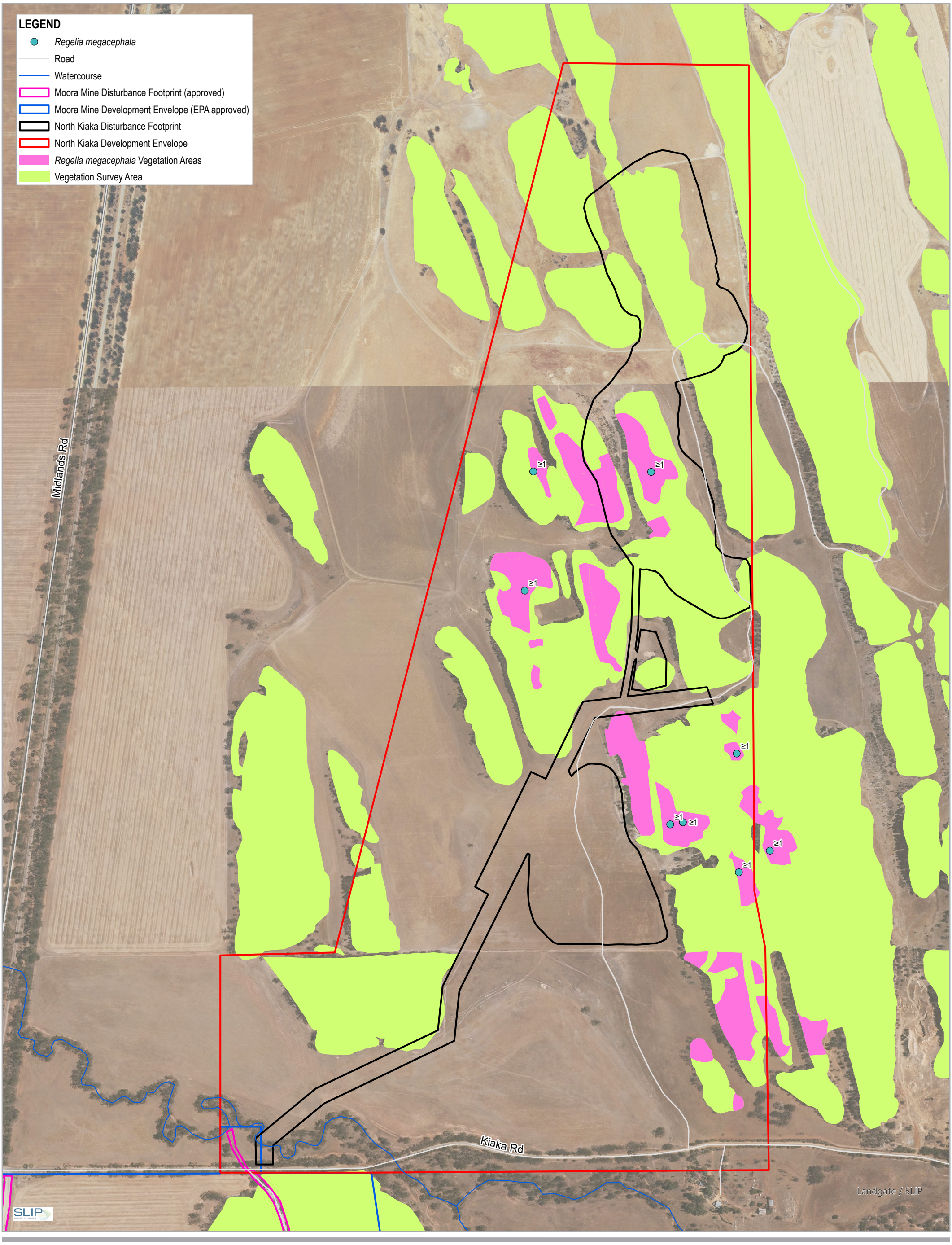

Paper Size ISO A3

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Metres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Regelia megacephala
Population Counts (Trudgen 2018)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.12

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Print date: 22 Mar 2024 - 12:16

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

5.2.4.6 Kemerton

Vegetation and flora survey of two small areas on the SIMCOA Kemerton Smelter property was completed by Trudgen & Associates (Trudgen, 2008).

– Five vegetation types were recorded over three landforms – ephemeral depression, drain, sandy hill and sandy loam flats
– No Threatened Ecological Communities were recorded within the survey area, however Kemerton Smelter is located next to a vegetated area representative of the Banksia Woodland TEC.

No further clearing is proposed for the Kemerton Smelter as part of the Revised Proposal, however a detailed vegetation survey would be undertaken prior to any future clearing.

5.2.5 Potential environmental impacts

This section addresses the potential impacts (direct and indirect) on flora and vegetation as a result of the Revised Proposal.

5.2.5.1 Construction

As Kemerton Smelter is an existing site, assessment of potential construction impacts in this document will be limited to the Project and the abandonment bund at Moora Mine.

Activities that have the potential to have direct impact on flora and vegetation during construction of the Project and abandonment bund include:

Clearing of up to 17.12 ha of native vegetation within the North Kiaka DF (44.59 ha) including:

– 16.45 ha of Coomberdale TEC (CR under the BC Act) vegetation alliances:
  - 16.03 ha of core vegetation associated with vegetation alliances 13, 15,16 and 17, which represents approximate 2.09% reduction of the total recorded Coomberdale TEC core vegetation associations (Table 5.13).
  - 0.42 ha of buffer vegetation associated with vegetation alliances 9 and 11, which represents less than 0.07% reduction of the total recorded Coomberdale TEC buffer vegetation associations (Table 5.14).
– 0.67 ha of other vegetation

Clearing of up to 1ha of native vegetation within the Moora Mine amended DF including:

  - 0.60 ha of Coomberdale TEC (Core and Buffer) (CR under the BC Act)
  - 0.35 ha of other vegetation

Impacts to flora species during construction of the Project including removal of:

– *Acacia aristulata* (EN, EN) – 6 populations (16 individuals)
– *Daviesia dielsii* (EN, EN) – 4 populations (15 individuals)
– *Diuris recurva* (Priority 4) – 2 populations (3 individuals)
– *Regelia megacephala* (Priority 4) – 1 population (number of individuals unknown).

Impacts to flora species during construction of the abandonment bund at Moora Mine including removal of:

– *Acacia aristulata* (EN, EN) – 1 population (1 individuals).
– Introduction and/or spread of invasive flora species and pathogens (*Phytophthora cinnamomi* or dieback), from movement of vehicles and plant and land clearing/ movement of soil and plant materials, causing increased competition with native vegetation in undisturbed and rehabilitated areas.

Potential indirect impacts, as a result of construction works may include:

– Disturbance to flora and vegetation due to accidental bushfires
– Changes to vegetation communities due to smothering of vegetation by dust emissions
– Changes to hydrological regimes result in indirect loss of species (see Inland Waters section 5.6 for further information).

5.2.5.2 Operations

5.2.5.2.1 The Project and Moora Mine

Once clearing within the North Kiaka and Moora Mine DF's is complete, and infrastructure has been constructed it is considered that there will be no direct impacts to flora and vegetation, outside those already approved under MS813.

Potential indirect impacts that have potential to result due to ongoing operations, may include:

– Disturbance of the 'Coomberdale' TEC outside of the DE and DF for the Revised Proposal
– Disturbance of the 'Eucalyptus Woodlands of the Western Wheatbelt' TEC the closest location is mapped within Midlands Road/ Rail reserve approximately 1 km to the west of the North Kiaka DE
– Disturbance to flora and vegetation due to accidental bushfires (noting that no fire has been through the area since 1981)
– Potential impact to vegetation through introduction of weed / pathogens due to vehicles entering and exiting the sites
– Changes to vegetation communities due to smothering of vegetation by dust

The most significant impacts on the TEC are coming from existing agricultural practices including grazing, spray drift from cropping and weed intrusion. None of these impacts are caused by or will be increased as a result of the operation of the Revised Proposal.

5.2.5.2.2 Kemerton Smelter

The Revised Proposal will not result in any change in the approved clearing extent, types of infrastructure at the Kemerton Smelter. Indirect impacts during operations include:

– Disturbance to flora and vegetation due to accidental bushfires
– Changes to vegetation communities due to smothering of vegetation by dust emissions
– Impact to vegetation through introduction of weed species.

5.2.6 Mitigation

The mitigation hierarchy (avoid, minimise, rehabilitation, offset) has been applied to the Revised Proposal in relation to flora and vegetation. SIMCOA has been operating Moora Mine and Kemerton Smelter since 1989, and in accordance with the requirements of MS 813. Agreement has previously been reached with DBCA to clear poorer quality vegetation and SIMCOA has actively avoided clearing areas of high quality vegetation at the Moora Mine and will do the same for the North Kiaka DE. Mitigation of impacts to vegetation, flora and fauna are of the highest priority for SIMCOA. This has been demonstrated through the existing environmental management strategies implemented at Moora Mine and the strategies proposed for North Kiaka throughout all phases of design, construction and operation.

SIMCOA is committed to the identification and implementation of monitoring, mitigation and management measures to avoid or reduce potential negative impacts to flora and vegetation values.

5.2.6.1 Moora Mine

SIMCOA has, as far as practicable, designed the abandonment bund and amended the DF to minimise potential impacts to native vegetation, in particular the Coomberdale TEC vegetation and Threatened flora (*Acacia aristulata).* Existing mitigation measures for the Moora Mine are outlined in Figure 5.19 and these will continue to be applied during construction and operational activities at Moora Mine.

Table 5.21 Mitigation measures – flora and vegetation – Moora Mine

Mitigation Category	Moora Mine
Avoid	– SIMCOA will only clear a maximum of 1 ha of native vegetation for the construction of the abandonment bund. – The amended disturbance footprint has been designed to avoid clearing of native vegetation by utilising the previously disturbed/cleared areas to construct the abandonment bund.

Mitigation Category	Moora Mine
	– Abandonment bund will be constructed using inert materials to avoid production of acid formation. – Construction of the bund will occur from within the cleared area of the pit to avoid clearing where possible.
Minimise	SIMCOA will continue to implement dust and bushfire mitigation measures (refer to Section 5.9.6): – Dust suppression on haul roads between North Kiaka DE and Moora Mine will be carried out during mining season by a dedicated water truck. – Application of water sprays as required to stockpiles and other cleared surfaces – Dust will continue to be suppressed by water sprays at the feeder to the primary crusher and sprays on the secondary crusher. Ore material will be washed by large spray bars and the water is recovered and re used. – Regular maintenance inspections and repairs will be undertaken on equipment (crushing and screening plant, conveyor) – Managing haulage trucks to minimise loss of materials during transport (refer to Section 5.9.6) – SIMCOA will continue to implement Hot Works Permit system, and Emergency Management Procedures to minimise the risk of bushfires.
Rehabilitate	SIMCOA will continue to undertake progressive rehabilitation of cleared areas (excluding abandonment bund) as per approved Mine Closure Plan (GHD, 2023b).
Offset	18 ha of vegetation was previously set aside within the Cairn Hill Reserve (Offset Site 1) to offset the residual impact of 5 ha of previously approved clearing for Moora Mine. SIMCOA has enhanced the preservation of significant communities of Coomberdale TEC by ensuring the protection of two offset sites (Cairn Hill Reserve and Cairn Hill North offset sites). Priority flora individuals are well represented at Cairn Hill /Cairn Hill North Class A reserve and are protected. For more details on offsets, see Section 7.

5.2.6.1.1 Rehabilitation at Moora Mine

Rehabilitation outcomes from the most recent (Trudgen, 2023) report are included below.

The major aim of the rehabilitation is to establish vegetation on the waste dumps comprised of native species found in the Coomberdale Chert Threatened Ecological community, especially those prominent in its vegetation, is being met to a moderate degree. However:

– The vegetation structure developed is less than desirable in many areas, often lacking the high cover of large shrubs found in natural *Regelia megacephala* and *Allocasuarina campestris* stands. Also in many quadrats the Regelia is losing cover and number of individuals (although there are episodes of recruitment);
– The stability of the vegetation (resistance to dry periods) is less than that of the natural stands (although some of those have also declined), and the cover of the larger shrubs is likely to continue to suffer in low rainfall periods;
– The average diversity of native species in individual quadrats is less than desirable. Although there is ongoing recruitments of native species in some quadrats this is mostly either annual species unlikely to survive increasing weed levels, or smaller perennial species.
– In many places the cover of weeds is higher than desirable. A feature of the recording has been that in many of the quadrats weed cover has increased significantly often even in drier years.

Trudgen (2023) also notes some of the rehabilitation has some limitations based in two main factors.

1. Firstly, the waste is not the same the substrate of the Coomberdale Chert Threatened Ecological Community (TEC) which is quite different to the waste in structure. Where Regelia megacephala is dominant in the TEC the substrate is massive chert, not highly broken up chert material. Where other species, such as *Allocasuarina campestris* are dominant in natural stands the substrate is less massive, but is still not so broken up and has more water retaining capacity.
2. The second major problem is that the waste areas (and the TEC) are in a highly fragmented environment with many weed species present in the paddocks surrounding them.

Other factors that complicate the effects of these two main factors are that some of the slopes of the waste material are steeper than in the TEC and the area is becoming more arid with decreasing and more erratic rainfall due to climate change and land clearing.

These factors have continued to interact in the period between the 2019 and 2022 recordings to result in ongoing loss of *Regelia megacephala*, one of the defining species of the Coomberdale Chert Threatened Ecological Community and a priority species for the rehabilitation. On the other hand, earlier decline of *Allocasuarina campestris*, the other main large shrub species in the TEC, has on balance stopped (as it had in 2019). In fact this species has increased in some quadrats.

While Allocasuarina huegeliana has been seen as not desirable, as it is not one of the main species that has been used in the definition of the TEC, it does occur in the TEC and is dominant in some areas of it. If a long term outcome is if it dominates some areas of the waste dumps, this should be seen as a good thing, as it means more diversity in vegetation structure on the waste. If it dominated all the waste areas, this would not be desirable, but this seems unlikely at the current time.

It seems likely that the native flora part of the floristic composition of the rehabilitation will take a considerable time to reach stability, and that the final composition will be affected by seed mobility (the ability of species to migrate into the waste areas from areas of the TEC), the ability to survive there and competition from weeds. Application of seed of selected species from the TEC would improve the rate of movement of native species into the TEC, this should be a mixture of annual species and perennial species that are not present in the rehabilitation (or only have low numbers) and which would improve the structure of the rehabilitation vegetation. Two species that have been observed to have good survival in more disturbed areas of the TEC should be included in this: *Calytrix aff. leschenaultii and Kunzea praestans*.

It is clear from the 2016, 2019 and 2022 data from the quadrats that weed cover is increasing, sometimes markedly, although is some quadrats there have been decreases of more prolific species. Several of the other weed species are also increasing in number and spread over the rehabilitation.

Where weed cover is high it is very likely to be inhibiting germination and establishment of native species and further increases in weed cover is likely to become more problematic in affecting the ongoing germination and establishment of native species in the rehabilitation areas. Given the range of species of weeds present there are practical limitations to what can be done about this. However, selective control of the introduced grass species is possible and may have little impact on the native grasses. To be successful, this would need to be done consistently for several years to prevent these species building up again while giving native species an opportunity to build up in abundance.

5.2.6.2 The Proposal

SIMCOA has, as far as practicable, located elements of the North Kiaka DF (including WRD, ancillary infrastructure and access roads) to minimise potential impacts to native vegetation, in particular the vegetation comprising the Coomberdale TEC and the Threatened flora (*Acacia aristulata* and *Daviesia dielsii*). The proposed clearing of 17.12 ha of native vegetation for the mine pit, however, has been determined by the location of the mineral resource (ore body).Mitigation measures have been included for the Project based upon the successful mitigation measures applied at the Moora Mine. Mitigation measures proposed for the Project are outlined in Table 5.22.

Table 5.22 Mitigation measures – flora and vegetation – the Proposal

Mitigation Category	The Proposal
Avoid	– SIMCOA has preferentially located the North Kiaka DF in an area of comparatively poor-quality vegetation (i.e.in existing cleared/disturbed areas) compared to alternative sites (e.g. Cairn Hill) to avoid unnecessary clearing. – The clearing is limited to the required mining pit and WRD, ancillary infrastructure and access roads have been located away from areas of high quality vegetation – SIMCOA will consider the location of identified threatened *Acacia aristulata* and *Daviesia dielsii* plants when siting final infrastructure / landform locations and avoid them where practical. – SIMCOA will seek Ministerial authorisation under s40 and s45 of the BC Act for the take of threatened flora and the modification of an occurrence of a TEC prior to the commencement of clearing. – SIMCOA's procedures for clearing/land disturbance within the approved boundary of the North Kiaka DE include: • Compliance with "Permit to Take" under the Biodiversity Conservation Regulations 2018 for the clearing of any Threatened Flora • Internal clearing permit to be granted prior to any clearing being undertaken

Mitigation Category	The Proposal
	• All clearing areas will be surveyed and demarcated prior to clearing • All clearing areas will be surveyed after clearing to confirm compliance with clearing permits (internal and regulator issued).
Minimise	– SIMCOA's EMP (Appendix C) will include procedures, management and mitigation measures which to be implemented to prevent and minimise impacts on native flora and vegetation – Areas will be surveyed prior to clearing to further avoid threatened flora species where possible. – SIMCOA will establish a vehicle hygiene and ground disturbance procedure in addition to the Dieback Management Plan (Appendix J) as well as a weed control program, which will be implemented for the duration of the Project. These procedures will prevent the spread and introduction of invasive pathogens and weeds – Topsoil affected by dieback or heavily weed infested will be collected separately and buried with overburden within the Tonkin WRD to avoid spread to rehabilitation areas – SIMCOA will undertake regular weed monitoring and control programs to limit the spread of invasive species. Weed management techniques may include, spraying with herbicides (to be undertaken in late winter or early spring), hand pulling and cutting; and seeding native species in cleared areas to be rehabilitated, at the earliest opportunity – Implement dust management controls including application of water/dust suppressants and managing haulage trucks to minimise loss of materials during transport (refer to Section 5.9.6) – Implementation of Hot Works Permit system, and Emergency Management Procedures to minimise the risk of bushfires – Clearing activities will not be undertaken when the Fire Danger Rating is severe or higher.
Rehabilitate	– Undertake rehabilitation activities on the waste dumps to achieve a percentage cover and species diversity of living self sustaining native vegetation in all rehabilitation areas comparable to that of undisturbed natural analogue sites. – Rehabilitation of the North Kiaka DE will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) (Appendix K) – Progressive rehabilitation of disturbed areas, where possible, will be undertaken for the duration of the LoM. Areas active for the duration the LoM will be rehabilitated at the end of mining activities as per the Moora Mine Closure Plan (GHD, 2023b). – Growth medium will be applied to rehabilitation areas to improve the likelihood of suitable vegetation establishment. Growth medium may comprise topsoil (if available) or weathered material that has proven suitable for rehabilitation of current mining landforms – The waste dump will be rehabilitated using local native species congruent with the Coomberdale TEC – Manage the rehabilitated area to act as a buffer for the existing Coomberdale TEC vegetation to prevent weed invasion from surrounding agricultural areas – Ongoing weed management to be undertaken in rehabilitation areas during the first three growing seasons to minimise weeds and promote native vegetation growth. Weed spraying undertaken in late winter or early spring.
Offset	SIMCOA has enhanced the preservation of significant communities of Coomberdale TEC by ensuring the protection of two offset sites (Cairn Hill Reserve and Cairn Hill North offset sites). Priority flora individuals are well represented at Cairn Hill /Cairn Hill North Class A reserve and are protected. For more details on offsets, see Section 7.

5.2.6.3 Kemerton Smelter

Mitigation measures currently undertaken for the existing Kemerton Smelter are outlined in Table 5.23.

Table 5.23 Mitigation measures – flora and vegetation – Kemerton Smelter

Mitigation Category	Kemerton Smelter
Avoid	No new clearing is proposed for the Kemerton Smelter.
Minimise	SIMCOA will continue to undertake existing dust and particulate control measures as per the current Environmental Monitoring and Management Plant (EMMP) for the Kemerton Smelter (refer to Section 5.9.6).
Rehabilitate	No rehabilitation required.
Offset	No offsets are required in relation to flora and vegetation

5.2.7 Assessment and significance of residual impact

5.2.7.1 Direct loss of native vegetation and flora

5.2.7.1.1 Loss of vegetation and flora

SIMCOA propose to clear native vegetation within the North Kiaka DF for the purpose of construction of the Project and Moora Mine DF for the construction of the abandonment bund. No further clearing is proposed for Kemerton Smelter.

The regional impacts to Pre-European Vegetation Associations (Beard, 1979) from the Revised Proposal include:

– A reduction in Vegetation Association 1041 which represents 2.9% of the current extent remaining in the State.
– A reduction Vegetation Association 142 which represents less than 0.0004% of the current extent remaining in the State.

The Revised Proposal will clear up to 17.12 ha of native vegetation within the 44.59 ha North Kiaka DF. The vegetation being cleared is made up of the following:

– Clearing of 16.45 of the Coomberdale TEC (CR under the BC Act) vegetation alliances:
  - 16.03 ha of core vegetation associated with vegetation alliances 13, 15,16 and 17, which represents approximate 2.0% reduction of the total recorded Coomberdale TEC core vegetation associations.
  - 0.42 ha of buffer vegetation associated with vegetation alliances 9 and 11, which represents less than 0.1% reduction of the total recorded Coomberdale TEC buffer vegetation associations.
– Threatened flora species listed under the Commonwealth EPBC Act and State BC Act:
  - *Acacia aristulata* (EN, EN) – 6 populations (16 individuals) which represents a 1.5 % reduction of individuals within the regional extent of the Coomberdale TEC
  - *Daviesia dielsii* (EN, EN) – 4 populations (15 individuals) which represents a 4.1 % reduction of individuals within the regional extent of the Coomberdale TEC.
– DBCA Priority listed flora species:
  - *Diuris recurva* (Priority 4) – 2 populations (3 individuals) which represents a 6.5 % reduction of number of stands of this species within the regional extent of the Coomberdale TEC.
  - *Regelia megacephala* (Priority 4) – 1 population (number of individuals unknown) which represents a 1.4 % reduction of number of stands of this species within the regional extent of the Coomberdale TEC.

Clearing of up to 1ha of native vegetation within the Moora Mine amended DF includes the following:

– 0.60 ha of Coomberdale TEC (Core and Buffer) (CR under the BC Act)
– 0.35 ha of other vegetation
– Threatened flora species listed under the Commonwealth EPBC Act and State BC Act:
  - *Acacia aristulata* (EN, EN) – 1 population (1 individuals).

5.2.7.1.1.1 Introduction and / or spread of invasive weeds and pathogens

SIMCOA will implement weed and dieback hygiene controls in accordance with the Project EMP (Appendix C) and Dieback Management Plan (Appendix J). SIMCOA propose to continue using existing weed and hygiene procedures undertaken for the Moora Mine for the Project. Based on proposed mitigation measures, introduction and/ or spread of invasive weeds and pathogens is not expected to have a significant impact on remnant vegetation surrounding the North Kiaka DE and Moora Mine.

5.2.7.2 Indirect impacts to native vegetation and flora

5.2.7.2.1.1 Dust causing reduce vegetation health

Mining and processing activities for the Revised Proposal (i.e. land clearing, blasting, ore handling and construction of the Tonkin WRD) are likely to generate dust. Excessive dust can potentially impact the health and condition of vegetation. If dust particles settle and accumulate on the surface of leaves, it can

block stomata causing reduced transpiration and photosynthesis, resulting in a decline in plant health. Dust has the potential to travel long distances, depending on the particle characteristics, weather conditions and topography and as a result there is the potential for dust to impact vegetation outside of the development envelopes.

Operations at Moora Mine have not resulted in a dust impact on nearby vegetation, so SIMCOA is confident of a similar outcome for the Revised Proposal. With the implementation of effective dust mitigation measures (refer to Section 5.2.6) it is considered unlikely dust from current and future activities of the Revised Proposal will adversely affect vegetation.

5.2.7.2.1.2 Vegetation loss due to bushfire

The North Kiaka DE and Moora Mine DE have been extensively disturbed over a long period of time due to historic agricultural activity with approximately 68.7% of the North Kiaka DE already cleared for agricultural purposes. The cleared area will expand as the Project is constructed and operated (as shown at Moora Mine), further reducing the fuel levels. As mining activities will be undertaken in predominately cleared areas, it is unlikely a fire will become established in the operational area and spread to surrounding vegetation. In the unlikely event a fire occurs and spreads beyond the North Kiaka DE, widespread damage and loss of vegetation within the surrounding area could occur.

The process of clearing native vegetation is the activity most likely to potentially cause a bushfire, as it is undertaken in areas where the fuel loads could support a bushfire. Effective management of clearing activities (refer to Section 5.2.6) will prevent the likely incident of a bushfire during clearing activities.

There are no records of bushfires resulting from Moora Mine operations in 30 years of mining activities and the risk of one being generated as a result of the Revised Proposal is considered to be very low.

5.2.7.3 Significance of residual impacts

Clearing of 18.12 ha of native vegetation within the North Kiaka DF and Moora Mine DF will result in minor residual impacts to the Coomberdale TEC and MNES threatened species *Acacia aristulata* and *Daviesia dielsii*. Based on the assessment above, and given the mitigation measures proposed, it is considered that the direct and indirect impacts of the Revised Proposal will not result in significant residual impact to biological diversity and ecological integrity at a local or regional level.

5.2.8 Environmental outcome

The North Kiaka DE and Moora Mine DE have been extensively disturbed over a long period of time due to historic agricultural activity. SIMCOA has, as far as practicable, located disturbance footprints within previously disturbed areas to minimise the potential impacts to native vegetation. The North Kiaka DF is however defined by the location of the mineral resource for the Project and the abandonment bund must be constructed around the existing pits at Moora Mine.

Whilst is considered that the residual impacts of the proposed clearing of native vegetation will not be significant, SIMCOA propose to offset the residual impacts to MNES from the Project. SIMCOA has negotiated a comprehensive offset package (refer to Section 7), to further research and preserve biological diversity and nature conservation within the Moora area, to compensate for the residual impacts of the Revised Proposal. This offset has culminated in the development of the Class A Cairn Hill Nature Reserve (Offset Site 1) and Cairn Hill North (Offset Site 2), located approximately 1.5 km south of Moora Mine.

Given the proposed mitigation measures, including an offset of residual impacts to MNES it is considered that the Revised Proposal meets the EPA's (2016b) objective for Flora and Vegetation.

5.2.9 Cumulative impact assessment

An assessment of cumulative impacts is provided in Section 10.

5.3 Key Environmental Factor – Landforms

This section discusses the landforms present within the Project and Moora Mine, and potential impacts resulting from their construction and operation.

There were no specific information requests received from the EPA (EPA, 2022b) for landforms, however this ERD has been updated to consider the combined impacts of the Revised Proposal. Furthermore, additional studies have been completed since the s 38 referral document that provide further information on landforms.

There are no indirect impacts on landforms resulting from the continued operations of Kemerton Smelter, outside those already approved in MS 813.

5.3.1 Relevant policy and guidance

EPA Policy and guidance

- *Environmental Factor Guideline – Landforms* (EPA, 2018b)
- *Statement of environmental principles, factors, objectives and aims of EIA* (EPA, 2023b)
- *Instructions on how to prepare an Environmental Review Document* (EPA, 2021b)
- *DMIRS Guidelines for Preparing Mine Closure Plans* (DMIRS, 2023b)
- *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management* (EPA, 2021a).

Other policy and guidance

- *WA Environmental Offsets Policy* (GoWA, 2011)
- *WA Environmental Offsets Guidelines* (GoWA, 2014)
- *Visual Landscape Planning in Western Australia a manual for evaluation, assessment, siting and design* (WAPC, 2007).

5.3.2 EPA objective

The EPA's objective for Landforms is:

'*To maintain the variety and integrity of significant physical landforms so that environmental values are protected*' (EPA, 2018b).

Landforms for the purpose of this ERD is the distinctive, recognisable physical features of the earth's surface having a characteristic shape produced by natural processes. A landform is defined by the combination of its geology (composition) and morphology (form).

5.3.3 Receiving environment

5.3.3.1 Baseline studies

The following baseline studies for the Revised Proposal have been used to ascertain the existing receiving environment at Moora Mine and North Kiaka DE.

- *An extension of a flora survey, floristic analysis, and vegetation survey of areas of the Coomberdale Chert to include a further area* (Trudgen et al, 2012)(Appendix H)
- Open pit and Tonkin WRD designs were developed by Snowden (2012), the report is titled "*Kiaka Hills Mine Development Plan*, and is attached as Appendix O.
- *Comparison of the flora and vegetation of the proposed North Kiaka DE to other parts of the Coomberdale chert threatened ecological community* (Trudgen, 2018) (Appendix G)
- *North Kiaka Approvals and Supporting Studies – Geotechnical Desktop Study* (GHD, 2019) (Appendix E)
- Desktop Assessment of Subterranean Fauna for the North Kiaka Quartzite Mine, Moora, Western Australia (Invertebrate Solutions, 2019a)(Appendix N)
- *North Kiaka Proposed Mine Expansion Fauna Assessment Report* (GHD, 2021a) (Appendix M)

Information provided in the s38 referral has been updated based on the EPA's additional information request (EPA, 2022b) and the notes from the meetings between SIMCOA, GHD and EPA. Additional studies have recently been completed to provide information relevant to the landforms factor and are included as appendices:

– Hydrogeological Assessment (GHD, 2023d) (Appendix W)
– Hydrological assessment (GHD, 2023e) (Appendix W)
– Geochemical characterisation assessment of geochemical and physical characteristics of subsurface materials at North Kiaka (GHD, 2023f) (Appendix F).

SIMCOA has also commissioned additional plans for the Revised Proposal:

– Moora Quartz Mining Operations Mine Closure Plan (GHD, 2023b).
– North Kiaka Mining Operations Mine Closure Plan

5.3.3.2 Landforms – Noondine Chert Formation

The key landform within the North Kiaka DE and the Moora Mine is the Noondine Chert Formation, which outcrops as north-north-west trending parallel ridges, elevated approximately 75 m above the adjacent valleys. The Noondine Chert (previously Coomberdale Chert), outcrops across a 150 km stretch between Moora and Three Springs.

SIMCOA currently mines the quartzite mineral resource present in the Noondine Chert, which occurs as unweathered and massive dolerite/quartzite intrusions at Moora Mine and proposes to mine this resource at North Kiaka.

The Noondine Chert Formation has a total extent of 14,586 ha, of which 254.37 ha (less than 2%) occurs within the Moora Mine DE and North Kiaka DE and 98.43ha (less than 1%) occurs within the Moora Mine DF (amended) and North Kiaka DF (Table 5.24 and Figure 5.13).

Table 5.24 Geological units occurring within the North Kiaka DE (GoWA, 2023)

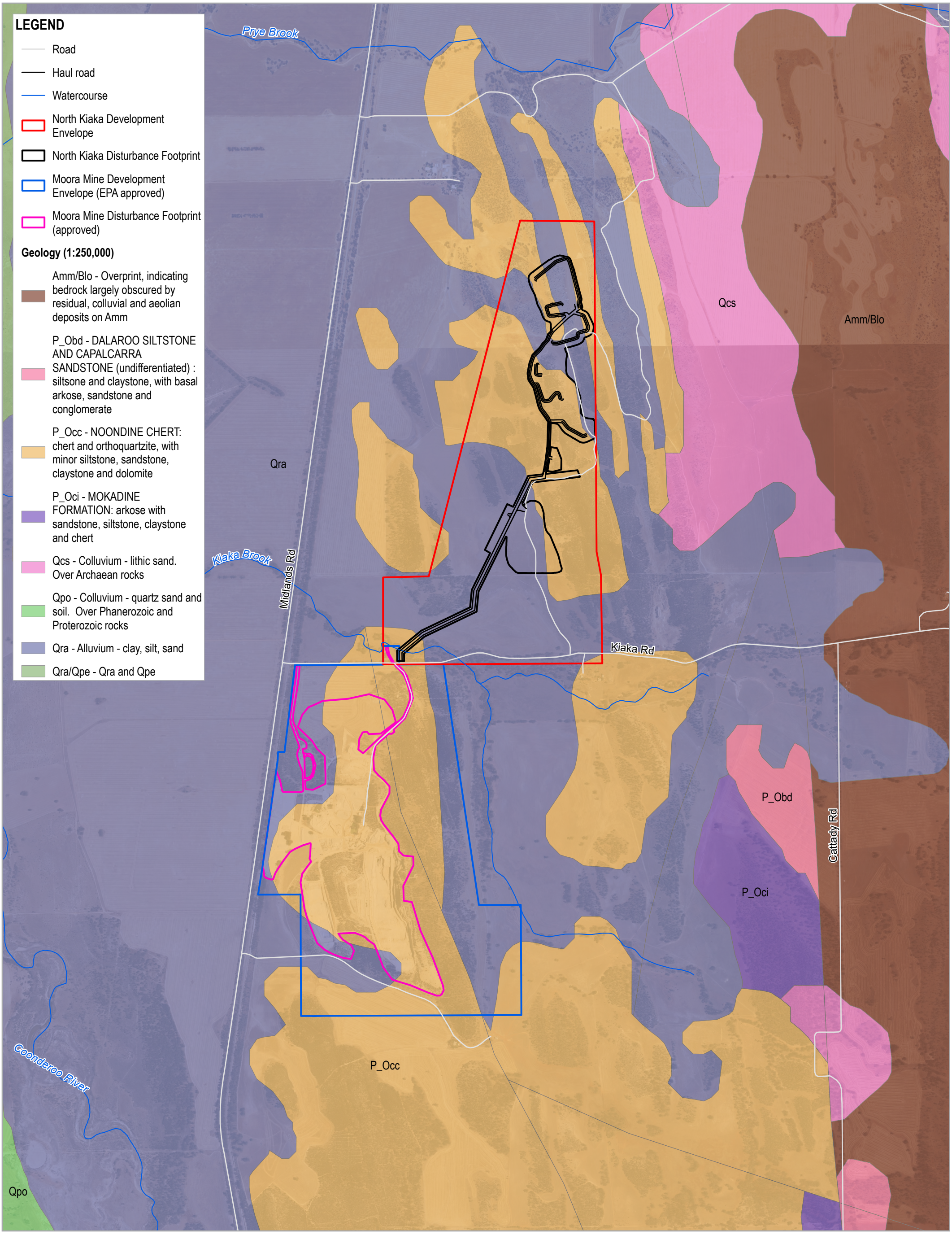
Unit	Description	Extent within North Kiaka DE (ha)	Extent within North Kiaka DF (ha)	Extent within the Moora Mine DE (amended) (ha)	Extent within the Moora Mine DF (amended) (ha)
Qra	**Alluvium** Clay, silt and sand	123.89	24.46	77.23	16.86
P_Occ	**Noondine Chert** Chert and orthoquartzite with minor siltstone, sandstone, claystone and dolomite	92.53	20.13	161.84	78.30
	Total	**216.42**	**44.59**	**239.07**	**95.16**

5.3.3.3 Geology and morphology

The Noondine Chert is described as consisting of "*bedded chert, chert breccia, orthoquartzite, silicified limestone and dolomite and contains significant siliceous siltstone and sandstone beds, and minor claystone*" (GHD, 2019). The rock strength is reported to be moderately hard (Saprolite Environmental, 2012).

Cavities formed through faulting, or leaching of carbonate rich chert, occur throughout the formation. Some of the cavities are empty, others are filled with quartz gravel. The gravel deposits are likely to be collapsed breccias, which appear to have been washed and sorted by underground streams (GHD, 2019). The formation is reported to contain physiographic amphitheatres which is likely a result of limestone/chert collapsing into large underground caverns (GHD, 2019).

Larger voids extending to the surface have been recorded in the Noondine Chert, such as the Jingemia cave system and Devil's Hole, located 27 km NNW of the North Kiaka DE and Moora Mine (GHD, 2019).



Paper Size ISO A3

0 100 200 300 400

Metres

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

N

GHD

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Regional Geology

FIGURE 5.13

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Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, Road - 20180601; DoW: River - 201108. Created by: rbrown3

5.3.3.4 Ecological values

The Noondine Chert ridges are characterised by skeletal soils with exposed rock, making these areas highly unsuitable for cropping. Consequently, the ridges support remnant native vegetation, which has been assessed by Trudgen (2018) and confirmed to be representative of the Coomberdale TEC (Appendix G). The Coomberdale TEC is geographically restricted to the exposed quartzite ridges of the Noondine Chert formation (DPAW, 2013b). Vegetation of the Coomberdale TEC, including the extent of vegetation alliances occurring within the North Kiaka DE and Moora Mine DE, is discussed in Section5.2.4.5.

The Noondine Chert also provides habitat for significant flora species, including the following which are known to occur within the North Kiaka DE and Moora Mine DE (Trudgen *et al.* (2012; 2018)):

– *Acacia aristulata* (Endangered) (Figure 5.9)
– *Daviesia dielsii* (Endangered) (Figure 5.10)
– *Diuris recurva* (P4) (Figure 5.11)
– *Regelia megacephala* (P4) (Figure 5.12).

A description of these species, their preferred habitat type and recorded distribution is discussed in Section 5.2.4.5.5. *Regelia megacephala* is known to be restricted in distribution to the Coomberdale TEC.

The areas of retained vegetation also provide habitat for the Endangered *Zanda latirostris* (Carnaby's Black Cockatoo). A description of Carnaby's Black Cockatoo preferred foraging and breeding habitat (including the recorded breeding range) is provided in Table 5.42 in Section 5.5.4.1.5.

Subterranean fauna habitat

Noondine Chert is known to contain palaeokarst and subsurface voids that provide highly suitable habitat for subterranean fauna (Invertebrate Solutions, 2019b).

While no subterranean fauna communities are known to occur within the North Kiaka DE; surveys of bores within Moora Mine DE (Knott and Goater , 2005; Bennelongia, 2023) identified stygofauna communities within fractured rock aquifers present in Noondine Chert approximately 0.1 km north and 0.8 km south of the North Kiaka DE, approximately 0.3 km from the closest mine pit. It is therefore possible that stygal communities may occur within the saturated zone of the Noondine Chert, within the North Kiaka DE.

Due to the confirmed presence of stygofauna at Moora Mine (Knott and Goater , 2005; Bennelongia, 2023) within fractured rock aquifers of the Noondine Chert, there is a moderate likelihood that habitat exists for troglofauna within the overlying unsaturated zone. However, it is unknown if the Noondine Chert formation within the North Kiaka DE has suitable fracturing and interconnected void space in the upper rock strata that could provide habitat for troglofauna based upon the desktop assessment of the North Kiaka DE undertaken by Invertebrate Solutions (2019b). Subterranean fauna is discussed further in Section 6.

5.3.4 Potential environmental impacts

5.3.4.1 Alteration to landform structure

The mapped extent of the Noondine Chert Formation has a total extent of 14,586 ha, of which 254.37 ha (less than 2%) occurs within the Moora Mine DE and North Kiaka DE and 98.43 (less than 1%) occurs within the Moora Mine DF (amended) and North Kiaka DF.

Relief across the North Kiaka DE varies from 210 – 285 m AHD (Soilwater Consultants, 2019). The proposed mine pit occurs on and follows the Noondine Chert ridgelines for 1.1 km. These elevated ridgelines extend across a 150 km stretch between Moora and Three Springs. Accordingly, the landform value of Noondine Chert ridges within the North Kiaka DE, in terms of extent, is not considered to be significant in the context of the regional distribution and expression of this formation. Nevertheless, the Tonkin WRD and the Administration Area have been positioned within valleys and other lower lying cleared areas to minimise impacts to this geological formation (Snowden, 2012).

Development of the Revised Proposal will directly affect 98.43 ha of the Noondine Chert formation, 20.13 ha within the North Kiaka DF and 78.30 ha within the Moora Mine DF (amended) (including 1.70 ha within the Abandonment Bund). This will impact less than 1% of the Noondine Chert formation which hosts quartzite minerals (the proposed ore body) required to be mined for this Revised Proposal.

To minimise impacts to the structure and integrity of this landform, SIMCOA has located the Tonkin WRD and other mine elements (i.e. workshop and administration area) to avoid, where practicable, impacts to the Noondine Chert (Snowden, 2012). Direct impact to the upper ridgeline of the Noondine Chert formation from development of the proposed mine pit is unavoidable and would be permanent.

Due to the skeletal soils and exposed rock which characterise the Noondine Chert ridges, past impacts on this landform have been limited to SIMCOA's existing mining operations at Moora Mine south of the North Kiaka DE, as these ridges are highly unsuitable for agriculture. Future impacts to this landform are expected to be limited to mining of quartzite minerals, as proposed in this ERD. Materials which comprise the Noondine Chert formation are considered robust, therefore, rock adjacent to the proposed mine pit is unlikely to be susceptible to degradation.

5.3.4.2 Impact to environmental values of the landform

Impacts to environmental values of the Noondine Chert formation resulting from construction and development of the Revised Proposal are assessed in:

- Section 5.2.7.1 (Flora and Vegetation) - this section includes a detailed assessment of impacts to the Coomberdale TEC; Threatened flora *Acacia aristulata* and *Daviesia dielsii*; and Priority flora *Diuris recurva* and *Regelia megacephala*
- Section 5.5.7.1 (Terrestrial Fauna) - this section includes a detailed assessment of potential impacts to Carnaby's Black Cockatoo foraging habitat
- Section 6 (Subterranean Fauna) - this section includes a detailed assessment of potential impacts to stygofauna and troglofauna habitat.

5.3.5 Mitigation

The key mitigation measures for Moora Mine and the Project as they relate to impacts on the Noondine Chert and the environmental values which this landform supports are outlined below. The construction of the Moora Mine abandonment bund is unlikely to require additional mitigation measures as no significant impacts are expected to the Noondine Chert landform as a result of these works. Additional mitigation measures are provided in Section 5.2.6 (flora and vegetation) and Section 5.5.6 (terrestrial fauna and subterranean fauna).

Table 5.25 Mitigation measures – landforms- Moora Mine and the Project

Mitigation Category	Moora Mine and the Project
Avoid	– SIMCOA has modified the abandonment bund to avoid native vegetation and planned for construction from within the existing cleared area where possible. – SIMCOA has modified the North Kiaka disturbance footprint to avoid areas of the Coomberdale TEC associated with the Noondine Chert, which are in Very Good to Excellent or Excellent condition.
Minimise	– SIMCOA has modified the North Kiaka disturbance footprint to minimise impact to the upper slopes of Noondine Chert ridgelines (highest elevation and most visible in the landscape), by locating the Tonkin WRD and other mine elements (i.e. ROM, workshop and administration area) in the adjacent valleys and lower slopes.
Rehabilitate	– Rehabilitation at Moora Mine will continue to be undertaken in accordance with the approved Mine Closure Plan and Mining Proposal. – Rehabilitation of the North Kiaka DE will be undertaken in accordance with the Mine Closure Plan. The Mine Closure Plan will be submitted to DMIRS together with the Mining Proposal. – Progressive rehabilitation of disturbed areas at Moora Mine has occurred where possible and will continue for the duration of Moora Mine life span. – Progressive rehabilitation of disturbed areas, where possible, will be undertaken for the duration of the Project life span. Areas active for the duration of the Project will be rehabilitated at the conclusion of mining operations. The final height of the constructed Tonkin WRD will not exceed the height of existing landforms (pre-development) and will be designed to reflect the topography of the surrounding landscape (refer to Section 5.3.4.1).
Offset	– No offsets are required in relation to Landforms as a result of the implementation of the Revised Proposal.

5.3.6 Assessment and significance of residual impacts

SIMCOA propose to impact the landform within the North Kiaka DF for the purpose of construction of the Project and Moora Mine DF (amended) for the construction of the abandonment bund. No change is proposed for Kemerton Smelter.

– Development of the Revised Proposal will directly affect 98.43 ha of the Noondine Chert formation, 20.13 ha within the North Kiaka DF and 78.30 ha within the Moora Mine DF (amended) (including 1.70 ha within the abandonment bund).
– This will impact less than 1% of the Noondine Chert formation which hosts quartzite minerals (the proposed ore body) required to be mined for this Revised Proposal.

5.3.7 Environmental outcome

Permanent impacts to the environmental values of the Noondine Chert landform will result from the clearing of remnant native vegetation isolated to hills and ridges within the North Kiaka DE, the Moora Mine DE and the surrounding landscape.

However, the extent of impact to flora and vegetation (refer to Section 5.2.5) and terrestrial fauna (refer to Section 5.5.5) resulting from construction and development of the Project, is not expected to have a significant impact on the identified values. This is partly due to the limited disturbance of the Noondine Chert landforms within the region to date, and the predicted limited disturbance of this landform in the future, due to rocky hills and ridges being unsuitable for agriculture (the primary land use in the region – refer to Section 5.7.4.2.7).

The Revised Proposal will reduce the extent of Noondine Chert ridges, however, given the limited extent of disturbance proposed, the expected resilience of the landform to degradation, limited past disturbance to this landform, and predicted limited impacts to this landform in the future; the Revised Proposal is not expected to significantly impact Noondine Chert landforms.

5.3.8 Cumulative impact assessment

An assessment of cumulative impacts is provided in Section 10.

5.4 Key Environmental Factor – Terrestrial Environmental Quality

This section discusses the direct impacts to Terrestrial Environmental Quality (TEQ) resulting from the implementation of the construction of the Project and construction of the abandonment bund at Moora Mine and indirect impacts from the continued operation of Approved Proposal on TEQ. Potential indirect impacts to TEQ at Moora Mine are managed through existing controls and indirect impacts to TEQ from the Project are included in the Project EMP (Appendix C).

This section updates information provided in the s38 referral, to include the abandonment bund at Moora and ongoing operations at Moora Mine and Kemerton Smelter. This section has also supplemented by additional studies undertaken post referral submission. It is noted that the EPA did not request any additional information for this factor.

5.4.1 EPA objective

The EPA's environmental objective for the factor Terrestrial Environmental Quality is:

"To maintain the quality of land and soils so that environmental values are protected".

The objective recognises the fundamental link between soil quality and the protection of ecological and social values that good soil quality supports. Therefore, the focus of this factor and its associated objective is how changes to soil quality impact environmental values.

5.4.2 Relevant policy and guidance

EPA Policy and guidance

- *Statement of Environmental Principles, Factors, Objectives and Aims of EIA* (EPA, 2023b)
- *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986). Rehabilitation of Terrestrial Ecosystems. No. 6* (EPA, 2006)
- *Environmental Factor Guideline, Terrestrial Environmental Quality* (EPA, 2016c)
- *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual Requirements under the Environmental Protection Act 1986 Environmental Protection Authority* (EPA, 2021a).

Other policy and guidance

- *Mine Closure Plan Guidance – How to Prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans* (DMIRS, 2023b)
- *Mining Act 1978, Statutory Guidelines for Mine Closure Plans* (DMIRS, 2023a)
- *2018 National Waste Policy: Less Waste, More Resources* (Commonwealth of Australia, 2018)
- *A guide to leading practice sustainable development in mining* (DIIS, 2011)
- *AS 1940:2017, The Storage and Handling of Flammable and Combustible Liquids* (Standards Australia, 2017)
- *Identification and investigation of acid sulphate soils and acidic landscapes* (DER, 2015a)
- *Environmental Protection Act 1986 (WA) incorporating subsidiary legislation:*
  - Environmental Protection Regulations 1987
  - Environmental Protection (Unauthorised Discharges) Regulations 2004
- *Dangerous Goods Safety Act 2004* (WA) incorporating subsidiary legislation:
  - Dangerous Goods Safety (General) Regulations 2007
  - Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007
- *Waste Avoidance and Resource Recovery Act 2007* (WA) incorporating subsidiary legislation:
  - Waste Avoidance and Resource Recovery Regulations 2008
- *Soil and Land Conservation Act 1945 (WA)*
- *Health Act 1911, Reprint 16: The Act as at 6 December 2013 (WA) incorporating subsidiary legislation:*
  - Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974

5.4.3 Receiving environment

The receiving environment for the North Kiaka DE is the same as was reported in the s38, noting that given Moora Mine is located nearby, many of the existing studies prepared describe a congruent TEQ.

5.4.3.1 Baseline studies

The following baseline studies of the Moora Mine and North Kiaka DE have been used to ascertain the existing receiving environment:

– Open pit and Tonkin WRD designs were developed by Snowden (2012), the report is titled, Kiaka Hills Mine Development Plan and is attached as Appendix O.
– North Kiaka Soil Characterisation (Soilwater Consultants, 2019) (Appendix D)
– North Kiaka Approvals and Supporting Studies – Geotechnical Desktop Study (GHD, 2019) (Appendix E)
– North Kiaka Proposed Mine Expansion – Materials Characterisation Assessment Report (GHD, 2020c) (Appendix F)
– Moora Quartzite Mine – Phase 2 Hydrogeological Investigations (Saprolite Environmental, 2012)
– Moora Quartz Mining Operations Mine Closure Plan (GHD, 2023b)
– Moora Quartzite Mine Rehabilitation Plan – Final (Ecoscape Australia, 2012).

Additional studies have recently been completed since the Section 38 referral and are included as appendices:

– Hydrogeological Assessment (GHD, 2023d) (Appendix W)
– Hydrological Assessment (GHD, 2023e) (Appendix W)
– Geochemical characterisation assessment of geochemical and physical characteristics of subsurface materials at North Kiaka (GHD, 2023f) (Appendix F).

5.4.3.2 Regional Geology

North Kiaka and Moora Mine DEs occur on the western margin of the Yilgarn Craton which comprises Archaean rocks (4000 – 2500 Ma) of which the Moora Group lies unconformally over these Archaean basement rocks (GHD, 2019). The Noondine Chert, a member of the Coomberdale Sub-group of the Moora Group, outcrops as a series of low hills and ridges across the DEs (GHD, 2019).

The Noondine Chert appears to have been formed by the surface silicification of carbonate rocks to approximately 75 m below the surface (GHD, 2019). The Noondine Chert is intruded by dolerite/quartzite dykes which remain unweathered and massive forming the ridges observed in the North Kiaka DE (Saprolite Environmental, 2012; GHD, 2019). The adjacent granitic rocks have weathered to form a typical saprolitic regolith, resulting in an abrupt contact between the quartzite and the weathered granite (Soilwater Consultants, 2019).

Table 5.24 and Figure 5.13 present geology units (1:250,000 – DMIRS-049) occurring within the North Kiaka DE (GoWA, 2023), which influences land and soil qualities.

5.4.3.3 Geomorphology

Soil characterisation studies undertaken across the North Kiaka DE indicate that relief varies from 210 – 285 m AHD (Soilwater Consultants, 2019). The proposed mine pit occurs on and follow the Noondine Chert ridgelines. The Tonkin WRD and the Administration Area have been positioned within valleys and other lower lying cleared areas (Snowden, 2012).

Slope within the North Kiaka DE varies from < 5° to a maximum of 25°. Whilst the majority of the area is generally flat (< 5°), the slopes associated with the quartz ridges are typically between 15 – 18° (Soilwater Consultants, 2019).

5.4.3.4 Soil landscapes

Soils within the North Kiaka DE and Moora Mine DE represent either in-situ weathered rock (Coorow System) or alluvium (Ranfurly System) (GoWA, 2023).

Soils associated with the remnant quartz ridges belong to the Zone of Ancient Drainage, which represent residual soils that have experienced prolonged weathering and lateritisation. Soils in the lower topographic areas belong to the Northern Zone of Rejuvenated Drainage and are characterised by erosional surfaces producing a gently undulating landscape (Soilwater Consultants, 2019).

Table 5.26 and Figure 5.14 present soil landscapes (GoWA, 2023) occurring within the North Kiaka DE and Moora Mine DE.

Table 5.26 Soil landscape mapping units of the Project and Moora Mine (GoWA, 2023)

Map Unit	Soil Name	Description	Total mapped extent (ha)	Extent within the North Kiaka DE (ha)	Extent within North Kiaka DF (ha)	Extent within Moora Mine DE	Extent within Moora Mine DF (amended)
258Cw	Coorow System	Undulating to gently undulating rises, and intervening level to gently undulating flats. Soils are variable comprising deep yellow/pale sands; grey sandy duplexes; loamy soils/duplexes; and rock.	40,593,819	128.41	36.02	124.11	77.01
256Ra	Ranfurly System	Level to gently undulating plains comprising partially rejuvenated loam, clay and duplex alluvium.	113,465,825	88.01	8.55	114.96	18.15
Total				**216.42**	**44.59**	**95.17**	**95.16**

5.4.3.5 Soil types

Table 5.27 and Figure 5.15 present soil types (GoWA, 2023) occurring within the North Kiaka DE as mapped by Soilwater Consultants (2019). Both SMU 2 and SMU 3 have three distinct soil horizons:

– Topsoil – friable sandy gravels, with minor organic accumulation (transported)
– Subsoil – friable sandy gravels, with negligible organic accumulation (transported)
– Overburden – granitic (mottled) saprolite (*in-situ*).

All soil horizons are slightly- to- moderately acidic, non-saline, and non-sodic.

The sandy gravels (topsoil and subsoil) present in SMU 2 and SMU 3, are friable and structurally stable, with high saturated permeabilities. These materials are ideal for use in rehabilitation, particularly as an outer surface material on the proposed Tonkin WRD. The underlying granitic saprolite (fine fraction) is structurally unstable, dispersive and highly erodible, and therefore will not be used in the reconstruction of the outer surface of the Tonkin WRD.

It is noted the Moora Mine DE was not included in the Soilwater Consultants (2019) survey area.

LEGEND

- Road
- Haul road
- Watercourse
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)

Soil Landscape Mapping

- 256Bg_1 - Burabidge Hill 1 Subsystem
- 256Bg_7 - Burabidge Hill 7 Subsystem
- 256Ra_1 - Ranfurly 1 Subsystem
- 258Cw_5a - Coorow 5 plain Phase
- 258Cw_7 - Coorow 7 Subsystem

256Bg_7

256Bg_1

256Ra_1

258Cw_7

Midlands Rd

Kiaka Brook

Kiaka Rd

Kiaka Brook

Cattady Rd

Paper Size ISO A3

0 100 200 300 400 500

Metres

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

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Soil Landscapes

Project No. **12518217**
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FIGURE 5.14

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Data source: Simcoa: Mining Development Shape Areas is derived from client received 2020; DPIRD: Soil Landscape Mapping - 20190803; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, Road - 20180601; DoW: River - 201108. Created by: rbrown3

Furthermore, the gravelly topsoil (SMU 2) and subsoil (SMU 3) materials contain elevated plant available nutrients (i.e. Nitrogen (N), Phosphorus (P), Potassium (K) and Sulphur (S)) making them ideal for use in rehabilitation, while the underlying granitic saprolite has very low levels of nutrients available to plants.

Table 5.27 Soil types of the North Kiaka DE (GoWA, 2023)

Map Unit	Name	Description	Extent within the North Kiaka DE (ha)	Extent within North Kiaka DF (ha)	Extent within Moora Mine DE (ha)
SMU 1	Skeletal Stony Soil	The surface soils, associated with the outcropping quartzite intrusion, are <10 cm in depth and are composed of weathered quartzite and organic debris.	26.20	9.03	-
SMU 2	Shallow Gravelly Duplex	The weathered granitic regolith, which forms the intervening lower topographic areas, is covered by a surficial gravel layer which is thinner and coarser along the ridge crest and upper slope (SMU 2), and is thicker and finer on the mid- to- lower slope positions (SMU 3).	54.95	9.49	-
SMU 3	Deep Gravelly Duplex		67.33	22.97	-
Total			148.48[1]	41.49[2]	0.00[3]

Notes:
[1] A 67.94 ha portion of the 216.42 ha Development Envelope does not fall within the mapped distribution of SMU1, SMU2 and SMU3
[2] A 3.10 ha portion of the 44.59 ha Disturbance Footprint does not fall within the mapped distribution of SMU1, SMU2 and SMU3.
[3] All of the Moora Mine Disturbance Footprint falls outside the mapped distribution of SMU1, SMU2 and SMU3.

5.4.3.6 Land use and existing condition

The majority of soils within the North Kiaka and Moora Mine DEs have been affected by historic clearing of native vegetation, and farming (broad-acre crop and livestock) practices. Impacts to soil from cropping, including high to severe water repellence in the organic-enriched topsoil, are restricted to soil types SMU 2 and SMU 3 (Soilwater Consultants, 2019), as insufficient soil depth and the presence of quartzite outcrops make SMU 1 unsuitable for cropping. Consequently, the majority of SMU 1 supports remnant native vegetation; noting that much of the remaining stands of native vegetation have been affected by long term grazing and weed invasion.

5.4.3.7 Acid sulphate soils

Figure 5.16 presents acid sulfate soil (ASS) risk mapping over the North Kiaka DE and Moora Mine as prepared by the CSIRO and available from the Australian Soil Resource Information System (ASRIS) National ASS Atlas (CSIRO, 2019). The CSIRO ASS risk mapping indicates the North Kiaka DE and Moora Mine are within an area that has a low (6% – 70%) to extremely low (1%– 5%) probability of ASS occurrence, with a low degree of confidence.

LEGEND

- Road
- Haul road
- Watercourse
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)

Soil Mapping Units

- 1 - Skeletal Stony Soil
- 2 - Shallow Gravelly Duplex
- 3 - Deep Gravelly Duplex

Midlands Rd

Kiaka Brook

Kiaka Rd

Kiaka Brook

Paper Size ISO A3

0 100 200 300 400

Metres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Soil Types (Soilwater 2019)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.15

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Print date: 22 Mar 2024 - 14:31

Data source: DPIRD - Soil Mapping Units; Simcoa: Mining Development Shape Areas is derived from client received 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, Road - 20180601; DoW: River - 201108. Created by: rbrown3

5.4.3.8 Materials characterisation

GHD (2020c) prepared a materials characterisation assessment of waste rock samples from Moora Mine to understand the potential for generation of Acid and Metalliferous Drainage (AMD) from mining operations, and to develop suitable management processes to prevent AMD from occurring. The abandonment bund at Moora Mine will be constructed using inert materials with a low risk of producing AMD. The samples were taken from material classified as waste rock, from faces exposed within the pit walls of Moora Mine. Sample material was reported as representative of a typical mix of waste rock, and from Moora Mine west and main pits. The waste dumps are comprised exclusively of material that has been extracted from Moora Mine main and west pits and therefore the samples taken for analysis are representative of materials which would be extracted from the mining pit within the North Kiaka DE.

An additional materials characterisation (GHD, 2023f) has been commissioned for North Kiaka DE that will further inform the MP and MCP.

Acid leaching potential

Noodine Chert is known to contain primary minerals including sulfide. The Materials Characterisation Assessment identified low concentrations of sulphur, at or marginally above detection limits (<0.01%), indicating there is little stored capacity within the waste rock to produce acid though the oxidisation of sulphides. The results indicate the waste material is deemed as a low risk from acid production. As expected in this silica style orebody, the data indicate that the neutralising capacity of the waste rock is low (negligible carbonates). As a consequence, the observed weak acidity (low concentrations of H+ ions indicated in the data), deemed as a consequence of the presence of other minerals (e.g. iron), should be subject to buffering and dilution and therefore not pose an adverse risk or persistence of acidic conditions within the subsurface (GHD, 2020c).

Metalliferous leaching potential

Metals likely to be present in waste rock samples include Iron (Fe), Aluminium (Al) and Manganese (Mn), all metals that commonly occurring in the Noodine Chert (silica-orebody) (GHD, 2020c). It was concluded that the metals concentrations are generally below the limits of reporting, or at concentrations which are below relevant drinking water health criteria and therefore should not pose a risk to human health receptors for drinking or other exposure scenarios (i.e. irrigation or dust suppression). Conditions should not be conducive for leaching and mobilisation of metals at concentrations which may cause adverse effects to human health and the environment, given the geological profile of the rock (ancient weathered and silicic geological profile) (GHD, 2020c).

Saline drainage potential

Due to the silicic nature of the orebody (predominately chert), it is unlikely that readily dissolvable minerals (i.e. halite, gypsum, and carbonate) will be present at notable concentrations. Analysis of the waste rock samples from Moora Mine indicates that the total leachable constituents (major-ions) are at low concentrations. Therefore, dissolution of minerals and saline discharge, at concentrations, which may be a cause for concern from the waste rock is not anticipated (GHD, 2020c).

Hazardous materials

Laboratory analysis of the waste rock material at Moora Mine by GHD (2020c) indicates the following:

– Asbestos was not detected
– Radioactivity was not detected above the limits of reporting (500 bq/Kg).

5.4.3.9 Contamination

The DWER Contaminated Sites Database (DWER-059), identified there are no known contaminated sites within, or in proximity to the North Kiaka DE and Moora Mine (GoWA, 2023).

LEGEND

- Road
- Haul road
- Watercourse
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)

Acid Sulfate Soils (CSIRO)

- Low Probability of occurrence (6-70% chance)
- Extremely low probability of occurrence (1-5% chance)

Kiaka Brook
Midlands Rd
Kiaka Rd
Kiaka Brook

Paper Size ISO A3

0 100 200 300 400

Metres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Acid Sulfate Soil Risk

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.16

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Print date: 22 Mar 2024 - 14:31

Data source: CSIRO: Acid Sulfate Soils - 20190213; Simcoa: Mining Development Shape Areas is derived from client received 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Cadastre, Road - 20180601; DoW: River - 201108. Created by: rbrown3

5.4.4 Potential environmental impacts

The impact assessment considers the potential direct and indirect impacts the Revised Proposal may have on terrestrial environmental quality.

Development of the Project and construction of the abandonment bund at Moora Mine have the potential to have direct and indirect impacts to terrestrial environmental quality during construction and operations.

Direct

– Soil erosion from vegetation clearing, earthworks, constructed landforms and stormwater release, impacting soil quality
– Disturbance of ASS during mining, resulting in acidification of soils and potential leaching of metals to groundwater
– AMD from abandonment bund and the Tonkin WRD, resulting in contamination of groundwater
– Release of environmentally hazardous materials (hydrocarbons and chemicals) from storage or handling areas, resulting in contamination of soils (and potentially surface water or groundwater in proximity to the release).

Indirect

– Solid/ liquid waste discharge, resulting in contamination of soils (and potentially surface water or groundwater in proximity to the release).

5.4.4.1 Moora Mine and the Project

5.4.4.1.1 Soil erosion affecting soil quality

Clearing of vegetation and earthworks will disturb and expose soils thereby increasing their susceptibility to erosion by wind or water. Construction of the abandonment bund at Moora Mine requires the disturbance of up to three (3) ha within the 96 ha Moora Mine DF (amended) and has been sited to minimise impacts to native vegetation, including reducing the buffer for the bund by constructing from within the existing disturbance area. The bund will be constructed using benign material and stabilised to reduce erosion.

It is expected that there will be minimal impact on TEQ from the abandonment bund due to the small area of disturbance, its locations and the selection of construction materials.

The Project requires clearing of approximately 17.12 ha of native vegetation within a 216.42 ha North Kiaka DE, to establish the access corridor and the mine pit. Other physical elements including the Tonkin WRD, administration, stockpile, process and workshop areas, have been situated to avoid direct impact to native vegetation, thereby minimising the potential clearing footprint for the Project. The total area of proposed disturbance is approximately 44.59 ha. Disturbance areas lie over three soil landscape systems (Table 5.26). Erosion of exposed surfaces is not expected to cause a significant impact to soil or land quality at the regional scale, as the disturbance footprint represents less than 0.01% of both the regional extent of the Coorow and Ranfurly systems.

Of the three soil types identified within the North Kiaka DE (Table 5.27) the overburden (granitic saprolite) underlying SMU 2 and SMU 3 have the greatest risk of erosion, as these materials have been classified as structurally unstable, dispersive and highly erodible. Exposure of overburden will occur during mining and may occur where the access corridor is constructed across ridges. The separate stockpiling of erodible materials, the application of mitigation measures, and avoiding placement of these materials at the surface of the Tonkin WRD, is expected to minimise the risk of erosion and subsequent sediment impacts to surrounding areas.

The establishment of administration, stockpile and workshop areas on relatively flat areas within SMU 3, is highly unlikely to result in exposure of overburden (granitic saprolite). A large proportion of surface soils (topsoil and subsoil) will be stripped from these areas and stockpiled for later return during rehabilitation works. The surficial gravels present in SMU 3 topsoil and subsoil are structurally stable and unlikely to result in erosion.

The majority of the areas within the proposed mine pit comprises SMU 1 (Skeletal Stony Soils) and SMU 2 (Shallow Gravelly Duplex). The stony soils of SMU 1 and the gravelly soils of SMU 2 are structurally stable and unlikely to erode (Soilwater Consultants, 2019). However, due to the shallow depth of these materials on the upper slopes and ridges (where the mine pit is located), there are limited quantities of these

materials available for use in rehabilitation. It is proposed that structurally stable topsoil (to a depth of 10 cm) and subsoil (to a depth of 30 - 40 cm) be harvested from SMU 3 within the proposed Tonkin WRD area and stockpiled for later use in rehabilitation of the outer surface of the Tonkin WRD (Soilwater Consultants, 2019). This is expected to significantly reduce the risk of erosion from the constructed Tonkin WRD.

Stockpiling of topsoil for later use in rehabilitation can result in reduced soil function and erosion impacts. Inappropriate stockpiling methods (e.g. stockpiles greater than 2 m in height), can increase the potential for erosion through wind and stormwater runoff, and may lead to compaction, reduced microbial activity, and reduced water infiltration. Where practicable, SIMCOA will progressively use topsoil to rehabilitate the Tonkin WRD, to reduce the timeframe that topsoil is stockpiled. Topsoil heavily impacted by weeds or dieback will be separately stockpiled and buried with overburden in the Tonkin WRD.

Stormwater runoff from access roads has the potential to cause soil erosion, and potential sedimentation of the Kyaka Brook, which the access corridor crosses. Access roads will either be covered with a bitumen seal, paved with a crushed aggregate, or compacted using in-situ materials, and are therefore not expected to erode. However, if erosion is observed (particularly in the bed and/or banks of Kyaka Brook), rock armouring or other protection will be installed to prevent further soil erosion.

5.4.4.1.2 Exposure of ASS resulting in acidification of soils

Acid Sulfate Soils (ASS) are naturally occurring soils containing iron sulfides, which predominately contain pyrite materials. ASS are generally benign when left in an anoxic state. When exposed to oxygen through disturbance (i.e. stripping of topsoil and subsoil), iron sulfides can oxidise to produce sulfuric acid. The sulfuric acid causes acidification of soils (a reduction in soil pH), compromising soil quality and future beneficial uses (i.e. agriculture), and may also contaminate surface water and groundwater environments. At a reduced soil pH, metals and metalloids can become mobilised contaminating groundwater and downstream surface waters.

As presented in Section 5.4.3.7, the North Kiaka DE and Moora Mine DE have a low (6% – 70%) to extremely low (1% – 5%) probability of ASS occurrence. It is expected that tertiary weathering processes have depleted sulphides in the upper profile of the Noodine Chert formation. While there is potential for sulfides to be preserved in the orebody, disturbance of ASS in both areas is considered unlikely.

5.4.4.1.3 Acid Metalliferous Drainage

AMD is caused by exposure of potentially acid forming (PAF) materials to oxygen producing sulfuric acid. Exposure can occur when PAF materials are disturbed (i.e. during mining), or when these materials are placed at the surface of constructed landforms (i.e. the Tonkin WRD). The acidic leachate can mobilise metals, metalloids and major ions present in elevated concentrations in the underlying soils. This process is known as AMD. In the event of extensive seepage, leachate may contaminate groundwater and surface water resources, resulting in compromised water quality, and impacts to riparian vegetation along Kyaka Brook.

As discussed in Section 5.4.3.8, the materials characterisation assessment (GHD, 2020c) determined the potential risk of Project operations causing AMD to be low. The waste material is deemed as a low risk from acid production, as this silica style orebody has low concentrations of sulphur, at or marginally above detection limits (<0.01%), indicating there is little stored capacity within the waste rock to produce acid though the oxidisation of sulphides.

Based on mining activity having been conducted at the Moora Mine (2 km south) for a number of years, and there being no impacts or evidence of AMD effects, the sound understanding of material characterisation, and the management practises proposed to prevent AMD (see Section 5.4.5), it is highly unlikely that AMD impacts will occur as a result of developing the Project.

5.4.4.1.4 Saline drainage

Saline drainage can result from exposure of dissolvable minerals during mining. Due to the silicic nature of the orebody (predominately chert), it is unlikely that readily dissolvable minerals (i.e. halite, gypsum, and carbonate) will be present at notable concentrations. Consequently, the potential for saline leaching is expected to be low.

5.4.4.1.5 Release of environmentally hazardous materials (diesel) to soils

The Revised Proposal requires establishment of a bulk hydrocarbon storage and refuelling area for the mining fleet (approximately 55,000 L of diesel, plus other oils and greases). This equates to approximately 55 m^3 of bulk hydrocarbon storage, which is well below the trigger levels for a prescribed premise licence under Part V of the EP Regulations 1987 for Category 73 (required for bulk hydrocarbon storage of 1,000 m^3 or more), and a Dangerous Goods Storage Licence under the Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 (required for bulk hydrocarbon storage of 100,000 L or more). Nevertheless, failure of hydrocarbon containment areas or the malfunction of mining equipment, has the potential to result in soil, surface and groundwater contamination through the accidental release of environmental hazardous materials into the environment.

Localised contamination could develop beyond the soil surface if a significant release of hydrocarbons occurs which is not remediated in a timely manner. Contaminants in soil may seep into the underlying aquifers (both surficial and fractured rock aquifers) and/or become mobilised in surface water runoff contaminating the nearby Kyaka Brook (an ephemeral waterway). Inferred groundwater depths within the North Kiaka DE (refer to Section 5.6.3.4) are estimated to occur from 11 – 14 mbgl in the west (GHD, 2019). The Kyaka Brook is crosses into the southern portion of the North Kiaka DE. To avoid the release of significant quantities of hydrocarbons to the environment, diesel will be stored in above-ground storage tanks in lined, bunded compounds designed in accordance with Standards Australia (AS 1940:2017) The Storage and Handling of Flammable and Combustible Liquids (Standards Australia, 2017). Additional mitigation measures are provided in Section 5.4.5.

The Project will incorporate stormwater drainage that isolates areas at risk of potential contaminant leaks (e.g. vehicle refuelling and wash-down areas), with stormwater runoff being directed to a hydrocarbon/ sediment traps, prior to discharge. Any hydrocarbon leaks from mining equipment would require a spill response procedure for loss of hydrocarbons from mobile equipment in the field. Any contaminated soil would be collected and disposed of offsite. Any hydrocarbon leaks within dedicated hydrocarbon storage areas are expected to be contained within bunded areas.

SIMCOA will also develop emergency management procedures for the Project based on the successful procedures implemented at Moora Mine, to minimise the extent of soil and land contamination in the event of significant hydrocarbon release. Consequently, no significant impact to soil and land quality is expected to result from the Revised Proposal.

5.4.4.1.6 Solid/ liquid waste discharge resulting in contamination of soils

The Revised Proposal will include an office for a small operating workforce (up to 12 staff) with some working at both Moora Mine and the Project. The Revised Proposal doesn't change the discharge at Moora Mine, but will include small quantities of sewage from the office in the North Kiaka DE (approximately 1,800 L/day) (DoW, 2016) which will be disposed to an on-site septic system comprising septic tanks and a horizontal leach drain or soakage wells. The septic system will be located at the administration area approximately 500 m north of Kyaka Brook and is not within a Floodplain Management Area (DWER-020) (GoWA, 2023).

It is expected that the deep gravelly duplex soils (SMU 3) identified by Soilwater (2019) to occur within the administration area will allow for effective infiltration of treated wastewater in accordance with the Health 'Treatment of Sewage and Disposal of Effluent and Liquid Waste' Regulations 1974 and the Australian/New Zealand Standard 1547:2012 'On-site domestic wastewater management' (Standards Australia, 2012). All other solid and liquid wastes from the Project will be disposed of at an off-site licensed waste facility. Accordingly, no significant impact to soil and land quality is expected to result from the disposal of solid and/or liquid waste at the Moora Mine or at the Project.

5.4.5 Mitigation

5.4.5.1 Moora Mine and the Project

Potential impacts on terrestrial environmental quality have been successfully managed at the existing Moora Mine for over 30 years. The Revised Proposal will continue to implement these proven techniques and where necessary use adaptive management practices to continually improve management measures and environmental outcomes. The following key mitigation and management measures that are currently implemented at the Moora Mine will be utilised for continued operations at Moora Mine and for the Project.

Table 5.28 TEQ - Mitigation – Moora Mine and the Project

Mitigation Category	Mitigation measures
Avoid	– Establishment of exclusion zones and access controls to prevent unauthorised disturbance – Hydrocarbon storage in accordance with: • AS 1940:2017 The Storage and Handling of Flammable and Combustible Liquids (Standards Australia, 2017) • WQPN 56 Tanks for fuel and chemical storage near sensitive water resources (DoW, 2018) – Apart from on-site sewage disposal, all wastes to be disposed off-site at licensed facilities.
Minimise	Soil erosion – Clearing undertaken in stages and limited to the extent required for construction of infrastructure and the undertaking of mine activities – Collection and stockpiling of topsoil immediately following vegetation clearing to prevent loss of topsoil from wind/water erosion – Where practicable, topsoil will be used to progressively rehabilitee the Tonkin WRD, in preference to stockpiling – Soil stockpiles maintained at a height not exceeding 2 m – Provision of erosion protection (i.e. rock armouring) where required, to prevent soil erosion at stormwater discharge locations. Release of environmentally hazardous materials: – Risk assessment developed for bulk hydrocarbon storage areas – Bulk hydrocarbon storage areas will provide: • Placarding on storage tanks including “combustible liquid C1”, “no ignition sources” and “maximum fill level” • Impact protective ARMCO railing or bollards • Dry powder fire extinguishers – Stormwater drainage system to be designed in accordance with DWER water quality protection note (WQPN) 52 Stormwater management at industrial sites (DoW, 2010), including capture of runoff from areas at risk of potential contamination (i.e. vehicle refuelling and wash-down areas), and the removal of hydrocarbons via a hydrocarbon/sediment trap prior to discharge – Hydrocarbon trap lined in accordance with WQPN 26 Liners for containing pollutants using synthetic membranes (DoW, 2013a) and WQPN 27 Liners for containing pollutants using engineered soils (DoW, 2013b) – Minor quantities of oils and greases will be stored in a workshop with a sealed floor – Liquid wastes (i.e. lubricants and hydraulic fluids) stored in holding tanks for recycling and disposal off-site. Spill contamination management: – Emergency management procedures and equipment for the recovery of contaminated soils in the event of accidental release – Daily inspection of machinery and equipment for integrity – Refuelling and repairs/servicing undertaken in a designated, bunded area – Spill kits readily available, and staff trained in the use of spill kits and appropriate disposal of contaminated material – Contaminated soil disposed of at an appropriately licensed waste disposal facility – In the event of extreme weather conditions (e.g. storm events) construction work will cease and the need for additional erosion and sediment control will be assessed and implemented where required Acid sulphate soils: – Though disturbance of ASS is considered highly unlikely, if ASS are detected these will be managed in accordance with the Department of Environment Regulation (2015b) Guidance: ‘Treatment and management of soils and water in acid sulfate soil landscapes’. Solid/liquid waste discharge: – Septic system designed and located in accordance with the ‘Health Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations 1974’ and the ‘Australian/New Zealand Standard 1547:2012 On-site domestic wastewater management’ (Standards Australia, 2012), and as approved under the Health Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations 1974 – Septic system located in accordance with DWER WQPN70 Wastewater treatment and disposal domestic systems (DoW, 2016), this includes locating the system at least 100 m from the Kyaka Brook (outside of the flood zone).

Mitigation Category	Mitigation measures
Rehabilitate	Mine closure and rehabilitation at Moora Mine is / will be completed in accordance with the DMIRS approved Mine Closure Plan (GHD, 2023b). A MCP will be prepared for the Project, which will be submitted and approved by DMIRS. This MCP will draw upon lessons learnt from Moora Mine and given their proximity it is expected that rehabilitation results that have been achieved at Moora (Trudgen, 2023) will be replicated within the Project. Section 5.2.6.1.1 provides a summary of the current status of rehabilitation at Moora. In addition to rehabilitation, the Waste Rock Dumps (WRD) and other hardstand areas will be designed to be stable and non-polluting. WRD's will be: – designed with a batter slope of 18°, placement of structurally stable soils at the surface – contoured, ripped and logs/rocks placed to prevent sheet flow from landforms – progressively rehabilitated to slow surface water flows across the embankment surface, thereby minimising soil erosion – revegetation species selected for each part of the WRD with slope/top/berm with species most likely to thrive (i.e. soil depth and water holding capacity are appropriate to plant water demand), aiding in preventing runoff and erosion – rehabilitation of disturbed areas with ameliorated soil to return soils to a condition suitable for the agreed post-mining land use.
Offset	No offsets are required in relation to Terrestrial Environmental Quality as a result of the implementation of the Revised Proposal.

5.4.6 Assessment of significance and residual impacts

5.4.6.1 The Revised Proposal

After implementing the mitigation and management measures described above, the following residual impacts are expected in regard to terrestrial environmental quality:

– Minor soil erosion as the result of vegetation clearing, earthworks, constructed landforms and stormwater release, impacting soil quality
– Low to very low impact risk of the contamination of groundwater from AMD or ASS
– Low to very low risk of soil contamination from hydrocarbon spills and leaks.

All of the above risks will be monitored, and corrective actions implemented where required. Long term impacts to terrestrial environmental quality will be managed in accordance with the MCPs. These MCPs are / will be approved and regularly updated in accordance with DMIRS requirements.

5.4.7 Environmental outcome

The Revised Proposal has the potential to affect soil or land quality, however, it is expected that potential impacts can be mitigated through the management and mitigation measures provided. The successful management of the Moora Mine including the design and management of the existing waste rock dumps is being supported by the building of the abandonment bund around the pits, planned for construction following completion of mining activities. No additional risks are expected at Moora Mine outside of those already managed through the existing environmental controls.

The design, management and closure of the Project will be regulated under the *Mining Act 1984* (i.e. through the MP and MCP). Ongoing monitoring, management and corrective actions will be implemented throughout the life of the Project, this will include erosion and sedimentation controls and management of the handling, storage and use of hydrocarbons. SIMCOA has demonstrated through the successful management of the Moora Mine that impacts to TEQ can be managed to mitigate environmental harm, and that rehabilitation can be achieved during and post mining. It is considered that with the proposed management measures the Revised Proposal will not result in significant or lasting impacts to TEQ and can meet the EPA's objective.

5.4.8 Cumulative impact assessment

An assessment of potential cumulative impacts is provided in Section 10.

5.5 Key Environmental Factor – Terrestrial Fauna

This section discusses the direct and indirect impacts to terrestrial fauna resulting from construction and operation of the Project and construction of the abandonment bund at Moora Mine. The construction and operation of the Revised Proposal will not result in any new clearing at Kemerton Smelter and as such only indirect impacts from the continued operation of Kemerton Smelter on terrestrial fauna are considered.

Potential indirect impacts to terrestrial fauna at Moora Mine and Kemerton Smelter are managed through existing controls. Impacts from development of the North Kiaka DE to terrestrial fauna are addressed in the EMP (GHD, 2023g)(See Appendix C).

5.5.1 EPA objective

The EPA's objective for the factor Terrestrial Fauna is:

"*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained*".

In the context of this objective, ecological integrity is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements.

5.5.2 Relevant policy and guidance

EPA Policy and guidance

- *Instructions on how to prepare an Environmental Review Document* (EPA, 2021b)
- *Statement of Environmental Principles, Factors and Objectives and Aims of EIA* (EPA, 2023b)
- *Environmental Factor Guideline: Terrestrial Fauna* (EPA, 2016d)
- *Technical Guidance – Terrestrial vertebrate fauna surveys for Environmental Impact Assessment* (EPA, 2020a)
- *Technical Guidance – Sampling of Short Range Endemic (SRE) Invertebrate Fauna* (EPA, 2016f).

Other policy and guidance

- *Environmental Offsets Policy*, Perth, Western Australia (GoWA, 2011)
- *Environmental Offsets Guidelines*, Perth, Western Australia (GoWA, 2014)
- *Environment Protection and Biodiversity Conservation Act 1999, Environmental Offsets Policy* (DSEWPAC, 2012)
- *Environment Protection and Biodiversity Conservation Act 1999, Outcomes-based Conditions Policy* (DER, 2016)
- *Referral guideline for 3 WA threatened black cockatoo species, Carnaby's Cockatoo (Zanda latirostris), Baudin's Cockatoo (Zanda baudinii) and the Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso)* (DAWE, 2022)
- Relevant recovery plans, conservation advice and/or threat abatement plans for conservation significant species.

5.5.3 Notice Requiring Information for Assessment – Terrestrial Fauna

Terrestrial Fauna is considered a key environmental factor for the Revised Proposal and is the focus of the assessment presented in this section. The draft ERD prepared in accordance with s40(2)(a) was amended to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the Draft ERD has been updated based on the EPA's additional information requests (EPA, 2022b; EPA, 2023d) as referenced in Table 5.29 and Table 5.30.

Table 5.29 2023 Additional information request – terrestrial fauna

Source	Additional Information	Section of the ERD
Terrestrial Fauna (Vertebrate) - DWER	Clarify if a search of the Great Cocky Count database was undertaken.	Section 5.5.4.1.5.2 and Figure 5.18 notes the source of the data (including the great cocky count information)
	Provide a clear map illustrating fauna habitats, the DE, and direct impact areas as the base layer, with survey and significant fauna locations.	Figure 5.17 in Section 5.5.4.1.2
Terrestrial Fauna (Vertebrate) - DCCEEW	Provide an updated fauna survey for the proposed proposal area. Specifically, provide an updated targeted assessment regarding impacts on the Carnaby's Black Cockatoo (*Zanda latirostris* listed as *Calyptorhynchus latirostris*) – Endangered.	Section 5.5.5 describes the fauna survey undertaken as consistent with the guidance which describes the impacts to Black Cockatoos
	Ensure that the updated survey is consistent with the Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2 (Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010).	Noted
Terrestrial Fauna (Invertebrate) - DWER	If additional fauna surveys are undertaken, invertebrate specimens should be retained appropriately to confirm identification by persons with relevant expertise and using available techniques (e.g. genetic analysis).	Noted
	Quantify the impacts on potential and confirmed SRE habitat and provide a map of SRE taxa in relation to their preferred habitat.	Section 5.5.4.1.6 of the ERD and Figure 5.21 describe the SRE habitat
	Discuss the significance of impacts to SRE habitat.	Section 5.5.7.1.3 of the ERD describes the impacts to SRE habitat
Threatened Fauna: Zanda latirostris (Carnaby's cockatoo)	Provide additional targeted surveys to inform a clear assessment of the potential impacts (direct, indirect and cumulative) on threatened fauna, at both a local and regional scale.	Section 5.5.4.1.1 describes the surveys undertaken for fauna Section 10 provides a description of the cumulative impacts to threatened fauna
Threatened Ecological Community (Coomberdale Chert Hills) - DBCA	Clarify/update the inconsistency in the total area of native vegetation proposed for clearing. Clarify the reasons behind the misalignment between the total fauna habitat and area of vegetation to be cleared.	Section 5.5.5 of the ERD correctly notes the portion of vegetation which is being cleared which is considered fauna habitat
Threatened Short Range Endemics (SREs) - DBCA	Provide additional targeted surveys to determine the presence of Idiosoma species and assess any potential impacts on the species.	Section 5.5.4.1.6 of the ERD describes that the survey effort for SRE was sufficient to determine the presence of the Idiosoma species and potential impacts on the species (if found)

Table 5.30 2021 Additional work – Terrestrial Fauna

Additional Information	Section of this ERD
The Figure 2 (Appendix M) from GHD's (2021a) Fauna Report should be revised to label the individual species rather than their listing status and Figure 3 shows Fauna Survey Methods (Appendix M). Figure 4 (Fauna Habitats) should clearly illustrate fauna habitats.	GHD's (2021a) Fauna Report included in Appendix M. Figure 2 (updated). Figure 4 (Fauna Habitats) shows all fauna habitats so no change has been made.
Targeted desktop search for any known locations of breeding or nesting sites of Carnaby's Black Cockatoo within 12 kilometres (km) of the Development Envelope (DE) should be undertaken and must be included in the referral documents.	Section 5.5.4.1.5 Desktop search of Cockatoo Roosting and Breeding sites Figure 5.19 (12 km buffer)

Additional Information	Section of this ERD
The information on Short Range Endemics (SRE) are incorrectly discussed under 'other environmental factors' in section 4 of the referral supporting document. It should be noted that the SREs are a component of EPA's Environmental Factor Guideline - Terrestrial Fauna and should be correctly discussed.	Section 5.5.4.1.6
The predicted distribution range of *Bothriembryon* and *Antichiropus* species and their percentage of habitat likely to be lost due to proposal should be assessed and discussed.	Section 5.5.4.1.6
Genetic analysis needs to be conducted to confirm whether the spider specimen collected is the same species *Kwonkan wonganensis* or a new species.	Section 5.5.4.1.6
The presence of Eucalypt woodlands of the Western Australian Wheatbelt Priority Ecological Community (PEC) should be recognised and discussed in referral supporting document. EPA notes that PEC have been identified to occur within the DE.	Addressed in Flora and Vegetation Section 5.2
The assessment of the distribution and quality of, and potential impacts on the PEC should be undertaken.	Addressed in Flora and Vegetation Section 5.2
Offsets that are required for the clearing of Carnaby's Black Cockatoo foraging habitat should be determined.	Offset Section 7.3 Figure 7.2 showing Cockatoo Roosting and Breeding sites around the Offset sites
If the above information is not provided, or if surveys determine risk of impact on significant terrestrial fauna species, Environmental Management Plans detailing the management and mitigation of impacts on significant terrestrial fauna should be prepared in accordance with *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* and submitted for assessment. This should include a commitment to avoid or minimise impacts to significant terrestrial fauna and consideration of offsets for any significant residual impacts to terrestrial fauna.	The Environmental Management Plan is provided as Appendix C

5.5.4 Receiving environment

5.5.4.1 North Kiaka DE and Moora Mine

5.5.4.1.1 Baseline studies

The following baseline studies of the Moora Mine and North Kiaka DE have been used to ascertain the existing receiving environment:

– North Kiaka Proposed Mine Expansion Fauna Assessment Report – level 2 vertebrate fauna assessment covering the North Kiaka DE (GHD, 2021a). The Fauna Assessment (Appendix M) included:
  - Desktop review of relevant databases and existing information prior to the field survey
  - Twelve-day Level 2 trapping program (19 - 30 November 2018) and reconnaissance survey, using a series of standardised systematic trapping quadrats comprising a combination of pit-fall, Elliott box, cage and funnel traps
  - Motion sensor cameras (Reconyx-Hyperfire) were deployed for a period of at least eight to 25 nights over the survey area
  - Bat detectors (SM2 and SM4 Songmeters) were deployed for a period of one to two nights
  - Targeted Malleefowl and Black Cockatoo habitat assessment.
– Terrestrial fauna assessments of the Moora Mine and surrounding areas were previously surveyed by Bamford (2001)
– Survey for Short Range Endemic (SRE) Fauna for the North Kiaka Quartzite Mine conducted by Invertebrate Solutions (2019b).

Information provided in the s38 referral has been updated based on the EPA's additional information request (EPA 2022) and the notes from the meetings between SIMCOA, GHD and EPA. SIMCOA has also commissioned additional studies for the North Kiaka DE. These are:

– An additional targeted desktop search for any known locations of breeding or nesting sites for Carnaby's Black Cockatoo within 12 km of the North Kiaka DE. This has been included in Section 5.5.4.1.5.2.
– An additional review of the Short Range Endemics (SRE) (2019b) assessment information has been included in Section 5.5.4.1.6.

A targeted assessment for Black Cockatoos will be undertaken in April 2024 to map for the presence and quality of foraging vegetation. The Terrestrial Fauna Report and Final ERD will be updated with the findings of these surveys.

5.5.4.1.2 Fauna Habitats

Terrestrial fauna assessments were previously completed for the Moora Mine to assess the impact of mining operations and have been used to assist in the assessment of potential impacts of the Revised Proposal.

A terrestrial fauna assessment of the North Kiaka DE was completed by GHD (2021a), and noted that the remnant vegetation present in the local area supported a varied assemblage of vertebrate species, is of moderate to high value, and has an important role in landscape connectivity. Desktop searches identified several conservation significant fauna potentially present with two conservation significant fauna species recorded or considered likely post field surveys. These are:

– Carnaby's Black Cockatoo (*Zanda latirostris*) (Endangered, Likely to occur)
– Peregrine Falcon (*Falco peregrinus*) (Other specially protected fauna (OS), Likely to occur).

The terrestrial fauna survey (GHD, 2021a) identified five broad habitat types, within the North Kiaka DE, which are closely aligned with the vegetation types and landforms. These habitat types are described in Table 5.31 and mapped in Figure 5.17. It is noted that Wandoo Woodland is present in within the survey area but was not recorded within the North Kiaka DE.

The potential fauna habitat within the amended DF for the Moora Mine (up to 1 ha) has been extrapolated based on the vegetation alliances/ communities and the findings of the fauna survey completed by GHD (2021a) for the North Kiaka DE (Table 5.31).

Table 5.31 Major habitat types within the North Kiaka DE (GHD, 2021a)

Description	Extent within the North Kiaka DE (ha)	Area to be cleared for North Kiaka DF (ha)	Area to be cleared Moora Mine amended DF
Kyaka Brook – Riparian /Dam *Eucalyptus wandoo* and/ or *E. loxophleba* woodland along Kyaka Brook over mixed introduced grasses and herbs. *Allocasuarina huegeliana* is present surrounding the small dam. An ephemeral brook/drainage line that runs from the south western corner of the North Kiaka DE east and crosses Kiaka Road outside of the North Kiaka DE. The main drainage line follows the gradient of the survey area, generally flowing from east to west. The creek and other small ephemeral drainage lines supports generally narrow, linear woodlands and was more structurally diverse than the surrounding habitats (which is primarily shrublands). The vegetation along these drainage lines is dominated by *Eucalyptus wandoo* and *E. loxophleba* and mixed scattered shrubs. The understorey consists of introduced herbs and grasses and was mostly degraded. Areas had some litter and debris present including large branches and logs creating numerous usable habitat options for fauna species. The drainage lines have a mosaic of substrates with a complex and variable mix of rocky, stony and sandy profiles. The substrates would vary and erode in response to rainfall and flooding. There was no evidence of fire in this habitat.	7.50	0.17	0.00

Description	Extent within the North Kiaka DE (ha)	Area to be cleared for North Kiaka DF (ha)	Area to be cleared Moora Mine amended DF
These linear patches of habitat provide a corridor for the movement of fauna through the local landscape. Small birds would utilise this denser vegetation for foraging, movement and nesting.			
Mallee Woodland Mallee Woodland of *Eucalyptus loxophleba* over scattered shrubs and very open herb and grass lands in fine sandy soils. The Mallee Woodland comprised a series of very small remnant areas throughout the North Kiaka DE. The woodland comprised fine sands over a deeper layer of heavy loams. The dominant plant species were *Acacia* and *Dodonaea* with herbs and grasses. The main areas of mallee woodlands were located in the mid to lower slopes of the North Kiaka DE and mostly cleared due to this habitat being aligned to desirable agricultural soils. It was also evident that cattle highly utilised these areas for shade and cover due to the grazing (showing signs of heavy grazing, soil compaction and trampling) noticeably impacted the ground layer. The Mallee Woodland had very little sign of fauna activity and is likely an artefact of the small habitat areas remaining and the high impact and use by agricultural species. However bats and other small hollow utilising species were present in this habitat.	9.30	0.05	0.02
Mixed shrublands on low hills Mixed Shrublands of *Acacia, Banksia, Regelia, Kunzea, Allocasuarina, Hibbertia, Xanthorrhoea* and *Melaleuca* on rocky low hills. The Mixed Shrublands vary in composition of species and quality according to historical disturbances and location in the environment. The mixed Shrublands has areas of singular species dominance such as *Allocasuarina* and *Banksia sessilis,* however these areas were relatively small. The patches of vegetation where fencing is not present show signs of edge or fringe effect from grazing, however outside of these are generally in good conditions. Some portions of the mixed shrubland such as those in the north eastern section of the North Kiaka DE are quite degraded and open, and likely historically cleared. This habitat was diverse in structure and was evidently sculptured by the base rock ultimately forming the low hills. Some areas were exposed rock while others heavy rocky loam. There were high points in the environment and areas where water ran or temporarily pooled. The environment had areas of good ground covers, litter, small logs or debris. There was no evidence of fire in this environment. This habitat would provide a variety of habitat resources for fauna species, and patches had a greater structural diversity than the surrounding shrublands. The lack of sandy soils was evident in the fauna assemblages trapped during the programs. This was particularly evident by the paucity of burrowing species trapped. No Striped skink (*Ctenotus sp*.) or Gould's monitors (*Varanus gouldii*) were recorded during the survey which would typically be represented.	68.73	15.58	0.93
Quartzite outcropping formations Mixed Shrublands of *Acacia, Banksia, Regelia, Kunzia* and *Allocasuarina*, amongst quartzite outcropping. Quartzite outcrops occurred in two small areas of the North Kiaka DE. The formations are usually associated with low vegetation types due to the shallow soils and comprise *Acacia*, *Banksia, Regelia, Kunzia* and *Allocasuarina* and an abundance of grasses and herbs. The environment had areas of good ground covers, litter and debris but lacked logs due to vegetation present. However, the outcropping with exfoliating rock, crevices and slabbing provides excellent cover for a range of fauna species. There was no evidence of fire in this habitat. The Common Wallaroo appears to be the most common mammal to frequent or reside in this habitat type. Cracks and ledges formed in	4.02	0.00	0.00

Description	Extent within the North Kiaka DE (ha)	Area to be cleared for North Kiaka DF (ha)	Area to be cleared Moora Mine amended DF
the granite and its loose stones provide a majority of the habitat for reptiles and small mammals to hide. The small caves may provide refugia for bat species.			
Total fauna habitats	**89.55**	**15.80[1]**	**0.95**
Disturbed areas Areas of the North Kiaka DE have been cleared and remain cleared for agriculture, tracks, mines and old fence lines. These areas provide very little habitat value to native fauna species.	126.87	28.79	2.05
Total	**216.42**	**44.59**	**3.00**

[1] Fauna habitat mapping (Figure 5.17) and native vegetation mapping (

Figure 5.5*) have slightly different polygon boundaries. Consequently, clearing of native vegetation (17.12 ha, Trudgen 2018) exceeds clearing of fauna habitat (15.80 for fauna and SRE and 15.58 ha of high value Black Cockatoo foraging habitat (GHD 2021)).*

5.5.4.1.3 Fauna habitat linkages

Ecological linkages can be described as a series of (both contiguous and non-contiguous) patches of vegetation which, by virtue of their proximity to each other, act as stepping-stones of habitat which facilitate the maintenance of ecological processes and the movement of organisms within and across a landscape (EPA, 2016d).

The fauna habitat surrounding the North Kiaka DE and Moora Mine is locally and regionally fragmented, predominately resulting from historical clearing for agricultural purposes. The low hill tops, where the soils are too rocky for agricultural purposes, provide islands of vegetation for species to persist and are loosely connected to adjacent areas north and south of similar habitats. These islands of remnant vegetation are most likely to be utilised by avian species, as they can move across the landscape (GHD, 2021a).

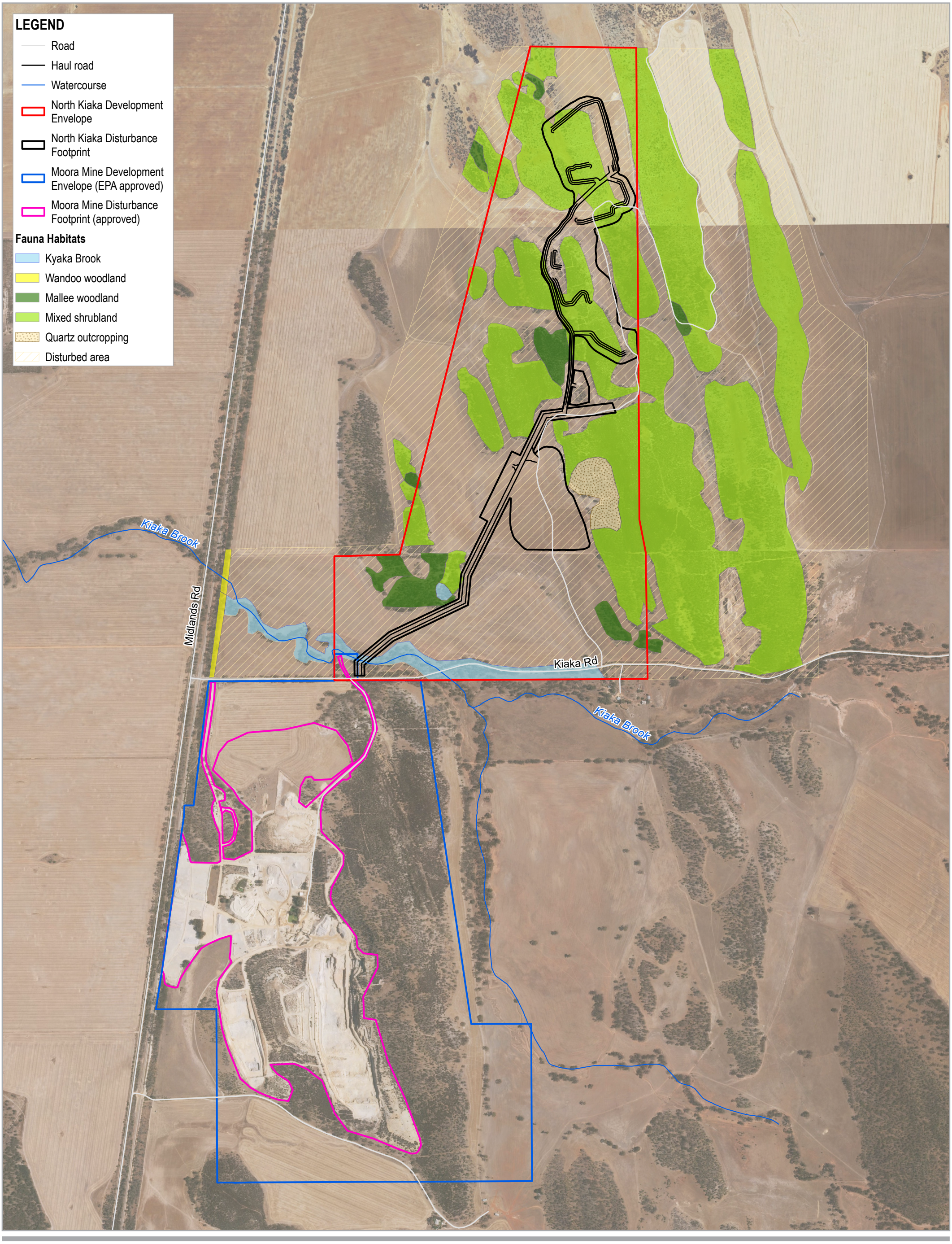
5.5.4.1.4 Fauna diversity

A desktop assessment of vertebrate fauna potentially occurring within the North Kiaka DE was undertaken by GHD (2021a). The desktop assessment included a review of the following available literature and searches of relevant databases within a 20 km radius of the North Kiaka DE:

– DBCA NatureMap database
– DBCA Threatened and Priority Fauna database
– DAWE Protected Matters Search Tool (PMST)

The desktop assessment identified 204 vertebrate fauna taxa previously recorded within a 20 km of the North Kiaka DE.

A Level 2 field survey (in November 2018) recorded 97 vertebrate fauna species, comprised of 16 mammals, 63 birds and 18 reptiles within the survey area (GHD, 2021a).



Paper Size ISO A3

0 100 200 300 400

Metres

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

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GHD

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Fauna Habitats within the North Kiaka DE

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.17

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Print date: 22 Mar 2024 - 14:32

Data source: Simcoa: Mining Development Shape Areas is derived from client received 2020; GHD: Survey area - 20180627, Fauna habitats - 20190213; Landgate: Roads - 20190128, Imagery - 20171202 (accessed: 20190212). Created by: rbrown3

5.5.4.1.5 Conservation significant fauna

GHD (2021a) completed a desktop assessment (refer to Section 5.5.4.1.5) that identified the presence / potential presence of 19 conservation significant fauna species (2 mammals, 1 freshwater fish, 1 reptile and 15 birds), within 20 km radius of the North Kiaka DE. Species identified by the PMST as marine and migratory marine were excluded from this assessment, as no marine habitats are present or in close proximity to the North Kiaka DE. However, species identified by the PMST as migratory terrestrial / wetland are considered as part of this assessment. As outlined in Table 5.32, of the 19 conservation significant species identified in the desktop assessment:

– One species (Carnaby's Black Cockatoo) is known to occur
– One species (Peregrine Falcon) is considered likely to occur
– Three species are considered unlikely to occur
– 14 species are considered highly unlikely to occur within the North Kiaka DE (GHD, 2021a).

Only one conservation significant fauna species was recorded during the field survey:

– Carnaby's Black Cockatoo (*Zanda latirostris*) – listed under Schedule 2 (Endangered) under the Endangered under the EPBC Act and BC Act.

Given the close proximity of the Moora Mine abandonment bund to the North Kiaka DE the results are considered to be representative of both areas.

Table 5.32 Conservation significant fauna species summary for the North Kiaka DE (GHD 2019c)

Species	EPBC Act listing	BC Act or DBCA listing	Species information	Likelihood of occurrence within the North Kiaka DE and Moora Mine DF (amended)
Birds				
Carnaby's Black Cockatoo (*Zanda latirostris*)	Endangered	Endangered	Carnaby's Black Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain salmon gum, wandoo, marri, jarrah and karri, and in shrubland or kwongan heathland dominated by Hakea, Dryandra, Banksia and Grevillea species. Breeding activity is restricted to eucalypt woodlands mainly in the semiarid and subhumid interior, from Kalbarri in the north, Three Springs District south to the Stirling Range, west to Cockleshell Gully and east to Manmanning. The species has expanded its breeding range west and south into the jarrah-marri forests of the Darling Scarp, the tuart forests of the Swan Coastal Plain, including the Yanchep area, Lake Clifton and near Bunbury.	Known This species was recorded in the North Kiaka DE and feeding observations were recorded. This species is considered likely to occur within the Moora Mine DF based on vegetation alliance/ communities present in the amended DF area.
Peregrine Falcon (*Falco peregrinus*)	-	Other specially protected fauna	The Peregrine Falcon is seen occasionally anywhere in the southwest of WA. It is found everywhere from woodlands to open grasslands and coastal cliffs - though less frequently in desert regions. The species nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities.	Likely The species is known from the region; however, use of the area would be opportunistic and utilised for foraging purposes only. No suitable breeding habitat is present in the North Kiaka DE.
Sharp-tailed Sandpiper (*Calidris acuminate*)	Migratory Marine	International Agreement	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.

Species	EPBC Act listing	BC Act or DBCA listing	Species information	Likelihood of occurrence within the North Kiaka DE and Moora Mine DF (amended)
			and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in salt works and sewage farms. They use flooded paddocks, sedge lands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. Sometimes they occur on rocky shores. They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division. Inland records indicate the species is widespread and scattered from Newman, east to Lake Cohen, south to Boulder and west to Meekatharra.	
Curlew Sandpiper (*Calidris Ferruginea*)	Critical Migratory	Critical International Agreement	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in salt works and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh, brackish waters and occasionally around floodwaters.	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.
Pectoral Sandpiper (*Calidris Melanotos*)	Migratory Marine	International Agreement	In Australia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. The bird can be seen on the Swan Coastal Plain but is rare to scarce on Lake Thompson, and as well on any freshwater wetland in the southwest with shallow, well-grassed margins. They are seen at Lake Warden, Esperance, and at Lake McLarty.	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.
Fork-tailed swift (*Apus pacificus*)	Migratory Marine	International Agreement	In WA there are sparsely scattered records along the coast, ranging from the Eyre Bird Observatory and up the west coast. They are widespread in coastal and sub-coastal areas between Augusta and Carnarvon, including some on nearshore and offshore islands. The species is regularly seen in the Pilbara and Kimberley following cyclone and major storm activity. This species is almost exclusively aerial, flying less than 1 m to at least 300 m above ground. This species is considered rare in the south-west region.	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.
Common Greenshank (*Tringa nebularia*)	Migratory Marine	International Agreement	The Common Greenshank is found in a wide variety of inland wetlands and coastal habitats of varying salinity. It occurs in sheltered coastal areas typically with large	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no

Species	EPBC Act listing	BC Act or DBCA listing	Species information	Likelihood of occurrence within the North Kiaka DE and Moora Mine DF (amended)
			mudflats and saltmarsh, mangroves or seagrass, including embayment's, harbours, river estuaries, deltas and lagoons, but less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats, and artificial wetlands. They occur around most of the coast from Cape Arid in the south to Carnarvon in the north-west.	suitable habitat for this species.
Common Sandpiper (*Actitis hypoleucos*)	Migratory Marine	International Agreement	The Common Sandpiper is found along all coastlines of Australia and uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around often narrow and steep muddy margins or rocky shores. The species has been recorded in estuaries and deltas of streams, as well as on banks further upstream; around lakes, pools, mangroves, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. It is often found near mangroves, and sometimes in areas of mud littered with rocks or snags. Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and WA.	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.
Malleefowl (*Leipoa ocellata*)	Vulnerable	Vulnerable	The Malleefowl generally occurs in semi-arid areas of WA, from Carnarvon to south east of the Eyre Bird Observatory (south-east WA). The Malleefowl is associated with long unburnt thick vegetation and occupies shrublands and low woodlands that are dominated by mallee vegetation, native pine Callitris woodlands, Acacia shrublands, Broombush vegetation or coastal heathlands. The breeding habitat is characterised by light soil and an abundant leaf litter, which is used in the construction of nesting mounds (Frith, 1959; Marchant & Higgins, 1993). The nest is a conspicuous large mound of sand or soil and organic matter.	Unlikely Although this species is widespread, populations are patchily disbursed and persist in dense low shrubland of Mallee and Acacia in the region. No habitat was considered suitable for this species due to its fragmented nature and no evidence of the species was recorded.
Eastern Curlew (*Numenius madagascariensis*)	Critical Migratory	Critical International Agreement	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, sometimes within the mangroves, and in coastal salt works and sewage farms (Marchant & Higgins, 1993). They are found commonly along the north coast of WA, but rarely south of Shark Bay (Morcombe, 2004). They are uncommon further south of Geraldton.	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.

Species	EPBC Act listing	BC Act or DBCA listing	Species information	Likelihood of occurrence within the North Kiaka DE and Moora Mine DF (amended)
Grey Wagtail (*Motacilla cinerea*)	Migratory	International Agreement	The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and South Australia (Morcombe 2004). The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DotE, 2015). It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams, and around waterfalls, both in forest and open country; but occurs almost anywhere during migration.	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.
Blue-billed Duck (*Oxyura australis*)	-	Priority 4	The blue-billed duck is a small Australian almost entirely aquatic duck (Morcombe, 2004). The blue-billed duck is endemic to Australia's temperate regions, ranging from the south west of WA, extending to southern Queensland, through NSW and Victoria, to Tasmania. The species is readily seen on freshwater lakes and billabongs where deep fresh water is present.	Highly unlikely The North Kiaka DE and Moora Mine DF (amended) has no suitable habitat for this species.
Night Parrot (*Pezoporus occidentalis*)	Endangered	Critical	The Night Parrot inhabits arid and semi-arid areas that are characterized by having dense, low vegetation. Based on accepted and recent records, the habitat of the Night Parrot consists of Triodia grasslands in stony or sandy environments and of samphire and chenopod shrublands, on floodplains and claypans, and on the margins of salt lakes, creeks or other sources of water. The distribution of the Night Parrot is very poorly understood however recent observations have recorded the species near to Lorna Glen (East of Wiluna), Pilbara and southern Kimberley.	Highly unlikely The species is not known to persist in the region. No habitat was present for this species to persist.
Western Rosella (*Platycercus icterotis subsp. Xanthogenys*)	-	Priority 4	The wheatbelt subspecies of Western Rosella lives in woodland, and its persistence is associated with habitat remnants. The main food of the western subspecies is the seeds of casuarinas, but it also takes seeds from grass, weedy herbs and fruit. Nesting of this subspecies is in hollows.	Unlikely. This species was not recorded during the survey and very little Eucalyptus woodland with hollows is present for the species. Feeding habitat is present and may be utilised opportunistically.
Australian Painted Snipe (*Rostratula australis*)	Endangered	Endangered	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum *Muehlenbeckia*, canegrass, or sometimes tea-tree. It sometimes uses areas that are lined with trees, or that have some scattered fallen or	Highly Unlikely. The survey area has no suitable habitat for this species.

Species	EPBC Act listing	BC Act or DBCA listing	Species information	Likelihood of occurrence within the North Kiaka DE and Moora Mine DF (amended)
			washed up timber (DotE, 2015). In the south west the Australian Painted Snipe can be found around Carnarvon and wetlands north of Perth, particularly those west of Moora and Gin Gin.	
Reptiles				
Western Spiny-tailed Skink (*Egernia stokesii subsp. Badia*)	Endangered	Vulnerable	The Western Spiny-tailed Skink (brown form) was originally known from a limited number of sites in the northern and central wheatbelt of WA. Most records of the brown form Western Spiny-tailed Skink are in York Gum (*Eucalyptus loxophleba*) woodland with some records in Gimlet (*E. salubris*) and Salmon Gum (*E. salmonophloia*) woodland. Populations persist in woodland patches as small as one hectare and completely surrounded by wheat fields. Sites with the greatest number of individuals contain numerous fallen logs and were subjected to low-intensity grazing by domestic stock. Hollow logs are used as refuge sites in woodland habitat. Preferred refuges consist of piles of several, overlapping, hollow logs providing a combination of basking and shelter sites. An increasing number of skinks are being located in altered habitat under piles of wood, scrap metal or under buildings on private property.	Unlikely. The species was not recorded during the survey and very little Eucalyptus Woodland with suitable micro habitats were available.
Fish				
Balston's Pygmy Perch (*Nannatherina Balstoni*)	Vulnerable	Vulnerable	Balston's Pygmy Perch inhabits acidic, tannin-stained freshwater pools, streams and lakes in peat flats within 30 km of the coast of south-west WA, preferring shallow water, and commonly associated with tall sedge thickets and inundated riparian vegetation.	Highly Unlikely. The survey area has no suitable habitat for this species.
Mammals				
Water-rat, Rakali (*Hydromys chrysogaster*)	-	Priority 4	Water-rats live primarily in a wide variety of freshwater habitats, from sub-alpine streams and other inland waterways to lakes, swamps, farm dams and irrigation channels and are thought to be one of the few native species to have at least partially benefited from human encroachment.	Highly Unlikely. The survey area has no suitable habitat for this species.
Chuditch (*Dasyurus geoffroii*)	Vulnerable	Vulnerable	The Chuditch inhabits eucalypt forest (especially Jarrah), dry woodland and mallee shrublands of semi-arid environs. In the Avon Region the species is known from forest around Mundaring, Toodyay and pockets of areas around the Swan Valley. There is a population persisting around the Julimar Forest and this would be the closest population to the survey area. This population is a translocated and monitored population that primarily persists within the large and intact remnant forest in the area. Although this species can travel large distances and has a large home range it is highly unlikely to be present in the Moora region due to the region being highly fragmented and unmanaged (for predators).	Highly unlikely. The species has not been recorded in the survey area and the species is considered regionally extinct.

LEGEND

- Road
- Haul road
- Watercourse
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)
- Moora Mine Disturbance Footprint (amended)
- Kyaka Brook
- Wandoo woodland
- Mallee woodland
- Mixed shrubland
- Quartz Outcropping
- Disturbed area

Conservation Significant Fauna Observations

- Active Carnaby's Black Cockatoo sighting
- Carnaby's Black Cockatoo feeding evidence (*Banksia sessilis*)
- Potential Carnaby's Black Cockatoo hollows

Kyaka Brook
Midlands Rd
Kiaka Rd

Paper Size ISO A3

0 100 200 300 400

Metres

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

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Simcoa Environmental Approvals s40AA ERD

Conservation Significant Fauna Observations (GHD 2021)

Project No. **12518217**
Revision No. **1**
Date **08/01/2024**

FIGURE 5-18

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Print date: 08 Jan 2024 - 15:06

Data source: Simcoa: Mining Development Shape Areas is derived from client received 2020; GHD: Survey area - 20180627, Conservation significant fauna observations - 20190213; Landgate: Rivers, Roads - 20190128, Imagery - 20171202 (accessed: 20190212). Created by: rbrown3

5.5.4.1.5.1 Peregrine Falcon (Falco peregrinus)

Listed as Special Protection under the BC Act, the Peregrine Falcon is a large falcon species which predominantly preys aerially on medium sized birds (e.g. pigeon, galah and ducks). The species prefers areas with deep gorges or large cliff faces associated with riparian or plain habitat surroundings. The Peregrine Falcon nests on ledges of cliffs, shallow tree hollows and ledges of buildings in cities. This species is wide ranging and mobile, therefore it is likely to utilise suitable habitat both inside and outside of the North Kiaka DE.

The fauna field survey identified suitable foraging habitat, but no large, rock cliff faces or nesting areas were recorded within the North Kiaka DE. Given the species is wide ranging and highly mobile, it is considered unlikely the development of the North Kiaka DE or the abandonment bund will adversely affect the availability of suitable habitat in the local and surrounding area.

5.5.4.1.5.2 Carnaby's Black Cockatoo (Zanda latirostris)

The North Kiaka DE and Moora Mine are within the modelled distribution of Carnaby's Black Cockatoo breeding range (DAWE, 2022). Carnaby's Black Cockatoo is endemic to the south-west of WA with a wide-spread distribution. Carnaby's Black Cockatoo's nest in hollows of live or dead eucalypts, primarily smooth-barked Salmon Gum and Wandoo as noted by Saunders (1977; 1982) although breeding has been reported in other wheatbelt tree species and some tree species on the Swan Coastal Plain and Jarrah forest (Storr, 1991; Johnstone and Storr, 2004).

Saunders (1982; 1987) noted that breeding is dependent on the quality and proximity of feeding habitat within 12 km of nesting sites. Along with the trees that provide nest hollows, the protection, management and increase of feeding habitat that supports the breeding of Carnaby's Black Cockatoo is a critical requirement for the conservation of the species (DPAW, 2013a).

5.5.4.1.5.3 Additional Information for Assessment – Carnaby's Black Cockatoo

In July 2022 and December 2023, in accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment (EPA, 2022b; EPA, 2023d). EPA's assessment of the Revised Proposal (EPA, 2022b) requested an additional targeted desktop search for any known locations of breeding or nesting sites for Carnaby's Black Cockatoo within 12 km of the North Kiaka DE as shown in Figure 5.19. A desktop search was undertaken of relevant DBCA datasets which uses information sourced from the Great Cocky Count database (GoWA, 2023) and indicated the following:

– The entire area of the North Kiaka DE and Moora Mine is located within the confirmed breeding area buffer (DBCA-054)
– Black Cockatoo breeding sites (DBCA -063) occur south of the of North Kiaka DE and Moora Mine and are shown to be located outside of the DE for both mines. The closest site is 5 km to the south, with the next closest recorded breeding site was 13 km to the south west (Figure 5.19)
– There are no roosting sites (DBCA-064) within the buffer of 12 km of North Kiaka or Moora Mine. The closest roosting site is 22 km to the south west of the North Kiaka DE (Figure 5.19).

The desktop assessment confirmed the results of the targeted search for Carnaby's Cockatoo which was undertaken across the survey area (which includes the DE) (GHD, 2021a). Figure 5.18 was also updated to show the location of the foraging habitat in relation to the mapped breeding habitat. The results of the desktop survey suggests that further survey work is not required.

During the field survey (GHD, 2021a) at least 29 individual Carnaby's Black Cockatoos were opportunistically recorded flying and foraging within the North Kiaka DE (Appendix M).

To estimate the density of suitable breeding trees the GHD (2021a) survey assessed 12 tree plots (each a 50 m x 50 m site). From the plot data, approximately three to four York Gum were recorded in the Mallee Woodland. The survey noted approximately seven Wandoo and two York Gum were present within a 50 m x 50 m plot in the Wandoo Woodland. No evidence of roosting or hollows were recorded within the North Kiaka DE. Three large hollows were recorded by GHD (2021a) outside of the south western corner of the North Kiaka DE (Appendix M).

Evidence of Carnaby's Black Cockatoo utilising habitat within the North Kiaka DE for feeding (old and fresh chewed *Banksia sessilis*) was recorded from across the site. Locations of feeding records observed during the field survey are indicated in Appendix M.

Moora Mine DE and DF were not surveyed during this fauna assessment, however the vegetation within the Moora Mine was considered, based on the mapped vegetation alliances/ communities (Trudgen et al, 2012), to include 0.95 ha of potential foraging and roosting habitat within the Moora Mine DF (amended).

GHD (2021a) considered the Carnaby's Black Cockatoo habitats present within the North Kiaka DE and DF and habitat has been extrapolated for the 3 ha Moora Mine amended DF (Section 5.18). In total the North Kiaka DF and Moora Mine amended DF provides the following potential Black Cockatoo habitat:

– 16.75 ha of potential foraging habitat including
  - 16.51 high value foraging habitat (Mixed Shrublands on low hills)
  - 0.17 ha of potential breeding habitat
  - 0.24 ha of potential roosting habitat.

Table 5.33 Potential Carnaby's Black Cockatoo habitats within North Kiaka DE and DF and Moora Mine amended DF

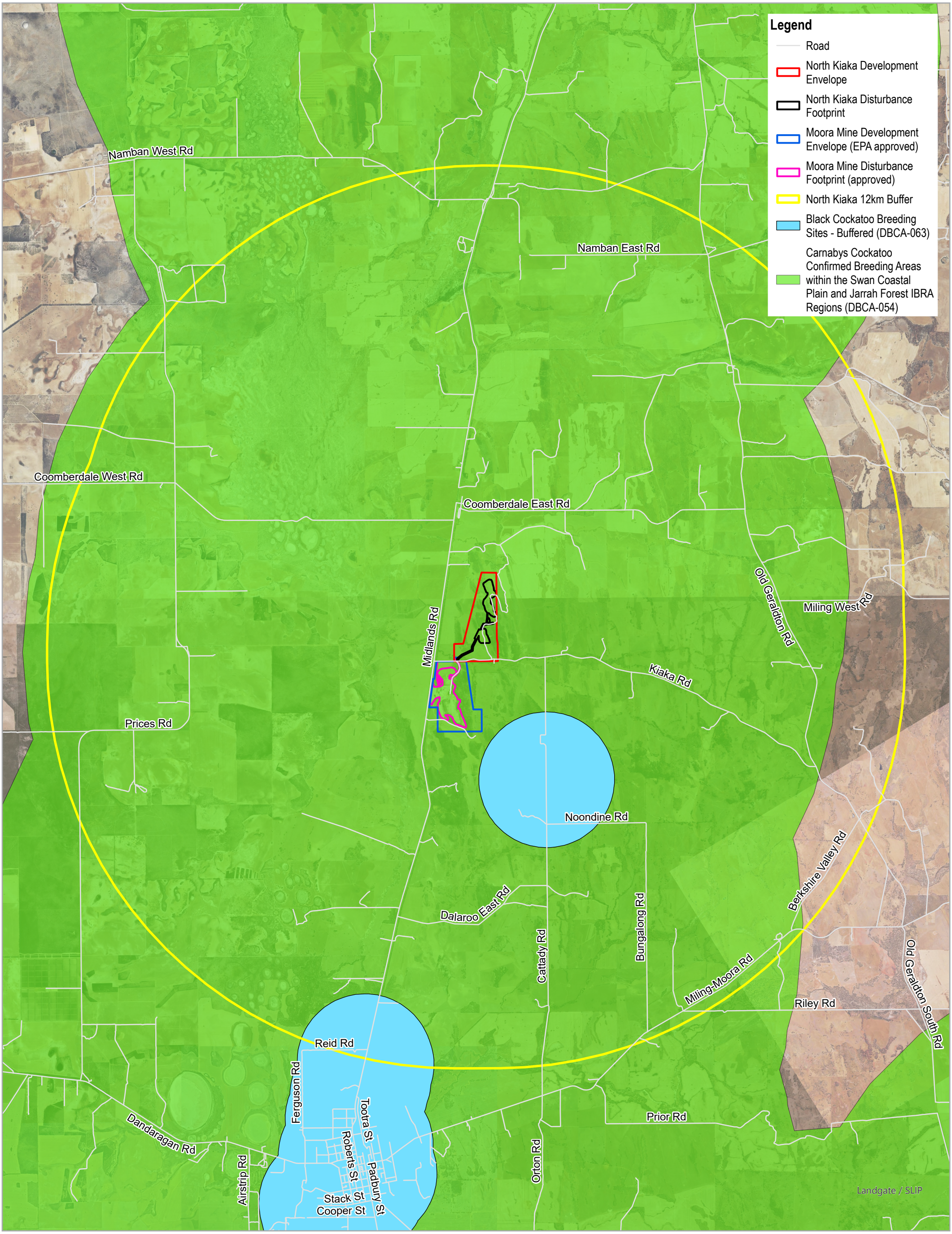
Habitat type	Potential Black Cockatoo habitat value	Extent within the North Kiaka DE (ha)	Area to be cleared for North Kiaka DF (ha)	Extrapolated extent in Moora amended DF
Kyaka Brook – riparian/dam	Breeding, foraging, roosting	7.50	0.17	0.00
Mallee Woodland	Foraging, roosting	9.30	0.05	0.02
Mixed Shrublands on low hills	High value foraging	68.73	15.58	0.93
Quartzite outcropping formations	Foraging	4.02	0.00	0.00
Total habitats		89.55	15.80	0.95
Disturbed		126.87	28.79	2.05
Total area		216.42	44.59	3.00

Note: Wandoo woodland, recorded in the survey area outside the North Kiaka DE along Midlands Road may provide potential Black Cockatoo foraging, breeding and roosting habitat.

The fauna survey was completed in 2018 at Level 2 (single season) and included a targeted search for The vegetation within Moora DE was not considered to be significant and has not been included in the offset assessment provided in Section 7.

Black Cockatoos by qualified zoologists. The data were assessed within the five year time frame and the assessment is valid under the EPBC Act survey guidelines 6.2 (Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010). There have been no significant changes to the landscape since the time of the survey, particularly clearing of native vegetation or major events such as bushfires.

A targeted assessment for Black Cockatoos will be undertaken in April 2024 to map for the presence and quality of foraging vegetation. The Terrestrial Fauna Report and Final ERD will be updated to include the data and findings of the survey.



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Kilometers

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

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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Cockatoo Roosting and Breeding Sites - 12km Buffer North Kiaka DE (DBCA)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.19

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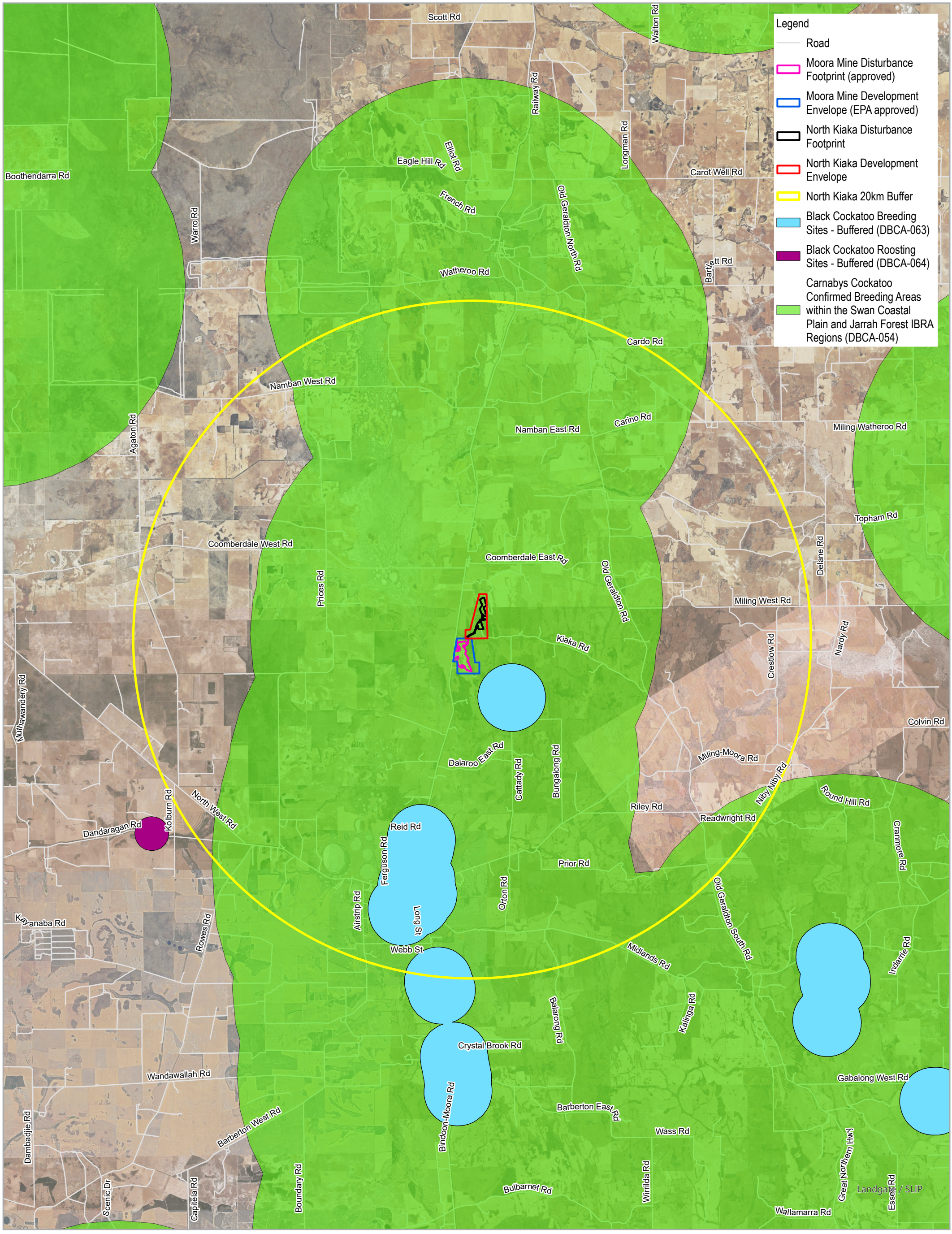
Data source: DBCA: Cockatoo Roosting and Breeding Sites; Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3



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Map Projection: Transverse Mercator
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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Cockatoo Roosting and Breeding Sites - 20km Buffer North Kiaka DE (DBCA)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.20

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Data source: DBCA: Cockatoo Roosting and Breeding Sites; Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

5.5.4.1.6 SRE invertebrate assessments

Invertebrate Solutions (2019a) undertook a short-range endemic (SRE) fauna desktop and field survey of the North Kiaka DE in November 2018.

The likelihood of SRE invertebrate species occurring within the North Kiaka DE was assessed using a combination of regional and local botanical and landform information and database searches. The outcomes of the assessment are summarised in Table 5.35.

The WA Museum databases records (for Arachnids, Crustacea and Molluscs) identified two Confirmed SRE species, one Likely SRE species, and one Possible SRE species; within approximately 25 km of North Kiaka.

5.5.4.1.6.1 Notice Requiring Information for Assessment – SRE's

In July 2022, in accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment (EPA, 2022b). The EPA requested genetic analysis to confirm whether the spider specimen collected (see Table 5.36) is the same species *Kwonkan wonganensis* or a new species. However, the specimen was not retained and genetic testing could not be undertaken.

In December 2023 the EPA requested additional information to be provided on Short Range Endemics (SREs) (EPA, 2023d), Table 5.34.

Table 5.34 2023 Additional information – SRE's

Source	Additional Information	Section of the ERD
Terrestrial Fauna (Invertebrate) - DWER	If additional fauna surveys are undertaken, invertebrate specimens should be retained appropriately to confirm identification by persons with relevant expertise and using available techniques (e.g. genetic analysis).	-
	Quantify the impacts on potential and confirmed SRE habitat and provide a map of SRE taxa in relation to their preferred habitat.	Section 5.5.4.1.6 of the ERD Figure 5.19
	Discuss the significance of impacts to SRE habitat.	Section 5.5.7.1.3 of the ERD
Threatened Short Range Endemics (SREs) - DBCA	Provide additional targeted surveys to determine the presence of Idiosoma species and assess any potential impacts on the species.	Section 5.5 of the ERD describes that the survey effort for SRE was sufficient to determine the presence of the Idiosoma species and potential impacts on the species (if found)

5.5.4.1.7 SRE invertebrate survey

The SRE survey was undertaken with regard to *EPA Technical Guidance – Sampling of Short-Range Endemic Invertebrate Fauna* (EPA, 2016f). Sixteen locations were sampled within the North Kiaka DE (Table 5.35), this included five pitfall traps along with 11 additional sites that were sampled using litter sifting and hand searching (Invertebrate Solutions, 2019b).

The SRE species were searched for during the survey using a range of forms including pitfall traps, active searching, leaf litter collection and opportunistic collection including targeted burrow searches for mygalomorph spiders.

The SRE report noted that there is a reasonable understanding that *Idiosoma nigrum* is restricted to the northern wheatbelt and is not known to occur in the desktop study area. Other trapdoor species were found and trapped during the survey in November 2018, but neither *Idiosoma nigrum* or *Idiosoma dandaragan* were located. The range of methodologies undertaken by Invertebrate Solutions for this SRE survey enabled for a suitable search for the species. Each of the SRE sites was searched for mygalomorph spider burrows as part of the active searching and opportunistic searching throughout the entire project area was undertaken during the SRE field survey.

The survey identified eight SRE invertebrate species (Table 5.36) and Figure 5.21. Of these species, two were Confirmed as SRE species, two were Likely to be SRE species, and four were Possible (or data deficient) SRE species. The two Confirmed SRE species were:

– Trapdoor spider (*Kwonkan wonganensis*?)
– Millipede (*Antichiropus* sp. 'Moora').

It is considered that, based on the extrapolated habitat types, that these species also have the potential to occur within the Moora Mine DF (amended).

An additional three species were identified from the desktop searches as Confirmed or Likely SRE species, of which two have a Moderate likelihood of occurrence and one has a Low likelihood of occurrence (Invertebrate Solutions, 2019b).

Table 5.35 SRE sample locations within identified fauna habitat types in the North Kiaka DE and Moora Mine amended DF

Sample location	Habitat type	Habitat	Extent within the North Kiaka DE (ha)	Area to be cleared for North Kiaka DF (ha)	Area to be cleared for Moora Mine (amended) DF
SIMSRE 1, SIMSRE 3, SIMSRE 2, SIMSRE 4, SIMSRE 7	Mixed shrublands on low hills	Mixed Shrublands of *Acacia, Banksia, Regelia, Kunzia, Allocasuarina, Hibbertia, Xanthorrhoea* and *Melaleuca* on rocky low hills. The Mixed Shrublands vary in composition of species and quality according to historical disturbances and location in the environment. The mixed Shrublands has areas of singular species dominance such as *Allocasuarina* and *Banksia sessilis*, however these areas were relatively small.	68.73	15.58	0.93
SIMSRE 5	Mallee Woodland	Mallee Woodland of *Eucalyptus loxophleba* over scattered shrubs and very open herb and grass lands in fine sandy soils. The Mallee Woodland compiled a series of very small remnant areas throughout the North Kiaka DE. The woodland comprised fine sands over a deeper layer of heavy loams. The dominant plant species were *Acacia* and *Dodonaea* with herbs and grasses.	9.30	0.05	0.02
SIMSRE 8	Quartzite outcropping formations	Mixed Shrublands of *Acacia, Banksia, Regelia, Kunzia* and *Allocasuarina*, amongst quartzite outcropping. Quartzite outcrops occurred in two small areas of the North Kiaka DE. The formations are usually associated with low vegetation types due to the shallow soils and comprise *Acacia, Banksia, Regelia, Kunzia* and *Allocasuarina* and an abundance of grasses and herbs.	4.02	0.00	0.00
SIMSRE 6, SIMSRE 9	Kyaka Brook – Riparian /Dam	*Eucalyptus wandoo* and/ or *E. loxophleba* woodland along Kyaka Brook over mixed introduced grasses and herbs. *Allocasuarina huegeliana* is present surrounding the small dam.	7.50	0.17	0.00
SIMSRE 10	Degraded – north end of pit disturbed areas	Much of the DE have been cleared and remain cleared for agriculture, tracks, mines and old fence lines. These areas provide very little habitat value to fauna species.	126.87	28.79	2.05
Total			**216.42**	**44.59**	**3.00**

Table 5.36 SRE species identified in the survey area (Invertebrate Solutions, 2019b)

Species	Site Recorded	SRE Status	Comments
Species recorded			
Bothriembryon 'Moora' n.sp.	SIMSRE2, SIMSRE4	Likely	The taxa is considered a Likely SRE species, primarily due to the highly fragmented nature of the remnant vegetation in the region reducing available habitat and area of occurrence for the species. The records from the North Kiaka DE occur both within and outside of proposed impact areas. The taxa most likely occurs throughout the vegetated areas of the surrounding area.
Buddelundia opaca	SIMSRE2, SIMSRE7	Possible (A)	The species appears to be restricted to rocky habitat types. The species should be considered a Possible SRE species.
Buddelundia sp. '88'	SIMSREP1, SIMSREP4, SIMSRE8, SIMSRE13, SIMSRE14, SIMSRE16,	Likely	Since it is restricted it should be considered a Likely SRE, however, it is noted that due to a lack of collecting in the Wheatbelt that it is likely that the taxon occurs elsewhere in remnant vegetation within the region.
Kwonkan wonganensis?	SIMSREP5	Confirmed	This designation is a tentative identification unless genetic evidence is obtained. If the specimens from the North Kiaka DE were subsequently shown not to be *Kwonkan wonganensis*, they would be an undescribed species that should still be considered an SRE species due to the highly fragmented nature of the remnant vegetation of the Wheatbelt and the limited powers of dispersal of mygalomorph spiders. All the adult male specimens recorded were from pitfall traps so the detailed location of the population within the landscape is unknown although female mygalomorph spiders can only live in remnant vegetation that has limited fire regimes and is protected from grazing, so is likely to be the restricted to vegetated rocky outcrop areas in the local region. The taxa most likely occurs throughout the rocky vegetated portions of the North Kiaka DE.
Beierolpium sp.	SIMSRE15	Possible (A)	The taxonomy of the *Olpiidae* is poorly known and, until further taxonomic resolution has been obtained, all species are considered to be Possible SRE species in Western Australia.
Indolpium sp.	SIMSRE12	Possible (A)	
Ribautia sp.	SIMSRE13	Possible (A)	It is highly unlikely that this soil dwelling species is restricted to the North Kiaka DE, and most likely occurs widely through the Wheatbelt and adjacent coastal areas but there are few records of the genus for comparison in collections. The population is not considered to be subject to any significant impact from the development of the North Kiaka DE.
Antichiropus 'Moora' n.sp.	SIMSRE2, SIMSRE7	Confirmed	The taxa most likely occurs throughout the rocky vegetated portions of the North Kiaka DE and consideration should be given to minimise the clearing of native vegetation to reduce impacts to this Confirmed SRE species.
Species identified from desktops			
Bothriembryon `Walebing` n.sp.	Desktop only	Likely	Following the field survey it is not considered likely that this species occurs within the North Kiaka DE.
Paralimnadia hyposalina	Desktop only	Confirmed	This species is known only from a series of salt pans in this area; however, these are not likely to be the subject of any impacts from the development of the North Kiaka DE and thus no impacts are anticipated to occur to the endemic clam shrimp.
Bungulla riparia	Desktop only	Confirmed	No specimens of this species were recorded during the field survey and it is outside of the known distribution and thus no significant impacts to this species are anticipated by the development of the North Kiaka DE.

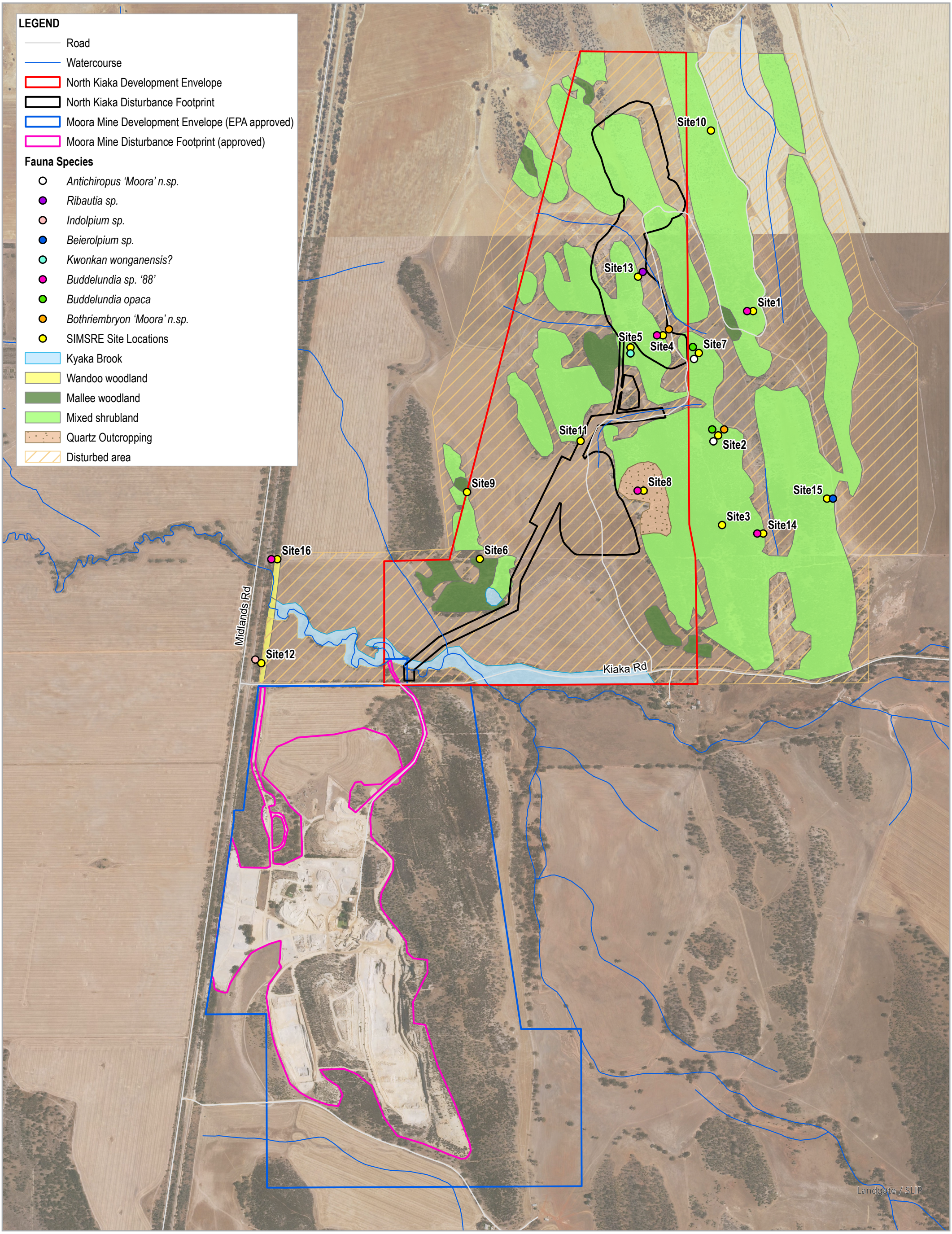
5.5.4.1.8 Introduced species

As outlined in Table 5.37 mammals were the only introduced fauna recorded within the North Kiaka DE, with five (5) recorded during GHD's (2021a) survey. Sheep are managed by the property owners, while the remaining species are considered feral fauna species to the region.

Table 5.37 Introduced mammal species recorded in the North Kiaka DE

Common name	Scientific name
Sheep (agricultural stock)	*Ovis aries*
Red fox*	*Vulpes vulpes*
Cat*	*Felis catus*
European rabbit*	*Oryctolagus cuniculus*
House Mouse*	*Mus musculus*

* Feral



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Map Projection: Transverse Mercator
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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

SRE Survey Locations and Species Identified within the North Kiaka DE

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.21

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Data source: Simcoa: Mining Development Shape Areas is derived from client received 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

5.5.5 Potential environmental impacts

This section addresses the potential impacts (direct and indirect) on terrestrial fauna from construction and operations of the Revised Proposal.

Direct impacts from the clearing of vegetation will occur from the Revised Proposal due to the development of the North Kiaka DE and the construction of the abandonment bund at Moora Mine. This section describes these direct impacts using current survey results.The Revised Proposal may also have indirect impacts on terrestrial fauna resulting from vehicles transporting ore between North Kiaka DE and Moora Mine (such as vehicle strike).

5.5.5.1 Construction

Assessment of potential construction impacts in this section only refer to those occurring at Moora Mine and North Kiaka DE. Existing Infrastructure at the Kemerton Silicon Smelter will not be impacted as a result of this Proposal and additional infrastructure is not required.

Activities that have the potential to have direct impact on terrestrial fauna during construction include:

– Clearing of 18.12 ha of native vegetation which comprises:
  - 15.58 ha North Kiaka DF of Carnaby's Black Cockatoo foraging habitat.
  - 16.75 ha of potential habitat for SRE habitat
– Death, injury or displacement of native fauna species due to vehicle interactions or entrapment associated construction.

Potential indirect impacts from construction works at both sites, may include:

– Disruption or disturbance to fauna from noise, vibration, light and dust emissions from construction activities (i.e. clearing, blasting, mining, processing, ore handling/transport)
– Bushfire caused accidentally by the operation of vehicles/plant/equipment, resulting in damage/ loss of surrounding fauna habitats
– Attraction of feral fauna due to food/water availability on-site, increasing competition with, or predation on, native fauna species.

5.5.5.2 Operation

5.5.5.2.1 The Moora Mine and North Kiaka DE

Once clearing of the North Kiaka DF and the abandonment bund is undertaken and constructed it is considered that there will be limited direct and indirect impacts to terrestrial fauna within both the Moora Mine and North Kiaka DE. Activities that have the potential to have direct impact on terrestrial fauna during operations may include:

– Death, injury or displacement of native fauna species due to vehicle interactions or entrapment associated with mining operations.

Potential indirect impacts that have potential to result due to ongoing operations, may include:

– Disturbance of the 'Eucalyptus Woodlands of the Western Wheatbelt' TEC (potential Black Cockatoo habitat), the closest location is mapped within Midlands Road/ Rail reserve approximately 1 km to the west of the North Kiaka DE.
– Disruption or disturbance to fauna as a result of noise, vibration, light and dust emissions from Proposal activities (i.e. clearing, blasting, mining, processing, ore handling/transport).
– Bushfire caused accidentally by the operation of vehicles/plant/equipment, resulting in damage/ loss of surrounding fauna habitats.
– Attraction of feral fauna due to food/water availability on-site, increasing competition with, or predation on, native fauna species.

5.5.5.2.2 Kemerton Smelter

The Revised Proposal will not result in any change in the approved clearing extent, types of infrastructure or the location of the proposed clearing at the existing Kemerton Smelter. The current operations include direct and indirect impacts on fauna.

Direct impacts may include:

– Death, injury or displacement of native fauna species due to vehicle interactions.

Indirect impacts during operations may include:

– Disruption or disturbance to fauna as a result of noise, vibration, light and dust emissions from smelter operations (i.e. ore handling/transport)
– Bushfire caused accidentally by the operation of vehicles/plant/equipment, resulting in damage/loss of surrounding fauna habitats
– Attraction of feral fauna due to food/water availability on-site, increasing competition with, or predation on, native fauna species.

5.5.6 Mitigation

The mitigation hierarchy (avoid, minimise, rehabilitation, offset) has been applied to the Revised Proposal in relation to terrestrial fauna. SIMCOA has been operating Moora Mine and Kemerton Smelter since 1989, in accordance with MS 813 they have prepared and implemented environmental management strategies throughout all phases of design, construction and operation.

SIMCOA is committed to the identification and implementation of monitoring, mitigation and management measures to avoid or reduce potential negative impacts to terrestrial fauna values from the implementation of the Revised Proposal.

5.5.6.1 Moora Mine

The mitigation measures currently implemented at the Moora Mine are outlined in Table 5.38.

Table 5.38 Mitigation measures – Terrestrial fauna – Moora Mine

Mitigation Category	Moora Mine
Avoid	– SIMCOA will only clear up to 1 ha of native vegetation – The amended disturbance footprint has been designed to avoid clearing of native vegetation wherever possible by utilising the previously disturbed/cleared areas to construct the abandonment bund – Construction of the bund will occur from within the cleared area of the pit to avoid clearing where possible Further information provided in Section 5.2.7.1.
Minimise	– A suitably qualified environmental professional (fauna spotter) will be present during all land clearing activities. The person will hold a permit to handle and move significant fauna under the BC Act and have access to a care facility which can be used to rehabilitate injured or sick fauna. – Traffic management rules are implemented to reduce the likelihood of fauna injury or mortality due to vehicle interactions. Measures include: • Reduced speed limits on internal roads, and • No off-road driving – All putrescible wastes are currently stored in lidded bins to prevent fauna entry and attraction of feral animals. – Implementation of dust management controls including, but not limited to, application of water/dust suppressants and covering of haulage truck (refer to Section 5.9.6) – Implementation of Hot Works Permit system, and Emergency Management Procedures to minimise the risk of bushfires – Clearing activities are not undertaken when the Fire Danger Rating is severe or higher.
Rehabilitate	Progressive rehabilitation is being undertaken at Moora Mine in accordance with the approved MCP.
Offset	18 ha of vegetation has been previously set aside within the Cairn Hill Reserve (Offset Site 1) to offset the residual impact of 5 ha of previously approved clearing for the Moora Mine. No further offsets are required for the Moora Mine in relation to Fauna as a result of the implementation of the North Kiaka DE.

5.5.6.2 North Kiaka DE

SIMCOA has, as far as practicable, located the North Kiaka DF to minimise potential impacts to native fauna habitat, however proposed clearing of native fauna habitat cannot be avoided as it is required to access the ore body. Mitigation measures have been included for the North Kiaka DF based upon the successful mitigation measures applied at the Moora Mine. Mitigation measures proposed for the North Kiaka DE are outlined in Table 5.39.

Table 5.39 Mitigation measures – Terrestrial fauna – the North Kiaka DE

Mitigation Category	North Kiaka DE
Avoid	– SIMCOA will only clear a maximum of 15.58 ha of Carnaby's Black Cockatoo high value foraging habitat – The disturbance footprint has been designed to avoid clearing of native vegetation wherever possible by utilising the previously disturbed/cleared areas – Clearing will be undertaken outside of the Black Cockatoo breeding season. Further information provided in Section 5.2.7.1.
Minimise	– SIMCOA's EMP (Appendix C) will include procedures, management and mitigation measures which to be implemented to prevent and minimise impacts on native terrestrial fauna – Site induction will include information on significant fauna which may be encountered within the North Kiaka DE. Information will include descriptions of the fauna, specific management measures to protect them, responsibilities for reporting sightings and incidents involving significant fauna. – A suitably qualified environmental professional (fauna spotter) will be present during all land clearing activities. The person will hold a permit to handle and move significant fauna under the BC Act and have access to a care facility which can be used to rehabilitate injured or sick fauna. – Due to the North Kiaka DE being located within the mapped breeding area for Carnaby's Black Cockatoos, a detailed survey of the proposed clearing area will be undertaken by a suitably qualified consultant prior to clearing to identify any suitable potential breeding hollows. – Where practicable, land clearing will be undertaken on one front and in one direction, thereby allowing fauna an opportunity to escape the clearing area to surrounding habitat. – All native fauna injured or killed will be recorded and reported internally, and to appropriate regulatory agencies, where required. – In the event of trenches being established (i.e. pipelines or services), which native fauna may be unable to escape from, they will be inspected on a regular basis (e.g. dawn, midday, and prior to sunset). Any entrapped fauna will be removed and relocated to surrounding vegetation. If trenches are left open overnight, ramps will be established to permit native fauna to escape. – Traffic management rules will be implemented to reduce the likelihood of fauna injury or mortality due to vehicle interactions. Measures shall include: • Reduced speed limits on internal roads, and • No off-road driving (unless authorised for exploration and land clearing). – All putrescible wastes will be stored in lidded bins to prevent fauna entry and attracting feral animals – Implementation of dust management controls including, but not limited to, application of water/dust suppressants and covering of haulage trucks (refer to Section 5.9.6)
Rehabilitate	– Where possible, progressive rehabilitation will be undertaken in accordance with the existing Rehabilitation Plan for Moora Mine (Ecoscape Australia, 2012) – Fauna habitat structures (e.g. logs, wood debris) will be incorporated into rehabilitated areas to encourage the return of native fauna, such as reptiles and small mammals.
Offset	SIMCOA has protected two offset sites (Cairn Hill Reserve and Cairn Hill North offset sites). For more details on offsets, see Section 8.

5.5.6.3 Kemerton Smelter

Although impacts on terrestrial fauna are not considered to be significant, mitigation and management measures are currently implemented to further reduce impacts on fauna from site operations. The mitigation measures currently implemented at Kemerton Smelter are outlined in Table 5.40.

Table 5.40 Mitigation measures – Terrestrial fauna – Kemerton Smelter

Mitigation Category	Kemerton
Avoid	– No further clearing is proposed
Minimise	– Traffic management rules implemented to reduce the likelihood of fauna injury or mortality due to vehicle interactions, including reduced speed limits on internal roads. – All putrescible wastes will be stored in lidded bins to prevent fauna entry and attracting feral animals. – Undertaken existing dust and particulate control measures are undertaken as per the current Environmental Monitoring and Management Plant (EMMP) for the Kemerton Smelter (refer to Section 5.9.6).
Rehabilitate	Rehabilitation will occur at the end of life of the Kemerton Smelter.
Offset	No offsets are required in relation to terrestrial fauna as a result of the ongoing operations of the Kemerton Smelter for the implementation of the Revised Proposal.

5.5.7 Assessment of significance and residual impacts

5.5.7.1 Loss of fauna habitat

The Revised Proposal will require clearing of up to 18.12 ha of native vegetation which includes removal of 16.51 ha (15.58 ha North Kiaka DF and 0.93 ha Moora Mine DF (amended)) of high value Carnaby's Black Cockatoo foraging habitat, and potential habitat for SRE species.

5.5.7.1.1 Loss of foraging habitat for Carnaby's Black Cockatoos

The Revised Proposal will result in the direct loss of up to 15.58 ha North Kiaka DF of high value Carnaby's Black Cockatoo foraging habitat. This habitat category was based the surveys and guidance from the *Better offsets for Western Australia's black-cockatoos fact sheet* (Maron, 2021).

The clearing loss associated with the construction works is estimated to contribute a 0.02% reduction in foraging habitat at a local scale (40 km buffer) (Table 5.42).

The extent of Black Cockatoo potential foraging and breeding habitat was estimated by reviewing previously described/ mapped vegetation associations (Beard, 1979) and based on vegetation structure and species present, assessing the suitability as foraging and breeding habitat. The quality of the foraging habitat was assessed using the DCCEEW foraging assessment (DCCEEW, 2022) as shown in Table 5.41.

Table 5.41 Carnaby's Black Cockatoo foraging assessment (DCCEEW)

Carnaby's Black Cockatoo	Score	Reasoning
Start at a score of 10 if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as *Banksia spp*. (including *Dryandra spp*.), *Hakea spp*. and *Grevillea spp*., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. This tool only applies to sites equal to or larger than 1 ha in size.	10	Size of site is greater than 1 ha
Context adjustor (attributes reducing functionality of foraging habitat)		
Subtract 2 from your score if there is no evidence of feeding debris on your site.	10	Fauna survey noted feeding debris (GHD 2021).
Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	10	Foraging habitat is found across North Kiaka DE and within 12 km (GHD, 2021a).
Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	10	Breeding habitat within 12 km of the North Kiaka DE and across North Kiaka – DBCA-063 (GoWA, 2023).

Carnaby's Black Cockatoo	Score	Reasoning
Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	9	22 km from nearest roosting site – DBCA-064 (GoWA, 2023). As shown in Figure xx.
Subtract 1 if your site has disease present (e.g. Phytophthora spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	9	Low disease risk, site assessment noted no vegetation with disease, mean annual rainfall is 480.8 mm with an average of 92.8 rain days per year (BoM, 2023). Dieback management plan in place (Appendix J).
Enter score	9	
To support your habitat score, you should provide an overall appraisal of the habitat on the impact site and within 20 km of the impact area to clearly explain and justify the score. It should include discussion on the foraging habitat's proximity to other resources (e.g. exact distance to proximate resources), frequency of use of proximate sites, the degree of evidence and description of vegetation type and condition.		

The vegetation associations identified as suitable foraging and breeding habitat within a 40 km radius of North Kiaka are provided in Table 5.42.

Table 5.42 Black Cockatoo potential habitat within a 40 km radius of North Kiaka DE

Association	Description	Black Cockatoo suitability	Potential habitat within a 40 km radius of North Kiaka DE (ha)
7	Wheatbelt; York gum, salmon gum etc. Eucalyptus	Breeding	7,314.14
31	Teatree with York gum, wandoo or *Casuarina* and *Melaleuca*	Breeding	763.25
142	Wheatbelt; York gum, salmon gum etc. Eucalyptus	Breeding	11,606.48
352	Wheatbelt; York gum, salmon gum etc. *Eucalyptus loxophleba*, *E. salmonophloia*. Goldfields; gimlet, redwood etc. *E. salubris*, *E. oleosa*. Riverine; rivergum *E. camaldulensis*. Tropical; messmate, woolybush	Breeding	798.21
694	Mixed heath with scattered tall shrubs *Acacia* spp., Proteaceae and Myrtaceae.	Foraging	25,731.69
936	Wheatbelt; York gum, salmon gum etc. *Eucalyptus loxophleba*, *E. salmonophloia*. Goldfields; gimlet, redwood etc. *E. salubris*, *E. oleosa*. Riverine; rivergum *E. camaldulensis*. Tropical; messmate, woolybush	Breeding	148.76
999	Jarrah, marri and wandoo *Eucalyptus marginata, Corymbia calophylla, E. wandoo*.	Breeding	49,20.93
1023	Wheatbelt; York gum, salmon gum etc. *Eucalyptus loxophleba*, *E. salmonophloia*. Goldfields; gimlet, redwood etc. *Eucalytpus*. Riverine; rivergum *E. camaldulensis.* Tropical; messmate, woolybush	Breeding	428.32
1030	Other acacia, banksia, peppermint, cypress pine, casuarina, York gum *Acacia* spp., *Banksia* spp., *Agonis flexuosa*, *Callitris* spp., *Allocasuarina* spp., *Eucalyptus loxophleba*.	Foraging	125.68
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	Foraging	5,659.03
1036	Other acacia, banksia, peppermint, cypress pine, casuarina, York gum Acacia spp., *Banksia* spp., *Agonis flexuosa*, *Callitris* spp., *Allocasuarina* spp., *Eucalyptus loxophleba*	Foraging	31,889.45
1038	Jarrah, banksia or casuarina *Eucalyptus marginata*, *Banksia* spp., *Allocasuarina* spp.	Breeding	32.59
1039	Wattle with York gum, casuarina, mulga *Acacia* spp. with *Eucalyptus loxophleba*, *Allocasuarina* spp. *Acacia aneura*.	Breeding	1,367.89

Association	Description	Black Cockatoo suitability	Potential habitat within a 40 km radius of North Kiaka DE (ha)
1040	Wheatbelt; York gum, salmon gum etc. *Eucalyptus loxophleba*, *E. salmonophloia*. Goldfields; gimlet, redwood etc. *E. salubris*, *E. oleosa*. Riverine; rivergum *E. camaldulensis*. Tropical; messmate, woolybush	Breeding	723.23
1041	Other acacia, banksia, peppermint, cypress pine, casuarina, York gum *Acacia* spp., *Banksia* spp., *Agonis flexuosa*, *Callitris* spp., *Allocasuarina* spp*., Eucalyptus loxophleba*.	Foraging	668.18
1044	Mosaic: Medium woodland; York gum & salmon gum / Shrublands; *Melaleuca thyioides* thicket	Breeding	209.20
1149	Mixed heath with scattered tall shrubs *Acacia* spp., Proteaceae and Myrtaceae.	Foraging	357.45
		Total breeding:	**23,392.07**
		Total foraging:	**64,742.21**
		GRAND TOTAL:	**88,134.28**

5.5.7.1.2 Loss of breeding and roosting habitat for Carnaby's Black Cockatoos

As detailed in Section 5.5.4.1.5.2, GHD (2021a) considered the Wandoo woodland (recorded outside the North Kiaka DE) and Kyaka Brook (7.5 ha within the North Kiaka DE and 0.17 ha within the DF) to provide potential breeding and roosting habitat. The Mallee woodland did not appear to produce hollows suitable for Carnaby's Black Cockatoo but may provide roosting habitat (9.3 ha within the North Kiaka DE and 0.05 ha within the DF).

During the survey opportunistic and quadrat-based sampling confirmed the presence of three trees with potential breeding hollows located in the south-western corner of the North Kiaka DE but these were not in use. The development of the access corridor will be located to avoid the potential breeding hollow trees (Figure 5 of Appendix M).

5.5.7.1.3 Impact to SREs

EPA's assessment of the North Kiaka DE (EPA, 2022b) resulted in a request for an assessment of the predicted distribution range of *Bothriembryon* and *Antichiropus* SRE species identified in the North Kiaka DE and the percentage of suitable habitat likely to be lost due to implementation of the North Kiaka DE.

Invertebrate Solutions (2019b) provides the broad habitat information for the above two species:

– *Bothriembryon* 'Moora' n. sp. – the taxa most likely occurs throughout the vegetated areas of the North Kiara survey area
– *Antichiropus 'Moora' n.* sp. – the taxa most likely occurs throughout the rocky vegetated portions of the North Kiaka survey area.

As shown in Table 5.43 and Figure 5.21, neither of these species were exclusively sampled within the North Kiaka DF and the *Bothriembryon* 'Moora' n sp. was recorded both within and outside of the North Kiaka DE. *Antichiropus 'Moora'* n. sp. was only recorded at two locations, outside the North Kiaka DE. However, it is likely that this species occurs within the rocky vegetated areas.

Of the eight SRE species identified in the desktop searches only one species, *Ribautia* sp., was only recorded (at one site) within the North Kiaka DF. Invertebrate Solutions (2019a) considered that it is highly unlikely that this soil dwelling species is restricted to the North Kiaka DE, and most likely occurs widely through the Wheatbelt and adjacent coastal areas, however there are few records of the genus for comparison in collections. The population is not considered to be subject to any significant impact from the development of North Kiaka DE.

Development and operation of the North Kiaka DE and Moora Mine DF (amended) will require clearing of native vegetation, which may provide habitat for SRE species recorded within the survey. However, given the limited extent of clearing proposed and the extent of the same habitats within the retained vegetation, it is anticipated that development of the North Kiaka DE and Moora Mine DF (amended) will not have a significant impact on the SRE invertebrate species recorded during the survey.

Cumulative impacts of SRE are linked to vegetation clearing. Given the small extent of clearing that occurs annually and the expected approvals/ offset requirements for future clearing, cumulative impacts to SRE are expected to be minimal (refer to Section 10).

Table 5.43 SRE survey locations and the North Kiaka DE (Invertebrate Solutions, 2019b)

	Outside DE							Within DE (outside DF)		Within DE and within DF	
Species	**1**	**2**	**7**	**12**	**14**	**15**	**16**	**5**	**8**	**4**	**13**
Bothriembryon 'Moora' n.sp.		X								X	
Buddelundia opaca		X	X								
Buddelundia sp. '88'	X				X		X		X	X	X
Kwonkan wonganensis?								X			
Beierolpium sp.						X					
Indolpium sp.				X							
Ribautia sp.											X
Antichiropus 'Moora' n.sp.		X	X								

Note: Survey locations 3, 6, 9, 10 and 11 had no SRE species recorded during the survey.

It is acknowledged that the Wheatbelt region has not be the subject of many previous systematic collections for SRE fauna, therefore, the distributions of some SRE species are unknown apart from isolated historical records. Nevertheless, the Invertebrate Solutions (2019b) survey methods meet the requirements of *EPA Technical Guidance Sampling of Short-Range Endemic Invertebrate Fauna* (EPA 2016n).

5.5.7.2 Death, injury or displacement of native fauna species

The Revised Proposal may result in direct impacts to terrestrial fauna during construction and operations through fauna mortality from vehicle and plant collisions. Interaction between vehicles/ machinery and fauna species is most likely to occur during vegetation clearing activities. Due to development in an area which is largely disturbed/ cleared fauna mortality and or injury is expected to be limited. The potential for fauna mortality and/ or injury from vehicle and plant collisions will be further reduced with the implementation of suitable management practices (refer to Section 5.5.6).

Truck movements on roads between the North Kiaka DE and processing facilities at Moora Mine, and between Moora Mine and Kemerton Smelter, may result in fauna mortality. However, given that the trucks will utilise established transport routes, no significant increase in terrestrial fauna mortality is anticipated.

5.5.7.3 Disruption or disturbance to fauna as a result of noise, vibration, light and dust emissions

Development of the North Kiaka DE and ongoing operation will result in the generation of noise, vibration, light and dust emissions, which can disrupt or displace fauna causing them to avoid habitat in impacted areas. Moora Mine (approximately 2 km south of the North Kiaka DE), has been in operation for 32 years, therefore fauna residing in the local area are likely to be already accustomed to the noise, vibration, light and dust emissions associated with operational activities of a mine. The North Kiaka DE is in an area which has previously been cleared / disturbed for agricultural purposes, and this has already led to a fragmentation of habitat.

Adoption and implementation of suitable mitigation measures (refer to Section 5.5.6) will minimise noise and light emissions during operations.

5.5.7.4 Bushfire

The potential impact and likelihood of bush fires caused by the Revised Proposal is discussed in Section 5.5.8.

5.5.7.5 Increased competition or predation by introduced species

Primarily due to the ready availability of food and water sources, mining activities can potentially lead to an increase in the presence of introduced (feral) fauna species. Introduced fauna species compete with native fauna species for food and shelter and can predate on native fauna species. As the Moora Mine and North Kiaka DE is in an area which has been subject to disturbance, principally for agriculture, there is an established population of introduced species (non-native) within the surrounding area.

5.5.8 Environmental outcome

The development of the Revised Proposal will result in the vegetation clearing of up to 18.12 ha of native vegetation:

– Including 17.12 ha at North Kiaka DE comprising 16.75 ha of direct loss of fauna habitat, which includes:
  - 16.51 ha of potential high value foraging habitat, 0.17 ha of potential breeding and roosting habitat along Kyaka Brook and 0.24 ha of potential roosting habitat (along Kyaka Brook and in Mallee woodlands) for the Carnaby's Black Cockatoo (refer to Section 7 for further details)
  - 16.75 ha of potential habitat for SRE habitat.

Fauna habitat is considered to be well represented in surrounding areas and within retained vegetation within both the Moora Mine DF (amended) and the North Kiaka DE and therefore, the loss is unlikely to result in an adverse impact on native fauna at a local or regional scale.

The potential indirect impacts associated with noise, dust, vibration and light emissions are unlikely to be significant as the area has been previously disturbed by agricultural and mining activities, and terrestrial fauna in the area have adapted to these emission sources.

The mitigation measures to be adopted and implemented for bushfire, introduced species control and interactions with vehicles/plant, will minimise the likelihood of adverse impacts to terrestrial fauna from the Revised Proposal.

SIMCOA considers the Revised Proposal is able to meet the EPA's objective to protect terrestrial fauna so that biological diversity and ecological integrity are maintained through offsets and adequate management practices.

5.5.9 Cumulative impact assessment

An assessment of cumulative impacts is provided in Section 10.

5.6 Key Environmental Factor – Inland Waters

This section discusses the direct impacts to inland waters resulting from the implementation of the Project and construction of the abandonment bund at Moora Mine. It also outlines the indirect impacts from the continued operation of Moora Mine and Kemerton Smelter.

There were no specific information requests received from the EPA (EPA, 2022b) for Inland Waters, however this ERD has been updated to consider the combined potential impacts of the Project, the Approved Proposal and abandonment bund. Furthermore, additional hydrological studies have been completed since the s38 referral document that provide further information on Inland Waters. The hydrology investigations were undertaken to inform the updates to the Moora Mine Closure Plan and Mining Proposal as required by DMIRS.

5.6.1 EPA objective

The EPA's objective for the factor Inland Waters is:

"*To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*" (EPA, 2023b) (EPA, 2023b).

This objective recognises the fundamental link between the hydrological regimes and water quality of inland waters and the environmental values supported by or dependent on them. These environmental values may include water dependent ecosystems, amenity, cultural values, recreation, public drinking water supplies, and agricultural and industry use of water. This objective also recognises the principle of waste minimisation in the *Environmental Protection Act 1986 (*EP Act*)*.

Therefore, the focus of this factor and its objectives are:

- The significant impacts the alteration of the hydrological regime will have on water dependent ecosystems and other environmental values
- How the discharge of waste is minimised
- How any discharge of waste, or use of land or water, will significantly impact on water quality, the local hydrological regime, and the environmental values inland water support.

5.6.2 Relevant policy and guidance

EPA Policy and guidance

- *Statement of Environmental Principles, Factors, Objectives and Aims of EIA* (EPA, 2023b)
- *Environmental Factor Guideline: Inland Waters* (EPA, 2018a)
- *Environmental Impact Assessment (Part IV Divisions1 and 2) Procedures Manual Requirements under the Environmental Protection Act 1986* (EPA, 2021a)

Other policy and guidance

- *Mining Proposal Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mining Proposals* (Version 4.0) (DMIRS, 2023a)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018)
- *Australian Groundwater Modelling Guidelines (Waterlines Report Series No. 82)* (NWC, 2012)
- Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource management Council of Australia and New Zealand (ARMCANZ) water quality monitoring guidelines (ANZECC & ARMCANZ, 2000)
- *Statutory Guidelines for Mine Closure Plans* (DMIRS, 2023b)
- *Waterways Conservation Act 1976* (Government of Western Australia)
- *Metropolitan Water Supply, Sewerage, and Drainage Act 1909*
- *Rights in Water and Irrigation Act 1914* (RiWI Act).

5.6.3 Receiving environment

The following baseline studies of the Moora Mine and North Kiaka DE have been used to ascertain the existing receiving environment:

– North Kiaka Approvals and Supporting Studies – Geotechnical Desktop Study (GHD, 2019) (Appendix E)
– Moora Quartzite Mine – Phase 2 Hydrogeological Investigations (Saprolite Environmental, 2012)
– Proposed Discharge Evaluation: Coonderoo River Wetlands (Actis, 2011).

Information provided in the s38 referral has been updated based on additional studies to supplement the assessments previously submitted. These additional studies have recently been completed and are included as appendices:

– Hydrogeological Assessment (GHD 2023 Appendix W)
– Hydrological assessment (GHD 2023 Appendix W)
– Geochemical characterisation assessment of geochemical and physical characteristics of subsurface materials at North Kiaka (GHD 2023 Appendix F)

Kemerton Smelter is located within the Kemerton Strategic Industrial Area (KSIA) 17 kilometres north of Bunbury, in the Shire of Harvey. The Revised Proposal does not propose to change the approved operations of the smelter under MS 813 or disturbance footprint.

5.6.3.1 Surface water

The Project is located in the Moore River catchment and Coonderoo / Marchagee sub-catchment. The Moora River catchment covers an area of 13,600 km^2. The major drainage lines within the catchment include the Moore River, the Coonderoo River and Gingin Brook (Department of Agriculture 2002). The Coonderoo / Marchagee sub-catchment covers an area of approximately 6,500 km^2 and in the vicinity of the North Kiaka DE drains from southeast to northwest. Drainage occurs via Pyre Brook Creek (approximately 4 km north of the North Kiaka DE), Kyaka Brook (located on the southern boundary of the North Kiaka DE) and their tributaries into the clay pans and samphire flats of the Coonderoo River (Saprolite Environmental, 2012).

Kyaka Brook extends east and north of the North Kiaka DE, flowing in a north-west direction where it terminates in the Coonderoo River Wetlands. The Brook has a well-defined course with banks up to a meter deep. Water flows are seasonal and episodic, characterised by fast flowing water and short-lived pools (Actis, 2011).

The hydrological modelling was undertaken by GHD (2023e) to determine the stormwater management required at the North Kiaka DF once infrastructure was installed.

5.6.3.2 Wetlands

Thera are no Ramsar listed or nationally important wetlands that occur within the North Kiaka DE or Moora Mine DE. The closest Ramsar wetland is Forrestdale and Thomson Lakes, located more than 200 km south and the closest nationally important wetland is Guraga Lake, located approximately 71 km south-west.

The Coonderoo River Wetlands is a historic saline wetland system located approximately 4.5 km north-west of the North Kiaka DE. The system is made up of a main channel as well as a series of periodic ponds and wetlands (Actis, 2011).

Based on the GHD (2023c) review of available data, none of the vegetation types recorded within the Moora Mine DE are considered to be GDEs reliant on the surface expression of groundwater or sub-surface presence of groundwater within the rooting depth of the ecosystem based on their species composition and location within the landscape. The majority of vegetation within the survey area (including the Coomberdale Chert TEC) occurs on ridges and upper slopes in shallow soils with underlying chert. The depth of groundwater on these areas of ridges and slopes ranges from 16 to 20 mbgl (Saprolite Environmental 2016). Although there is limited to no data available on maximum root depths of these species, it is unlikely that they are accessing groundwater at this depth. Trudgen (2012) noted in the assessment of ridges that there were a number of deaths of dominant species *Regelia megacephala* at the time which was attributed to a drier than average winter season, indicating that this species is entirely reliant on surface water.

The zone of groundwater drawdown anticipated to occur as a result of mine dewatering operations is expected to be confined by the eastern and western ridges which are likely to form impenetrable barriers to groundwater movement (Saprolite Environmental 2016). To the north and south a maximum 1.5 km

radius of influence would potentially extend, however remnant vegetation that occurs in these areas is also on hilltops and ridges, with the exception of the flow line to the north which is a seasonally inundated channel with narrow fringing band of vegetation (dominated by *Acacia acuminata*) within cleared farmland, the species composition of which indicates that it is unlikely to be reliant on ground water levels.

5.6.3.3 Proclaimed water resources

The North Kiaka DE and Moora Mine DE does not fall within a PDWSA. The nearest PDWSAs (refer to Figure 5.23) are located at the:

– Coomberdale Water Reserve (Priority 2) approximately 1 km north
– Moora Eastern Water Reserve (Priority 2) approximately 11 km south (DWER-003, GoWA 2019).

5.6.3.4 Groundwater

The main groundwater aquifer in the region is hosted by the Noondine Chert, which is extensively fractured and cavernous, typically providing high bore yields. Local groundwater is used to supply the townships of Moora and Watheroo. Groundwater recharge occurs via infiltration of rainwater (GHD, 2019). The surface hydrology of the area shown in Figure 5.22 and proclaimed water resources for the region are shown in Figure 5.24. The interpreted groundwater contours suggest a north-south groundwater flow direction consistent with the site topography with a water table between 6 and 9 m bgl.

There is limited groundwater data available for the North Kiaka DE, however extensive groundwater monitoring and abstraction pumping trials have been completed for Moora Mine. Groundwater data from Moora Mine has been used to infer groundwater conditions at the North Kiaka DE given the geological continuity between the North Kiaka DE and Moora Mine.

An assessment of the hydrogeology of the North Kiaka DE was completed in December 2022 by GHD (2023d) and included installation of several new groundwater bores to provide a baseline assessment of the Project. This will supplement the existing understanding of the groundwater conditions collected at Moora Mine. The groundwater monitoring bores which were installed are listed in

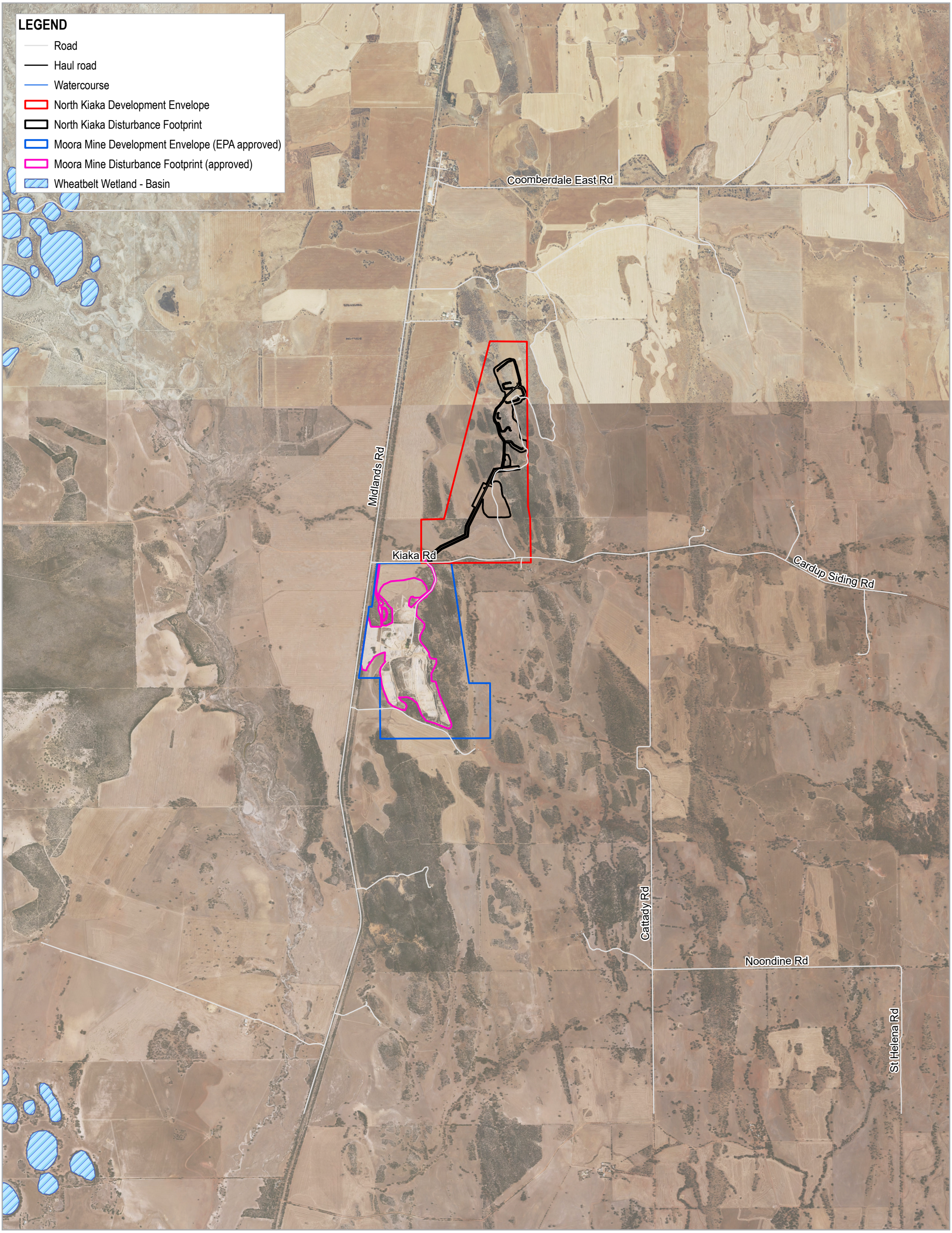
Table 5.44 and their locations are shown Figure 5.23.

Table 5.44 Monitoring Bore Installation – North Kiaka DE and Moora Mine

Bore ID	Water level at installation (m bgl)
NKMB01	19.0
NKMB02	35.0
NKMB03	-
NKMB04	4.6
NKMB05	6.0
NKM06	12.0

Monthly groundwater data collected from Moora Mine production and monitoring bores indicates that the groundwater level varies annually, with the trend being for levels to fall between October to May and rise between June to September. The variance in these levels reflects the seasonal rainfall and consequent recharge of the aquifer. Based on the bores installed within the North Kiaka DE the depth to groundwater is between 4.6 m to 35 m bgl. These depths may change as they settle following installation. The groundwater will continue to be monitored alongside the current bores.

The GHD (2023d) hydrogeologic investigations noted that several ecosystems are categorised as having variable potential for groundwater interaction. Several areas of high potential for groundwater interaction may also contain rich stygofauna that may be impacted by dewatering and mining below the water table. Groundwater level readings for the newly installed bores at North Kiaka DE are based on a single value collected during December 2022. This data alone may not represent minimum groundwater levels as there is not enough data to show seasonal fluctuations, however the Moora monitoring data has been collected annually for the previous 30 years and the salinity of groundwater ranges from fresh to brackish and groundwater pH is slightly alkaline (Saprolite, 2022). The salinity of the groundwater is less than that of the Kiaka Creek and therefore no negative impacts from the saline water discharge are anticipated.



Paper Size ISO A3

0 250 500 750 1,000

Metres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Surface Hydrology

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.22

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Print date: 22 Mar 2024 - 14:58

Data source: Simcoa: Mining Development Shape Areas is derived from client received 2020; DBCA: Wheatbelt wetland - 20191211; Landgate: Watercourses, Roads - 20190128, Imagery - 20171202 (accessed: 20190212). Created by: rbrown3

Legend

- GW Monitoring Bore
- GW Production Bore
- Road
- Watercourse
- Mine Dewater Pipeline
- Dewater Discharge Point
- Moora Mine Disturbance Footprint (approved)
- Moora Mine Development Envelope (EPA approved)
- North Kiaka Disturbance Footprint
- North Kiaka Development Envelope

NKMB01
NKMB02
NKMB03
NKMB04
NKMB05
NKMB06
MB01
MB02
MB03
MB04
MB05
MB06
BH1
BH2
Midlands Rd
Kiaka Rd

Paper Size ISO A3
at Scale: 1:14,000

0 100 200 300 400
Meters

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Groundwater Sampling Locations

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.23

\\ghdnet\ghd\AU\Perth\Projects\61\12518217\GIS\Maps\Working\12518217_Figures\12518217_Figures_RB.aprx\12518217_Fig5-23_GroundwaterSamplingLocations_Rev0
Print date: 22 Mar 2024 - 14:58

Data source: WMS: . Created by: rbrown3

LEGEND

- Road
- Haul road
- Watercourse
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)

Public Drinking Water Source Area

- P2 Area

Coomberdale Water Reserve

Coomberdale East Rd

Prye Brook

Kiaka Brook

Coonderoo River

Midlands Rd

Kiaka Rd

Cardup Siding Rd

Cattady Rd

Paper Size ISO A3

0 250 500 750 1,000

Metres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Proclaimed Water Resources

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.24

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Print date: 22 Mar 2024 - 14:58

Data source: Simcoa: Mining Development Shape Areas is derived from client received 2020; DWER: Public drinking water source area - 20191211; Landgate: Rivers, Roads - 20190128, Imagery - 20171202 (accessed: 20190212). Created by: rbrown3

5.6.4 Potential environmental impacts

Activities associated with the Revised Proposal that have potential to impact on Inland Waters are:

– Construction activities to develop the Project and
– construction of the abandonment bund at Moora Mine.

The ongoing operations at Moora Mine include mining below the water table and the ongoing crushing and screening activities. The mining operations at the Project are only planned to be above the water table and therefore minimal impacts on groundwater from the ongoing mining activities at the North Kiaka DE. There is no proposed change to the impacts currently managed under MS813 for the continuing operation of the Kemerton Smelter.

Without suitable management measures applied, the following impacts could occur:

– Sedimentation of surface waters, resulting from erosion following ground disturbance (i.e. vegetation clearing and earthworks), or from constructed landforms/surfaces (i.e. abandonment bund at Moora Mine, North Kiaka mine pit, Tonkin WRD and other raised areas)
– Contamination of groundwater and/or surface water due to accidental release/spillage of environmentally hazardous materials (diesel) from storage and handling areas.
– Disturbance of ASS during mining, resulting in acidification of soils and potential leaching of metals to groundwater
– Production of AMD from the Tonkin WRD, resulting in contamination of groundwater
– Exposure of dissolvable minerals during mining, resulting in saline drainage to groundwater.

5.6.4.1 Sedimentation of surface waters

Sedimentation of surface waters, resulting from erosion following vegetation clearing and earthworks to construct the Project. Sedimentation of surface waters from constructed landforms/surfaces including the mine pit and Tonkin WRD at North Kiaka DE and other raised areas including the abandonment bund at Moora Mine. The GHD (2023e) modelled risks and issues are below:

– Proposed infrastructure areas based on current topography would experience minor ponding during a 1% AEP event.
– There are no major flow paths passing through the proposed WRD location. Minor runoff from the road adjacent to the WRD and from the north is likely to drain towards this area. Flow diversion channels around the WRD need to be considered during further design development stages.
– High velocity runoff can be expected from the WRD depending to the design side slopes. Erosion and scour protection controls may need to be considered in this case during WRD design development stages. Further runoff from the WRD may need to be diverted so that runoff from the WRD does not impact the road directly west of the WRD.
– Minor runoff is expected to flow into the pit from the area in between the pit and the proposed diversion levee. Runoff expected into the pit for 10% (1 in 10) AEP is around ~101 kL (0.25 m3/s) and for 1% (1 in 100) AEP is ~3,800 kL (0.3 m3/s).
– Any pit-dewatering requires water quality monitoring and treatment to ensure maintenance of the sediment levels of water entering either Pyre or Kyaka Brook.
– Risk to Kyaka Brook is possible if water from North Kiaka Pit is diverted into surrounding waterbodies. A surface water management and monitoring plan should be developed to maintain surface water quality of Kyaka Brook and downstream Coonderoo River.
– No erosion or scour risk is expected to occur along or near the road as estimated velocities are less than 2 m/s, refer Appendix B, Figure B.10.

5.6.4.2 Contamination of groundwater / surface water due to hydrocarbon release/spillage

Contamination of groundwater and/or surface water due to accidental release/spillage of hydrocarbons from storage and handling areas at Moora Mine and the Project.

5.6.4.3 AMD or ASS into groundwater

Disturbance of ASS during mining, resulting in acidification of soils and potential leaching of metals to groundwater. Contamination of groundwater as a result of AMD produced by waste rock stored at the Tonkin WRD. Potential impacts on ASS / AMD are discussed in section 5.4.4. The abandonment bund will be constructed using inert materials and is not expected to pose any risk of either ASS / AMD impact to the groundwater.

5.6.4.4 Saline drainage to groundwater

There is a potential for exposure of dissolvable minerals during mining below the groundwater at Moora Mine, resulting in saline drainage to groundwater. There is a low risk of contamination from the Moora Mine pit lake water interacting with groundwater following closure.

5.6.5 Mitigation

SIMCOA is committed to the identification and implementation of mitigation, management and monitoring measures to avoid or reduce potential negative impacts to inland water values. The key aspects which may be impacted by the Revised Proposal are contamination of groundwater and surface water. There are no proposed changes to the operations at Kemerton, which will continue to be managed with existing management measures.

The mitigation measures for the Project and Moora Mine are outlined in the tables below.

5.6.5.1 The Revised Proposal

Table 5.45 Mitigation measures – Inland Waters - the Project

Mitigation Category	The Project
Avoid	Hydrocarbon storage in accordance with: – AS 1940:2017 The Storage and Handling of Flammable and Combustible Liquids (Standards Australia, 2017) – WQPN 56 Tanks for fuel and chemical storage near sensitive water resources (DoW, 2018). Other avoidance measures as detailed in the operating licence (GWL 104693 (6)) issued to SIMCOA for groundwater extraction at Moora Mine – Construction during heavy rainfall events will be avoided.
Minimise	SIMCOA propose to implement management of surface and groundwater in accordance with the Environmental Management Plan (Appendix C) which will include constructing stormwater and diversion infrastructure to address: – Risk of inundation in pit • Diversion bund west of North Kiaka Pit to intercept direct rainfall and reduce pumping in North Kiaka Pit. – Water collected in the pit • No mining below the water table so no pit dewatering required. Any rainwater collected from the pit will be managed prior to dispersal to external environment. Appropriate water quality control measures and monitoring to be put in place to ensure appropriate regulation of mine site water release to the downstream environment. – Road drainage • Culvert underneath southern access road to reduce road flooding and maintain site operations. – WRD runoff management • Additional channels may be required to divert water between WRD and main access road • Diversion channels around WRD and sedimentation pond may be required to manage sediment runoff. – Scour protection: • Upstream and downstream of culverts • At all sections along WRD where high velocity runoff is expected to occur – Other management measures

Mitigation Category	The Project
	• Where appropriate drainage channels may need to be considered in the future to trap 'dirty' runoff from pads and other infrastructure on-site and prevent pollution of the surrounding environment. Sedimentation of surface waters has been minimised by: – Design of the Project to minimise the vegetation clearing, thus reducing the area of exposed soil prone to erosion. – Where practicable, progressive rehabilitation will be undertaken, thus reducing the area of exposed soil prone to erosion (Trudgen, 2023). – Construction of the easement across Kyaka Brook will be prioritised for commencement in the dry season to minimise impacts, noting that the waterway is ephemeral. – If construction takes place during wet weather conditions the need for additional erosion and sediment control will be assessed, and where required, implemented. SIMCOA will develop: – A SWMP should be developed to ensure the development of the mine does not impact downstream environments including Kyaka Brook and Coonderoo River.which will include: • A risk assessment for bulk hydrocarbon storage areas prior to construction. • Stormwater drainage system to be designed in accordance with DWER water quality protection note (WQPN) 52 Stormwater management at industrial sites (DoW, 2010), including capture of runoff from areas at risk of potential contamination (i.e. vehicle refuelling and wash-down areas), and the removal of hydrocarbons via a hydrocarbon/sediment trap prior to discharge. • Hydrocarbon trap lined in accordance with WQPN 26 Liners for containing pollutants using synthetic membranes (DoW, 2013a) and WQPN 27 Liners for containing pollutants using engineered soils (DoW, 2013b). Minor quantities of oils and greases stored in a workshop with a sealed floor. • Liquid wastes (i.e. lubricants and hydraulic fluids) stored in holding tanks for recycling and disposal off-site. Spill contamination management: – Emergency management procedures and equipment for the recovery of contaminated soils in the event of accidental release. – Daily inspection of machinery and equipment for integrity. – Refuelling and repairs/servicing undertaken in a designated, bunded area – Spill kits readily available, and staff trained in the use of spill kits and appropriate disposal of contaminated material – Contaminated soil disposed at an appropriately licensed waste disposal facility – Cessation of construction work in the event of extreme weather conditions (e.g. storm events) and the assessment of the need for the implementation of additional erosion and sediment controls where required
Rehabilitate	Rehabilitation will be completed in accordance with a Mine Closure Plan to be approved by DMIRS. This will include: – The Tonkin WRD designed to be stable and non-polluting (i.e. batter slope of 18°, placement of structurally stable soils at the Tonkin WRD surface) – The Tonkin WRD contoured and ripped, and logs/rocks placed to prevent sheet flow and sediment transport from landforms – Progressively rehabilitate the Tonkin WRD to slow surface water flows across the embankment surface, thereby minimising soil erosion – Revegetation of the Tonkin WRD slope/top/berm with species most likely to thrive (i.e. soil depth and water holding capacity are appropriate to plant water demand), aiding in preventing runoff and erosion – Disturbed areas rehabilitated and soils ameliorated as required to return soils to a condition suitable for the agreed post-mining land use.
Offset	No offsets are required in relation to Inland Waters as a result of the implementation of the Project

Table 5.46 Mitigation measures – Inland Waters – Moora Mine

Mitigation Category	Moora Mine
Avoid	Hydrocarbon storage in accordance with: – AS 1940:2017 The Storage and Handling of Flammable and Combustible Liquids (Standards Australia, 2017)

Mitigation Category	Moora Mine
	– WQPN 56 Tanks for fuel and chemical storage near sensitive water resources (DoW, 2018). Other avoidance measures as detailed in the operating licence (GWL 104693 (6)) issued to SIMCOA for groundwater extraction at Moora Mine – Construction during heavy rainfall events will be avoided.
Minimise	Sedimentation of surface waters – the abandonment bund has been designed to minimise the amount of vegetation to be cleared, thus reducing the area of exposed soil prone to erosion. – If construction takes place during wet weather conditions the need for additional erosion and sediment control will be assessed, and where required, implemented. SIMCOA will continue to implement: – Stormwater drainage system – Hydrocarbon trap and minor quantities of oils and greases stored in a workshop with a sealed floor. – Liquid wastes (i.e. lubricants and hydraulic fluids) stored in holding tanks for recycling and disposal off-site. Spill contamination management: – Emergency management procedures and equipment for the recovery of contaminated soils in the event of accidental release. – Daily inspection of machinery and equipment for integrity. – Refuelling and repairs/servicing undertaken in a designated, bunded area – Spill kits readily available, and staff trained in the use of spill kits and appropriate disposal of contaminated material – Contaminated soil disposed at an appropriately licensed waste disposal facility
Rehabilitate	– Rehabilitation will be undertaken on the completed lower slopes of the bund in line with current rehabilitation measures and in accordance with the DMIRS approved MCP (GHD, 2023b)
Offset	No offsets are required in relation to Inland Waters as a result of the implementation of Moora Mine

5.6.6 Assessment of significance and residual impacts

With the updated information provided in the hydrological assessment (GHD, 2023e) and hydrogeological assessment (GHD, 2023d) and following implementing the mitigation and management measures described in section 5.6.5, the following residual impacts are expected in regard to inland waters:

– Very low risk to surface water and groundwater from contamination during construction and operation of the Revised Proposal.

5.6.6.1 Sedimentation of surface waters

No changes to impacts to surface water outside those already approved in MS813 are expected as a result of building the abandonment bund around the Moora Mine pits on closure.

Given the water flows in the Kyaka Brook are seasonal and episodic, it is not anticipated that the development of the Project will result in any residual impacts to surface water from sediment as all risks will be managed through a SWMP.

5.6.6.2 Contamination of groundwater / surface water due to hydrocarbon release/spillage

There is a low residual risk of contamination of groundwater and/or surface water due to accidental release/spillage of hydrocarbons from storage and handling areas at Moora Mine and the Project. It is not anticipated that the development of the Revised Proposal will result in any significant impacts to groundwater as a result of hydrocarbon storage.

5.6.6.3 AMD or ASS into groundwater

There is also a low residual risk of contamination of groundwater as a result of AMD from Tonkin WRD as metals concentrations are generally below the limits of reporting, or at concentrations which are below relevant drinking water health criteria and therefore should not pose a risk to human health receptors for

drinking or other exposure scenarios. The CSIRO ASS risk mapping indicates the North Kiaka DE and Moora Mine are within an area that has a low (6% – 70%) to extremely low (1%– 5%) probability of ASS occurrence.

5.6.6.4 Saline drainage to groundwater

There is a low residual risk of exposure of dissolvable minerals during mining below the groundwater at Moora Mine. There is also low residual risk of contamination from the Moora Mine pit lake water interacting with groundwater following closure given the modelling undertaken by GHD (2021b) shows that the Moora Mine Pits are likely to be dry most of the time. Analysis of the waste rock samples from Moora Mine indicates that the total leachable constituents (major-ions) are at low concentrations in the types of rocks found in the mine pit at Moora and likely to be found in the North Kiaka DE. Therefore, dissolution of minerals and saline discharge, at concentrations, which may be a cause for concern from the waste rock is not anticipated for the Revised Proposal (GHD, 2020c).

5.6.7 Environmental outcome

There are no Ramsar listed, Nationally Important wetlands or PDWSAs occurring within or near to the North Kiaka DE or Moora Mine DE. The risk is low for ASS/AMD/saline drainage. Risk to groundwater drawdown - none for the Project as there are no plans to mine below water table, Moora Mine dewatering is already approved through 45 C amendment to the MS813. Surface water modelling shows there are minimal risks to the site from surface water and these can be managed through a diversion bund west of North Kiaka Pit to intercept direct rainfall and reduce pumping in North Kiaka Pit, a culvert under southern access road to reduce road flooding and maintain site operations and a Surface Water Management Plan (SWMP) developed for the mine to minimise impact downstream environments including Kyaka Brook and Coonderoo River. The SWMP would include management of sediment within surface water and would include sampling for turbidity and TSS. Groundwater management will be implemented at the Project in line with the measures which have been successfully implemented at Moora Mine. Kemerton Smelter will require no change to existing management measures approved under MS813.

Given the receiving environment and implementation of the proposed mitigation and management measures listed in Section 5.6.5, it is considered that the Revised Proposal can achieve the EPA's objective to maintain the quality of groundwater and surface water.

5.6.8 Cumulative impact assessment

An assessment of cumulative impacts is provided in Section 10.

5.7 Key Environmental Factor – Social Surroundings

This section discusses the direct and indirect impacts to social surroundings resulting from construction and operation of the Project and construction of the abandonment bund at Moora Mine. The construction and operation of the Revised Proposal will not result in any changes to Kemerton Smelter and as such only indirect impacts from the continued operation of Kemerton Smelter on social surroundings will be discussed.

5.7.1 EPA objective

The EPA's environmental objective for the factor Social Surroundings is: *"To protect social surroundings from significant harm".*

For the purposes of EIA, the EPA defines Social Surroundings as the aesthetic, cultural, economic and social surroundings to the extent that those surroundings directly affect or are affected by physical or biological surroundings

The objective recognises the importance of ensuring that social surroundings are not significantly affected as a result of the implementation of a proposal or scheme.

5.7.2 Relevant policy and guidance

EPA Policy and guidance

– *Statement of Environmental Principles, Factors, Objectives and Aims of EIA* (EPA, 2023b)
– *Environmental Factor Guideline: Social Surroundings* (EPA, 2023e)
– *Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage*, (EPA, 2023c)

Other policy and guidance

– Environmental Protection (Noise) Regulations 1997 (EPN Regulations)
– *Aboriginal Heritage – Due Diligence Guidelines. Version 3.0* (Department of Planning, Lands and Heritage (DPLH) and Department of the Premier and Cabinet (DPC) (DPLH, 2013))
– *State Planning Policy 5.4: Road and Rail Noise (SPP 5.4)* (DPLH, 2019)
– *Aboriginal Heritage Act 1972 (WA)*

5.7.3 Notice requiring information for assessment

In July 2022, in accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of the Revised Proposal (EPA, 2022b). There were no specific information request items relating to Social Surroundings. However, the EPA requested that potential environmental impacts in the context of both the Approved Proposal and the Project be considered. The EPA further advised (during a meeting on the 16 September 2022) that Social Surroundings be included as a Key Environmental Factor and should be considered relevant to the Approved Proposal and the Project (supporting information/studies to be provided that are suitable for the EPA to assess significance of impact). This section was updated to include consideration of the Approved Proposal, the Project and the Moora Mine abandonment bund.

The draft ERD prepared in accordance with s40(2)(a) was amended to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request (EPA, 2023d) as referenced in Table 5.47

Table 5.47 2023 Additional information request – social surroundings

Source	Additional Information	Section of the ERD
	Provide the 2018 Moora Noise Survey report for review.	Section 5.7.4.1 and Appendix R of the ERD

Source	Additional Information	Section of the ERD
Social Surroundings (Noise) – DWER	Provide an explanation for the higher LA10 noise levels observed at night.	Section 5.7 of the ERD
	Clearly demonstrate compliance with noise regulation at all times, including during the 6:00 am to 7:00 am period.	Section 5.7 of the ERD
	Conduct noise monitoring during the operation of the existing Moora site to verify the noise modelling for the proposed project and demonstrate compliance with noise regulations.	Section 5.7 of the ERD

5.7.4 Receiving environment

The receiving environment for the North Kiaka DE is the same as was reported in the s38 application, noting that given the Moora Mine is located nearby, many of the existing studies prepared describe a congruent Social Surroundings.

5.7.4.1 Moora Mine

SIMCOA commissioned the following baseline studies for the Moora Mine which could be used to infer the conditions of the North Kiaka DE:

- Kee and Quartermaine (1985). Report of the Survey for Aboriginal Sites at the Area Proposed for a Quarry Development by Cliffs International Ltd, Moora, WA. Unpublished report prepared for Simcoa Operations Pty Ltd.
- Johnson. (2019). Report of an Archaeological Aboriginal Heritage Survey for the proposed SIMCOA North Kiaka Quartzite Mine, Moora, Western Australia. Unpublished report prepared for GHD on behalf of Simcoa Operations Pty Ltd.
- North Kiaka – Noise Assessment (GHD, 2020b) (Appendix Q) which referred to RedOHMS (2018) Moora Noise Survey Final
- Moora Mine – Air Quality Assessment (GHD, 2020a) (Appendix R).
- Report on Archaeological Investigations into the Locations of the Kiaka Brook 1 And Koolera Well Artefact Scatters, North of Moora, Western Australia (Brad Goode and Associates, 2022) (Appendix P)

Aboriginal and European cultural heritage

Aboriginal heritage

The Moora Mine has been subject to a number of heritage surveys including Kee and Quartermaine (1985), Johnson (2019) and Brad Goode and Associates (2019; 2022) as included in Appendix P. The Heritage surveys for the Moora Mine have been prepared in accordance with the *Aboriginal Heritage – Due Diligence Guidelines (*DPLH, 2013) and the *Aboriginal Heritage Act 1972*.Kee & Quartermaine (1985) identified two (2) archaeological sites of Aboriginal significance (quartz artefact scatters) and two (2) isolated finds (steep scraper and quartz flake). In 1992 SIMCOA was granted approval under s.18 of the *Aboriginal Heritage Act 1972 (repealed)* to disturb archaeological site 4659 (previously site S2251) a quartz artefact scatter.

It was established that the 'Koolera Well' Site 4751 artefact scatter is not located at or near the coordinates given on the DPLH (WA) List of Other Heritage Places (AHIS). As a result of archival research and fieldwork, Site 4751 was determined to be located in the area immediately northwest of the Koolera Well. The recorded location of Site 4751 was part of a larger farm at the time and is now contained within an area adjacent to the current mining operations. Accordingly, Johnson (2019) completed archaeological surveys of the area near the Koolera Well to locate the site however no Aboriginal archaeological material was identified. An additional survey by Brad Goode and Associates (2022) noted that the Koolera Well site location was incorrectly reported and DPLH's mapping has since been updated to show the site located in the Eastern Ridge, away from the area of disturbance.

No new ethnographic sites or archaeological Aboriginal heritage sites or places were recorded during recent heritage surveys by Brad Goode and Associates (2019; 2022) or Johnson (2019).

One active Native Title Claim covers the North Kiaka DE (WC1997/71) and was registered in 1997. The claim area covers a region of almost 30,000 km^2 and stretches from Two Rocks to Leeman and inland to Dalwallinu (Mine Earth, 2018). The abandonment bund will be sited to avoid impact to any heritage sites.

Existing s. 18 approvals are consistent with the *Aboriginal Heritage Act 1972.* Any future impacts to cultural heritage will be managed under the *Aboriginal Heritage Act 1972 (WA)* and regulations, including all consultation processes and management measures.

European heritage

There are no known registered European heritage sites within 5km of Moora Mine.

5.7.4.1.1 Land use

The existing land use for Moora Mine is consistent with that described for the Project in section 5.7.4.2.2.

5.7.4.1.2 Demographics and economy

The demographic of the Moora Mine is consistent with that described for the Project in section 5.7.4.2.7.

5.7.4.1.3 Noise

As an active mine site, noise sources associated with Moora Mine include plant and equipment such as crushers, screens, wash plant, workshop, conveyor system and mobile plant. Moora Mine operates between 6:30am and 5:30pm Monday to Friday with the occasional Saturday operations between 6:30am and 5:30pm. There are no night-time operations at the mine. According to the *Environmental Protection (Noise) Regulations 1997*, air blast levels are not to exceed 125 dB linear, peak between 0700 and 1800 hours from Monday to Saturday inclusive. In addition to this, Part 2, sub-regulation 4 of the Environmental Protection (Noise) Regulation 1997 also requires that: “air blast levels for 9 in any 10 consecutive blasts (regardless of the interval between each blast), when received at any premises, must not exceed 120 dB linear, peak between 0700 and 1800 hours from Monday to Saturday inclusive.” Operations at the Mine are compliant with the EPA Environmental Protection (Noise) Regulations 1997.

SIMCOA’s environmental licence (Part V) for Moora Mine requires blasts vibration levels be below 5mm/sec peak particle velocity for 95% of blasts, and below 10mm/sec peak particle velocity for all blasts at the nearest noise sensitive premise.

SIMCOA performs periodic blast noise and vibration monitoring to assess compliance with its environmental licence. The monitoring GHD conducted is consistent with the provided guidance documents. Environmental Protection (Noise) Regulations 1997, EPA’s 2023 Environmental Factor Guideline Social Surroundings (EPA, 2023e) and Draft Guideline on Environmental Noise for Prescribed Premises May 2016(DER, 2016)Through observation of logger noise data (GHD Noise Assessment (GHD, 2020b)- Appendix Q) noise levels during the night time (Monday – Saturday 10pm-7am) are lower between the midnight and 6am time period, typically ranging between 20 to 35 dB, LA10. They are somewhat higher (between 6am and 7am) for a good number of days. Given Moora Mine was not operating when the monitoring occurred (since it was outside of operating hours) all noise recorded at these locations is taken to be external sources. These external sources are likely attributable to road traffic and domestic activities around the residential properties where the loggers were located rather than associated with mining operations or possibly a passing train.

Monitoring during blasting over the past three (3 years) has shown compliance with licence conditions. The most recent result at the nearby Goonderoo Homestead in 2022 showed no events over 2.54mm/sec peak particle velocity.

No complaints were received during the past three (3) years regarding air blast over pressure levels or ground vibration due to blasting at the Moora Mine. The Moora Mine noise emissions are not considered to be significant in Part IV and should continue to be managed and assessed under the existing Part V licence.

5.7.4.1.4 Visual amenity

Mining continues mainly at depth in the Main Pit and is generally out of sight from public roads, with some limited visibility of activities. Mining at the south end of the Main Pit has removed the high part of the South Hill exposing more of the open pit to the public from Midlands Road. Clearing and mining of the West

Ridge has opened up the mine area, and the West Pit is partly visible to the public from Midlands Road. Tree planting on the west side of the West Pit is designed to shield the West Pit from the Midlands Road.

The Main waste dump stopped receiving waste in 2011 and rehabilitation has been completed around the base and on the western slopes. The Southeast Waste Dump has not increased in size and is not visible to the public, although it is visible from a nearby farmhouse. The West Pit Waste Dump to the southeast of the West Pit is complete and has been revegetated.

Rehabilitation (battering and seeding) of the lower west slope of the Main Waste Dump has been completed and screens the Main Pit area from Midlands Road to a large extent (Trudgen, 2023). All of the lower slopes have been rehabilitated; however the upper plateau of the waste dump still requires final shaping and rehabilitation. Clearing of vegetation and topsoil from the north western end of the main pit area and vegetation cleared from the west and south sides of the west pit has provided some of the top soil needed to rehab another section on the northern end of the Main Waste Dump. The old North Waste Dump is totally rehabilitated.

The quartz product stockpiles at the railway siding are partly visible from the Midlands Road through native vegetation along the road and railway reserves. The quartz by-product (fines) stockpiles are partially visible from Kiaka Road through the shelterbelt. To date there have been no complaints from the public in respect to the visual amenity of the mine site.

Previous plantings along the north side of the mine and fines stockpile area (shelterbelt) hide the view of the mine from the Kiaka Road. The trees are dominantly local eucalypts (about 50 trees) and have reached a maximum height of about 9m. About 10 *Allocasuarina* plants have also grown. A row of eucalypts were also planted along the road to the south of the Southeast Waste Dump in order to hide the view of the dump from the nearby farmhouse.

5.7.4.1.5 Road traffic

Current road traffic between Moora Mine and Kemerton Smelter is approximately 5,200 truck movements per annum (return) assuming a 50 t truck capacity; or 10,400 truck movements per annum (return) assuming a 25 t truck capacity. Trucks will follow the same transport route between Kiaka Road (the Project) and the Kemerton Smelter. A Noise Assessment including assessment of traffic impacts (GHD, 2020b) was completed under the relevant guidance (DPLH, 2019).

5.7.4.1.6 Dust

At Moora Mine, dust suppression on the haul roads is carried out during the mining season by a dedicated water truck (Moora Quartz Mining Operations Annual Environmental Report 2022, Simcoa Operations). During crushing and screening operations, dust is suppressed by water sprays at the feeder to the primary crusher and sprays on the secondary crusher. Ore material is washed by large spray bars and the water is recovered and re used. During the past three (3) years no complaints about dust were received from the public.

SIMCOA undertakes ambient dust monitoring on an annual basis in accordance with the Moora Mine environmental licence. Peak ambient dust levels the boundary of the site - the North haul road, South West WRD, at the West Entry point and at the East Entry since 2014 were 233.6 µg/m^3 (2016), 120.3 µg/m^3 (2017), 362 µg/m^3 (2017) and 215.7 µg/m$_3$ (2017) respectively. During 2019 the South West WRD, the West Entry point the East Entry results were 1.3 µg/m^3, 7.1 µg/m^3 and 32.9 µg/m^3 respectively (SIMCOA , 2022b). These are all significantly less than the licence conditions which state that dust leaving the Project must not exceed 1,000 µg/m^3 of air. High volume air sampling for airborne dust was last completed in December 2022 as per SIMCOA's environmental licence conditions.

Results from recent monitoring can be found in Moora Quartz Mining Operations Annual Environmental Report(SIMCOA , 2022b) and GHD's (2020a) Air Quality assessment for the Revised Proposal (Appendix R).

5.7.4.2 North Kiaka DE

SIMCOA commissioned the following baseline studies to ascertain the existing receiving environment of the North Kiaka DE:

– Report of an Aboriginal heritage survey for SIMCOA Operations Pty Ltd for the proposed North Kiaka Quartzite Mine located North of Moora, Western Australia (Brad Goode and Associates, 2019) (Appendix P)

– North Kiaka Approvals and Supporting Studies – Noise Assessment (GHD, 2020b) (Appendix Q)
– North Kiaka Approvals and Supporting Studies – Air Quality assessment (GHD, 2020a) (Appendix R).
– Report on Archaeological Investigations into the Locations of the Kiaka Brook 1 And Koolera Well Artefact Scatters, North of Moora, Western Australia (Brad Goode and Associates, 2022) (Appendix P)

5.7.4.2.1 Aboriginal and European cultural heritage

Native title

The North Kiaka DE falls within the Yued Native Title Claim (Yued NTC) (WC1997/71) (Brad Goode and Associates, 2019). The claim area covers a region of almost 30,000 km^2 and stretches from Two Rocks to Leeman and inland to Dalwallinu (Mine Earth, 2018).

Aboriginal heritage

The North Kiaka DE has been subject to a number of heritage surveys and review of the following online inquiry systems (accessed January 2023):

– Aboriginal Heritage Inquiry System
– Heritage Council Database
– Protected Matters Search Tool.

Brad Goode and Associates (2019) reports on the results of heritage surveys previously undertaken in proximity to the North Kiaka DE, the recent archaeological survey undertaken by of the North Kiaka DE, and recent consultation undertaken with the Yued NTC group (December 2018, refer to Appendix P). Heritage surveys undertaken for the North Kiaka DE have been prepared under s18 of the *Aboriginal Heritage Act 1972* and Aboriginal Heritage – Due Diligence Guidelines (DPLH, 2013).

As a result of a desktop search and reported by Brad Goode and Associates (2019) there is one Registered Aboriginal Heritage Site in the North Kiaka DE, Table 5.48, Figure 5.25.

Table 5.48 DPLH Aboriginal Sites and Heritage places search results

ID	Name	Status	Type
5141	Kiaka Site Complex 1-3	Registered Site	Artefacts/Scatter, Water Source

Two Registered Aboriginal Heritage Sites (artefacts/scatter), Kiaka Brook 1 (Site ID 4658) and Kiaka Brook 2 (Site ID 4659), occur within tenement M70/191 south of the North Kiaka DE.

The archaeological Aboriginal heritage survey conducted by Johnson (2019) in December of 2018, did not locate the Kiaka Road Scarred Tree (Site ID 4605). In September 2020, the Aboriginal Cultural Materials Committee (ACMC) reassessed the registered Kiaka Road Scarred Tree (Site ID 4605) and determined the Site no longer meets section 5 of the AH Act and it has subsequently been removed from the Aboriginal heritage sites register.

Brad Goode and Associates (2022) undertook archaeological investigations to determine the precise location and extent of the Site 4658 ‘Kiaka Brook 1’ and Site 4751 ‘Koolera Well’, located adjacent to SIMCOA’s current mining operations north of Moora, Western Australia (Appendix P).

The Site 4658 ‘Kiaka Brook 1’ artefact scatter was identified close to the coordinates given on the DPLH (WA) List of Registered Aboriginal Sites (Aboriginal Heritage Inquiry System, AHIS), near the top of a hill immediately east of a large open pit or quarry where mining has been undertaken in the past. It was determined that the area containing the Site 4658 artefact scatter may have been utilised in the past for agricultural purposes and therefore has been universally disturbed.

No new ethnographic sites or archaeological Aboriginal heritage sites or places, were recorded during the recent heritage survey (Johnson, 2019), or during consultation with the Yued NTC group (Brad Goode and Associates, 2019).

The *Moodjar* Christmas trees (*Nuytsia floribunda*), which grow in association with ridgeline vegetation, were identified by Johnson (2019) as culturally significant to the Yued people due to their association with spirits of the deceased. The *Moodjar* does not meet DPLH criteria for Registered Aboriginal Sites under the AH Act.

The 2012 survey found six plants across the survey area (Trudgen et al, 2012). A map showing the location of Moodjar trees will be produced using aerial photography collected in January 2024. This will be used to avoid these trees, where possible when the site is developed.

While the Moodjar trees are not registered as culturally significant sites SIMCOA has committed to engage heritage monitors during construction of the Proposal where any clearing is to directly impact the of Moodjar trees. The *Moodjar trees* are managed through the measures described in SIMCOA's EMP (GHD, 2023g) (see Appendix C).

Indigenous interests of the Coomberdale TEC

The Coomberdale TEC Interim Recovery Plan (DPaW 2013) states the threatened community "contains sites that are known to have particular Aboriginal significance". The Plan makes recommendations for consultation with the "South West Aboriginal Land and Sea Council (SWALSC) and in particular, the Yued Working Party" if "potentially damaging ground disturbance is proposed".

European heritage

There are no known registered European heritage sites within 5 km of the North Kiaka DE.

5.7.4.2.2 Land use

Existing land use

The North Kiaka DE is in a region with a long history of broad-acre agricultural practices, primarily cropping and livestock (sheep) farming. Accordingly, the landscape has been largely cleared (>90%) and the exposed soils have been subject to wind and water erosion. Rocky outcrops in the region support remnant vegetation, due to the exposed rock and skeletal soils being unsuitable for cropping. While the vegetation types identified are of high conservation value, grazing and weed spread have impacted the vegetation present, with 2.67% of the vegetation mapped within the North Kiaka DE identified as being of Degraded / Completely Degraded condition.

The Project is located on tenements M70/1292 which is situated on a farm owned by SIMCOA. Land adjacent the North Kiaka DE continues to be used for broad-acre agriculture. The closest rural residential dwelling is located approximately 0.01 km south of the North Kiaka DE (Figure 5.28).

Conservation areas

No DBCA managed areas occur within the North Kiaka DE. Table 5.49 summarises the three DBCA managed lands located within approximately 20 km radius of the North Kiaka DE. The closest area is Cairn Hill Nature Reserve (NR) (R47694, Class A), located approximately 3.5 km south of the North Kiaka DE. Cairn Hill NR occurs on the Coomberdale Chert formation and supports the Coomberdale Chert TEC. The reserve was established to offset clearing of the Coomberdale TEC (including DBCA-listed Priority flora *Regelia megacephala* (P4)) associated with development of Moora Mine.

Table 5.49 DBCA managed lands within 20 km of the North Kiaka DE

ID	Classification	Name	Distance from North Kiaka DE boundary
R 47694	Class A nature Reserve	Cairn Hill Nature	1.5 km south
E 28674	Class A nature Reserve	Manaling Nature Reserve	10.9 km north-west
R 23316	Class A nature Reserve	Namban Nature Reserve	13.6 km north-west

Environmentally sensitive areas

The majority of the North Kiaka DE lies within an Environmentally Sensitive Area (ESA) which is associated with the Coomberdale TEC and known Threatened flora species. The potential for impact to the Coomberdale TEC has been assessed in Section 5.2.6.

5.7.4.2.3 Noise

Existing noise within the vicinity of the North Kiaka DE is anticipated to be dominated by local noise sources (e.g. vehicles, nature (wind in trees, birds and insects), distant aeroplanes, distant farming

equipment, livestock and general household noise). Noise sources associated with the Moora Mine include plant and equipment such as crushers, screens, wash plant, workshop, conveyor system and mobile plant.

The Noise Impact Assessment (GHD, 2020b) undertaken for the Project, identified sensitive receptors in proximity to the North Kiaka DE, as shown in Table 5.50. The impact assessment considered three locations in the assessment however SIMCOA has subsequently purchased the property containing the residential dwelling R02 to the east of the Moora Mine and along the southern border of the North Kiaka DE and the previous residents have moved out. The nearest residential dwelling to the North Kiaka DE is R03 (located at4034 The Midlands Road, Moora),a rural residential dwelling, located approximately 0.7km north west of the North Kiaka Mine Pit(GHD, 2020b).

Table 5.50 Sensitive receptors (noise)

ID	Address details	Distance from Moora Mine boundary	Distance from Project boundary	Distance from mine pit	Distance from easement
R01 (residential dwelling)	3536 Midlands Road, Moora	0.17 km south	2.5 km south	3.6 km south	2.3 km south
R03 (residential dwelling)	4034 The Midlands Road, Moora	2.8 km north	0.35 km north-west	0.65 km north-west	1.7 km north

5.7.4.2.4 Visual amenity

The North Kiaka DE is in a landscape which has been heavily cleared and otherwise impacted by agricultural land use. Moora Mine, located directly adjacent to Midlands Road, is the only mining land use in the local landscape.

The proposed mine pits occur on and follow the Noondine Chert ridgelines which occur at elevations of up to 285 m AHD. The Tonkin WRD has been strategically located in the valley and other lower lying cleared areas and will have a final constructed height of 20 m (264 mRL) (Snowden 2012). In the context of the surrounding landscape, all constructed landforms will be between 21 – 45 m below the tallest landform in the North Kiaka DE (pre-development).

Visual receptors in the landscape include users of Midlands Road (west of the North Kiaka DE) and Kiaka Road (south of the North Kiaka DE), and nearby rural residential dwellings (Figure 5.28).

Midland Road is the primary transport route between Moora and town sites further north such as Coomberdale, Namban and Watheroo. Visibility of the Project from Midlands Road is expected to be limited given the tall woodland vegetation present in the road reserve, and the rocky outcrops to be retained west of the disturbance footprint. Traffic along Kiaka Road is mostly limited to owners/lessees of rural properties adjoining this road.

5.7.4.2.5 Road traffic

The existing road traffic experienced at Project locality is consistent with that described for Moora Mine in section 5.7.4.1.5.

5.7.4.2.6 Dust

North Kiaka DE has pasture and native vegetation where dust sources are limited. Dust from the adjacent Moora Mine is currently managed (see section 5.7.4.1.6).

5.7.4.2.7 Demographics and economy

The Moora Mine and the Project are in the Shire of Moora local government area, approximately 171 km north of the Perth CBD. The 2016 Australian Bureau of Statistics (ABS) reported a population of 1,773 people residing within the Shire of Moora (ABS 2016). Agriculture (livestock and cropping) is the primary industry accounting for approximately 25.5% of employment, followed by education (10.4%) and retail trade (10%) (ABS 2016). Mining accounted for 1.9% of employment.

5.7.4.3 Kemerton Smelter

The Kemerton Smelter is located within Kemerton Strategic Industrial Area (KSIA), which Development WA is developing for the purpose of industrial and infrastructure growth. Kemerton Smelter is located on Lot 5548 on deposited plan 188562 within the industrial core of the Kemerton Industrial Park (KIP). The Shire of Harvey District Planning Scheme No. 1 and the Greater Bunbury Region Scheme (GBRS) both provide a zoning of “Industrial” for the core area of the KIP.

The premises (Lot 5548) on which Kemerton Smelter is situated covers 115.6 ha, although only approximately 75 ha of the premise is being used operationally.

Non-operation areas are generally comprised of bushland. SIMCOA owns both Lot 5548 and the adjacent property, Lot 5549 on deposited plan 188561. Lot 5549 will be used to accommodate any future expansions of the operations subject to relevant regulatory approvals.

5.7.4.3.1 Aboriginal and European cultural heritage

There are no known registered European or Aboriginal heritage sites within 5km of the Kemerton Smelter.

5.7.4.3.2 Land use

A wide range of land uses and landowners currently exists within the KSIA. Some current land uses will continue, with the potential for the future activities including, basic raw materials extraction/mining, noxious/heavy industry, light and general industry, renewable energy developments, infrastructure, telecommunications, agriculture/forestry and conservation.

5.7.4.3.3 Noise

The operation of the Kemerton Smelter and its various ancillary activities generate noise. Generally, the noise from the Kemerton Smelter is at a minimum during the night and on weekends because crushing and packaging, and truck loading/unloading are mostly restricted to weekdays during normal business hours. The main noise sources at the Kemerton Smelter are the loading and unloading of wood block at the retorts, the retort stack, combustion fans and baghouse fans.

An independent noise assessment carried out by Herring Storer Acoustics in 2017 demonstrated compliance with the requirements of the Environmental Protection (Noise) Regulations 1997 during normal operation of the Kemerton Smelter. The study concluded that noise from the Kemerton Smelter is unlikely to have an impact on noise levels at nearby sensitive receptors.

5.7.4.3.4 Visual amenity

No changes to the Kemerton Smelter are proposed with the Revised Proposal, and it is located within the KSIA – has been operational since 1989 and consistent with the visual amenity of the area.

5.7.4.3.5 Road traffic

Road traffic between Moora Mine and Kemerton Smelter is estimated at 5,200 truck movements per annum (return) assuming a 50 t truck capacity; or 10,400 truck movements per annum (return) assuming a 25 t truck capacity (GHD, 2020b). Trucks will follow the same transport route between Kiaka Road (North Kiaka) and the Kemerton Smelter.

5.7.4.3.6 Dust

As discussed in the Simcoa Annual Environmental Report, Kemerton Silicon Smelter, 2022, the handling and transfer of raw materials, particulate emissions from the charcoal plant stack and amorphous silica fume, generated in the smelting process, have the potential to contribute to the ambient dust levels in the environment and nearby community surrounding the Kemerton Smelter. Dust has the potential to adversely affect human health, visual amenity, and surrounding vegetation and fauna.

SIMCOA minimises dust emissions from the Kemerton Smelter using a number of methods, including:

– Wetting down raw material stockpiles using fixed and mobile sprinklers prior to loading or handling raw materials that could generate dust
– Bituminising high traffic areas
– Washing quartz during crushing (at the Moora mine) and prior to offloading at Kemerton

– Mulching non-traffic areas of the plant
– Using covered conveyors
– Enclosing raw material transfer points
– Using mist sprinklers on the charcoal loading hopper at the charcoal retorts and transfer points in Kemerton Smelter
– Storing materials such as silica fume, charcoal fines and charcoal in sheds, silos and bunkers.
– Performing regular preventative maintenance on dust control equipment such as the baghouses and dust collectors
– Conducting monthly ventilation audits to provide proper operation of dust control equipment.

5.7.4.3.7 Demographics and economy

The Kemerton Silicon Smelter is in the Shire of Harvey local government area, approximately 175km south of Perth. The 2021 Australian Bureau of Statistics (ABS) reported a population of 9,630 people residing within the Shire of Harvey (ABS, 2021). Manufacturing is the primary industry accounting for approximately 18.5% of employment, followed by agriculture, forestry and fishing (12.3%) and construction (9.1%).

LEGEND

- Road
- Haul road
- Watercourse
- Easement
- Infrastructure
- Mine pit
- Tonkin waste
- North Kiaka Development Envelope
- North Kiaka Disturbance Footprint
- Moora Mine Development Envelope (EPA approved)
- Moora Mine Disturbance Footprint (approved)

Aboriginal Heritage

- Registered Site
- Other Heritage Place

Kiaka Brook
Midlands Rd
Kiaka Rd
4605
4751
5141
Kiaka Brook
4659
4658
Cattady Rd

Paper Size ISO A3

0 130 260 390 520

Metres

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

N

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Aboriginal Heritage

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.25

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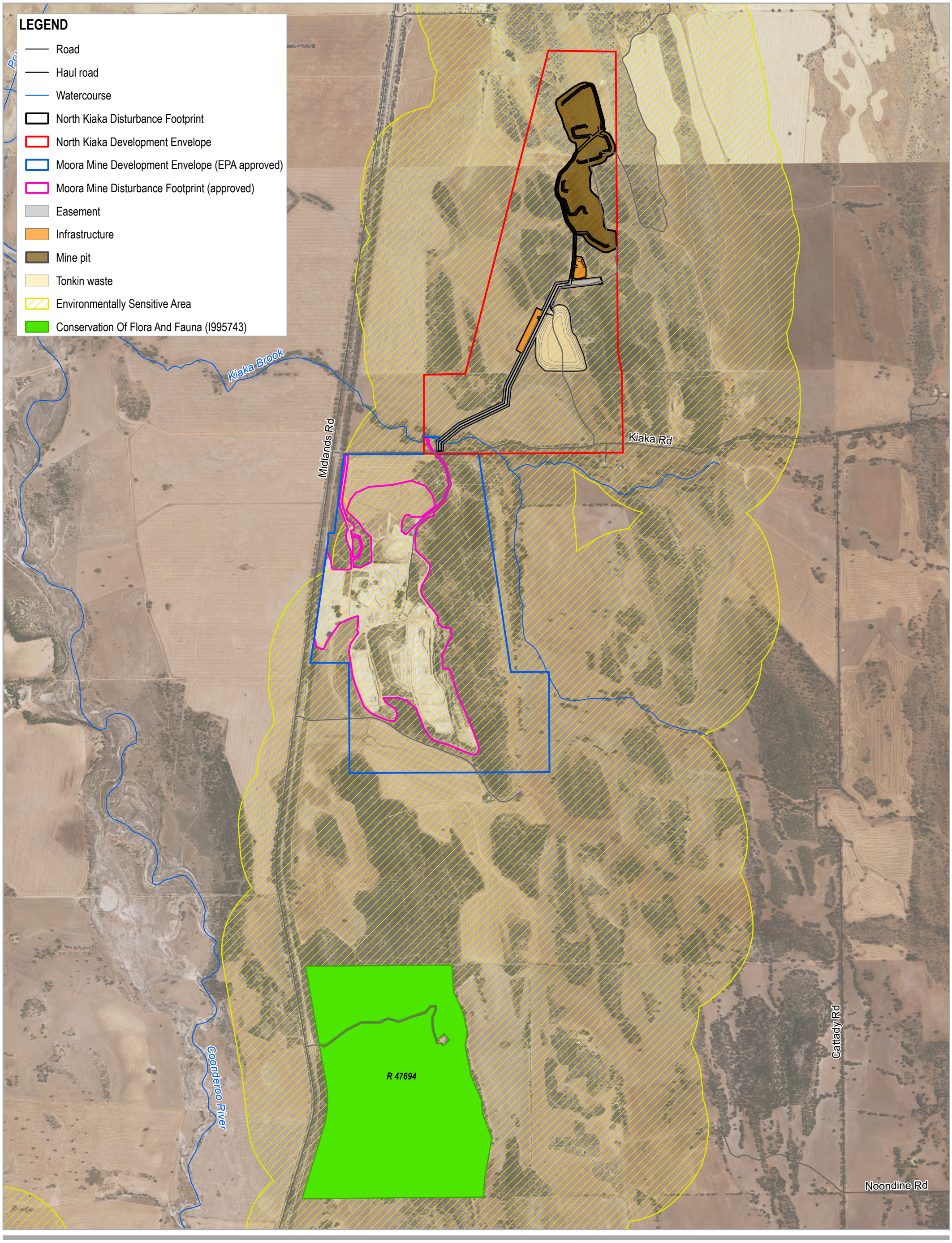
Print date: 22 Mar 2024 - 15:13

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Road - 20180601; DoW: River - 201108; DIA: Aboriginal Heritage Site - 201806. Created by: rbrown3



Paper Size ISO A3

0 250 500 750 1,000

Metres

N

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

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Nature Reserves and Environmentally Sensitive Areas

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.26

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Print date: 22 Mar 2024 - 15:13

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; DBCA: Legislated lands and waters - 2019; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), Road - 20180601; DoW: River - 201108. Created by: rbrown3

5.7.5 Potential environmental impacts

There is the potential to impact social surroundings during both construction of the abandonment bund at Moora Mine and construction of the Project, and operation of the Revised Proposal.

The Revised Proposal has the potential to impact the following social values:

– Aboriginal heritage
– Noise
– Dust
– Odour
– Vibration
– Visual amenity.

Activities associated with the Revised Proposal that have potential to impact on Social Surroundings are increased traffic, landscape amenity and noise. Mitigation and management measures to avoid or reduce impacts on social surroundings are outlined in section 5.7.6 and further information on the assessment of impacts is provide in section 5.7.7.

5.7.5.1 The Project

5.7.5.1.1 Direct impacts to Aboriginal heritage sites

There are 2 known Registered Aboriginal Heritage Sites and Other Heritage Places located within the North Kiaka DE. The North Kiaka DF is approximately 44.59 ha in size and has been located to avoid the identified sites (which includes a 0.2 km buffer around each site) thereby avoiding the potential for direct impact.

The location of the abandonment bund does not impact any known Registered Aboriginal Heritage Sites and Other Heritage Places within the Moora Mine DE.

There is also potential for unknown artefacts or burial locations to be uncovered during vegetation clearing and earthworks. The Yued people have identified the *Moodjar* trees and the bed of Kyaka Brook, as two locations where the uncovering of materials is most likely to occur. Design of the Project avoids (where practicable) and otherwise minimises impacts to *Moodjar* trees. Furthermore, SIMCOA commits to engaging Heritage Monitors to monitor ground disturbing activities when clearing *Moodjar* trees or disturbing the bed of Kyaka Brook as described in the EMP (GHD, 2023g). Ground disturbance procedures will be in place in the event of heritage discovery, however, given that that the area has been extensively surveyed (the most recent in 2019), discovery of artefacts or buried locations is considered unlikely.

The Revised Proposal will not result in impacts to any State Heritage sites listed under the *Heritage of Western Australia Act 1990*, as there are no sites within proximity of the North Kiaka DE or Moora Mine DE. The closest State Heritage listed sites are located within the Moora town site.

Given SIMCOA's commitment to avoid direct impact to Registered Aboriginal Heritage Sites and Other Heritage Places, and the absence of European heritage sites in the North Kiaka DE or surrounding areas, the Revised Proposal is not anticipated to have a significant impact on Aboriginal or European heritage.

The Project has the potential to impact social surroundings during construction and operations as outlined in Table 5.51 below.

Table 5.51 Potential impacts – social surroundings – development of the Project

Aspect	Direct Impacts	Indirect Impacts
Construction		
Heritage	– Loss/disturbance of Aboriginal heritage sites (located to the south of the DE) due to ground disturbance (i.e. vegetation clearing and earthworks)	–
Noise	– Sensitive receptors (nearby rural residential dwellings) affected by noise	– Amenity impacts (noise/vibration) resulting from traffic movements during construction

Aspect	Direct Impacts	Indirect Impacts
	and vibration from construction of buildings/infrastructure	
Dust	– Release of pollutants/particulates to air, associated with clearing, traffic movements and earthworks	– Amenity impacts (dust emissions) resulting from clearing, traffic movements, and earthworks during construction
Visual amenity	– Visual amenity affected by clearing elevated topographic features and construction of the Tonkin WRD/buildings/infrastructure	–
Road traffic	– Release of pollutants/particulates to air, associated with traffic movements	– Amenity impacts (noise/dust emissions) resulting from traffic movements during construction
Operation		
Noise	– Release of noise/vibration to air and ground, associated with blasting/mining/processing/ transport of quartz ore	– Sensitive receptors (nearby rural residential dwellings) affected by noise/vibration emissions from the operation of plant and equipment
Dust	– Release of pollutants/particulates to air, associated with blasting/mining/processing/ transport of quartz ore	– Amenity impacts (dust emissions) resulting from operational activities and traffic movements between the Project, Moora Mine, and Kemerton Smelter
Visual amenity	– Visual amenity affected by mining elevated topographic features operation of the Tonkin WRD/ buildings/ infrastructure – Impact to visual amenity for farmhouse	–
Road traffic	– Increase in traffic movement across Kiaka Road, through Moora and to Kemerton Smelter	– Amenity impacts (noise/dust emissions) resulting from traffic movements between the Project, Moora Mine, and Kemerton Smelter including impact to local traffic due to volume of trucks through Moora.

5.7.5.1.2 Noise and vibration emissions impacting nearby sensitive receptors

Primary noise sources associated with development of the Project include:

– Operation of mobile plant (i.e. clearing, earthworks, construction, mining)
– Blasting
– Vehicle movements (light vehicles and haulage trucks)
– ROM at the Project
– Operation of equipment at the workshop
– Generator
– Motor Control Centre
– Wash bay
– Refuelling facility.

Sources of noise at Moora Mine include:

– Operation of mobile plant (i.e. clearing, earthworks)
– Vehicle movements (light vehicles and haulage trucks)
– ROM pad with mobile plant
– Operation of process plant and equipment including crushers, screens, wash plant and conveyor system
– Vehicles on roads between Kiaka Road and the process plant

A noise assessment was undertaken by GHD in July of 2019 and updated in August 2020 to establish existing ambient noise levels at locations surrounding the North Kiaka DE (GHD, 2020b). Noise monitoring was conducted using two Svan 955 noise loggers (the locations shown in Figure 5.28), with consideration to the specifications outlined in the *Department of Environment Regulation (2015) Noise Regulations: Part*

3 – Noise measurement. No 'significantly contributing' noise sources were identified during the noise assessment, consequently, noise impacts from the Project were modelled in isolation.

GHD (GHD, 2020b) modelled predicted operational noise using SoundPLAN v 8.1 software, which considers local characteristics, site sources and the location of sensitive receptors when predicting noise levels.

The results of the modelling indicate that no exceedance of assigned noise levels is expected during the construction phase(GHD, 2020b) of the Project. Development of the Project will preferentially occur during normal construction hours (7.00 am to 7.00 pm Monday to Saturday). Similarly, operational activities are not expected to exceed assigned noise levels (GHD, 2020b). This assessment assumes daytime operation and a worst-case scenario for wind (i.e. that wind is always blowing in the direction from sources to receivers). The Project operations (i.e. mining and processing of quartz ore) will predominately occur during daylight hours between 7.00 am and 5 pm, Monday through to Friday. However, elements of the site may become operational from 6.30 am, therefore, noise impacts have been assessed against the more stringent noise criteria provided in the EPN Regulations (DER, 2016). It was determined that development and operation of the Project is not expected to result in significant noise impacts to sensitive receptors.

Vibrations may occur during construction and development of the Project, when operating particular equipment or machinery, or when undertaking activities such as blasting. A separation distance of approximately 0.7 km between the proposed pit and sensitive receptors, is expected to attenuate the majority of vibrations. The Project is not expected to have any negative effect on the structural integrity of sensitive receptors (GHD, 2020b).

5.7.5.1.3 Release of pollutants/particulates to air

The Revised Proposal has the potential to generate dust during construction of the abandonment bund at Moora Mine and the Project construction and operations through:

– Vegetation clearing and earthworks prior to construction
– Excavation and dozing
– Drilling and blasting.
– Loading and dumping of ore product
– Wind erosion dust from pits, stockpiles (ROM, crushed ore, finished goods), and traffic movements on unsealed roads
– Transport of ore product from the North Kiaka DE to Moora Mine

Dust generation at Moora Mine include:

– Crushing and screening activities at Moora Mine
– Operation of mobile plant (i.e. clearing, earthworks)
– Vehicle movements (light vehicles and haulage trucks)
– Transport of lump quartz from the processing plant to Kemerton Smelter.

Dust arising from mining activities will comprise coarse particles and particles larger than PM_{10}. Air quality modelling undertaken by GHD (GHD, 2020a) identified Total Suspended Particle (TSP) concentrations (the highest predicted) were unlikely to exceed the NEPM Guidelines (NEPC, 2021) at sensitive receptors, when taking into account both processing at Moora Mine and transporting ore from the North Kiaka DE to Moora Mine.

However, exceedances are predicted to occur no more than one day in the year, when worst case meteorological conditions as well as worst case emissions align if no mitigation measures are in place. The air quality assessment did not consider the proposed dust mitigation measures such as watering of the haul road and watering during drill and blast operations. The Project did not exceed relevant criteria for PM_{10}, $PM_{2.5}$, or dust deposition at any of the identified sensitive receptors.

With the implementation of dust mitigation measures outlined in Section 5.7.6, which includes dust suppression measures for dust generating activities and covering ore during haulage; the Project is not expected to result in significant dust emissions that would impact the amenity of the surrounding environment or nearby sensitive receptors.

5.7.5.1.4 Reduced visual amenity

Construction of the abandonment bund at Moora Mine and development of the Project have the potential to impact visual amenity through:

– Removal of native vegetation
– Disturbance of landforms (elevated rocky outcrops)
– Construction of the abandonment bund
– Construction of the Tonkin WRD.

The design of the abandonment bund at Moora Mine has been undertaken to minimise the visual amenity by retaining vegetation and keep the construction close to the current area of impact.

The Project layout has been designed to minimise visual amenity impacts as far as is practicable. This includes positioning the Tonkin WRD in a valley and the administration, stockpile, process and workshop facilities to the east of vegetated rocky outcrops, making these mine elements much less visible from Midlands Road. The final height of the constructed Tonkin WRD is expected to be 21 - 45 m below the tallest landform in the North Kiaka DE (pre-development) and is therefore unlikely to stand out in the landscape. Nearby sensitive receptors (i.e. rural residential dwellings) will have limited visibility of the Tonkin WRD given the positioning and height of these landforms.

Within the North Kiaka DE, the closest mine element (excluding the easement) is located approximately 0.8 km east of Midlands Road. Comparatively, material stockpiles at Moora Mine occur directly adjacent (0.05 km from) the Midlands Road. Furthermore, the rocky outcrops occurring west of the disturbance footprint, and the woodland vegetation present in the Midlands Road reserve, are expected to reduce visibility of the Project from Midlands Road. The southern infrastructure area and the Tonkin WRD are likely to be visible from Kiaka Road, however, this road is used infrequently and is primarily used to access the adjoining rural properties.

Given the separation distance between Moora Mine and the Project and Midlands Road, existing native vegetation buffers, the strategic positioning of infrastructure and constructed landforms in an undulating landscape, and the limited use of Kiaka Road, it is not expected that the Revised Proposal will have a significant impact on visual amenity.

5.7.5.1.5 Amenity impact resulting from traffic movements

The Project will use existing facilities/infrastructure to process (crush and screen) ore at Moora Mine. Transportation of ore from the Project to Moora Mine for processing will increase the number of trucks crossing Kiaka Road. It is estimated that road traffic between the Project and the Moora Mine will be between 3,795 and 7,590 truck movements per annum (return), equating to approximately 55 – 110 movements per mining day depending on haulage capacity (GHD, 2020b). The amenity impacts resulting from increased traffic are anticipated to be negligible, given Kiaka Road is primarily used for access to the adjoining rural properties and therefore has limited use.

Road traffic between Moora Mine and Kemerton Smelter is between 5,200 and 10,400 truck movements per annum (return) depending on capacity. Trucks will follow the same transport route between Kiaka Road (North Kiaka) and the Kemerton Smelter and there won't be any discernible change in traffic to Kemerton as the quantity of quartz to be sent there is essentially the same as the existing Approved Proposal.

5.7.5.1.6 Socio-economic benefits (positive impact)

Development of the Revised Proposal will extend SIMCOA's operations by 18 years, providing ongoing employment for approximately nine employees and two full time contractors (SIMCOA's current workforce connected with the Moora Mine and the Kemerton Silicon Smelter).

SIMCOA is Australia's only silicon manufacturing company. Geoscience Australia (2023) has listed silicon as one of Australia's 26 critical minerals that are essential for modern technologies, economies or national security, and that has a supply chain at risk of disruption. A 'no development' alternative for the Project would require SIMCOA to cease operations. The Project is expected to have a net-positive benefit on economic and social aspects, providing ongoing employment for approximately nine employees and two full time contractors across the life of the project (18 years). The Project will maintain the socio- economic benefits to the South West (Kemerton Smelter) and continue to contribute to the broader WA economy.

5.7.5.2 Moora Mine

The Revised Proposal will not cause any impact to Aboriginal heritage sites in the Moora Mine DE. Moora Mine will continue to be utilised for crushing and screening of ore, prior to transport to Kemerton Smelter. There is no plan to change the location of crushing plant and therefore no consequent impact on visual amenity.

There will continue to be ongoing rehabilitation of the site occurring as described in the Moora Revegetation Plan (Appendix K) and Mine Closure Plan. The socio-economic benefits outlined in section 5.7.5.1.6 will apply.

5.7.5.2.1 Abandonment bund

There will be minor ground disturbing activities, including vegetation clearing and earthworks related to constructing the abandonment bund around the Moora Mine pits. This will only have minor impacts to social surroundings during construction but will continue to be managed through existing management measures.

Moora Mine impacts social surroundings during construction of the abandonment bund and operations as outlined in Table 5.52 below.

Table 5.52 Potential impacts – social surroundings – ongoing operations at Moora Mine

Aspect	Direct Impacts	Indirect Impacts
Construction of the abandonment bund		
Heritage	– Loss/disturbance of Aboriginal heritage sites due to ground disturbance (i.e. vegetation clearing and earthworks)	–
Noise	– Sensitive receptors (nearby rural residential dwellings) affected by noise and vibration from construction of the abandonment bund	– Amenity impacts (noise/vibration) resulting from traffic movements during construction
Dust	– Release of pollutants/particulates to air, associated with clearing, traffic movements and earthworks	– Amenity impacts (dust emissions) resulting from clearing, traffic movements, and earthworks during construction of the abandonment bund
Visual amenity	– Visual amenity affected by clearing elevated topographic features and construction of the abandonment bund	–
Road traffic	– Release of pollutants/particulates to air, associated with traffic movements	– Amenity impacts (noise/dust emissions) resulting from traffic movements during construction of the abandonment bund
Operation		
Noise	– Release of noise/vibration to air and ground, associated with blasting/mining/processing/ transport of quartz ore	– Sensitive receptors (nearby rural residential dwellings) affected by noise and vibration from the operation of plant and equipment
Dust	– Release of pollutants/particulates to air, associated with blasting/mining/processing/ transport of quartz ore	– Amenity impacts (dust emissions) resulting from traffic movements between the Project, Moora Mine, and Kemerton Smelter
Visual amenity	– Mining at the south end of the Main Pit has removed the high part of the South Hill exposing more of the open pit to the public from Midlands Road. – Clearing and mining of the West Ridge has opened up the mine area, and the West Pit is partly visible to the public from Midlands Road. – The Southeast waste dump has not increased in size and is not visible to the public. – Impact to visual amenity for farmhouse	

Aspect	Direct Impacts	Indirect Impacts
Road traffic	– Increase in traffic movement across Kiaka Road, through Moora and to Kemerton Smelter – Transportation of ore from the Project to the Moora Mine for processing will increase the number of trucks crossing Kiaka Road. It is estimated that road traffic between the Project and the Moora Mine will be in the order of 3,795 truck movements per annum (return) assuming a 50 t truck capacity; or 7,590 truck movements per annum (return) assuming a 25 t truck capacity, equating to approximately 55 – 110 movements per mining day (depending on haulage capacity) (GHD, 2020b).	– Amenity impacts (noise/dust emissions) resulting from traffic movements between the Project, Moora Mine, and Kemerton Smelter including impact to local traffic due to volume of trucks through Moora.

5.7.5.3 Kemerton Smelter

The Kemerton Smelter will process the same volume of quartz for the implementation of the Revised Proposal as it does for the Approved Proposal, and is not and is not expected to have any change to the impacts outlined above. The Revised Proposal will not cause any impact to Aboriginal heritage sites in the area surrounding the Kemerton Smelter, and there will be no additional impacts to nearby sensitive receptors from noise and vibrations or release of pollutants/particulates. There is no plan to change the site arrangement to impact on visual amenity or increase the traffic movements to the Kemerton Smelter, as the volume of quartz will be the same. The socio-economic benefits outlined in section 5.7.5.1.6 above will apply.

Kemerton Smelter currently impacts social surroundings during operations as outlined in Table 5.53, noting that the operations are entirely ithin the Kemerton Strategic Industrial Estate. There is no expected increase in the magnitude of the existing impacts at Kemerton Smelter outside of the extension of time for operations.

Table 5.53 Potential impacts – social surroundings – ongoing operations at Kemerton Smelter

Aspect	Direct Impacts	Indirect Impacts
Operation		
Noise	– Noise generated by the operation of the Smelter and its various ancillary activities.	– Sensitive receptors (nearby rural and residential dwellings) affected by noise/vibration from the operation of the Smelter.
Visual amenity	– Visual amenity impacted by storage of raw materials on site	
Road traffic	– Traffic movement through Moora and to Kemerton Smelter	– Amenity impacts (noise/dust emissions) resulting from traffic movements between Moora Mine, and Kemerton Smelter
Dust	– Dust generated by the handling and transfer of raw materials, particulate emissions from the charcoal plant stack and amorphous silica fume, – Dust generated in the smelting process, – Potential impacts to human health, visual amenity, and surrounding vegetation and fauna from dust.	– Amenity impacts (dust emissions) resulting from operational activities at the Kemerton Smelter
Odour		– Amenity impacts (odour) on sensitive receptors from operational activities at Kemerton Smelter

5.7.6 Mitigation

SIMCOA is committed to the identification and implementation of mitigation, management and monitoring measures to avoid or reduce potential negative impacts to social surroundings values. The key aspects which may be impacted by the Revised Proposal are noise and vibrations and traffic volume increase. The mitigation measures for the Project, Moora Mine and Kemerton Smelter are outlined in the tables below.

Table 5.54 Mitigation measures – social surroundings – the Project

Mitigation Category	The Project
Avoid	Aboriginal heritage – The disturbance footprint will avoid direct impact to known Registered Aboriginal Heritage Sites and Other Heritage Places identified within the North Kiaka DE. – The disturbance footprint will avoid, where practicable, direct impact to Moodjar trees.
Minimise	SIMCOA propose to implement management of impact to social surroundings in accordance with the Environmental Management Plan (Appendix C) which will include addressing impacts to: Aboriginal heritage – Engineering controls will be applied to minimise direct impact to the bed of Kyaka Brook during construction of the access road crossing. – Potential impacts are managed under s18 of the AH Act. SIMCOA will develop a management plan (where required) describing the ongoing management of cultural heritage for the Revised Proposal. – SIMCOA will engage Heritage Monitors to monitor construction of the Kyaka Brook access road crossing. – Where direct impact to Moodjar trees cannot be avoided (i.e. within the mine pit), SIMCOA will engage Heritage Monitors to assess the Moodjar tree and surroundings for possible burials and approve for future clearing, or at request of the Heritage Monitors, a monitor will be present when disturbing ground around Moodjar trees. – Should any significant or substantial quantity of Aboriginal artefacts be discovered during construction, all work will cease within the immediate area, and an Aboriginal heritage consultant will be engaged by SIMCOA to record and report the material to the DPLH. – If skeletal material is uncovered during ground disturbing activities, work will cease in the immediate area and the discovery reported to the WA Police Force under the Coroners Act 1996. If the police determine that the remains are likely of Aboriginal origin, then the discovery will be reported to the Registrar at the DPLH. Noise and vibrations – Construction will be preferentially undertaken during normal construction hours (7.00 am to 7.00 pm, Monday to Saturday). – If construction occurs outside of normal construction hours the following measures apply: • Construction work carried out in accordance with Section 6 of AS 2436-2010 • Equipment used is the quietest reasonably available • All sensitive receptors notified of works at least 24 hours ahead • Preparation and approval of a construction noise management plan (internal) at least 7 days prior – Best available technology will be used to minimise noise and vibration emissions from plant and equipment – Where plant and equipment are housed in buildings (or under roofed structures), the design will incorporate sound insulation properties. – Operations will preferentially occur during daylight hours (7.00 am to 5 pm, Monday to Friday). – SIMCOA will maintain a register of complaints relating to noise and vibrations caused by blasting. – SIMCOA will commit to undertaking noise and vibration monitoring in accordance with operating licence conditions. Air quality (dust) – Access roads and other trafficked areas will be paved, sealed, or otherwise treated with water or dust suppressants. – Wetting down of areas will be undertaken ahead of drilling, blasting, and excavation. – Application of water or dust suppressants will be undertaken where materials are handled or stockpiled. – Cessation of handling of materials during adverse wind conditions, or if complaints are received from sensitive receptors.

Mitigation Category	The Project
	– Haulage trucks will be covered to minimise loss of materials along transport routes. – SIMCOA will commit to undertaking ambient dust monitoring in accordance with operating licence conditions. Visual amenity – Mine elements will be located east of rocky outcrops (to be retained) where practicable. – The Tonkin WRD will be positioned and designed to minimise visual impacts to the landscape.
Rehabilitate	Air quality (dust) – Progressive revegetation of the Tonkin WRD will be undertaken where practicable and weed control (if required). Visual amenity – The Tonkin WRD final landform design will incorporate features to integrate the landform with the surrounding landscape.
Offset	No offsets are required in relation to Social Surroundings as a result of the implementation of the Project.

Table 5.55 Mitigation measures – social surroundings – Moora Mine DE

Mitigation Category	Moora Mine DE
Avoid	Aboriginal heritage – The abandonment bund and disturbance footprint (amended) will avoid direct impact to known Registered Aboriginal Heritage Sites and Other Heritage Places identified within the Moora Mine DE. – The disturbance footprint will avoid, where practicable, direct impact to Moodjar trees.
Minimise	Operation of the Moora Mine will continue to implement existing proven management measures including: Air quality (dust) – Dust control will be undertaken during construction of the abandonment bund, if necessary managed by the selection of materials for construction. – Dust suppression on haul roads and storage areas for raw materials is carried out during mining season by a dedicated water truck. – Dust is suppressed by water sprays at the feeder to the primary crusher and sprays on the secondary crusher, ore material is washed by large spray bars and the water is recovered and re used. – Washing quartz during crushing (at Moora mine) and prior to offloading at Kemerton. Noise and vibrations – SIMCOA's environmental licence requires blasts vibration levels be below 5mm/sec peak particle velocity for 95% of blasts, and below 10mm/sec peak particle velocity for all blasts at the nearest noise sensitive premise. – SIMCOA perform periodic blast noise and vibration monitoring to comply with licence conditions. – Impacts from the abandonment bund will be temporary, during the construction phase only, and it required management measures outlined above (such as dust suppression) will be implemented.
Rehabilitate	Visual amenity – Tree planting on the west side of the West Pit is designed to shield the West Pit from the Midlands Road. – Rehabilitation of Waste Dumps at the Moora Mine site has been completed on a staged basis over the life of the mine (Trudgen, 2023).
Offset	No offsets are required in relation to Social Surroundings as a result of the implementation of Revised Proposal.

Table 5.56 Mitigation measures – social surroundings – Kemerton Smelter

Mitigation Category	Kemerton Smelter
Avoid	Existing facility within a designated industrial estate
Minimise	Kemerton will continue to operate under existing management practices that include:

Mitigation Category	Kemerton Smelter
	Air quality (dust) – Raw material stockpiles that could generate dust are wet down using fixed and mobile sprinklers prior to loading or handling. – High traffic areas are sealed with bitumen and non-traffic areas of the plant are mulched. – Using covered conveyors and enclosing raw material transfer points. – Mist sprinklers are used on the charcoal loading hopper at the charcoal retorts and transfer points in Kemerton Smelter. – Materials such as silica fume, charcoal fines and charcoal are stored in sheds, silos and bunkers. – Regular preventative maintenance is performed on dust control equipment such as the baghouses and dust collectors. Noise and vibrations – Loading and unloading of trucks is restricted to weekdays during normal business hours (where possible).
Rehabilitate	No rehabilitation required.
Offset	No offsets are required in relation to Social Surroundings as a result of the implementation of the Revised Proposal.

5.7.7 Assessment and significance of residual impacts

There are 2 known Registered Aboriginal Heritage Sites and Other Heritage Places located within the North Kiaka DE. The North Kiaka DF is approximately 44.59 ha in size and has been located to avoid the identified sites (which includes a 0.2 km buffer around each site) thereby avoiding the potential for direct impact.

The location of the abandonment bund does not impact any known Registered Aboriginal Heritage Sites and Other Heritage Places within the Moora Mine DE.

The Revised Proposal will not result in impacts to any State Heritage sites listed under the *Heritage of Western Australia Act 1990*, as there are no sites within proximity of the North Kiaka DE or Moora Mine DE. The closest State Heritage listed sites are located within the Moora town site.

Construction of the abandonment bund at Moora Mine and development of the Project have the potential to impact visual amenity through:

– Removal of native vegetation
– Disturbance of landforms (elevated rocky outcrops)
– Construction of the abandonment bund
– Construction of the Tonkin WRD.

The Project layout has been designed to minimise visual amenity impacts as far as is practicable. Amenity impacts (i.e. noise) along the transport route is anticipated to be negligible, as per the existing operation.

The design of the abandonment bund at Moora Mine has been undertaken to minimise the visual amenity by retaining vegetation and keep the construction close to the current area of impact.

There will be minor ground disturbing activities, including vegetation clearing and earthworks related to constructing the abandonment bund around the Moora Mine pits. This will only have minor impacts to social surroundings during construction but will continue to be managed through existing management measures.

As outlined above, Moora Mine will continue to be utilised for crushing and screening of ore, prior to transport to Kemerton Smelter. There is no plan to change the crushing plant to impact on visual amenity with a minimal impact to traffic movement across Kiaka Road from trucks transporting ore from the Project to Moora Mine for processing.

Kemerton Smelter currently impacts social surroundings during operations as outlined Table 5.53. There is no expected increase in the magnitude of the existing impacts at Kemerton Smelter outside of the extension of time for operations.

5.7.8 Environmental outcome

The Revised Proposal is not anticipated to result in significant impacts to social surroundings given:

- Both Moora Mine and the North Kiaka DE are situated in a rural area which is heavily cleared and zoned for agricultural uses
- The closest DBCA managed land is 250m km south of the Moora Mine DE.
- No European heritage sites occur within 10 km
- The disturbance footprint avoids impact to Aboriginal heritage sites identified within the North Kiaka DE and Moora Mine DE
- Activities are not expected to exceed assigned noise levels.
- Vibrations from mining activities are expected to sufficiently attenuate before reaching nearby sensitive receptors, the closest being located 0.7 km from the proposed North Kiaka pits
- Mitigation measures will be implemented to minimise dust emissions
- The undulating topography and Tonkin WRD design and positioning minimises visual amenity impacts
- The haulage of ore between North Kiaka DE and Moora Mine (while processing ore) occurs almost entirely within tenements held by SIMCOA (i.e. the haulage road passes through M70/1292, crosses Kiaka Road and enters M70/191) with agreements with landowners, with only minor increase in traffic movements along Kiaka Road
- Truck movements between Moora Mine and Kemerton Smelter under the Revised Proposal will be similar to current operations.

Given the measures outlined above it is considered the EPA's objective to protect social surroundings from significant harm is achieved and there are no significant residual impacts on Social Surroundings as a result of the Revised Proposal.

5.7.9 Cumulative impact assessment

An assessment of cumulative impacts is provided in Section 10.

5.8 Key Environmental Factor – Greenhouse Gas Emissions

The implementation of the Revised Proposal will not result in an increase in operational GHG emissions at the Moora Mine or Kemerton Smelter, outside of those associated with the extension of operations during the life of the Project.

The emissions resulting from construction of the Project and the abandonment bund at Moora Mine will be minor compared with the ongoing operational emissions from Kemerton Smelter. Operational emissions at the Project will be comparable to current operational emissions at Moora Mine.

5.8.1 EPA Objective

The EPA's environmental objective of the updated 'Greenhouse Gas Emissions' factor is:

"To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable".

For the purposes of Environmental Impact Assessment (EIA), the EPA's Greenhouse Gas Emissions guideline applies to the six categories of greenhouse gases covered by the United Nations Framework Convention on Climate Change (UNFCCC) Reporting Guidelines on Annual Inventories. These gases are Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O), Sulphur hexafluoride (SF6), hydro fluorocarbons (HFCs) and perfluorocarbons (PFCs) (EPA, 2020c).

5.8.2 Relevant policy and guidance

EPA Policy and guidance

- Instructions on how to prepare an Environmental Review Document (EPA, 2021b)
- Statement of Environmental Principles, Factors and Objectives and Aims of EIA (EPA, 2023b)
- Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2023a).

Other policy and guidance

- *National Greenhouse and Energy Reporting Act 2007* (NGER Act)
- National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 (Cth)
- National Greenhouse and Energy Reporting Regulations 2008
- Greenhouse Gas Emissions Policy for Major Projects (State Emissions Policy) (GoWA, 2019)
- Australian National Greenhouse Account Factors, For individuals and organisations estimating greenhouse gas emissions (DCCEEW, 2022a)
- ISO 14064-1:2018 Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals (ISO, 2018)
- ISO 14064-2:2019 Greenhouse Gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of GHG emission reductions or removal enhancements (ISO, 2019a)
- ISO 14064-3:2019 Greenhouse Gases – Part 3: Specification with guidance for the verification and validation of greenhouse gas statements (ISO, 2019b)
- Western Australian Climate Policy (GoWA, 2020)
- WA Environmental Offsets Policy (GoWA, 2011)
- WA Environmental Offsets Guidelines (GoWA, 2014)
- *Carbon Credits (Carbon Farming Initiative) Act 2011*
- Carbon Credits (Carbon Farming Initiative) Regulations 2011
- Carbon Credits (Carbon Farming Initiative) Rule 2015
- Greenhouse Gas Protocol – Technical Guidance for Calculating Scope 3 Emissions (version 1.0) (World Resources Institute & World Business Council for Sustainable Development, 2013)
- Sustainability Indicators 2021 and Our Sustainability Journey (World Steel Association, 2021).
- Australia's National Greenhouse Accounts, National Inventory by Sector (NIbES, 2020)

– Australia's National Greenhouse Accounts, National Inventory by Economic Sector (DCCEEW, 2020).

5.8.3 Notice Requiring Information for Assessment – GHG

In July 2022, in accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of the Project (EPA, 2022b).

The EPA's initial assessment of the Project (CMS 18097) required that Greenhouse Gas emissions be addressed as a Key Environmental Factor. This included assessment of the impacts from the Revised Proposal (the Project, Moora Mine and Kemerton Smelter), and would need to be supported by a Greenhouse Gas Management Plan (GHGMP).

The GHGMP would be prepared in accordance with the EPA's *Environmental Factor Guideline - Greenhouse Gas Emissions* (EPA, 2023a). Information presented this section is based on GHD's initial assessment of impacts prepared for the s38 referral (GHD, 2022) and the updated assessment of Scope 1, Scope 2 and Scope 3 emissions for the Revised Proposal which was included in the GHGMP prepared by GHD (2023a).

The draft ERD prepared in accordance with s40(2)(a) was amended to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request (EPA, 2023d) as referenced in Table 5.57

Table 5.57 2023 Additional information request – greenhouse gas

Source	Additional Information	Section of the ERD
Greenhouse Gas - DWER	The GHGMP should be updated and submitted for consideration as part of the assessment of this proposal. Guidance and instructions for the GHGMP can be accessed at: *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*.	Section 5.8 of the ERD
	Ensure that emission estimates and scopes align with the EP Act 'proposal' boundaries. Include NGER Act data to provide emission estimates, adapting them to meet EP Act requirements if there are difference between NGER Act and EP Act estimates or scopes.	Section 5.8 of the ERD
	Verify that GWP factors are consistent with the most recent NGER Act and IPCC publications. In the case of any discrepancies, estimates applying both factors should be provided.	Section 5.8 of the ERD
	Confirm the feasibility of an additional charcoal retort at the Kemerton Smelter expected to achieve 90 percent reduction in scope 1 emission and provide clear information regarding the feasibility of the assessment.	Section 5.8 of the ERD
	Provide the confidential benchmarking report for review. The proponent can request confidentiality for the benchmarking information/report if provided separately.	Section 5.8 of the ERD
	Conduct an independent expert review of best practices and design approaches focusing on emission sources, source data, calculation methodologies, emission baseline, review of best practice emissions reduction technologies (from implementation through operation), and relevant considerations and assumptions for GHG emissions throughout the project lifetime.	Section 5.8 of the ERD
	Clarify the mitigation measures for Scope 2 emissions, particularly in the event that SWIS does not meet its decarbonisation trajectory. In addition, provide additional information for addressing Scope 2 emissions uncertainty.	Section 5.8 of the ERD

5.8.4 Receiving environment

5.8.4.1 Global context

The United Nations Framework Convention on Climate Change (UNFCCC) provides the framework for international cooperation to reduce global GHG emissions and limit climate change. The UNFCCC Paris Agreement which came into force on 4 November 2016 aims to limit warming to well below 2°C, preferably 1.5°C, compared to pre-industrial levels (EPA, 2023a).

The 2018 Intergovernmental Panel on Climate Change (IPCC) special report on the impacts of warming shows the catastrophic consequences of allowing the world to heat by more than the 1.5°C. This report indicated that to limit global warming to 1.5°C, global emissions would need to fall by approximately 45% from 2010 levels by 2030, with net zero achieved by 2050 (EPA, 2023a).

The 2021 Glasgow Climate Pact requires nations to revisit and strengthen their current 2030 targets in 2022, acknowledging that current pledges are insufficient (EPA, 2023a).

5.8.4.2 National and Western Australian context

Australia currently contributes around 1.3% of global GHG emissions (EPA, 2023a). In 2020 Australian Scope 1 and Scope 2 greenhouse gas emissions were estimated to be 497.7 Mt CO_2-e, with Scope 1 and Scope 2 emissions 20% lower and 13% lower respectively compared to 2005 (NIbES 2020). Under the UNFCCC Paris Agreement, Australia is currently committed to reducing GHG emissions by 43% below 2005 levels by 2030, which the Australian Government enshrined into legislation in September 2022, along with committing Australia to net zero greenhouse gas emissions by 2050.

Australia's national commitments are supported by two key Western Australian (WA) State policies:

– The 'Greenhouse Gas Emissions Policy for Major Projects' (GoWA, 2019)
– The 'Western Australian Climate Policy' (GoWA, 2020), which aims to achieve net zero greenhouse gas emissions from all sectors of the WA economy by 2050 (EPA, 2020c).

In 2020 WA contributed 81.7 Mt CO_2-e (16%) to national emissions with Scope 1 and Scope 2 emissions 4% lower and 43% higher respectively compared to 2005 due to strong growth in the States mining and exports of fossil fuels (NIbES, 2020).

5.8.4.3 Emission scopes and reduction targets

The EPA (EPA, 2023a) categorises emission 'scopes' based on emission sources as follows:

– Scope 1 GHG emissions are those released to the atmosphere as a direct result of an activity, or a series of activities, at a facility level.
– Scope 2 GHG emissions are those from the consumption of an energy product.
– Scope 3 emissions are indirect GHG emissions other than scope 2 emissions that are generated in the wider community. Scope 3 emissions occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business.

The EPA considers that global warming should be limited to no more than 1.5 degrees Celsius above pre-industrial levels to minimise the risk of environmental harm to WA's environment. To achieve this a deep and substantial reduction in WA's emissions is required this decade, with achievement of net zero emissions no later than 2050 through a straight-line trajectory (at a minimum) from 2030 (EPA, 2023a).

As presented in Section 5.8.5, Scope 1 and Scope 2 GHG emissions generated by the Revised Proposal warrant formal assessment by the EPA given they are reasonably expected to exceed:

– 100,000 t CO_2-e of Scope 1 emissions in any year
– 100,000 t CO_2-e of Scope 2 emissions in any year.

The Project is very similar to the Moora Mine, having the same project elements that will contribute to the creation of operational Scope 1 GHG emissions. These include the combustion of diesel to mine approximately 236,000 tpa of ore to produce 130,000 tpa of quartzite as well as the operation of administration and workshop buildings.

Because of this similarity, the GHG emissions estimate for the Project was derived by applying the Scope 1 GHG emissions intensity of Moora Mine (total Scope 1 GHG emissions per tonne of lump quartzite

produced) to the anticipated production (130,000 tpa) of the Project. The allocation of diesel emissions to either mobile or stationary activities were based on the percentage contribution to each activity recorded in previous years.

Scope 1 GHG emissions associated with the Project operations were estimated at 1,546 tonnes CO2-e annually. It is considered unlikely that the operational Scope 1 GHG emissions will exceed 100,000 tonnes CO2-e annually. This places emissions for the Project well below the EPA's threshold criteria for assessment under Part IV (100,000 tonnes of scope 1 emissions measured in CO2-e) as per the EPA's Environmental Factor Guideline for Greenhouse Gas Emissions (EPA, 2020c). The EPA's request for further information required the assessment of the Project to consider the emissions from the Moora Mine and Kemerton Smelter when undertaking an environmental impact assessment. This will result in the Revised Proposal exceeding the EPA's threshold, thereby requiring assessment.

Scope 2 emissions are associated with the purchase of energy and are only applicable to Kemerton Smelter and are not expected to change with the implementation of the Project as the total throughput of Kemerton Smelter will remain consistent. As noted above, due to the assessment criteria requiring the Revised Proposal to be assessed, the Kemerton Smelter emissions will be considered in the EPA's assessment.

Scope 3 GHG emissions relating to the Project operations were estimated for the following activities:

– Transportation and distribution of product (sold product)
– Purchased goods and services (operational)
– Purchased capital goods
– Fuel and energy related activities (other than those included in Scope 1 estimates)
– Employee commute and business travel
– Waste Generation.

Transportation and distribution GHG emissions were estimated using the distance-based approached in accordance with the Greenhouse Gas Protocol (GHG Protocol) Corporate Value Chain (Scope 3) Accounting and Reporting Standard. The anticipated mass of each product, estimated average transportation distance, and the appropriate emissions factor for the vehicle type (heavy goods vehicle), were used in calculating the emission estimates. The emissions factors applied were sourced from the United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) GHG Conversion Factors (UKDEFRA, 2022) and United States Environmental Protection Agency (USEPA) GHG emission factors (USEPA, 2022).

Estimates relating to purchased goods and services were made using a spend based approach in line with the recommendations of the Greenhouse Gas Protocol (GHG Protocol) Corporate Value Chain (Scope 3) Accounting and Reporting Standard (WRI, 2011). The spend based approach estimates emissions for goods and services by using economic value of goods and services purchased and multiplying it by the relevant emission factors. The GHG Protocol Scope 3 Evaluator (WRI, 2022) was used for calculating the emission estimates.

GHG emissions from fuel and energy related activities were estimated based on anticipated construction fuel consumption and the emissions factor in Table 45 of the National Greenhouse Accounts (NGA) Factors 2021 (DISER, 2021b).

Emissions relating to employee commuting and business travel were estimated using an average travel distance for the anticipated full-time employees required for the operation of the Project, multiplied by the appropriate emissions factor for the vehicle type (light vehicle). The emissions factors applied were sourced from the UK DEFRA GHG Conversion Factors and USEPA GHG emission factors.

Emissions relating to waste generation were estimated using an average waste volume per person for the anticipated full-time employees required for the operation of the Project activities, multiplied by the appropriate emissions factors for municipal solid waste. The emissions factors applied were sourced from the National Greenhouse Accounts (NGA) Factors 2021 (DISER, 2021b).

Since the EPA required the Revised Proposal to be assessed as a significant amendment, the emissions for the Revised Proposal (the Project, Moora Mine and Kemerton Smelter) are required to be considered in both the current and proposed operations calculations.

Table 5.58 presents the characteristics of the Project construction emissions from the GHG assessment (GHD, 2022) and included in the GHGMP (GHD, 2023a). The operational emissions of the Revised Proposal are included in Table 5.59.

Table 5.58 Construction GHG emissions (GHD, 2023a)

Parameter	UoM	The Project (construction)
Scope 1		
Diesel Consumption - Mobile	tCO_2-e	3
Diesel Consumption - Stationary	tCO_2-e	70
Vegetation clearing (Construction)	tCO_2-e	2,095
Total Scope 1		**2,168**
Scope 2		
Purchased electricity	tCO_2-e	0
Scope 3		
Category 1 - Purchased Goods and Services	tCO_2-e	Immaterial
Category 2 - Capital Goods	tCO_2-e	3,652
Category 3 - Fuel and Energy	tCO_2-e	Immaterial
Category 4 - Upstream Transport and Distribution	tCO_2-e	Immaterial
Category 5 - Waste Generated in Operations	tCO_2-e	Immaterial
Category 6 - Business Travel	tCO_2-e	Immaterial
Category 7 - Employee Commuting	tCO_2-e	0.7
Category 10 - Processing of Sold Products	tCO_2-e	Immaterial
Category 12 - End of life treatment of sold products	tCO_2-e	Immaterial
Total Scope 3		**3,653**
Total Scope 1, 2 and 3		**5,821**

Table 5.59 Operational GHG emissions (GHD, 2023a)

Parameter	UoM	The Project	Kemerton Smelter
Scope 1			
Stationary and Mobile energy consumption	tCO_2-e	1,546	123,454
Scope 2			
Purchased electricity	tCO_2-e	0	300,024
Scope 3			
Category 1 - Purchased Goods and Services	tCO_2-e	3,788	0
Category 2 - Capital Goods	tCO_2-e	174	0
Category 3 - Fuel and Energy	tCO_2-e	83	24,059
Category 4 - Upstream Transport and Distribution	tCO_2-e	7,687	89,059
Category 5 - Waste Generated in Operations	tCO_2-e	11	7,055
Category 6 - Business Travel	tCO_2-e	0	12
Category 7 - Employee Commuting	tCO_2-e	18	272
Category 10 - Processing of Sold Products	tCO_2-e	0	559,340
Category 12 - End of life treatment of sold products	tCO_2-e	0	1,882
Total Scope 3		**11,760**	**681,680**
Total Scope 1, 2 and 3		**13,306**	**1,105,157**

5.8.5 Potential environmental impacts

Development of the Revised Proposal will generate GHG emissions through the combustion of hydrocarbons for mobile and stationary purposes and the clearing of native vegetation to construct the Project and the abandonment bund at Moora Mine.

The potential environmental impacts of GHG emissions from the Revised Proposal are described in this section. A quantitative assessment of GHG emissions was undertaken to describe the predicted change in emissions from the Revised Proposal. The assessment predicted a decrease in Scope 1 and 2 operational GHG net emissions from 511,792 tCO_2-e/yr (pre-the Project construction) to 425,024 tCO_2-e/yr (post-the Project construction). This decrease is primarily due to rapidly lowering, and predicted further lowering, of emissions from power generation on the SWIS grid (i.e. Scope 2 emissions). SIMCOA are committed to further reducing Scope 1 and 2 operational GHG emissions to achieve net zero tCO_2-e by 2050.

This GHG assessment considered both direct emissions and indirect emissions resulting from the implementation of the Revised Proposal as outlined in Table 5.60.

Table 5.60 Greenhouse gas emission types (DISER, 2022)

Emission Type	Definition
Direct	Produced from sources within the boundary of an organisation as a result of the organisation's activities (e.g., consumption of fuel in on-site vehicles).
Indirect	Generated in the wider economy as a consequence of the organisation's activities (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation (e.g., consumption of purchased electricity).

Scope 1, Scope 2 and Scope 3 emissions, as defined in Table 5.61, have been considered within this GHG assessment.

Table 5.61 Greenhouse gas emission scopes

Emission Scope	Definition
Scope 1	Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO_2-e) emitted per unit of activity at the point of emission release (i.e., fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). These factors are used to calculate Scope 1 emissions.[a]
Scope 2	Indirect emission factors are used to calculate Scope 2 emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO_2-e per unit of electricity consumed. Scope 2 emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station.[a]
Scope 3	Other indirect GHG emissions.[b]
Note: [a] as per NGA Factors (DISER, 2022) [b] as per GHG Protocol (WRI, 2004)	

Table 5.62 presents the broad activities/operations considered in this assessment, which have the potential to result in GHG emissions for the Revised Proposal.

Table 5.62 Greenhouse gas emission sources

Scope	Revised Proposal Component	Emission Source Description
1	Stationary energy sources	Fuel usage for site based, non-road registered equipment and machinery
	Mobile energy sources	Fuel usage for road registered vehicles and machinery
2	Purchased Electricity	Electricity consumed from the SWIS
3	Category 1 - Purchased Goods and Services	Total spend for purchased goods and services
	Category 2 - Capital Goods	Total spend for capital goods
	Category 3 - Fuel and Energy	Fuel and Energy purchased for operations
	Category 4 - Upstream Transport and Distribution	Transportation of input materials
	Category 5 - Waste Generated in Operations	Waste generated from smelter and mining operations
	Category 6 - Business Travel	Travel and accommodation for business purposes
	Category 7 - Employee Commuting	Employee commute to and from site
	Category 10 - Processing of Sold Products	Emissions related to processing of sold silicon
	Category 12 - End of life treatment of sold products	End of life treatment of silicon products

While there will be some increase in vehicle movements during construction of the Project, the assessment indicates that GHG emissions resulting from Project operations will be comparatively minor compared to those emissions from the continued operation of the Kemerton Smelter. SIMCOA will continue to implement best practice in mining and transport of ore and will mitigate emissions where possible.

5.8.6 Mitigation

As a requirement of the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), SIMCOA estimates its annual GHG emissions, energy consumption and production for the Approved Proposal (Moora Mine and Kemerton Smelter). All GHG emissions are estimated using the emission factors and methodologies as set out under the NGER Commonwealth guidelines and factsheets and NGA Factors (DISER, 2022). SIMCOA has engaged a consultant to conduct an independent expert review of best practice emissions reduction technologies (from implementation through operation), and relevant considerations and assumptions for GHG emissions throughout the project lifetime. The mitigation approach for GHG emissions for the Revised Proposal as detailed in the GHGMP (GHD, 2023a) follows the Avoid, Minimise and Offset hierarchy as shown in Table 5.63. This GHGMP expands upon the current management measures in place for the Approved Proposal (Moora Mine and Kemerton Smelter) under MS 813. Further detail for the mitigation approach can be found in the GHG Management Plan (Appendix U).

Table 5.63 Mitigation hierarchy – Greenhouse gas emissions – Revised Proposal

Mitigation Category	Revised Proposal
Avoid	SIMCOA aim to install an additional charcoal retort at the Kemerton site to replace coal feed to achieve approximately 90% reduction in Scope 1 emissions due to the avoidance of coal usage. SIMCOA currently operates charcoal retorts at the Kemerton site and has a high level of confidence in the technology.
Minimise	**Greenhouse Gas Management Plan** SIMCOA are committed to implementing their GHGMP in accordance with the EPA's 'Revised Environmental Factor Guideline – Greenhouse Gas Emissions' (EPA, 2023a).The GHGMP has reduction targets which enable the Revised Proposal to achieve net zero emissions no later than 2050, and through a straight-line trajectory (at a minimum) from 2030. **Utilisation of SWIS grid** Utilisation of SWIS grid for 100% electricity required to power smelter operations provides confidence that SIMCOA can effectively decarbonise 100% of their Scope 2 operational emissions, in line with WA State targets. The SWIS is currently the only commercially feasible source of power for SIMCOA's operations. SIMCOA has no influence on the decarbonisation progress of the SWIS. SIMCOA is having ongoing discussions with other potential power providers. SIMCOA will continue to investigate options to reduce Scope 2 emissions to zero.
Offset	Where net Scope 1 greenhouse emissions cannot be avoided or reduced through feasible measures, Scope 1 emissions exceeding committed targets will be offset through acquisition of carbon offsets.

5.8.7 Assessment and significance of residual impact

The GHG assessment has been undertaken to examine the potential environmental impacts of the Revised Proposal relating to emissions of GHG. Based on a quantitative assessment of emissions, the annual Scope 1 and Scope 2 GHG emissions resulting from the implementation of the Revised Proposal are estimated to be 511,792 t CO_2-e yr^{-1}, which is anticipated to represent less than 0.5% of the WA 2020 total GHG emissions and up to 0.08% of Australian 2020 total GHG emissions.

Table 5.64 Summary of the significance of the Revised Proposal's emissions compared to WA and National emissions

Emission Scope	Revised Proposed Annual Emissions (tCO2-e)	WA Emissions (2020)	Contribution to State Emissions (%)	Australia Emissions (2020)	Contribution to National Emissions (%)
Scope 2	300,024	25,089,547	1.2%	171,961,297	0.17%
Total Scope 1 and 2 Emissions	425,024	81,703,526	0.5%	497,700,078	0.08%

Development of a GHGMP (Appendix U) and implementation of the associated decarbonisation strategies will result in SIMCOA 's construction and operation of the Project, Moora Mine operations and Kemerton Smelter contributing less to both State and National emissions on an annual basis.

5.8.8 Environmental outcome

Development and operation of the Revised Proposal is not expected to result in significant contribution to GHG emissions. The estimated annual emissions are equivalent to 0.5 % of WA's total annual GHG emissions. SIMCOA are committed to:

– Implementing a GHG MP (Appendix U) which achieves net zero emissions no later than 2050 and through a straight-line trajectory (at a minimum) from expected start of construction, 2023 in accordance with the EPA's '*Environmental Factor Guideline – Greenhouse Gas Emissions*' (EPA, 2023a)
– Reducing greenhouse gas emissions from the operation of the Kemerton Smelter as this contributes the majority of SIMCOA's Scope 1 and 2 emissions
– Surrender of self generated carbon offsets for Scope 1 and Scope 2 greenhouse gas emissions which cannot be avoided or reduced through other feasible measures.

The volume of GHG emissions as a result of this Revised Proposal means that the EPA's objective to reduce net greenhouse gas emissions to minimise the risk of environmental harm associated with climate change, is considered to be achieved.

5.8.9 Cumulative impact assessment

An assessment of cumulative impacts is provided in Section 10.

5.9 Key Environmental Factor – Air Quality

This section discusses the direct impacts to air quality resulting from the construction of the Project and abandonment bund at Moora Mine and operation of the Project and Moora Mine.

There are no changes to processing (total volume of quartz / throughputs/ wastes or processing methods) at Moora Mine or Kemerton Smelter as a result of the Revised Proposal. As such, there is no change in the air quality other than extending the current approved emissions at these two facilities.

5.9.1 EPA objective

The EPA's environmental objective for the factor Air Quality is:

"To maintain air quality and minimise emissions so that environmental values are protected"

The EPA defines air quality as the chemical, physical, biological, and aesthetic characteristics of air, with 'air' referring to all the air above the ground up to and including the stratosphere.

5.9.2 Relevant policy and guidance

EPA Policy and guidance

- *Instructions on how to prepare an Environmental Review Document* (EPA, 2021b)
- *Statement of Environmental Principles, Factors, Objectives and Aims of EIA*(EPA, 2023b)
- *Environmental Factor Guideline: Air Quality* (EPA, 2020b).

Other policy and guidance

- *Draft Guideline: Dust Emissions* (DWER, 2021)
- *Draft Guideline: Air Emissions* (DWER, 2019)
- *National Environment Protection (Ambient Air Quality) Measure* (NEPC, 2021)
- *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999*
- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (Approved Methods)* (NSW EPA, 2022).

5.9.3 Notice Requiring Information for Assessment

In July 2022, in accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of the Project (EPA, 2022b). No specific items were requested in this notice for Air Quality. However, during a meeting with the EPA on the 16 September 2022 it was requested that Air Quality be included as Key Environmental Factor relevant to Kemerton Smelter and Moora Mine (supporting information/ studies will need to be suitable for the EPA to assess significance of impact) and that electronic copies of the Air Quality Modelling to be provided.

The draft ERD prepared in accordance with s40(2)(a) was amended to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request (EPA, 2023d) as referenced in Table 5.65.

Table 5.65 2023 Additional Information – air quality

Source	Additional Information	Section of the ERD
Air Quality - DWER	Provide an updated air quality modelling assessment prepared in accordance with the Air quality modelling guidance notes 2006.	Section 5.9 of the ERD
	Include all dust emission sources from the Moora mine and all gaseous emissions from diesel generators in air quality modelling and assessment.	Section 5.9 of the ERD
	Provide information on dust composition for the Moora Mine operation, noting that crystalline silica dust may be produced due to the nature of the mined mineral.	Section 5.9 of the ERD

Source	Additional Information	Section of the ERD
	Assess the potential cumulative impacts of the proposed operation, including existing emission sources from the Moora mine and background pollution levels, by incorporating these factors into the air quality modelling assessment	Section 5.9 of the ERD
	Assess the potential significance of dust composition for Moora Mine operation and consider additional measures to mitigate potential impacts on sensitive receptors, particularly those immediately adjacent to the DE.	Figure 5-26 in section 5.9 of the ERD
	Consider utilizing other regional data as a proxy or utilize global modelling data such as CAMS global reanalysis (EAC4) if local particle monitoring data is unavailable.	Section 5.9 of the ERD
	Provide additional evidence on the selection of representative year in the updated air quality assessment.	Section 5.9 of the ERD

5.9.4 Receiving Environment

The Moora Mine has been operating for 30 years and there is significant understanding of the baseline air quality of the area from SIMCOA's operations. The following baseline study of the has been used to ascertain the existing receiving environment for the Revised Proposal, based upon the existing operations of Moora Mine and the proposed operations within the North Kiaka DE:

– Air Quality Assessment (GHD, 2020a) (Appendix R).

Kemerton Smelter is located within the Kemerton Strategic Industrial Area (KSIA) 17 kilometres north of Bunbury, in the Shire of Harvey. The Revised Proposal does not propose to change the approved operations of the Smelter under MS 813 or the disturbance footprint.

5.9.4.1 The Project and Moora Mine

GHD (2020a) completed a Air Quality Assessment to ascertain potential environmental impacts to baseline air quality from development and operation of the Project (the full report is provided as Appendix R). The Air Quality Report (GHD, 2020a) was prepared using the Air Quality Guidance Notes (DoE, 2006), as well as the Draft Guideline Dust emissions (DWER, 2021) and the Environmental Factor Guideline: Air Quality (EPA, 2020b). The Air Quality Assessment used available data to provide a baseline for the Revised Proposal and used existing Moora Mine data. The impact assessment also considered other sources of data including information accessed from Copernicus Atmosphere Monitoring Service (CAMS) for the period 2003- June 2022. The CAMS data were considered as part of the air quality assessment (GHD, 2020a) but it was determined that it would not add value. EAC4 CAMS reanalysis particulate matter data is a highly complex dataset that requires downscaling using high-performance computing. The impact assessment considered extracting and using CAMS data to be unnecessarily detailed to be used for the air quality impact assessment for the Moora Mine and the North Kiaka proposed mine (GHD, 2020a). Furthermore, using CAMS data only indicates dust and will not provide monitoring data of existing PM10 or PM2.5 concentrations.

The data was sourced from Section 3.3.1 of the Air Quality Report (2020a) provided in Appendix R. The report states that background air quality monitoring was not available for the Proposal, and the assessment only modelled incremental impacts. Section 3.3 of the Air Quality Report does discuss the license condition of the Moora Mine, with the measurements taken over 15-min periods of TSP only and as a result they cannot be incorporated to 24-hour or annual averages.

The estimated emissions for generators included in the model for both scenarios are shown in Table 5-3 of the Air Quality Report (2020a). The emissions were calculated using a different NPI Emissions Estimate Tables (EET) to those shown in Table 5-1 and Table 5-2 of the Air Quality report so the emissions were provided in separate tables.

5.9.4.2 Climate and meteorology

The climate of the region is characterised by hot, dry summers and cool, wet winters, with the majority of rainfall occurring between the months of May and August (Figure 5.27). The Bureau of Meteorology (BoM) Badgingarra Research Station (site number: 009037) is located approximately 51 km west-north-west of the Project. The mean maximum temperature ranges from 17.6 °C in July to 34.6 °C in January and

February, and the mean minimum temperature ranges from 7.1 °C in August to 17.8 °C in February (BoM, 2023).

The mean morning (9:00 am) wind speed reported during summer for the BoM Badgingarra Research Station (site number: 009037) is 22.5 km/hr, prevailing predominately from the east and south-east. The wind speed is generally consistent in the afternoon (3:00 pm) with a mean wind speed of 27.7 km/hr reported which prevails from a south-west direction. During winter months winds abate to an average of 12.7 km/hr during the morning, prevailing from the north and north-east. Afternoon winds increase to a mean of 21.2 km/hr during winter months and range in direction but are predominately westerly (BoM, 2023).

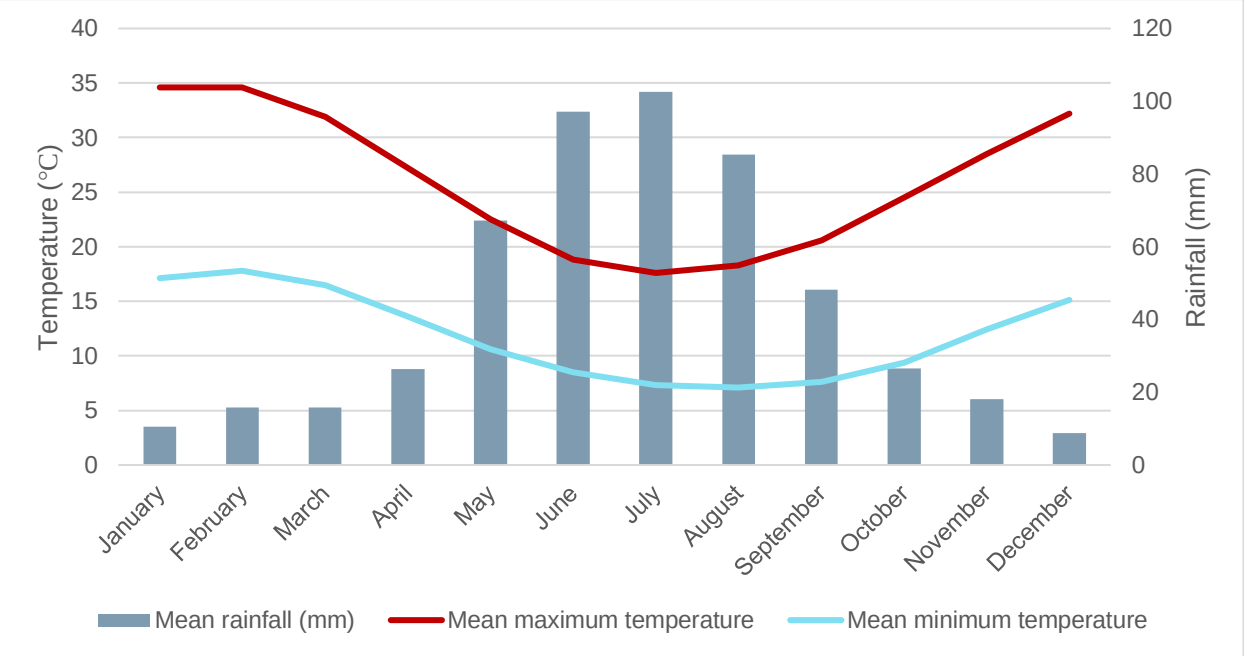


Figure 5.27 Long term temperature and rainfall trends 1962-2022 (BoM Station 009037)

5.9.4.2.1 Ambient air quality

Ore mined from the North Kiaka DE will be pre-processed (crushed and screened) at the Moora Mine for the duration of operations. As part of Licence L6149/1988/8, SIMCOA is required to carry out ambient dust monitoring in accordance with methods described in the licence.

The concentration of ambient TSP from Moora Mine must not exceed 1000 µg/m^3 as the difference between two 15-minute sampling periods, one of which shall be upwind and one downwind from the source. This method intends to measure the contribution to the local airshed of airborne dust associated with operations at Moora Mine (excluding background concentrations). In accordance with this requirement, SIMCOA has carried out ambient dust monitoring at Moora Mine and results are available from 2014 (Table 5.66).

As shown, the average contribution of airborne TSP from existing SIMCOA operations to the local airshed was well below the Licence limit of 1000 µg/m3. Between 2014 and 2022 the largest recorded TSP contribution from SIMCOA operations was 169 µg/m3 in 2017.

As detailed in Table 5.66 dust monitoring since 2014 indicates that the baseline air quality has consistently compliant with the licence condition of 1000 ug/m3. Results from the most recent dust monitoring can be found in Table 5.67 (SIMCOA , 2022b).

Table 5.66 Ambient dust monitoring at Moora Mine for 2014 - 2022 (GHD, 2020a; SIMCOA , 2022b)

Year	Total suspended particulates (TSP; µg/m^3)		
	Average downwind concentration	Average upwind concentration	Moora Contribution to airborne dust
2014	5.0	Below detection limit	5.0
2015	Below detection limit	Below detection limit	Below detection limit
2016	97.3	Below detection limit	97.3

Year	Total suspended particulates (TSP; µg/m^3)		
	Average downwind concentration	Average upwind concentration	Moora Contribution to airborne dust
2017	288.9	120.3	168.6
2018	90.5	Below detection limit	90.5
2019	20	1.3	18.7
2020	132.4	42.4	90
2021	123.5	76.1	47.4
2022	51.65	Below detection limit	51.65

Table 5.67 2022 High volume dust sampling report – Moora Mine (wind – south) (SIMCOA , 2022b)

ID	Date	Flow rate (m^3/hr)	Result (ug/m^3) (Adjusted for STP)	Result-Baseline (ug/m^3)
Moora (South Boundary)	14/12/2022	66.0	BDL	
Moora (North boundary)	14/12/2022	66.0	1.8	1.8
Moora (West - office area)	14/12/2022	66.0	101.5	101.5

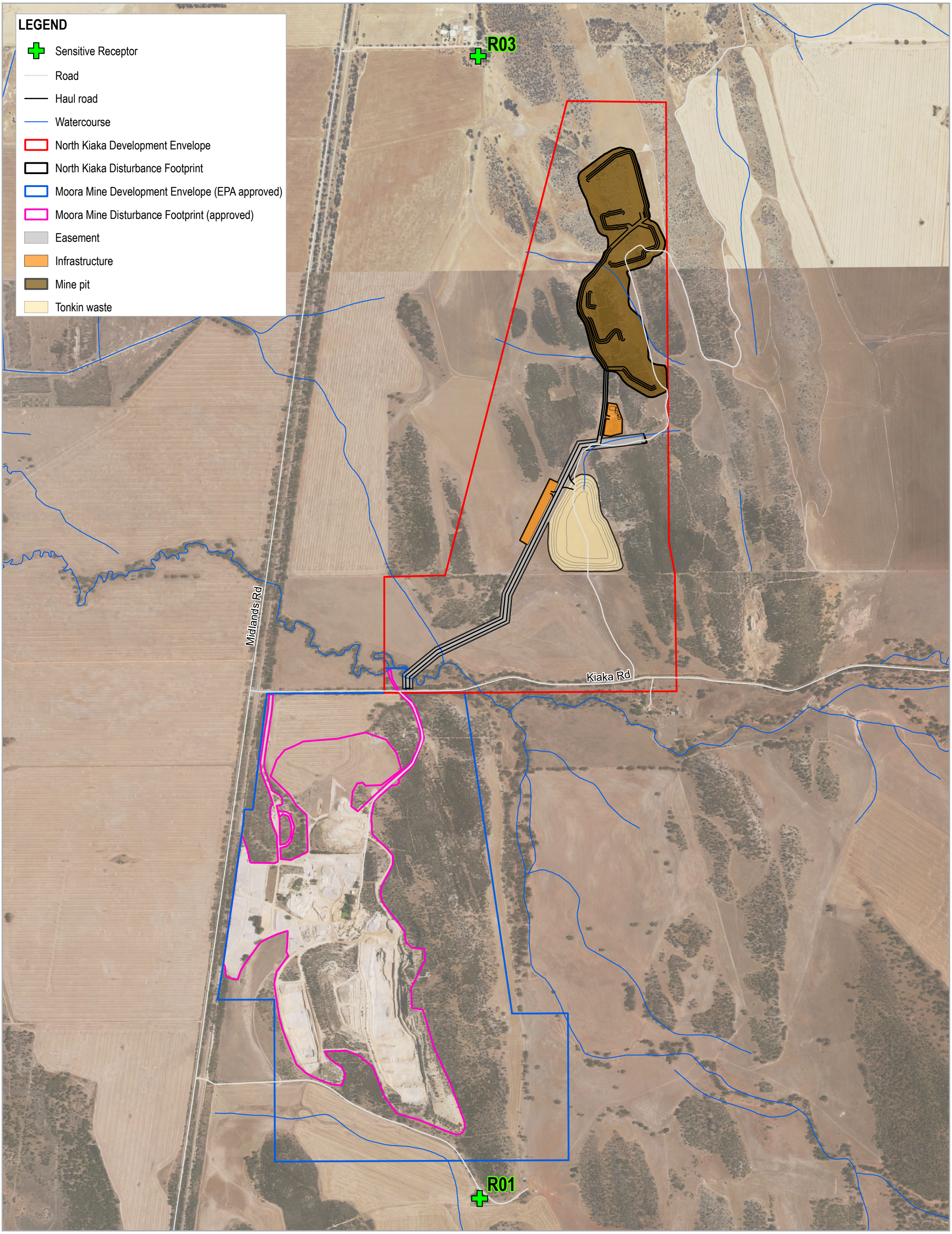
5.9.4.2.2 Sensitive receptors

In WA, the assessment criteria applied at sensitive receptors are defined as “places where people live or regularly spend time, and which are therefore sensitive to emissions from industry with implications for human health or amenity” (DWER, 2021).

Two sensitive receptors surrounding the Moora Mine and North Kiaka DE have been identified for the Revised Proposal, the details of each being provided in Table 5.68 and their locations shown in Figure 5.28.

Table 5.68 Sensitive receptors (GHD, 2020a)

Receptor ID	Location (m UTM)		Distance from Moora Mine boundary	Distance from North Kiaka DE boundary
	Easting	Northing		
R01 (residential dwelling)	407961.28	6622545.91	170 m south	170 m south
R03(residential dwelling)	407954.49	6627597.51	2.8 km north	350 m north-west



Paper Size ISO A3

0 150 300 450 600

Metres

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

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GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Sensitive Receptors
(North Kiaka DE and Moora Mine)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.28

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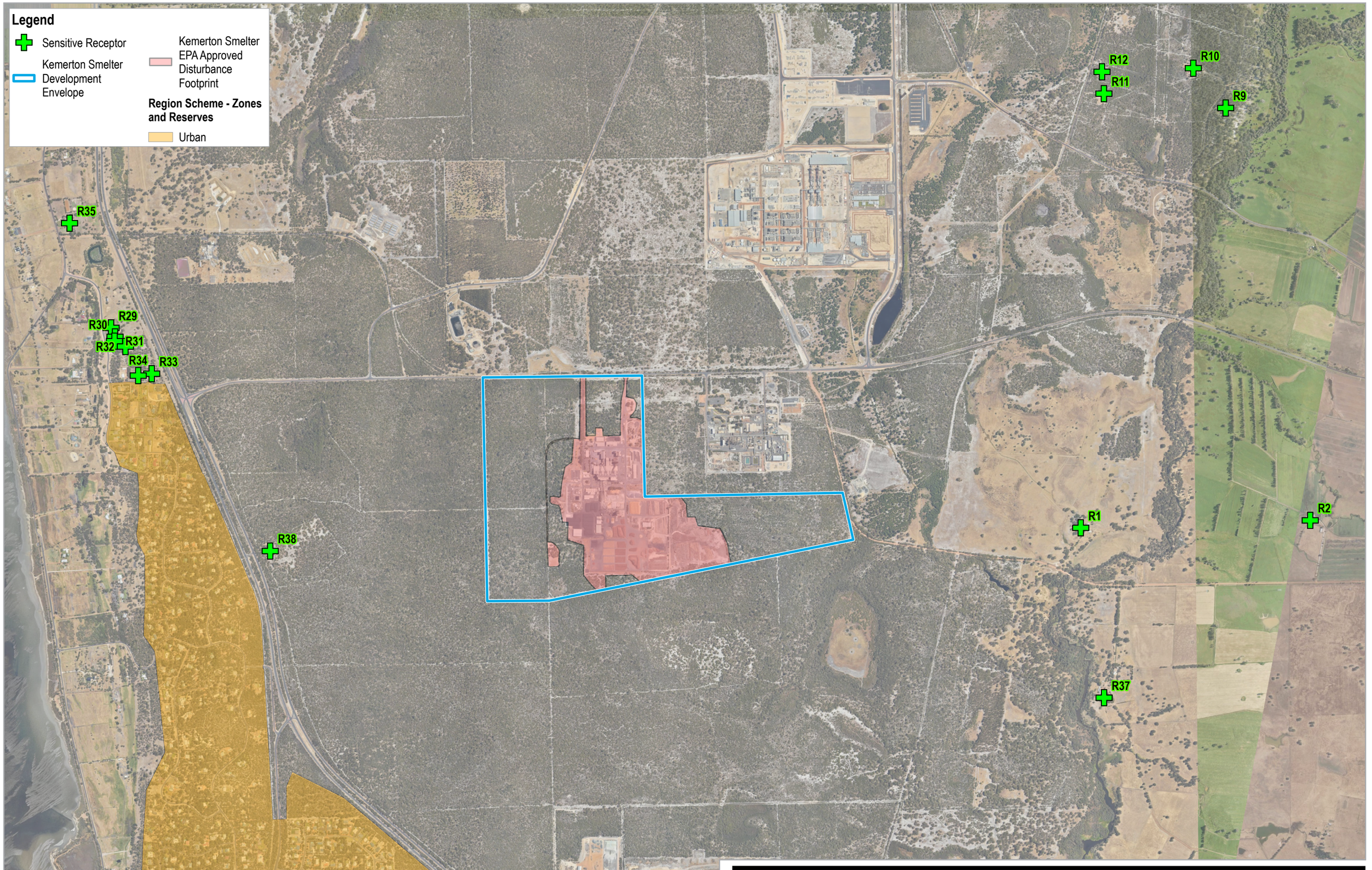

Paper Size ISO A3

0 150 300 450 600

Meters

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

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GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Sensitive Receptors (Kemerton Smelter)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 5.29

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5.9.4.3 Kemerton Smelter

Several sensitive receptors surrounding the Kemerton Smelter have been identified for the Revised Proposal with their locations shown in Figure 5.29.

The stacks at Kemerton Smelter are tested annually to relevant US EPA standards (as per the Kemerton Environmental Licence) by a NATA registered consultant. The most recent report from Emission Assessments Pty Ltd in March 2022 to conduct emission sampling of the charcoal retort stack and Furnace 3 baghouse stack (Report No. 2022-184) (SIMCOA, 2022a). The results from 2022 had two emissions which were significantly higher than previous years, including PM10 and SO_2.

The results of the most recent emission testing, including a comparison to previous four (4) years of results, can be found in Table 5.69 and Table 5.70 (SIMCOA, 2022a).

Table 5.69 Retort Stack (Emission point reference A3) Emission Testing 2019-2022 (SIMCOA, 2022a)

Parameter	Method	UOM#	2019	2020	2021	2022
TSP	USEPA Method 5	mg/m^3	23	9.7	15	81
		g/s	0.46	0.21	0.31	1.7
PM10	USEPA Method 5^	mg/m^3	10	4.6	8.4	45
		g/s	0.2	0.1	0.17	0.94
Carbon Monoxide	USEPA Method 10	mg/m^3	1.2	3.2	<1.3	1.6
		g/s	0.023	0.065	<0.026	0.032
Nitrogen Oxides	USEPA Method 7E	mg/m^3	30	17	38	50
		g/s	0.61	0.35	0.77	1
Sulphur Dioxide	USEPA Method 6C	mg/m^3	3	<2.9	<2.9	9.9
		g/s	0.059	<0.06	<0.06	0.21
Stack velocity	USEPA Method 2	m/s	37.2	42.0	42.0	45.1
Stack flow rate	USEPA Method 2	m^3/s	20.1	21.4	20.4	21.9

Table 5.70 Furnace 3 Baghouse (Emission point reference A2) Emission Testing 2019-2021 (SIMCOA, 2022a)

Parameter	Method	UOM#	2019	2020	2021	2022
TSP	USEPA Method 5	mg/m^3	1.3	1.7	1.5	1.8
		g/s	0.065	0.083	0.074	0.074
PM10	USEPA Method 5^	mg/m^3	0.75	0.94	0.79	0.98
		g/s	0.039	0.044	0.040	0.04
Carbon Monoxide	USEPA Method 10	mg/m^3	51	68.5	36.5	49.5
		g/s	2.6	3.1	1.8	2.1
Nitrogen Oxides	USEPA Method 7E	mg/m^3	61	50	68.5	79
		g/s	3.1	2.3	3.4	3.2
Sulphur Dioxide	USEPA Method 6C	mg/m^3	31	29	22	33
		g/s	1.6	1.3	1.1	1.4
Stack velocity	USEPA Method 2	m/s	13.2	11.9	13	9.9
Stack flow rate	USEPA Method 2	m^3/s	51.1	45.3	50.2	40.8

**All units are referenced to STP dry*

^ SIMCOA's environmental licence was amended in 2020 to allow use of Method 5 for measurement of PM10.

5.9.4.3.1 Dust Monitoring

Dust monitoring of the total suspended particulate (TSP) concentration in the environment was performed in accordance with the conditions of SIMCOA's Environmental Licence. The results for the previous four years are shown in Table 5.71. The 2021 average TSP readings were lower than the previous two years at both monitoring locations (SIMCOA, 2022a).

Table 5.71 SIMCOA Boundary and Leschenault Ambient Dust Monitoring – Annual Averages (2019-2022) (SIMCOA, 2022a)

Year	Average Concentration (ug/m^3)	
	West Boundary (AQ1)	Leschenault Parklands (AQ2)
2019	20	26
2020	71	30
2021	42	28
2022	32.4	20.9

5.9.4.3.2 Ambient Sulphur Dioxide Monitoring

SIMCOA's environmental licence specifies limits for sulphur dioxide at location AQ3 (Leschenault community location) of 572 µg/m3 (1 hour average) and 229 µg/m3 (24-hour average). No limits are specified for location AQ1 (SIMCOA Boundary) (SIMCOA, 2022a).

The average annual mass emission rate of sulphur dioxide in 2022 was approximately 9.69g/s, a slight decrease on previous emissions. A comparison of the average annual mass emission rate of sulphur dioxide for the period 2019-2022 is shown in Table 5.72 (SIMCOA, 2022a).

Table 5.72 Historical Mass Emission Rate of Sulphur Dioxide 2019-2022 (SIMCOA, 2022a)

Average Sulphur Dioxide Mass Emission Rate (g/s)			
2019	2020	2021	2022
11.8	10.1	10.0	9.69

5.9.5 Potential environmental impacts

Air quality may be impacted by a range of pollutants, each of which have different emission sources and effects to air quality. The potential impacts to air quality from implementation of the Revised Proposal are described within this section.

5.9.5.1 Construction

As Kemerton Smelter and Moora Mine are existing site, assessment of potential construction impacts in this document will be limited to construction of the abandonment bund at Moora Mine and implementation of the Project.

Activities that have the potential to have direct impact on air quality during construction include:

– Dust generated from clearing of vegetation clearing, earthworks, vehicle/ equipment operation and construction activities
– Gaseous and particulate emissions from construction vehicles, heavy equipment and temporary power combustion emissions.

Potential indirect impacts to air quality, as a result of construction works, may include:

– Smoke from accidental bushfires
– Impacts on sensitive receptors due to health, nuisance and visual amenity impact of visible dust (addressed in Section 5.7)
– Changes to vegetation communities and native fauna habitat and movement due to smothering of vegetation by dust emissions (addressed in Section 5.2 and Section 5.5)
– Increase in greenhouse gas emissions (addressed in Section 5.8).

5.9.5.2 Operation

5.9.5.2.1 Moora Mine and the Project

Activities that have the potential to have direct impact on air quality during operation, at both Moora Mine and the Project, include:

– The vast majority of airborne particulates from the existing and proposed mine sites, during mining and process activities, are likely to be visible dust with a proportion of fine particulates as PM_{10} and $PM_{2.5}$, from such activities as:
  - Materials handling operations
  - Cleared areas and stockpiles
  - Screening and crushing
  - Vehicle movement, earth movement and transport activities
  - Wind erosion to the local airsheds and sensitive receptors
  - Rehabilitation operations
– Emissions of combustion products associated with earthmoving machinery and mining activities.

Potential indirect impacts as a result of operations, may include:

– Smoke from accidental bushfires
– Impacts on sensitive receptors due to health, nuisance and visual amenity impact of visible dust (addressed in Section 5.7)
– Changes to vegetation communities and native fauna habitat and movement due to smothering of vegetation by dust emissions (addressed in Section 5.2 and Section 5.5)
– Increase in greenhouse gas emissions (addressed in Section 5.8).

5.9.5.2.1.1 Dust generation

The handling, storage and transport of quartz ore/ by-products, at Moora Mine and the Project, has the potential to generate dust emissions causing localised, temporary impacts to air quality. The majority of dust from mining activities consists of coarse particles and particles larger than PM_{10}, generated from activities such as mechanical disturbance of rock and soil materials by drilling, blasting, dozing, excavation, loading and dumping, and trucks on haul roads. A small amount of dust emissions can be associated with crushing and processing. Dust is also generated when wind blows over open ground and different types of stockpiles (GHD, 2020a).

Potentially significant sources of airborne particulates from the site have been assessed as being:

– Dust from drilling and blasting of the proposed pit at the Project
– Dust from excavation and dozing in the proposed pit at the Project
– Dust from crushing and screening of quartz ore at the Moora Mine
– Wind erosion dust from the proposed pit at the Project
– Wind erosion dust from additional stockpiles at the Project (ROM, waste rock landform)
– Wheel-generated dust from the haul road from the Project to processing facilities at the Moora Mine.

High volume air sampling for airborne dust is completed annually at Moora Mine as per SIMCOA's environmental licence conditions (See Table 5.67).

5.9.5.2.1.1.1 Dust assessment criteria – combined impact of existing Moora Mine and the Project

Dust generated from mining activities will mostly consist of coarse particles and particles larger than PM_{10}. The assessment of predicted dust impacts associated with the Project were included in the Air Quality Assessment (GHD, 2020a) and were compared to relevant air quality criteria, including:

– National Environment Protection (Ambient Air Quality) Measure (Air NEPM) (NEPC, 2021)
– Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999 (Kwinana EPP) (GoWA, 1999)
– Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW AMMAAP) (NSW EPA, 2022).

The air dispersion model AERMOD (V9.5.0) was used to predict ground level concentrations of total suspended particulates (TSP), particulate matter with an aerodynamic diameter of 10 microns (PM10) and 2.5 microns (PM2.5), and dust deposition at the identified sensitive receptors for the operating scenario with no dust controls (GHD, 2020a). AERMOD atmospheric dispersion modelling process requires meteorological data that is representative of conditions at the site for input into the software. GHD considered meteorological data from the Badgingarra BOM station for the period 1 January 2014 to 31 December 2018. One year of data covering the period 1 May 2014 to 30 April 2015 was chosen as this year was recent and is generally seen to be representative of average weather of the area. In order to demonstrate a worst case scenario, the current dust mitigation practices of watering roads has been excluded as a control in this modelling assessment, however in reality, watering will occur as required.

SIMCOA does not consider the Moora Mine air emissions to be significant in Part IV of the EP Act and suggests that air emissions should continue to be assessed under the existing Part V licence. TSP monitoring at Moora Mine is presented in Section 3-3 of the Air Quality Assessment (GHD, 2019). Refer to Row 18 of table xx in the assessment which details why TSP has not been added as a background concentration to model the incremental impacts. Gaseous pollutants such as NOx, VOC, SO2, and CO are minor, relative to their respective ambient air quality criteria when compared to dust emissions, which are the key pollutants of concern for the air quality impact assessment.

Cumulative impacts from Moore Mine and North Kiaka Mine operations sourced from the Air Quality Assessment (GHD, 2019) are included in table x of section 10. Refer to Section 5.2 of the Air Quality Assessment (GHD, 2019) which is included in Appendix R for further information.

Table 5.73 demonstrates predicted maximum incremental (no background) 24-hour and annual PM_{10} concentrations comply with the relevant criteria at all sensitive receptors during operations (GHD, 2020a).

Table 5.73 Predicted PM_{10} concentrations at sensitive receptors (GHD, 2020a)

Sensitive receptor	Max. 24-hour PM_{10}	Percent of criteria	Annual PM_{10}	Percent of criteria
	50 µg/m³ (Air NEPM)		25 µg/m³ (Air NEPM)	
R01 (residential dwelling)	12	24%	0.7	3%
R03 (residential dwelling)	8	16%	1.0	4%

Table 5.74 demonstrates predicted maximum incremental (no background) 24-hour and annual $PM_{2.5}$ concentrations comply with the relevant criteria at all sensitive receptors during operations (GHD, 2020a).

Table 5.74 Predicted $PM_{2.5}$ concentrations at sensitive receptors (GHD, 2020a)

Sensitive receptor	Max. 24-hour $PM_{2.5}$	Percent of criteria	Annual $PM_{2.5}$	Percent of criteria
	25 µg/m³ (Air NEPM)		8 µg/m³ (Air NEPM)	
R01 (residential dwelling)	5	20%	0.4	5%
R03 (residential dwelling)	3	13%	0.5	6%

Table 5.75 shows predicted maximum 24-hour TSP concentrations exceed the Kwinana EPP criteria at R02, but comply with the criteria at R01 and R03 during Project operations.

Table 5.75 Predicted TSP concentrations at sensitive receptors (GHD, 2020a)

Sensitive receptor	Max. 24-hour TSP	Percent of criteria	Annual TSP	Percent of criteria
	90 µg/m³ (Kwinana EPP)		90 µg/m³ (NSW AMMAAP)	
R01 (residential dwelling)	84	93%	3	4%
R03 (residential dwelling)	22	24%	2	2%

Table 5.76 demonstrates predicted maximum monthly increase and total monthly dust (TSP) deposition comply with the relevant criteria at all sensitive receptors during operations (GHD, 2020a).

Table 5.76 Predicted dust deposition at sensitive receptors (GHD, 2020a)

Sensitive receptor	Max. monthly increase	Percent of criteria	Max. total monthly deposition	Percent of criteria
	2 µg/m^2/month (NSW AMMAAP)		4 µg/m^2/month (NSW AMMAAP)	
R01 (residential dwelling)	0.04	2%	0.04	1%
R03 (residential dwelling)	0.04	2%	0.04	1%

There are only two sensitive receptors close to the Moora Mine and the North Kiaka proposed mine and neither are immediately adjacent to the disturbance footprints. SIMCOA has long established dust management measures in place at the Moora Mine, as evidenced in the recorded dust emissions at the boundary of the Moora Mine are consistently less than licence conditions. SIMCOA will continue to implement these measures. SIMCOA has purchased the property SE of the Moora Mine and notes that the sensitive receptor (R02) is no longer of concern. Figure 5.28 showing sensitive receptors has been amended to reflect this change. SIMCOA will continue to implement the management measures for dust to mitigate impacts on the remaining sensitive receptors.

SIMCOA notes that Silica dust is a potential risk to human health (employees at the Mine) as described in Section 5.2.3 of the Materials Characterisation report for North Kiaka (GHD, 2023f). SIMCOA monitors dust levels at the Mine boundary (Part V licence requirement) and the results are well within the licence requirement. SIMCOA deploys a separate silica dust monitoring program to meet the requirements of workplace health and safety regulations and maintains workers health and safety measures for employees at the Mine. The closest sensitive receptor is R01, a rural residential dwelling, located approximately 0.17 km south of the Moora Mine boundary (GHD, 2020a).

Operation of Moora Mine and the Project, assuming no dust controls, is predicted to have the following impacts on air quality:

– Predicted maximum incremental (no background) 24-hour and annual PM_{10} concentrations comply with the relevant criteria at all sensitive receptors
– Predicted maximum 24-hour and annual $PM_{2.5}$ concentrations comply with the relevant criteria at all sensitive receptors
– Predicted maximum 24-hour TSP concentrations exceed the Kwinana EPP criteria at R02, but complies with the criteria at R01 and R03. Subsequent highest concentrations complied comfortably with the Kwinana EPP criteria. Predicted annual concentrations of TSP comply with the NSW AMMAAP criteria at all sensitive receptors.
– Predicted maximum monthly increase and total monthly dust deposition concentrations comply with the relevant criteria at all sensitive receptors (GHD, 2020a).

The GHD (2020a) modelling predicts that concentrations of TSP may exceed the Kwinana EPP criteria at R02 when worst case meteorological conditions as well as worst case emissions align (predicted to occur 1 day in the year) assuming no dust control measures are implemented. Concentrations of TPS are predicted to comply at R01 and R03 under the same conditions.

Exceedances are predicted to occur no more than 1 day in the year and when worst case meteorological conditions as well as worst case emissions align, which is less likely to occur in reality. Furthermore, this modelling assessment did not include watering as a dust mitigation measure, however, it is anticipated that watering of the haul road, and watering during drill and blast operations will reduce emissions of dust (GHD, 2020a).

5.9.5.2.1.2 Gaseous emissions

Gaseous emissions are likely to be generated from mobile equipment and generators as by-products of combustion. However, these emissions are only expected to have minor and temporary impact on local air quality. Therefore, it is considered that these gaseous emissions will not impact the identified sensitive receptors.

The extent to which these emissions may impact the surrounding land uses would depend on several site-specific factors including type and number of construction equipment/machinery, soil characteristics,

meteorology and shift times. SIMCOA will minimise the gaseous emissions by ensuring mobile equipment and generators are maintained in accordance with the manufacturer's specifications.

5.9.5.2.1.3 Smoke from accidental bushfires

Indirect impact on air quality may occur from smoke due to bushfire caused accidentally by the operation of vehicles/ plant/ equipment. There are no records of bushfires resulting from Moora Mine operations throughout the past 30 years of operation and the risk of one being generated as a result of the Project is considered to be very low.

Approximately 68.7% of the North Kiaka DE is currently cleared for agricultural purposes and the cleared area will expand as the Project is developed, further reducing the fuel levels. As mining activities will be undertaken in predominately cleared areas, it is unlikely a fire will become established in the operational area and spread to surrounding vegetation. In the unlikely event a fire occurs and spreads beyond the North Kiaka DE, widespread damage and loss of vegetation within the surrounding area could occur.

The process of clearing native vegetation is the activity most likely to potentially cause a bushfire, as it is undertaken in areas where the fuel loads could support a bushfire. Effective management of clearing activities (refer to Section 5.2.6) will prevent the likely incident of a bushfire during clearing activities.

5.9.5.2.2 Kemerton Smelter

Quartzite is transported to Kemerton Smelter from Moora Mine and is then combined with charcoal, manufactured on-site and other reductants in submerged arc electric furnaces to produce high purity silicon. The silicon is then crushed and packaged to customer requirements, before being shipped, primarily through the port of Fremantle. Baghouses are used to filter furnace off-gasses and the resultant fume is then collected, packaged and sold. The filtered off-gases are vented to the atmosphere.

Existing approved activities that have the potential to have direct impact on air quality during operation include:

– Dust emissions through:
  - Handling of raw materials
  - Unsealed surfaces
  - Wood processing and charcoal screening operations.
– Gaseous and particulate emissions from:
  - The submerged arc furnaces, which generate particulates in the form of amorphous silica fume which are entrained in the furnace off-gases (including PM, PM_{10}, NO_X, SO_2 and CO)
  - Furnace off-gases (direct venting)
  - Furnace baghouse in the form of crystalline quartz in silica fume.

Potential indirect impacts, as a result of reduced air quality, may include:

– Smoke from accidental bushfires
– Impacts on sensitive receptors due to health, nuisance and visual amenity impact of visible dust (a Section 5.7)
– Changes to vegetation communities and native fauna habitat and movement due to smothering of vegetation by dust emissions (addressed in Section 5.2 and Section 5.5)
– Increase in greenhouse gas emissions (addressed in Section 5.8).

5.9.5.2.2.1 Dust generation

There is potential for dust emissions during the operation of the Kemerton Smelter through the handling of raw materials, unsealed roads, wood processing and charcoal screening operations. As there is no change proposed to the Kemerton Smelter it is expected that there will be no change to current dust emissions approved in MS813.

5.9.5.2.2.2 Gaseous emissions

Gaseous emissions may be emitted during operations at the Kemerton Smelter during the process of producing char and silicon, including the following:

– Amorphous silica fume in the furnace off-gases if they vent directly to the atmosphere. This may occur if there is a power failure, high-temperature alarm in the baghouse, or failure of the baghouse fans.
– Greenhouse gas emissions (addressed in Section 5.8).

As there is no change proposed to the Kemerton Smelter it is expected that there will be no change to current gaseous emissions.

5.9.6 Mitigation

Mitigation measures for the Revised Proposal are described in this section. Mitigation measures for the Project based upon the successful mitigation measures applied at the Moora Mine. Mitigation measures currently undertaken for Moora Mine are outlined in Table 5.77.

Table 5.77 Mitigation measures – Air Quality – Moora Mine

Mitigation Category	Moora Mine
Avoid	– Employee (and contractor) inductions include dust management and safety (in accordance with licence conditions and other approvals), including reporting requirements – Review of daily weather forecasts to assist with dust management. Commitment to cease handling of materials during adverse wind conditions, or if complaints are received from sensitive receptors. – Maintenance of a complaints register for the site, with all complaints being investigated and corrective actions implemented as appropriate.
Minimise	Implementation of dust and bushfire mitigation in accordance with the standard operating procedures including the following measures: – Dust suppression on haul roads is carried out during mining season by a dedicated water truck. – Application of water via sprays at a minimum rate of 2 L/m^2/hr to excavation areas, haul roads, and ahead of drilling and blasting. – Application of water via sprays as required to stockpiles and other cleared surfaces (i.e. the open mine pit area). – Dust suppression by water sprays at the feeder to the primary crusher and sprays on the secondary crusher. Ore material is washed by large spray bars and the water is recovered and re used. – Regular maintenance inspections and repairs on equipment (crushing and screening plant, conveyor) – Washing quartz during crushing and prior to offloading at the Kemerton Smelter. – Progressive rehabilitation of cleared areas where practicable – Implementation of Hot Works Permit system, and Emergency Management Procedures to minimise the risk of bushfires.
Rehabilitate	Rehabilitation of the Moora Mine will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) (Appendix K) and Moora Mine Closure Plan (GHD, 2023b).
Offset	No offsets are required in relation to Air Quality as a result of the implementation of the Project.

Mitigation measures proposed for the Project are outlined in Table 5.78.

Table 5.78 Mitigation measures – Air Quality – the Project

Mitigation Category	The Project
Avoid	– Employee (and contractor) inductions to include dust management information and instruction (in accordance with licence conditions and other approvals), including reporting requirements – Review of daily weather forecasts to assist with dust management. Commitment to cease handling of materials during adverse wind conditions, or if complaints are received from sensitive receptors. – Maintenance of a complaints register for the site, and a process to investigate all complaints with corrective actions implemented as appropriate.
Minimise	SIMCOA propose to implement dust and bushfire mitigation controls in accordance with the Project Environmental Management Plan (Appendix C) which will include the following measures: – Materials handling and storage facilities will be designed to minimise the loss of materials.

Mitigation Category	The Project
	– Dust suppression on haul roads will be carried out during mining season by a dedicated water truck. – Application of water via sprays at a minimum rate of 2 L/m^2/hr to excavation areas, haul roads, and ahead of drilling and blasting. – Application of water via sprays as required to stockpiles and other cleared surfaces (i.e. the open mine pit area). – Undertake progressive rehabilitation of cleared areas where practicable – Implementation of Hot Works Permit system, and Emergency Management Procedures to minimise the risk of bushfires.
Rehabilitate	Undertake progressive rehabilitation as per Mine Rehabilitation/ Closure Plan to be prepared and approved by DMIRS.
Offset	No offsets are required in relation to Air Quality as a result of the implementation of the Revised Proposal.

Mitigation measures currently undertaken for the existing Kemerton Smelter are outlined in Table 5.79.

Table 5.79 Mitigation measures – Air Quality – Kemerton Smelter

Mitigation Category	Kemerton Smelter
Avoid	Separation distance to the closest sensitive premises (residential) is approximately 1.7 km, with areas of native vegetation providing screening and separation.
Minimise	Existing dust and particulate control measures are undertaken as per the current Environmental Monitoring and Management Plan (EMMP) for the Kemerton Smelter, including: – Wetting down raw material stockpiles using fixed and mobile sprinklers prior to loading or handling raw materials that could generate dust – Bituminising high traffic areas and mulching non-traffic areas of the plant – Washing quartz before offloading at the Kemerton Smelter – Mulching non-traffic areas of the plant – Using covered conveyors – Enclosing raw material transfer points – Mist sprinklers are used on the charcoal loading hopper at the charcoal retorts and transfer points in Kemerton Smelter – Storing materials such as silica fume, charcoal fines and charcoal in sheds, silos and bunkers – Performing regular preventative maintenance on dust control equipment such as the baghouses and dust collectors – Conducting monthly ventilation audits to provide proper operation of dust control equipment. Monitoring of ambient dust levels (TSP) in accordance with the Smelter's environmental licence.
Rehabilitate	No rehabilitation required.
Offset	No offsets are required in relation to Air Quality as a result of the implementation of the Revised Proposal.

5.9.7 Assessment and significant of residual impacts

After implementing the mitigation and management measures described above, the following residual impacts are expected in regard to air quality:

– Very low to negligible risk of workers and sensitive receptors being exposed to dust generated from construction and operational activities.

5.9.8 Environmental outcome

Development and operation of the Revised Proposal is not expected to result in significant impacts to air quality given the following:

– Modelling (without controls) predicts that dust levels will not exceed relevant criteria for PM_{10}, $PM_{2.5}$ and dust deposition, at any of the identified sensitive receptors.

– Modelling predicts that maximum 24-hour TSP concentrations at all sensitive receptors comply with the NSW AMMAAP criteria (even though they exceed the Kwinana EPP criteria at R02).
– SIMCOA are committed to ensuring dust mitigation measures are implemented in accordance with Moora Mine standard operating procedures, Kemerton Smelter EMMP and the Project EMP.
– Air quality at both Moora Mine and Kemerton Smelter demonstrates that emissions are below licence conditions, and the operational emissions at these two sites will not change in response to the Revised Proposal

The Revised Proposal can achieve the EPA's objective to maintain air quality and minimise emissions so that environmental values are protected.

5.9.9 Cumulative impact assessment

An assessment of cumulative impacts is provided in Section 10.

6. Other environmental factors

Environmental factors that are not expected to be impacted by any aspect of this Revised Proposal and have not been assessed include:

– Sea: Benthic Communities and Habitat, Coastal Processes, Maine Environmental Quality and Marine Fauna: The Revised Proposal is terrestrial and will not impact upon the marine environment
– People: Human Health: The Revised Proposal does not include radiation and other potential impacts to human health (such as air and noise) have been considered in other key factors

Although not considered to be a key environmental factor, Subterranean Fauna has been assessed and is discussed below.

6.1 Other Environmental Factor – Subterranean Fauna

There were no specific information requests received from the EPA (EPA, 2022b) for further information related to for subterranean fauna in relation to the Project nor a request for it to be included as a Key Environmental Factor. An additional study conducted by Bennelongia (2023) related to Moora Mine has been completed since the s 38 referral document that provides additional information and it has been included in the table below. The assessment on subterranean fauna is provided in Table 6.1.

Table 6.1 Assessment of impact to other environmental factors

Considerations for EIA	Assessment
Subterranean fauna	
EPA Objective	*To protect subterranean fauna so that biological diversity and ecological integrity are maintained.* In the context of this objective, ecological integrity is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements.
Receiving Environment	SIMCOA have been operating Moora Mine since 1985 primarily above the water table. The pilot study conducted by Knott & Goater (2005) was to ascertain whether stygofauna occur in the area proposed for quartzite mining below the water table in the Moora Quartzite Mine, owned and operated by SIMCOA. The assessment was part of a long-term strategic mining and conservation plan required under Environmental Conditions No 20 and 21 to be developed prior to SIMCOA commencing mining on the Easter Ridge of their lease. In order to assist the progressive development of the plan it was proposed that quartzite could potentially be extracted by mining below the water table, reducing the impact of mining. A pilot stygofauna study was conducted by Knott & Goater (2005) to determine whether stygofauna occurred in the groundwater within the Moora Mine. The survey included 23 bores which were located across the Moora Mine DE, Cairn Hill and most of the North Kiaka DE. A total of 17 bores were sampled and four of these yielded stygofauna. Four taxa were identified including two syncarids, an oligochaete worm and a nematode. The syncarids were, at the time, considered to be of zoological significance (Knott and Goater , 2005). SIMCOA commissioned Invertebrate Solutions (2019b) to undertake a desktop assessment for subterranean fauna (stygofauna and troglofauna), to ascertain the existing receiving environment of the North Kiaka DE and determine the likelihood of subterranean fauna in that area. The desktop report is presented as Appendix N. **Desktop Results** A search of the WA Museum databases records (for Crustaceans and Arachnids/Myriapods), revealed no records of any subterranean fauna species within approximately 25 km of the North Kiaka DE. No subterranean fauna species listed under the BC Act (Wildlife Conservation (Specially Protected Fauna) Notice 2018) or the EPBC Act (Protected Matters Search Tool) (DCCEEW, 2023c) are known to occur within or in proximity to the North Kiaka DE. The North Kiaka DE occurs within two geological units (refer to Table 5.24 and Figure 5.13), the lithologies of which provide habitat of variable suitability for subterranean fauna (Table 6.2).

Considerations for EIA	Assessment

Table 6.2 Subterranean fauna habitat suitability

Unit	Habitat Suitability	
	Stygofauna	Troglofauna
Noondine chert (P_Occ)	Noondine Chert is known to contain palaeokarst and subsurface voids that provide highly suitable habitat for stygofauna. The subterranean fauna survey by Knott and Goater (2005) identified stygal communities within local groundwater approximately 0.1 km north and 0.8 km south of the North Kiaka DE, the southern community occurring within SIMCOA's Existing Mine.	Due to the presence of stygofauna within fractured rock aquifers of the Noondine Chert, there is a moderate likelihood that habitat exists for troglofauna within the overlying unsaturated zone. However, it is unknown if the Noondine Chert formation within the North Kiaka DE has suitable fracturing and interconnected void space in the upper rock strata that could provide habitat for troglofauna.
Alluvium (Qra)	Low suitability for stygofauna and troglofauna due to absence of interconnected voids within fine sediments	

Bennelongia (2023) notes that the depth to the water table, groundwater salinity, and underlying geology are all conducive to stygofaunal habitation. This is particularly true in the western extremity of the Moora Mine area, where alluvium occurs over a palaeovalley. The extensive and continuous nature of this association suggests substantial prospective habitat for stygofauna immediately west of the mine pits and running north-south for many kilometres.

Nevertheless, stygofaunal populations in the Moora Mine area are unlikely to be recharged by these hypothetical populations to the west. The direction of groundwater flow is westerly and transmissivity is high, increasing the difficulty of small animals dispersing east to replenish decreased stocks. Thus, any stygofaunal populations present are probably susceptible to impacts of mining activity, depending on the depth to which suitable habitats occur and the degree of interconnectedness among habitats, both of which remain unknown.

While stygofauna certainly exist in the Moora Mine, sampling effort and rigour have historically been low in the area. Stygofauna in the area will almost certainly be affected by the proposed Moora Mine dewatering, but the extent of the impact depends on the connectivity and distribution of existing populations, which remain unknown.

Further to the desktop assessment SIMCOA engaged Bennelongia (2023) to carry out a baseline survey of subterranean fauna at Moora Mine to provide updated information for DMIRS as part of their assessment of SIMCOA's Mining Proposal for mining below the water table at Moora Mine.

The baseline assessment and survey was undertaken with regard to:

– *Environmental Factor Guideline – Subterranean Fauna* (EPA, 2016a)
– *Technical Guidance – Subterranean Fauna Surveys for environmental impact assessment* (EPA, 2021f).

Baseline Assessment and Survey – Results

Bennelongia (2023) found a moderately significant to rich assemblage of stygofauna in the Moora Mine DE, expanding on the results of the survey conducted by Knott & Goater (2005) .

The survey collected 110 specimens identifiable to at least 15 distinct species-level taxa. Almost all the species identified were stygofaunal, with the exception of the troglofaunal symphylan Hanseniella sp. and some probably amphibious enchytraeids. Four of the species-level identifications constitute new species, i.e. they are not known to have been collected prior to this survey.

The presence of four new species from only seven sampled boreholes indicates that a substantial but unknown stygofauna community exists in the Moora Mine area. It is possible that some or all of the new species detected, or other species as yet undetected, may be endemic to groundwater systems in and around the Moora Mine area, in which case they may be vulnerable to significant impacts as a result of dewatering. This possibility remains speculative given the absence of sampling effort in the region to date and the lack of biological information about species potentially present.

By contrast, several of the species recovered in the field survey are widespread, and thus will not be significantly affected by activities. The Bennelongia (2023) assessment indicated that habitat suitable for stygofauna and possibly troglofauna was present in the

Considerations for EIA	Assessment
	Moora Mine, but that sampling in the region has historically been absent. The subsequent field survey indicates a moderately significant assemblage of stygofauna occurs in the Moora Mine, expanding substantially on the results of the survey conducted by Knott and Goater (2005). Only two of the boreholes sampled in 2023 had also been sampled in 2005; of these, one yielded stygofauna in both collection periods. Connectivity was difficult to assess with a relatively small number of samples but appears to be low to moderate. For a baseline survey to clarify the results of desktop assessment, the number of holes sampled was adequate. However, given that the diversity and abundance of stygofauna were higher than expected, the number of holes sampled is overall not sufficient to provide a clear picture of the stygofauna community in the Moora Mine and by extension, the North Kiaka DE. While the specimens collected constitute a relatively substantial assemblage of stygofauna given the low number of holes sampled, the results for troglofauna are less clear. The absence of definitive troglofauna in the field survey does not necessarily indicate troglofauna do not occur in the area. Rather, the small number of holes sampled (two) restricts conclusions about the diversity and abundance of any troglofauna present. While nine holes were successfully sampled, five could not be accessed and/or were damaged or blocked. Two of these holes occur a sufficient distance from the Moora Mine to provide a reference sample to shed light on the interconnectivity of subterranean populations. For example, the southern bores may have yielded additional species, or may have yielded species already collected elsewhere in the area. Without further sampling, it is not possible to speculate further.
Assessment of Impacts	The impacts of mining below the water table at Moora Mine have previously been approved by the EPA under a s45C (MS 813), and by the DWER (Works Approval W6391/2020/1). The Bennelongia (2023) survey of Moora Mine subterranean fauna has provided updated the knowledge about species, however it hasn't changed the impacts already approved by the EPA previously for mining below the water table, or provide any information contradicting the information provided in the s38 outlining the proposed impacts from the Project. The Project may directly and indirectly impact subterranean fauna habitat through: – Direct destruction of potential subterranean habitat from mining – Contamination of soils and groundwater (from hydrocarbon spills, AMD), reducing the quality of potential subterranean fauna (troglofauna and stygofauna) habitat – Indirect impacts to groundwater recharge from altered surface hydrology from landforms (mine pit, Tonkin WRD) and other raised/sealed surfaces (haul roads), impacting potential stygofauna habitat The Revised Proposal is not expected to have a significant impact on subterranean fauna for the following reasons: – Habitat type (Noondine Chert Formation) stretches 150 km between Moora and Three Springs – The Project will not result in mining below the water table and the impacts from Moora Mine are already understood and approved (MS813) – The Tonkin WRD is located predominately within alluvium units (of low habitat suitability for troglofauna) – The mine pit and Tonkin WRD not expected to significantly alter surface hydrology (and consequently groundwater recharge) following the implementation of appropriate mitigation (refer to Section 5.6.5). Cumulative impacts to subterranean fauna in the local region are expected to be minimal with the only other impacting activity being current approved mining operations at Moora Mine (refer to Section 10).
Predicted Outcome	Significant residual impacts to subterranean fauna from development of the Revised Proposal is not expected based on the following key reasons: – No dewatering or groundwater abstraction is proposed for the Project (which greatly reduces the likelihood of impact to stygofauna). Dewatering and mining below the water table has already been approved at Moora Mine under MS813. – The design of the North Kiaka DE minimised (where possible) impacts to the Noondine Chert Formation which has the potential to provide suitable habitat for subterranean fauna (noting that impacts to the formation cannot be avoided as the formation hosts the quartzite resource that SIMCOA is seeking to mine). The Revised Proposal will impact <1% of the total mapped extent of the Noondine Chert Formation which stretches 150 km stretch between Moora and Three Springs. – SIMCOA has protected two offset sites (the 152.01 ha Cairn Hill offset and 58.34 ha Cairn Hill North offset). Both offset sites comprise Coomberdale TEC which is known

Considerations for EIA	Assessment
	to be geographically restricted to the exposed quartzite ridges of the Noondine Chert Formation. Hence the protection of these two sites for nature conservation, also offers protection to potential subterranean fauna (if present).

7. Offsets

The *WA Environmental Offsets Policy 2011* and the *EPBC Act Environmental Offsets Policy 2012* require that environmental offsets are applied to counterbalance the significant residual environmental impacts of Proposals.

The assessment in Section 5 assessed there are significant residual impacts that may result from the Revised Proposal activities at North Kiaka DE and Moora Mine. The activities include:

– Clearing 17.12 ha of vegetation within the North Kiaka DE comprising:
  - 16.45 ha of vegetation associated with the Coomberdale TEC
  - 15.58 ha of suitable foraging habitat for Threatened fauna Carnaby's Black Cockatoo (*Zanda latirostris*) [species listed Endangered under EPBC Act]
  - Direct loss of 16 Watheroo Wattle (*Acacia aristulata*) threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under the EPBC Act]
  - Direct loss of 15 *Daviesia dielsii* threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under the EPBC Act]
– Clearing of up to 1 ha of native vegetation within the Moora Mine DE including:
  - 0.60 ha of vegetation associated with the Coomberdale TEC.
  - Direct loss of 1 Watheroo Wattle (*Acacia aristulata*) threatened flora individual within habitat that is of Good – Very Good to Degraded condition [species listed Endangered under the EPBC Act]

A description of SIMCOA's existing offset agreements (for Moora Mine and future requirements), the predicted significant residual impacts of the Revised Proposal, the anticipated offset requirement, and the proposed offsets are presented in subsequent sections.

SIMCOA relinquished rights to mine the property at Cairn Hill (152.01 ha) in 2013 as part of their long-term mining strategy. Handover of the area was agreed with the EPA and the Department of Conservation and Land Management (CALM, now DBCA). The offset was offered to counterbalance significant residual impacts from the Moora Mine and to provide suitable and agreed offsets for impacts resulting from future resource extraction identified by SIMCOA (North Kiaka resource). The offset was provided prior to the assessment process under the *EPBC Act* and the *EP Act,* however it is considered that the proposed offset areas in both Cairn Hill and Cairn Hill North Class A Reserve are consistent with guidance provided under both the Acts.

As part of the assessment of the residual impacts for the Revised Proposal, the calculations of the offset areas have been revised to reflect the updated TEC category and the available guidance documents and advice. The offset calculations have been reviewed to confirm the area proposed within the Cairn Hill and Cairn Hill North offset areas are sufficient to meet the requirements of the *EPBC Act Environmental Offsets Policy* (DSEWPAC, 2012) for Black Cockatoos and MNES threatened flora including the Watheroo Wattle and Diels' Daviesia. SIMCOA considers that the areas provided in the A Class Reserve, as outlined in the offset strategy are sufficient to offset the potential residual environmental impacts from the Revised Proposal.

7.1.1 Notice Requiring Information for Assessment – Offsets

In July 2022, the EPA requested additional information to inform the environmental assessment of the Revised Proposal (EPA, 2022b). This notice included additional information on the area required to offset the residual impacts from the clearing of Carnaby's Black Cockatoo foraging habitat at the Project.

The draft ERD prepared in accordance with s40(2)(a) was amended to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request from December 2023 (EPA, 2023d) as referenced in Table 7.1.

Table 7.1 2023 Additional information request – offsets

Source	Additional Information	Section of the ERD
Offsets - DCCEEW	Provide an offset strategy for the following protected matters, listed as Endangered under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): – Carnaby's Black Cockatoo – Watheroo Wattle – Diels' Daviesia Ensure that the proposed offset strategy is consistent with the *EPBC Act Environmental Offsets Policy* (Department of Sustainability Environment, Water, Population, and Communities, 2012). The offset strategy should be prepared in accordance with *Environmental offsets under the EPBC Act - DCCEEW* and *Offsets assessment guide - DCCEEW*.	A discussion of offsets is included in Section 7.2 of the ERD and the offset strategy is included in Appendix T
	Assess the potential need for an additional offset and take necessary steps to meet the requirements of the *EPBC Environmental Offsets Policy* (2012).	Offsets are discussed in Section 7.2 of the ERD with additional detail provided describing the measures taken to satisfy the EPBC offset policy
	Provide evidence that the Cairn Hill site has approval from the legislating party (State government and/or Commonwealth government) to be removed as an offset component of the other project (EPA 1783) it was being used for to establish it as an offset component for the proposed action.	Section 7.2.1 of the ERD discusses this offset and the offset strategy is provided in Appendix T
Offsets – Department of Biodiversity, Conservation and Attractions (DBCA)	That once the proposed offset measures are determined by DWER to meet WA environmental offsets policy and guidelines, DBCA is provided with the opportunity to comment on possible conservation offset measures aimed at mitigating the residual impacts of the proposal on threatened flora, threatened fauna and TECs	No changes required

7.2 SIMCOA's existing offset agreements

Following establishment of the Moora Mine, SIMCOA intended to mine the Cairn Hill area. Detailed vegetation mapping of Cairn Hill in the mid-1990s identified 'special vegetation' (later to be listed as the Coomberdale Threatened Ecological Community (TEC)) which occurred in association with the Coomberdale Chert (now the Noondine Chert) quartz resource.

SIMCOA elected to modify their proposed mine plan to avoid all disturbance to Coomberdale TEC at Cairn Hill. To facilitate this modification, SIMCOA sought to amend the conditions of MS 279 via a Section 46 (s46) application to the EPA. The revised mine plan included a 5.0 ha mine on the Western Ridge within M70/191 (Moora Mine) and the establishment of a conservation strategy to offset environmental impacts from the proposed mine. This included an offset area of 18.0 ha. The conservation strategy was included in a Resource Access and Conservation Package (the Package) (refer to Section 7.2.2). Cairn Hill nature reserve

A key aspect of the Package was the relinquishment of SIMCOA's interest in Cairn Hill, allowing the area to be transferred to a 152.01 ha A-Class reserve for nature conservation. SIMCOA's relinquishment of tenements over Cairn Hill was part of a long-term mining and conservation strategy to provide ongoing access to quartzite resources in the area. Surveys undertaken by SIMCOA determined the Coomberdale TEC vegetation within Cairn Hill to be of exemplary quality because the area contains:

– All three threatened flora species known in the area (*Acacia aristulata*, *Daviesii dielsii* and *Synaphea quartzitica*)
– The only known location of *Synaphea quartzitica* [not found in the Revised Proposal area]
– High species richness
– Very Good to Excellent vegetation condition reflective of the exclusion of grazing from the area (DPaW 2013).

CALM supported SIMCOA's relinquishment of Cairn Hill, regarding the area as the "jewel in the crown" of the Coomberdale TEC.

The EPA supported the s46 application if the recommended environmental conditions outlined in Bulletin 1027 were met (refer to Attachment C of Appendix T). Bulletin 1027 recognised the Package (including the offset of Cairn Hill) was very generous and being offered against both immediate access to the Western Ridge within M70/191 (Moora Mine), as well as future mine locations identified as part of the long-term mining strategy. The EPA supported both the environmental offset approach and the long-term strategic approach to mining, recognising the offset would only occur when SIMCOA was assured of guaranteed long-term access to the quartz resource in the Moora leases.

In July and August 2013, the DPaW (now DBCA) provided support for the Package, noting the positive and cooperative approach to conservation adopted by SIMCOA (refer to Attachment D of Appendix T). DPaW recognised that without the mining at Moora there would be no conservation of the TEC and that: *"SIMCOA's activities provided a unique opportunity to secure the Coomberdale TEC for State conservation".*

Based on the commitments made in the Package, the support of CALM and later DPaW, and the EPA's assessment (Bulletin 1027), the Minister granted approval of the proposed variations in MS575 (refer to Appendix T). Cairn Hill was subsequently transferred to an A-Class nature reserve (R 47694).

The transfer of the offset from freehold to an A-Class nature reserve greatly reduces the risk of the vegetation contained in the TEC being lost in the future and increase confidence that this offset will persist and continue to counterbalance any significant residual impacts of Moora Mine and the Project. The Cairn Hill nature reserve was fenced in 2013 to prevent livestock access from the adjacent farmland, and to minimise weed spread, two factors that could cause a decline in vegetation condition over time. This fencing also prevents vehicle access into the area which also maintains and improves the vegetation quality of the area, particularly the edges which are most impacted without fencing.

The remaining offset (after 18 ha to offset the clearing at Moora Mine) is 134.01 ha.

7.2.1 Cairn Hill North nature reserve

One of the additional commitments of the Package was the addition of Cairn Hill North (58.34 ha) to the existing conservation offset (refer to Attachment A, Figure 2, of Appendix T). Cairn Hill North is located immediately north of Cairn Hill nature reserve on Lot 52 (M70/191 and M70/424) and the vegetation has been surveyed by Trudgen (2012) as part of the surveys of the area, and is in Good to Very Good condition (DPaW 2013). In a letter dated 30 January 2020, DMIRS on behalf of DBCA, proposed a land exchange whereby the land owner (Gardiner) would relinquish the land outlined as Cairn Hill North (refer to Attachment F of Appendix T) and in return would be granted grazing access to Lot 4358 (58 ha) located east of Cairn Hill nature reserve to offset the land being handed over. The land exchange arrangement has been agreed upon by SIMCOA and the landowner. SIMCOA agreed to the arrangement subject to "*a strategic outcome for resource access and conservation of the Coomberdale TEC and associated threatened flora (Declared Rare Flora)*" (letter from SIMCOA to DPaW – 11 June 2014).

Upon approval from the Minister for Mines and Petroleum of the Project, land tenure will be changed under s16(3) of the *Mining Act 1978* to Reserve for the purposes of Conservation of Flora and Fauna. Cairn Hill North has been fenced to prevent livestock access from the adjacent farmland (and to minimise weed spread).

The combination of Cairn Hill nature reserve (152.01 ha) and Cairn Hill North (58.34 ha) provides a total offset package of 210.35 ha, including the 18 ha previously set aside as an offset for the Moora Mine residual impacts.

7.2.2 Resource access and conservation package

The resource and access package described the actions SIMCOA would take to relinquish SIMCOA's interest in Cairn Hill as a mining resource and instead set aside the property as an A-Class nature reserve (R 47694) refer to Attachment A, Figure 2 of Appendix T. The Package was put forward on the basis that:

– Approval was granted to mine the Western Ridge within M70/191 (Moora Mine)
– A commitment was made by the relevant WA regulators to guarantee SIMCOA long-term access to quartzite resources in the region

– An approval was granted by the Minister for Mines and Petroleum (DMP) for SIMCOA to clear Threatened Flora present on the proposed Western Ridge.

SIMCOA also committed to the following as part of the Package:

– Possible additional conservation offsets, with the Cairn Hill North area and other significant areas of vegetation to form stepping stones or linkages with Cairn Hill and other ridges in the area.
– Conducting additional reconnaissance exploration to identify other parts of the Noondine Chert, both within and outside current lease areas, which may contain sufficiently high grade quartzite in areas where the chert-associated vegetation is already absent or degraded.
– Cost sharing (maximum amount to be agreed) with CALM (now DBCA) of regional flora surveys necessary to identify and map other part of the Noondine Chert formation which may contain the same or other significant flora associated with the chert.
– Developing in cooperation with DBCA, a long-term mining strategy based on outcomes of regional geological and flora surveys
– Conducting rehabilitation trials with any Threatened Flora species removed by SIMCOA's mining operations
– Conducting rehabilitation trials with significant flora species (additional to the successful germination and establishment of *Regelia megacephala* (P4) demonstrated at Moora Mine to date).
– Funding (amount to be agreed) for fencing significant areas of vegetation (whether part of reserves or other properties), and possible funding for ongoing management of protected vegetation (to cease at the time mining ceases).

Providing a significant area of vegetation representing the TEC and foraging vegetation within both Cairn Hill and Cairn Hill North properties has already been adding value for the flora and fauna within the Moora Area. Since Cairn Hill was handed over in 2013, the vegetation has been maintained at a similar or better quality due to the management actions undertaken by DBCA.

The Package is considered to offer similar benefits to the TEC and Black Cockatoos (and other MNES) similar to an Advanced Offset under the current EPBC guidance. The offset of 152.01 ha was handed over to DBCA to offset the residual impacts at Moora Mine (of only 18 ha) and future impacts from mining and would be considered to be "*additional to what is already required by an existing duty of care, existing legal or planning instruments"* and has already *"delivered a conservation benefit for the impacted protected matter that would not have occurred in a business-as-usual scenario".* (DCCEEW, 2017).

When considering the importance of this offset package, it is worth noting that the vegetation found at both Cairn Hill and Cairn Hill North is considered to be high quality foraging vegetation for Black Cockatoos. The factsheet *Better offsets for Western Australia's black-cockatoos* (Maron, 2021) notes that while trying to improve medium or lower quality foraging vegetation has significant benefits to foraging vegetation, it can never replicate high quality foraging vegetation. SIMCOA's intention with the Package is to protect the existing vegetation contained within the central portion of the property, while assisting the natural restoration of the large area of Completely Degraded (scattered native vegetation and cleared paddock) totalling 55.27 ha to protect and restore habitat as described in the guidance provided in *Better offsets for Western Australia's black-cockatoos* (Maron, 2021).

7.3 Offsets required for the Revised Proposal

7.3.1 Significant residual impacts of the Revised Proposal

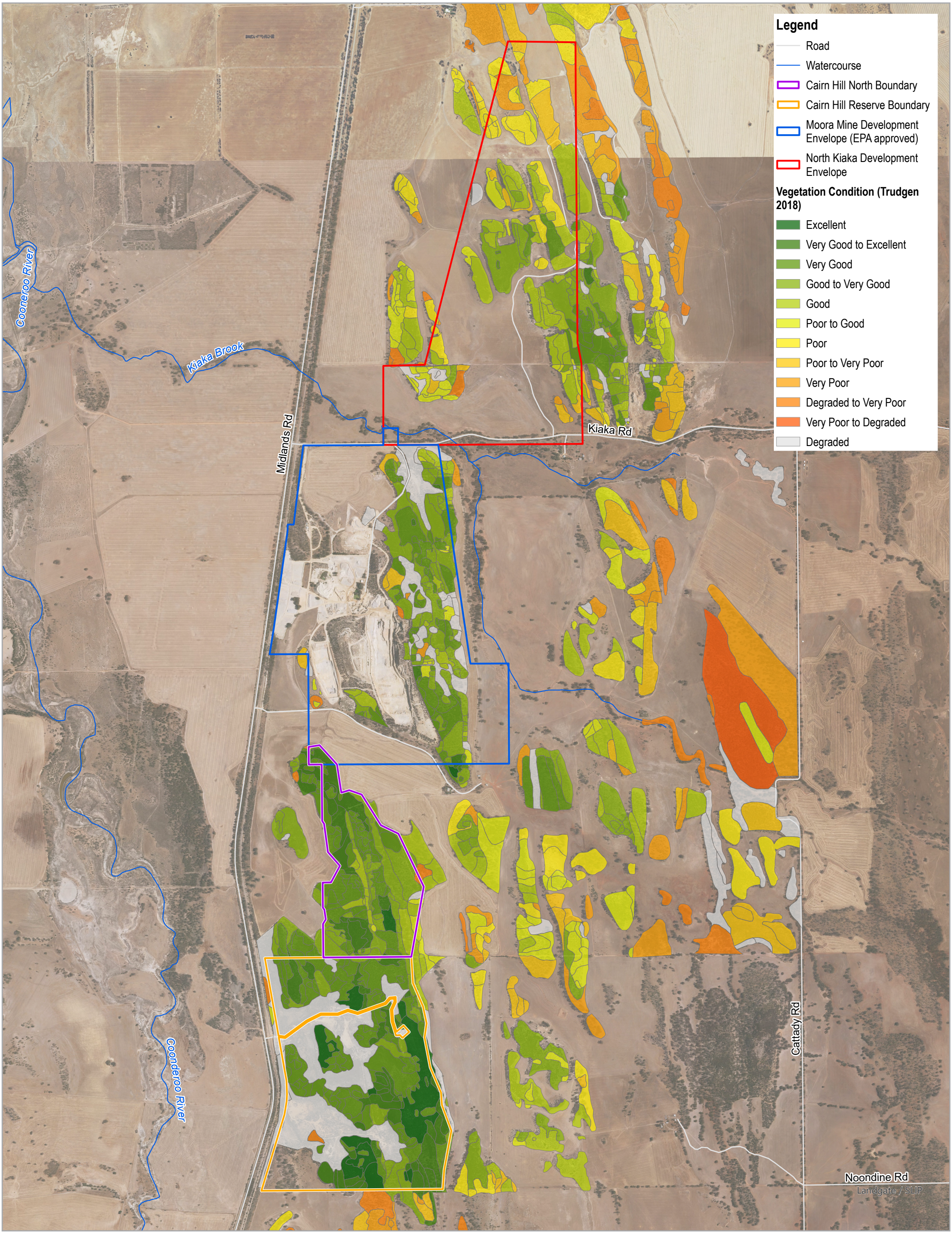
The majority of the native vegetation within the North Kiaka DE and Moora Mine is representative of Coomberdale TEC "Heath dominated by one or more *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomberdale Floristic Region" (Coomberdale TEC). The Coomberdale TEC is geographically restricted to the exposed quartzite ridges of the Noondine Chert formation (previously the Coomberdale Chert formation) (DPaW 2013). Therefore, direct impact to the upper ridgeline of the Noondine Chert formation and the Coomberdale TEC vegetation from development of the Revised Proposal is unavoidable. The vegetation also provides habitat for known threatened flora species and for Carnaby's Black Cockatoo (*Zanda latirostris*). Further information on the residual impacts to vegetation and flora and terrestrial fauna is provided in section 5.2 and 5.5.

The Project will result in the following residual impact:

– Direct loss of 17.12 ha of native vegetation (including 16.45 ha of Coomberdale TEC [combined core and buffer vegetation alliances] in Very Good to Degraded condition)
– Direct loss of 15.58 ha of potential foraging habitat for Carnaby's Black Cockatoo [species listed Endangered under EPBC Act]
– Direct loss of 16 Watheroo Wattle (*Acacia aristulata*) Threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under EPBC Act]
– Direct loss of 15 *Daviesia dielsii* Threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under EPBC Act]

Moora Mine abandonment bund construction will result in the following residual impact that require offsets:

– Clearing of 1ha native veg within Moora Mine DF (amended) (including 0.60 ha Coomberdale TEC of combined core and buffer vegetation alliances in Good – Very Good to Degraded condition)
– Direct loss of 1 Watheroo Wattle (*Acacia aristulata*) threatened flora individual within habitat that is of Good – Very Good to Degraded condition [species listed Endangered under EPBC Act]



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Meters

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

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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Cairn Hill and Cairn Hill North Vegetation Condition

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 7.1

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Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

7.3.2 Proposed offset sites

The Cairn Hill offset was proposed prior to the establishment of the EPBC Act *Offsets Assessment Guide*. However, retrospectively applying the offset assessment guide, the clearing 5 ha along the Western Ridge for the construction of the Moora Mine would have required an offset of approximately 18 ha. Accordingly, the protection of Coomberdale TEC at Cairn Hill nature reserve, has secured an offset that was approximately 134 ha larger than is required to offset significant residual impacts to native vegetation for the development of the Moora Mine.

On the basis of relinquishing a total of 210.35 ha of Cairn Hill and Cairn Hill North as offsets, when only 18 ha was required, SIMCOA consider that offsets currently in place are adequate to counterbalance any significant residual impacts as a result of the Revised Proposal (with respect to flora and vegetation and terrestrial fauna).

The Cairn Hill nature reserve is known to support Coomberdale TEC in Very Good to Excellent condition, with presence of Threatened flora species *Acacia aristulata* and *Daviesii dielsii* (EPBC Act listed) confirmed at the time of the survey (Trudgen, 2018).

At time of establishment of Cairn Hill as a resource access and conservation package there was some risk that Cairn Hill could be cleared as it had been zoned as ‘rural'. Additionally, Cairn Hill North is currently at risk of clearing for the purpose of mining under tenement M70/424. Both offset sites are high quality examples of the Noondine Chert TEC (Table 7.2) and will be protected and managed by DBCA as ‘reserve’ for future offsets by SIMCOA that secures this landform in perpetuity.

Table 7.2 Offset Sites vegetation condition (Trudgen, 2018)

Condition	Cairn Hill Area (ha)	Cairn Hill %	Cairn Hill North Area (ha)	Cairn Hill North %
Pristine	-	-	-	-
Excellent	20.08	13.21	1.04	0.59
Very Good to Excellent	22.66	14.91	12.877	0.44
Very Good	44.39	29.20	20.036	1.78
Good to Very Good	9.40	6.18	17.63	8.64
Good	0.20	0.13	5.04	30.22
Poor to Good	0.01	0.01	0.78	1.35
Poor	-	-	-	-
Poor to Very Poor	-	-		-
Very Poor	-	-	-	-
Degraded to Very Poor	0.49	0.32	0.25	34.34
Degraded	1.03	0.68	0.34	22.07
Completely Degraded	53.75	35.36	0.33	0.55
Total	**152.01**	**100**	**58.34**	**100**

The values associated with the proposed offset sites are summarised in Table 7.3 below.

Table 7.3 Summary of proposed offset sites

Aspects	Proposed offset sites	
	Cairn Hill (Offset Site 1)	Cairn Hill North (Offset Site 2)
Total area of offset site	152.01 ha	58.34 ha
Area of vegetation within offset site considered suitable for offset of Coomberdale TEC and Black Cockatoo foraging habitat	96.74 ha	58.34 ha
Area of Completely Degraded (scattered native vegetation and cleared paddock)	55.27 ha	-
Area previously offset for the Moora Mine	18.00 ha	-

Aspects	Proposed offset sites	
	Cairn Hill (Offset Site 1)	Cairn Hill North (Offset Site 2)
Number of *Acacia aristulata* individuals recorded	9*	48
Number of *Daviesia dielsii* individuals recorded	7*	128
Area of suitable Coomberdale TEC/ Black Cockatoo habitat available for current offset	**78.74 ha**	**58.34 ha**

**If no number of individuals was recorded for each location in the Trudgen (2018) data, assumed number is one (1) individual per population location.*

7.3.3 Offset calculations

Offset calculations were conducted using the EPBC Act *Offsets assessment guide* in accordance with the *EPBC Act Environmental Offsets Policy* and *WA Environmental Offsets Policy 2012* and the EPA's *How to use the Offsets assessment guide*. Calculations were conducted for the Coomberdale TEC at the Project and Moora Mine abandonment bund and Carnaby's Black Cockatoo foraging habitat just for the Project (included in Appendix T). The Moora Mine clearing for the abandonment bund has residual impact to the Coomberdale TEC but not for Black Cockatoo's. The offset calculations have been reviewed to confirm the area contained within the Cairn Hill and Cairn Hill North properties is sufficient to meet the updated TEC category for offsets and guidance from the *WA Environmental Offsets Policy 2012*. As outlined in the Offset Strategy (GHD, 2024) the offsets identified are sufficient to offset the residual environmental impacts from the Revised Proposal for Black Cockatoo's, as determined by the EPBC Act *Offsets assessment guide*.

7.3.3.1 Coomberdale TEC – Quantum of impact and offsets - the Project

Table 7.4 and Table 7.5 provide the values and justification for assessment using the EPBC Offset Calculator for the Project. Based on the EPA guidance, if habitat quality varies across the impact site, separate calculations should be used rather than average quality across the entire site. As the condition of the Coomberdale TEC varies from Degraded to Very Good, two calculations for the Project have been made for the vegetation in Poor / Good to Very Good condition and vegetation in Degraded to Very Poor condition.

As shown in Table 7.4 and Table 7.5, the 16.45 ha of Coomberdale TEC within the Project is 100% offset by Offset Site 1 (Cairn Hill) and Offset Site 2 (Cairn Hill North). A copy of the calculator is provided in Appendix T.

Table 7.4 Impact calculator –Coomberdale TEC – the Project

Attribute	Value	Justification
Area of impact	16.45ha	Trudgen (2012, 2018) confirmed TEC
Quality	6	7.29 ha of Poor/ Good to Very Good condition
	3	9.16 ha of Degraded to Very Poor condition
Quantum of impact	4.37 ha	EPBC calculator – Poor/ Good to Very Good condition in the clearing area.
	2.75 ha	EPBC calculator – Degraded to Very Poor condition in the clearing area.

Table 7.5 Offset calculator – Cairn Hill– Coomberdale TEC

Attribute	Value	Justification
Proposed offset area	42 ha	For residual impact of Poor/ Good to Very Good condition in the clearing area.
	26 ha	For residual impact of Degraded to Very Poor condition in the clearing area.
	68 ha	Total – Cairn Hill and Cairn Hill North changed from Rural/ mining to reserve and fenced.
Start quality	8	Quality score based on Trudgen (2012, 2018).

Attribute	Value	Justification	
Future quality without offset	7	Potential reduced foraging quality overtime due to impacts from rural activities i.e. grazing.	
Future quality with offset	8	With offset and management it is considered reasonable to expect over time the site to remain consistent, conservatively, or improve with management.	
Risk related time horizon	20	As the offset site will be transferred to reserve, the maximum duration of 20 years is applied.	
Time until ecological benefit (years)	0	Offset site rezoned from 'rural' to 'reserve'.	
Risk of loss without offset (%)	20%	There is some risk that the offset sites could be cleared when zoned as 'rural' and/ or for mining (M70/424). The offset package sites will be changed to 'reserve'.	
Risk of loss with offset (%)	5%	As the offset site will be a 'reserve' risk of loss with offset is reduced.	
Confidence in result (%)	95%	As negotiations have already begun with the neighbouring landowner and the proposed vesting agency, there is a very high level of confidence that the offset will be achieved.	
% of impact offset	102.34%	Poor/ Good to Very Good condition.	offset requirement met.
	100.84%	Degraded to Very Poor condition.	

7.3.3.2 Coomberdale TEC – Quantum of impact and offsets - Moora Mine

Table 7.6 and Table 7.7 provide the values and justification for assessment using the Commonwealth Offset Calculator for the Project. Based on the DCCEEW impact calculator, if habitat quality varies across the impact site, separate calculations should be used rather than average quality across the entire site. As the area of the Coomberdale TEC is so small only one calculation for the Moora Mine abandonment bund has been made for all vegetation condition.

As shown in Table 7.6 and Table 7.7, the 1 ha of Coomberdale TEC within the Moora Mine is 100% offset by Offset Site 1 (Cairn Hill) and Offset Site 2 (Cairn Hill North). A copy of the calculator is provided in Appendix T.

Table 7.6 Impact calculator –Coomberdale TEC - Moora Mine

Attribute	Value	Justification
Area of impact	0.60 ha	Trudgen (2012, 2018) 0.6 ha confirmed TEC
Quality	5	0.6 ha of Good – Very Good to Degraded condition
Quantum of impact	0.30 ha	EPBC calculator – Good – Very Good to Degraded condition in the clearing area.

Table 7.7 Offset calculator – Cairn Hill– Coomberdale TEC

Attribute	Value	Justification
Proposed offset area	3 ha	Total – Cairn Hill and Cairn Hill North changed from Rural/ mining to reserve and fenced.
Start quality	8	Quality score based on Trudgen (2012, 2018).
Future quality without offset	7	Potential reduced quality over time due to impacts from rural activities i.e. grazing.
Future quality with offset	8	With offset and management it is considered reasonable to expect over time the site to remain consistent, conservatively, or improve with management.
Risk related time horizon	20	As the offset site will be transferred to reserve, the maximum duration of 20 years is applied.
Time until ecological benefit (years)	0	Offset site rezoned from 'rural' to 'reserve'.

Attribute	Value	Justification	
Risk of loss without offset (%)	20%	There is some risk that the offset sites could be cleared when zoned as ‘rural' and/ or for mining (M70/424). The offset package sites will be changed to ‘reserve’.	
Risk of loss with offset (%)	5%	As the offset site will be ‘reserve’ risk of loss with offset is reduced.	
Confidence in result (%)	95%	As negotiations have already begun with the neighbouring landowner and the proposed vesting agency, there is a very high level of confidence that the offset will be achieved.	
% of impact offset	106.58%	Good – Very Good to Degraded condition.	offset requirement met.

7.3.3.3 Black Cockatoo – Quantum of impact and offsets

Table 7.8 and Table 7.9 provide the values and justification for assessment of the Project impacts using the Commonwealth Offset Calculator. There are no residual impacts for the abandonment bund at Moora Mine due to the limited clearing required. As shown in these tables, the 15.58 ha of high value Black Cockatoo foraging habitat loss within the Project area is offset by 100% by Offset Site 1 (Cairn Hill) and Offset Site 2 (Cairn Hill North). Locations of known breeding and roosting sites are shown in Figure 7.2 and Figure 5.19. A copy of the calculator is provided in Appendix T.

Table 7.8 Impact calculator – Black Cockatoo

Attribute	Value	Justification
Area of impact	15.58 ha	Potential high value Black Cockatoo foraging habitat (GHD, 2021a).
Quality	9	Quality based on DAWE (2022) foraging assessment tool in Referral guideline for 3 WA threatened black cockatoo species (refer to Section 5.5.7.1).
Quantum of impact	14.02 ha	EPBC calculator

Table 7.9 Offset calculator – Cairn Hill – Black Cockatoo

Attribute	Value	Justification
Proposed offset area	126 ha	Cairn Hill change from Rural to reserve and Cairn Hill North change from exploratory mining (M70/424) and both areas fenced.
Start quality	10	Quality of foraging quality is based on DAWE foraging assessment tool *Referral guideline for 3 WA threatened black cockatoo species* (refer to Section 5.5.7.1) (DAWE, 2022). The offset site has conservatively been noted as a 10 as the closest known roosting site is 20km to the SW of the offset site.
Future quality without offset	9	Potential reduced foraging quality over time due to impacts from rural activities including grazing, vehicle access, climate change, spray drift and weed incursion. The foraging quality is shown to decrease as the whole area is impacted by those impacts and would have decreased in quality over the past 10 years if it had not been set aside as a Class A reserve.
Future quality with offset	10	With offset and management, it is considered reasonable to expect over time the site to remain consistent, conservatively, or improve with management. The quality should be maintained in the areas of existing foraging vegetation with increases in quality in the fringes due to fencing of the area, preventing stock access and weed intrusion.
Risk related time horizon	20	As the offset site will be transferred to reserve, the maximum duration of 20 years is applied.
Time until ecological benefit (years)	1	Offset site rezoned from ‘rural’ to ‘reserve’.
Risk of loss without offset (%)	5%	There is some risk that the offset sites could be cleared when zoned as ‘rural' and/ or for mining (M70/424). The offset package sites will be changed to ‘reserve’. This ROL has been calculated using average annual background rates of loss of 0.24% between 2005 and 2014 and Risk of Loss over a 20 year time period for the Moora Local Government Area sourced from Guidance for deriving ‘Risk of Loss’

Attribute	Value	Justification
		estimates when evaluating biodiversity offset proposals under the EPBC Act. The ROL is calculated as 4.48% (rounded to 5%).
Risk of loss with offset (%)	0%	As the offset site will be a 'reserve' risk of loss with offset is reduced.
Confidence in result (%)	85%	Confidence is high as we have recent vegetation quality data sourced from veg surveys, recent fauna surveys, assessment of foraging quality, management measures (data), class A reserve as management. Negotiations completed with the neighbouring landowner and the vesting agency, there is a very high level of confidence that the offset will be achieved.
% of impact offset	100.73%	offset requirement met.

7.3.4 Summary of proposed offsets for the Revised Proposal

The EPBC *Offsets assessment guide* calculation of the impacts from the Revised Proposal separately calculated the impacts of the offsets required based on the vegetation condition of each impact area. The EPBC *Offsets assessment guide* calculation of the impacts from the Project determined an offset of 126 ha (the larger of the two offset calculations (comparisons of the extent of offset for Coomberdale TEC and black cockatoo foraging habitat)) is required to counterbalance significant residual impacts to Carnaby's Black Cockatoo foraging habitat and Coomberdale TEC (including EPBC-Act listed Threatened flora *Acacia aristulata* and *Daviesia dielsii*).

The *Offsets assessment guide* calculation of the impacts from the abandonment bund at Moora Mine requires an offset of 3 ha to counterbalance residual impacts to the Coomberdale TEC.

The Cairn Hill nature reserve (152.01 ha) was relinquished as an offset for Moora Mine (to clear 5 ha along Western Ridge), as well as for future mine locations identified as part of SIMCOA's long-term mining strategy.

As identified in Section 7.3.2, an offset of at least 126 ha is required to sufficiently counterbalance the residual significant impact of clearing 16.45 ha of Coomberdale TEC, including 15.58 ha of Carnaby's Black Cockatoo foraging habitat, for development of the Revised Proposal.

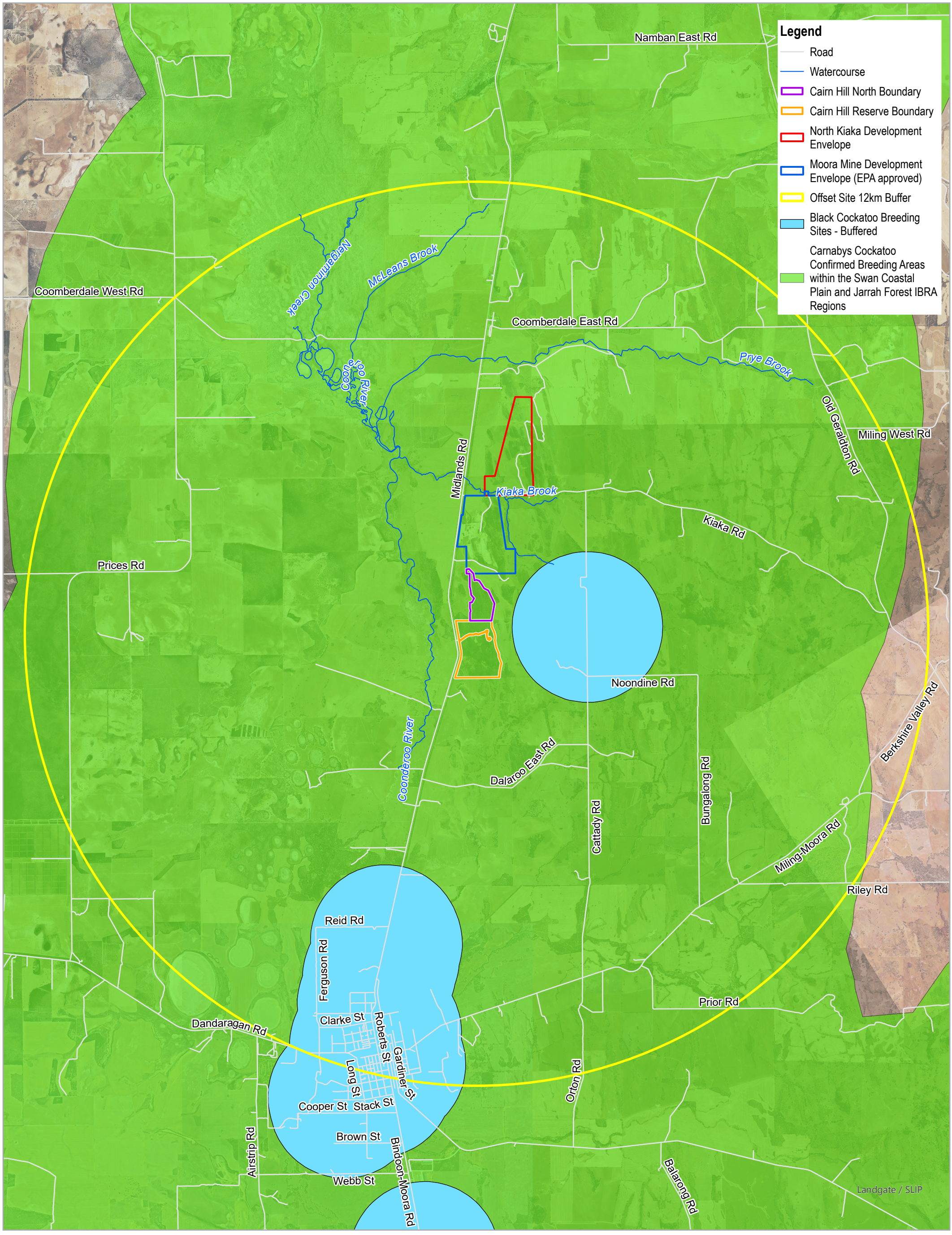
As shown in Table 7.10 vegetation considered as suitable offset for Coomberdale TEC and Black Cockatoo foraging habitat within Cairn Hill and Cairn Hill North meet 100% of the offset requirement for the Revised Proposal (Table 7.10).

Table 7.10 Reconciliation of offset requirements

Location	Clearing area (ha)	Offset required (ha)	Offset area (ha) for TEC and BC
Western Ridge (Moora Mine) – previously offset within Cairn Hill and is now reserved	5	18	-
The Project (North Kiaka DE)	17.12 ha Coomberdale TEC *(including 15.58 ha of foraging habitat for Carnaby's Black Cockatoo)*	126	-
Moora Mine abandonment bund	0.60 ha *of Coomberdale TEC*	3	
Total native vegetation clearing	**23.12**	**147**	
Cairn Hill (Offset Site 1 - 152.01ha)			96.74
Cairn Hill North (Offset Site 2 – 58.34)			50.26
Total Area required to offset impacts from Moora Mine and the North Kiaka DE			147

There remains a Balance of Offset sites for future developments is 63.35 ha which includes 55.27 ha Completely Degraded area (potential rehabilitation area) within Cairn Hill (Offset Site 1).

Therefore, SIMCOA proposes that the excess area from the total offset package should be considered as an offset for any potential future expansions of North Kiaka.



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Grid: GDA 1994 MGA Zone 50

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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Cockatoo Roosting and Breeding Sites - 12km Buffer Cairn Hill and Cairn Hill North (DBCA)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 7.2

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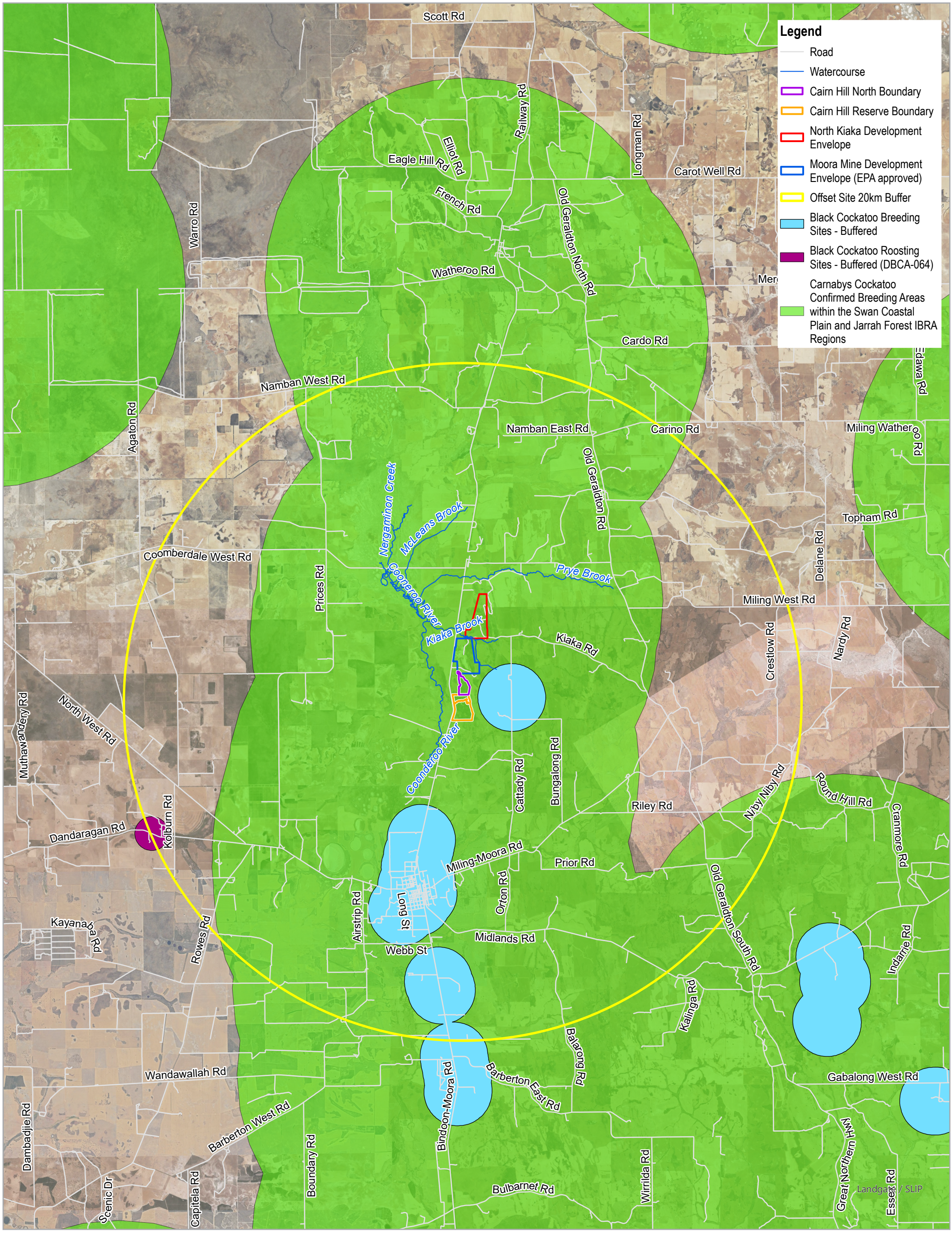

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Map Projection: Transverse Mercator
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Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

Cockatoo Roosting and Breeding Sites - 20km Buffer Cairn Hill and Cairn Hill North (DBCA)

Project No. **12518217**
Revision No. **0**
Date **22/03/2024**

FIGURE 7.3

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Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: rbrown3

8. Matters of National Environmental Significance

8.1 Policy and guidelines

Matters of National Environmental Significance (MNES) are listed and protected under the following legislation and guidelines:

– EPBC Act 1999
– EPBC Regulations 2000
– Significant impact guidelines 1.1 – Matters of National Environmental Significance (DoE, 2013)

Under the EPBC Act, proposals which have the potential to significantly impact MNES, trigger the requirement for referral to the Commonwealth (DCCEEW) for potential assessment as a 'controlled action'. MNES which trigger the requirement for referral include:

– World heritage properties
– National heritage places
– Wetlands of International Importance (listed under the RAMSAR Convention)
– Listed threatened species and ecological communities
– Migratory species protected under international agreements
– Commonwealth marine areas
– The Great Barrier Reef Marine Park
– Nuclear actions (including uranium mines)
– A water resource, in relation to coal seam gas development and large coal mining development.

8.2 Summary of existing environmental values and potential impacts on MNES

This section only relates to MNES for the Project (North Kiaka DE only). The Project was initially referred to DAWE (now DCCEEW) in November 2021 (EPBC 2021/9089) and on 23 December 2021, it was determined to be a controlled action, requiring assessment and approval under the EPBC Act. SIMCOA provided additional information to DCCEEW (previously DAWE) to inform their assessment of the Project (Appendix V). DCCEEW considered the Project as likely to have a significant impact on 'listed threatened species and communities' protected under s18 and s18A of the EPBC Act, specifically:

The impacts:

– Clearing of 15.58 ha of suitable foraging habitat for Threatened fauna Carnaby's Black Cockatoo (*Zanda latirostris*) [species listed Endangered under EPBC Act]
– Clearing of 16 Watheroo Wattle (*Acacia aristulata*) Threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under EPBC Act]
– Clearing of 15 *Daviesia dielsii* Threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under EPBC Act].

Following the submission of the Project in 2021, the EPA confirmed the assessment approach for the Revised Proposal as an ARI with a two (2) week public comment in 2022 (EPA, 2022b) and have communicated this approach to DCCEEW. The assessment approach for the proposed action has been confirmed as being assessed by the EPA through the accredited assessment.

The additional impacts from the continued operation of the Approved Proposal (Moora Mine and Kemerton Smelter) and construction of Moora Mine abandonment bund will not be considered in this MNES assessment as they are not considered to have a significant impact under the EPBC Act. This approach was discussed with DCCEEW (01 June 2023), and advice provided via email (pers comms C. Tindale assessment officer (DCCEEW) 09 June 2023) confirmed that SIMCOA was to continue the submission of an ERD to the WA EPA, which would be assessed under an accredited assessment. DCCEEW would comment on the draft documents upon receival from the WA EPA, as per the standard procedure.

A number of desktop and targeted field surveys have been undertaken to define the impacts of the Project on MNES. Table 8.1 provides an assessment of the Projects impacts on MNES. Simcoa are actively managing the impacts on threatened flora in Moora Mine through mitigation measures (section 5.2.6), rehabilitation (section 5.2.6.1.1) and provision of offsets (section 7) and propose to do so for residual impacts identified at the Project .

Table 8.1 Assessment against MNES

Matter of National Environmental Significance	Presence / potential presence within the North Kiaka DE
World heritage properties	None present
National heritage places	None present
Wetlands of International Importance	None present
Nationally threatened species and ecological communities	**Carnaby's Black Cockatoo (*Zanda latirostris*) [EPBC Act-listed Endangered fauna]** Development of the Project requires clearing of 15.58 ha of suitable foraging habitat for Carnaby's Black Cockatoos. The North Kiaka DE and DF have been designed to avoid the three potential breeding hollows for Carnaby's Black Cockatoos recorded in the area. North Kiaka DE is located within the known breeding and feeding range of Carnaby's Black Cockatoo (DAWE, 2022). North Kiaka DE provides suitable foraging habitat and potential breeding hollows for black cockatoos. Foraging habitat within the DE comprises Mixed shrubland. Evidence of feeding (represented by old and fresh chewed Banksia sessilis, in particular snipped branches on the ground) was recorded across the DE (GHD, 2021a). Black cockatoo habitat is well represented within the region. Approximately 64,742 ha of suitable foraging habitat occurs within a 40 km radius of the North Kiaka DE (based on current mapped extent of Beard (1979) vegetation associations) (GoWA, 2023). The Project is expected to only reduce the total habitat extent within the region (40 km radius) by less than 0.02%. Much of the North Kiaka DE has previously been cleared for agriculture and vegetation condition ranges from Completely Degraded to Very Good. Based on the mobility of the species and the availability of suitable habitat within surrounding area, the Project is unlikely to impose a physical barrier to the movement of black cockatoos between habitats within the North Kiaka DE. Clearing 15.58 ha of suitable foraging habitat will have a cumulative impact, reducing the total extent of foraging habitat which has the potential to impact long-term survival of the species. However, the Project is not expected to disrupt Carnaby's Black Cockatoo breeding and is unlikely to introduce disease that may cause species decline. The residual impact is offset by more than 100% by Cairn Hill and Cairn Hill North see section 7 **Watheroo Wattle (*Acacia aristulata*) [EPBC Act-listed Endangered flora]** Surveys of the Coomberdale TEC including DE, offset area and surrounds undertaken by Trudgen 2012 and 2018, has identified 220 populations of *A. aristulata* (a total of approximately 1,100 individual plants). A total of 16 individual *A. aristulata* plants, occur within the Project DF and will be cleared to develop the mine pit (refer to Figure 5.9). Minor clearing to establish haul roads will not impact known records of *A. aristulata.* The Project is expected to only reduce the total plants within the region (40 km radius) by 1.45%. No clearing is required to establish other mine activities which are located on cleared farmland. SIMCOA will implement dust and weed management measures. This is to manage Project impacts from dust and introduced weed species. The activities do not adversely impact the health and condition of vegetation within or adjacent to North Kiaka DE. The offset sites of both Cairn Hill and Cairn Hill North have this species in abundance as shown in Figure 5.6. ***Daviesia dielsii* [EPBC Act-listed Endangered flora]** Surveys of the Coomberdale TEC including DE, offset area and surrounds undertaken by Trudgen 2012 and 2018, identified 135 populations of *D. dielsii*, of which 16 locations occur within the DE. A total of 15 individual *D. dielsii* plants, occur within the DF and will be cleared to develop the mine pit and haul roads (refer to Figure 5.10). No clearing is required to establish other mine activities which are located on cleared farmland.

Matter of National Environmental Significance	Presence / potential presence within the North Kiaka DE
	SIMCOA will implement dust and weed management measures. This is to manage Project impacts from dust and introduced weed species do not adversely impact the health and condition of vegetation within or adjacent to North Kiaka DE. The offset sites of both Cairn Hill and Cairn Hill North have this species in abundance as shown in Figure 5.6.
Migratory species	The PMST desktop search identified eight EPBC Act listed Migratory fauna (excluding marine migratory) as potentially occurring within the North Kiaka DE, however the fauna survey (GHD, 2021a) did not identify any suitable habitat for these species in the survey area.
Commonwealth marine areas	None present
Great Barrier Reef Marine Park	Not applicable
Nuclear actions (including uranium mining)	Not applicable
A water resource, in relation to coal seam gas development and large coal mining development	Not applicable

9. Holistic Impact Assessment

Each key environmental factor has been considered independently from one another in previous sections of this ERD. However, potential environmental impacts are not isolated, and all ecosystems comprise complex interactions. The EIA process considers the benefits and impacts of the Revised Proposal in a holistic manner. Where the combination of two or more environmental factors has the potential to result in a significant impact, a holistic impact assessment considers the interconnectedness of the assessed environmental factors through the application of the EPA's objectives for environmental factors.

The draft ERD prepared in accordance with s40(2)(a) was amended to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request, where relevant (EPA, 2023).

Table 9.1 2023 Additional information – Holistic Impact Assessment

Source	Additional information	Section of the ERD
Other - DWER	Provide a diagram of the links between environmental factors or values in the holistic impact assessment of the proposal on the environment	Section 9 of the ERD Figure 9.1 shows the links between the different environmental factors. SIMCOA considers that this figure is sufficient to show the links between the environmental factors or values of the Revised Proposal.

The environmental surveys and studies undertaken for the Revised Proposal have considered and assessed potential impacts at both a local and regional scale. The results of these surveys have informed the impact assessment and mitigation measures for each of the EPA Factors the Revised Proposal and are provided in each Section of this ERD. SIMCOA recognises the connections and interactions between the preliminary key environmental factors and has considered these interrelationships when applying the mitigation hierarchy (avoid, minimise, rehabilitate, offset) and developing mitigation and management measures for the Revised Proposal. Where possible, the management and mitigation measures described throughout this ERD have taken a holistic perspective. These management and mitigation measures are considered sufficient to meet the principles contained in the EP Act and the EPA's objectives for each factor.

This section presents the holistic impact assessment for environmental factors relevant to the Revised Proposal against the EP Act Principles. An overview of the key relationships between key and other environmental factors identified for the Revised Proposal is shown in Figure 9.1.

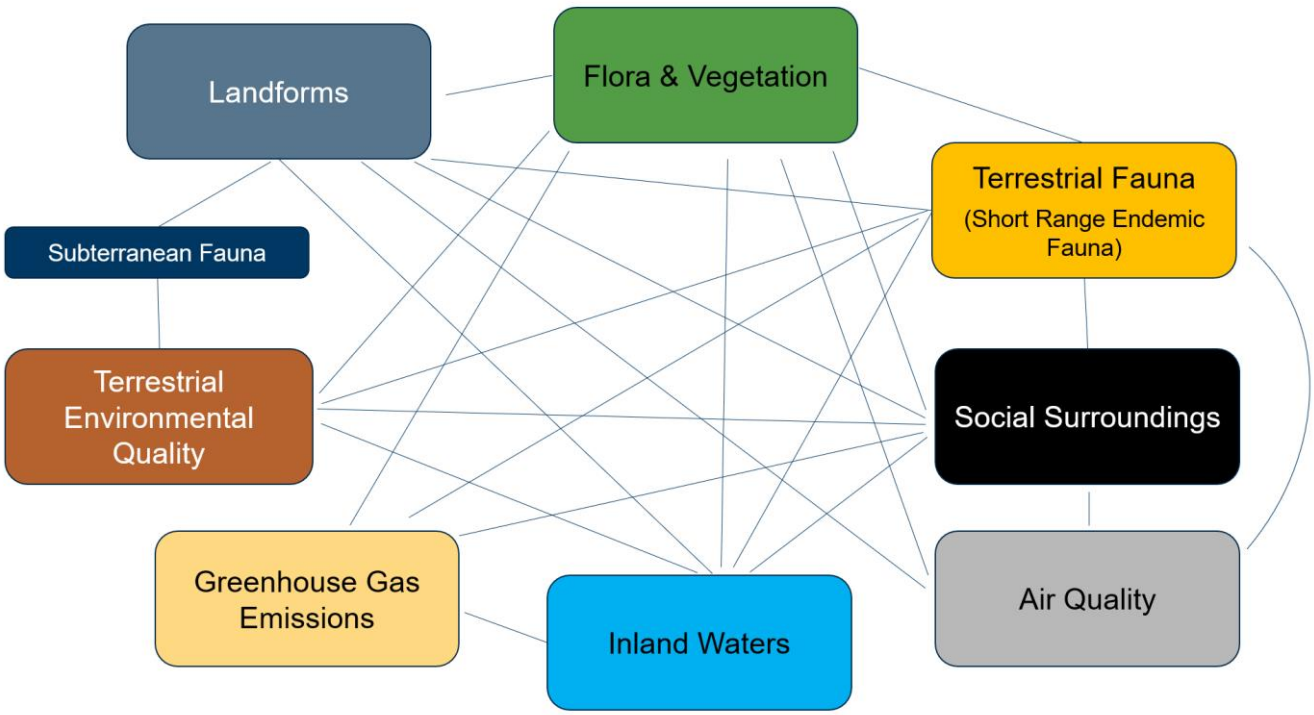


Figure 9.1 Relationships between key and other environmental factors

Potential direct and indirect impacts from the Revised Proposal, including clearing of up to 17.12 ha of native vegetation within the North Kiaka DF (44.59 ha) for the purpose of mining quartzite (Noondine Chert Formation), and the clearing of up to 1ha of native vegetation within the Moora Mine DF (amended) for the construction of the abandonment bund which may affect and interact with key environmental factors are outlined in Table 9.2.

Table 9.2 Connections and interactions between Key Environmental Factors and predicted outcomes

Key Environmental Factor	Interacting Factors	Connection and Interaction Pathway – direct and indirect impacts	Mitigation and Management Measures	Predicted Outcome
Flora and Vegetation	Landforms	Vegetation contributes to the maintenance of landforms and TEQ (e.g. through minimising wind erosion from cleared surfaces, reducing potential for soil salinisation).	Avoid – SIMCOA has preferentially located the North Kiaka DF in an area of comparatively poor-quality vegetation (i.e.in existing cleared/disturbed areas) compared to alternative sites (e.g. Cairn Hill) to avoid Threatened *Acacia aristulata* and *Daviesia dielsii* clearing, where practicable. Minimise – Minimise clearing of native vegetation within the design phase to reduce the footprint and maximise use of existing cleared areas. – Hygiene and weed management procedures to prevent the introduction and/ or spread of weeds and invasive pathogens into fauna habitat. – Implement a Project EMP to manage dust from construction/ operational works and smoke from accidental bushfire. Rehabilitate – Progressive rehabilitation of disturbed areas, where possible within the North Kiaka DE during operation and at the end of mining activities. – Rehabilitation of the Moora Mine will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) (Appendix K). – No rehabilitation required for the Kemerton Smelter. Offset – SIMCOA has confirmed the protection of two offset sites (Cairn Hill Reserve and Cairn Hill North offset sites) to offset residual impacts of the of the North Kiaka DE and including previous offsets for Moora Mine for Flora and Vegetation. – No offsets are required for the Kemerton Smelter in relation to the Flora and Vegetation factor as a result of the implementation of the Revised Proposal.	The North Kiaka DE and Moora Mine have been extensively disturbed as a result of land clearing associated with agriculture. SIMCOA has, as far as practicable, located the disturbance footprint for the Project within previously disturbed areas to minimise the potential impacts to native vegetation. The Project DF is however restricted by the location of the mineral resource. Whilst is considered that the residual impacts of the proposed clearing of native vegetation will not be significant, based on the precautionary principle SIMCOA propose to offset the residual impacts to MNES from the Project. SIMCOA has negotiated a comprehensive offset package, to further research and preserve biological diversity and nature conservation within the area, to compensate the residual impacts of the Project. This offset has culminated in the development of the Class A Cairn Hill Nature Reserve (Offset Site 1) and Cairn Hill North (Offset Site 2), located approximately 1.5 km south of Moora Mine. Taking into account the key mitigation and management measures applicable across the inter-connected factors relevant to Flora and Vegetation and given the existing operational context of the continued use areas, the holistic impacts associated with the Revised Proposal are demonstrated to be manageable. SIMCOA considers that the impacts to the health of other environmental factors including the values associated with landforms, terrestrial environmental quality, terrestrial fauna, inland waters, social surroundings, GHG and air quality, are unlikely to be inconsistent with the EPA's environmental factor objectives.
	Terrestrial Environmental Quality (TEQ)			
	Terrestrial Fauna	Vegetation provides habitat and ecological linkages for terrestrial/ short-range endemic fauna. Clearing of native flora and vegetation directly impacts on habitat. Introduction of weeds and pathogens may change vegetation community composition and indirectly impact on fauna habitat.		
	Inland Waters	Contribution to maintenance of inland water quality and surface water runoff (e.g. through minimising erosion, reducing potential for soil salinisation, sediment transport to nearby creek lines).		
	Social Surroundings	Visual amenity impacts from clearing (due to elevation) noting that the surrounding landscape is largely cleared for agriculture. Flora and vegetation may be culturally important i.e. Moodjar trees.		
	Greenhouse Gas (GHG) Emissions	Vegetation absorbs CO_2 and sequesters carbon.		
	Air Quality	Vegetation provides cover stabilising soils and preventing dust lift. Indirect impact to flora and vegetation may arise due to smoke from accidental bushfire.		

Key Environmental Factor	Interacting Factors	Connection and Interaction Pathway – direct and indirect impacts	Mitigation and Management Measures	Predicted Outcome
Landforms	Flora and Vegetation Terrestrial Fauna and Subterranean Fauna	Vegetation contributes to the maintenance of landforms (e.g. through minimising wind erosion from cleared surfaces, reducing potential for soil salinisation). Changes in landform such as removal of the Noondine Chert Formation may impact on the vegetation composition of flora species that may regenerate on site thereby altering vegetation communities and fauna habitat. The Noondine Chert formation is known to contain palaeokarst and subsurface voids that are likely to provide suitable habitat for subterranean fauna, though no subterranean fauna communities are known to occur within North Kiaka DE.	Avoid – SIMCOA has preferentially located the North Kiaka DE in an area of comparatively poor-quality vegetation (i.e.in existing cleared/disturbed areas) compared to alternative sites (e.g. Cairn Hill) to avoid Threatened *Acacia aristulata* and *Daviesia dielsii* unnecessary clearing, where practicable. – The North Kiaka DE has also been designed to avoid impact to the Noondine Chert landform and the environmental values which this landform supports, where practicable. Minimise – SIMCOA has modified the disturbance footprint to minimise impact to the upper slopes of Noondine Chert ridgelines (highest elevation and most visible in the landscape), by locating the Tonkin WRD and other mine elements (i.e. ROM, workshop and administration area) in the adjacent valleys and lower slopes. – As far as practicable, the DE has been located within cleared areas to minimise impacts to fauna habitats (i.e. Carnaby's Black Cockatoo foraging habitat) and flora/vegetation (i.e. Coomberdale TEC and threatened flora species). – Implement EMP to manage environmental impacts from construction and operational works. Rehabilitate – No rehabilitation proposed for the Landforms factor. Offset No offsets are required in relation to the Landforms factor as a result of the implementation of the Revised Proposal.	Given the limited disturbance to Noondine Chert (<1% of total mapped extent), the representation of this landform and associated values in the surrounding region, limited past disturbance to this landform from agriculture, and predicted limited impacts to this landform in the future; development of the North Kiaka DE is not expected to have a significant residual impact on this landform. SIMCOA considers that the impacts to the health of other environmental factors including the values associated with the Flora and Vegetation, Terrestrial Fauna, Subterranean Fauna, Inland Waters, Social Surroundings and Air Quality factors, are unlikely to be inconsistent with the EPA's environmental factor objectives.
	Inland Waters	Soil degradation and impacts to groundwater quality may result due to the mining process and potential formation of AMD.		
	Social Surroundings	Visual amenity impacts from the landform (noting that the Tonkin WRD has been positioned within a valley to minimise visual amenity impacts).		
	Air Quality	Dust emissions from drill and blast, ore handling and transport, crushing and screening etc.		
Terrestrial Environmental Quality (TEQ)	Flora and Vegetation	Vegetation contributes to the maintenance of TEQ (e.g. through minimising wind erosion from cleared surfaces, reducing potential for soil salinisation).	Avoid – Avoid spills, release of environmentally hazardous materials and solid/ liquid waste discharge through appropriate design and construction of containment	Progressive mining and clearing activities associated with the Revised Proposal will result in the temporary loss of soil structure and increase in potential erosion/ sedimentation potential.

Key Environmental Factor	Interacting Factors	Connection and Interaction Pathway – direct and indirect impacts	Mitigation and Management Measures	Predicted Outcome
	Terrestrial Fauna and Subterranean Fauna	Soil health and structure influences rehabilitation outcomes. Spills through inappropriate storage and handling of chemicals and hydrocarbons can have a direct impact on flora, fauna (terrestrial and subterranean) and habitat.	facilities as per Australian Standards and relevant guidelines. Minimise – Minimise and manage cleared areas/ stockpiles to control stormwater runoff/ sedimentation and possible ASS. – Minimise spills, release of environmentally hazardous materials and solid/ liquid waste discharge through appropriate use and maintenance of containment facilities as per Australian Standards and relevant guidelines. Rehabilitate – Progressive rehabilitation of disturbed areas, where possible within the North Kiaka DE during operation and at the end of mining activities. – Rehabilitation of the Moora Mine will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) (Appendix K). – No rehabilitation required for the Kemerton Smelter. Offset – No offsets are required in relation to TEQ factor as a result of the implementation of the Revised Proposal.	SIMCOA will limit disturbance where practical and rehabilitate where possible. Whilst mining results in impacts to visual amenity it also provides other social benefits through employment and social programmes supported by the business. Once rehabilitation is completed impacts to Flora and Vegetation, Terrestrial Fauna, Inland Waters, and Social Surroundings will be revegetated and are expected to support native flora and fauna as per mine closure and rehabilitation requirements. On-site management measures associated with ASS, sedimentation and erosion during construction of river crossings will minimise impacts water quality, amenity and cultural heritage values. Stockpiling is a visual component of mining and is not considered a permanent, noticeable change to the existing visual amenity in the area, taking into account the pre-existing land use context of agriculture and existing operations. SIMCOA has assessed the impacts of the Project on TEQ and in relation to the other factors of flora and vegetation, inland waters and social surroundings. SIMCOA considers that with the application of mitigation measures to reduce clearing, erosion and through the implementation of existing management practices, the Project would not unreasonably impact terrestrial environmental quality or the interrelated factors of Flora and Vegetation, Terrestrial Fauna, Subterranean Fauna, Inland Waters and Social Surroundings or be inconsistent with the EPA's factor objective.
	Inland Waters	Sedimentation and erosion can impact water quality of inland waters.		
	Social Surroundings	Stockpiling can directly impact amenity values, noting that the surrounding landscape is largely cleared for agriculture.		

Key Environmental Factor	Interacting Factors	Connection and Interaction Pathway – direct and indirect impacts	Mitigation and Management Measures	Predicted Outcome
Terrestrial Fauna (including SREs)	Flora and Vegetation	Vegetation provides habitat and ecological linkages for terrestrial/ short-range endemic fauna. Clearing of native flora and vegetation directly impacts on habitat. Introduction of weeds and pathogens may change vegetation community composition and indirectly impact on fauna habitat. Fauna disperse and pollinate flora and support the continuation of vegetation communities.	Avoid – SIMCOA has preferentially located the North Kiaka DF in an area of comparatively poor-quality vegetation (i.e.in existing cleared/disturbed areas) compared to alternative sites (e.g. Cairn Hill) to avoid unnecessary clearing Threatened fauna habitat, where practicable. Minimise – Minimise clearing of fauna habitat within the design phase to reduce the footprint, and maximise use of existing cleared areas. – Hygiene and weed management procedures to prevent the introduction and/ or spread of weeds and invasive pathogens into fauna habitat. – Implement EMP to manage dust from construction/ operational works and smoke from accidental bushfire. Rehabilitate – Progressive rehabilitation of disturbed areas, where possible within the North Kiaka DE during operation and at the end of mining activities. – Rehabilitation of the Moora Mine will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) (Appendix K). – No rehabilitation required for the Kemerton Smelter. Offset – SIMCOA has confirmed the protection of two offset sites (Cairn Hill Reserve and Cairn Hill North offset sites) to offset residual impacts of development of the North Kiaka DE and including previous offsets for the Moora Mine for Terrestrial Fauna. – No offsets are required for the Kemerton Smelter in relation to the Terrestrial Fauna factor as a result of the implementation of the Revised Proposal.	The Revised Proposal has the potential to impact on terrestrial fauna and change the relationship between flora and vegetation and reduce people's social surroundings and interactions with nature through the clearing of native vegetation and habitat which supports several conservation significant species. All fauna habitat types will continue to be represented within the DE and broader region. Offsets are proposed for significant residual impacts to the MNES. Implementation of offsets will provide net benefits for terrestrial fauna, protection of flora and vegetation that comprises their habitat, and broader land connectivity of land parcels of ecological, social and cultural value. By applying the proposed mitigation, management, the recommended counterbalancing of impacts on terrestrial fauna through offsets, and the consideration of the precautionary principle through avoidance of significant habitat where possible, SIMCOA considers that the impacts to the health of other environmental factors including the values associated with Flora and Vegetation, Social Surroundings and Air Quality factors are likely to be consistent with the EPA's environmental factor objectives.
	TEQ	Spills through inappropriate storage and handling of chemicals and hydrocarbons can have a direct impact on TEQ and fauna habitat values.		
	Inland Waters	Construction and mining operations have the potential to generate erosion and sedimentation which can impact on fauna habitat values.		
	Social Surroundings	Contribution to social wellbeing in highly disturbed environments, such as agriculture and mining areas. Scientifically and culturally important, particularly with relevance to conservation significant terrestrial fauna.		
	Air Quality	Construction and mining operations have the potential to generate dust and smoke (accidental bushfire) which can impact on fauna and habitat values.		

Key Environmental Factor	Interacting Factors	Connection and Interaction Pathway – direct and indirect impacts	Mitigation and Management Measures	Predicted Outcome
Inland Waters	Flora and Vegetation	Contribution to maintenance of inland water quality and surface water runoff (e.g. through minimising erosion, reducing potential for soil salinisation, sediment transport to nearby creek lines).	Avoid – Avoid spills, release of environmentally hazardous materials and solid/ liquid waste discharge through appropriate design and construction of containment facilities as per Australian Standards and relevant guidelines. Minimise – Minimise and manage cleared areas/ stockpiles to control stormwater runoff/ sedimentation and possible ASS. – Minimise spills, release of environmentally hazardous materials and solid/ liquid waste discharge through appropriate use and maintenance of containment facilities as per Australian Standards and relevant guidelines. Rehabilitate – No rehabilitation proposed for Inland Waters factor. Offset – No offsets are required in relation to Inland Waters factor as a result of the implementation of the Revised Proposal.	The implementation of the Revised Proposal has the potential to impact on Inland Waters due to changes in surface water runoff, sedimentation and spills. It is considered that on-site management measures associated with sedimentation and erosion during construction will minimise both ecological impacts and impacts to amenity and cultural heritage values. SIMCOA has assessed the impacts of the proposal on inland waters and in relation to the Flora and Vegetation, TEQ, Terrestrial Fauna and Social Surroundings factors. SIMCOA considers that with the application of mitigation measures to reduce clearing, erosion and through the implementation of existing management practices, the Proposal would not unreasonably impact inland waters or be inconsistent with the EPA's factor objective.
	TEQ	Spills through inappropriate storage and handling of chemicals and hydrocarbons can have a direct impact on TEQ.		
	Terrestrial Fauna	Construction and mining operations have the potential to generate erosion and sedimentation which can impact on fauna habitat values.		
	Social Surroundings	Health of the Kyaka Brook and downstream waterways is important to maintain cultural and amenity values.		
Social Surroundings	Flora and Vegetation	Visual amenity impacts from clearing (due to elevation) noting that the surrounding landscape is largely cleared for agriculture.	Avoid – The DF will avoid direct impact to known Registered Aboriginal Heritage Sites and Other Heritage Places identified within the North Kiaka DE. – The DF will be mapped to show the locations of all Moodjar trees and avoid, where practicable, direct impact to the trees. Minimise Implement EMP to minimise impacts to Aboriginal heritage, noise and vibrations, air quality (dust) and visual amenity. Rehabilitate	Impacts to Flora and Vegetation, Terrestrial Fauna and Air Quality will impact visual amenity and cultural heritage values. Mining will unavoidably remain a dominant feature of the landscape, however, with the implementation of mitigation measures for permanent, noticeable changes, and the continuation of progressive rehabilitation, this impact is not considered to be significant. SIMCOA has assessed the impacts of the Revised Proposal on Social Surroundings and its interaction with the other factors of Flora and Vegetation, Terrestrial Fauna and Air Quality.
	Terrestrial Fauna	Terrestrial fauna and habitat contribute to social wellbeing in highly disturbed environments, such as agriculture and mining areas. Scientifically and culturally important, particularly with relevance to conservation significant terrestrial fauna. Noise and vibration emissions can impact terrestrial fauna behaviour.		

Key Environmental Factor	Interacting Factors	Connection and Interaction Pathway – direct and indirect impacts	Mitigation and Management Measures	Predicted Outcome
	Inland Waters	Health of the Kyaka Brook and downstream waterways is important to maintain cultural and amenity values.	– Progressive rehabilitation of disturbed areas, where possible within the North Kiaka DE during operation and at the end of mining activities to reduce cleared areas. – Rehabilitation of the Moora Mine will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) (Appendix K). – No rehabilitation required for the Kemerton Smelter. Offset – No offsets are required in relation to Social Surroundings factor as a result of the implementation of the Revised Proposal.	SIMCOA considers that with the application of mitigation measures to reduce clearing, noise management and avoidance of heritage sites and through the implementation of existing management practices for dust control the Revised Proposal would not unreasonably impact Social Surroundings or be inconsistent with the EPA's factor objective.
	Air Quality	Construction and mining operations have the potential to generate dust and smoke (accidental bushfire) which can impact on amenity values of nearby residents. Implementation of progressive rehabilitation reduces the area exposed.		
Greenhouse Gas Emissions	Flora and Vegetation	Vegetation absorbs CO_2 and sequesters carbon.	Avoid – SIMCOA aim to install an additional charcoal retort at the Kemerton site to replace coal feed as a reductant to achieve approximately 90% reduction in Scope 1 emissions due to the avoidance of coal usage. Minimise – GHG Management Plan (GHGMP) – SIMCOA is committed to implementing a GHGMP in accordance with the EPA's 'Revised Environmental Factor Guideline – Greenhouse Gas Emissions' (EPA, 2023a). The GHGMP has reduction targets which enable the Revised Proposal to achieve net zero emissions no later than 2050, and through a straight-line trajectory (at a minimum) from 2030. – Utilisation of SWIS grid for 100% electricity required to power smelter operations provides confidence that SIMCOA can effectively decarbonise 100% of their Scope 2 operational emissions, in line with WA State targets. Rehabilitate – No rehabilitation proposed for GHG Emissions factor. – Offset	SIMCOA recognises that there is an established link between GHG emissions and climate change and that emissions associated with the Revised Proposal and continued operation will contribute to this. In turn it is recognised that changes to climate will have effects on a wide variety of environmental factors including flora and vegetation, inland waters terrestrial fauna and social surroundings. Development and operation of the Revised Proposal is not expected to result in significant contribution to GHG emissions. The estimated annual emissions are equivalent to 0.5 % of WA's total annual GHG emissions. GHG emissions and the resulting contribution to climate change is predicted to result in a drying climate in the southwest of Western Australia. This will impact on inland waters through reduced availability of water and run off, flora and vegetation again through reduced rainfall and also increased temperatures and subsequently terrestrial fauna as vegetation complexes change in response to the dryer conditions.
	Terrestrial Fauna	Incremental contribution of GHG emissions that influence climate systems, landscapes and habitats in a broader context.		
	Inland Waters			
	Social Surroundings			

Key Environmental Factor	Interacting Factors	Connection and Interaction Pathway – direct and indirect impacts	Mitigation and Management Measures	Predicted Outcome
			– Where net Scope 1 and Scope 2 greenhouse emissions cannot be avoided or reduced through feasible measures, emissions exceeding committed targets will be offset through acquisition of carbon offsets.	Predicted changes to climate will impact on Social Surroundings as liveability of areas changes. SIMCOA has assessed the impacts of GHG from the Revised Proposal recognizing its broader contribution to climate change and the resulting impacts across a broad range of factors. SIMCOA's commitment to reduce emissions and decarbonise its business is consistent with the EPA's factor objective.
Air Quality	Flora and Vegetation	Vegetation provides cover stabilising soils and preventing dust lift. Indirect impact to flora and vegetation may arise due to smoke from accidental bushfire.	Avoid – Avoid handling of materials during adverse wind conditions, or if complaints are received from sensitive receptors. Minimise – Implement EMP to manage dust from construction/ operational works and to minimise the risk of accidental bushfire. Rehabilitate – Progressive rehabilitation of disturbed areas, where possible within the North Kiaka DE during operation and at the end of mining activities to reduce cleared areas. – Rehabilitation of the Moora Mine will be undertaken in line with the details outlined in the Moora Quartzite Mine Rehabilitation Plan (Ecoscape Australia, 2012) (Appendix K). – No rehabilitation required for the Kemerton Smelter. Offset – No offsets are required in relation to Air Quality as a result of the implementation of the Revised Proposal.	Air quality can be impacted as a result of implementation of the Revised Proposal through clearing and subsequent exposure of soil. Dust resulting from these practices can lead to impacts on vegetation, terrestrial fauna and social surroundings (reduced amenity). Based on proposed mitigation measures, no significant residual impacts are expected to Flora and Vegetation, Terrestrial Fauna and Social Surroundings factors due to dust emissions associated with the Revised Proposal. Air emissions such as combustion product emissions present a very low risk of impacting air quality, with the most significant contributions to the local and regional airsheds being attributed to GHG emissions. SIMCOA has assessed the impacts of the Revised Proposal on air quality and based on proposed mitigation measures, its interaction with the other factors of flora and vegetation, and social surroundings. SIMCOA considers that with the application of mitigation measures to reduce clearing, erosion and through the implementation of existing management practices for dust control and deposition and the Revised Proposal would not unreasonably impact air quality or be inconsistent with the EPA's factor objective.
	Terrestrial Fauna	Indirect impact to fauna habitat may arise due to smoke from accidental bushfire.		
	Social Surroundings	Construction and mining operations have the potential to generate dust and smoke (accidental bushfire) which can impact on amenity values of nearby residents. Implementation of progressive rehabilitation reduces the area exposed.		

10. MpCumulative Impact Assessment

Cumulative environmental impacts are defined as the successive, incremental and interactive impacts on the environment of a Proposal with one or more past, present and reasonably foreseeable future activities (EPA, 2023b). The North Kiaka mine is located in a broad acre agricultural environment, where large extents of land clearing occurred to provide for the predominately wheat and sheep enterprises. The mining and operational footprint of the North Kiaka is small as compared to the surrounding land uses.

While clearing for agricultural production began as early as 1847, the more extensive areas of land cleared of native vegetation for agriculture began in 1906-1908 with the post WWII years bringing more land into agricultural production under the War Service Land Settlement Scheme.

Since that time, the landscape in the Shire of Moora has remained largely unchanged. Impacts to native vegetation area largely attributable to dryland salinity, herbicides, and edge effects. Reasonably foreseeable future activities include third party (or proponent) activities which are already approved, are in a government approvals process, or are otherwise reasonably likely to proceed.

10.1.1 Notice Requiring Information for Assessment

In July 2022, in accordance with s40(2)(a) of the EP Act, the EPA requested SIMCOA provide additional information to inform the environmental assessment of the Project (EPA, 2022b). No specific items were requested in this notice for the Cumulative Impact Assessment section.

The draft ERD was prepared to address the comments and additional information requested and was submitted to the EPA on 6 July 2023. Information provided in the draft ERD has been updated based on the EPA's additional information request (EPA, 2023d) as referenced in Table 10.1.

Table 10.1 2023 Additional Information – Cumulative Impact Assessment

Key Environmental Factor / Source	Additional Information	Section of the ERD
Flora and Vegetation - Department of Water and Environmental Regulation (DWER)	Revise the cumulative impact assessment to include analysis of existing and historical impacts, using current data.	Section 10 of the ERD

The Revised Proposal will result in only minor additional clearing of native vegetation at Moora Mine and no additional clearing at Kemerton Smelter:

– Existing Moora Mine – development of the North Kiaka DF will result in the same volume of throughputs at the current Moora Mine, however the life of the processing plant will be extended by approximately 18 years.
– Kemerton Smelter – development of the North Kiaka DF will be consistent with current operation at Kemerton. The same quantity and quality product will be processed. No expansion or land disturbance is required. The CIA has not considered further assessment of the Kemerton Smelter, as it will be consistent with current approved environmental emissions. The Kemerton Smelter will have an extended life of approximately 18 years, this has been considered in the GHG assessment.
– GHG emissions generated from downstream silicon production (i.e. Kemerton Smelter located at the KSIA) have been included as requested by the EPA as outlined in Section 5.8.

Table 10.2 summarises the outcome of a review of current and foreseeable future activities within the Shire of Moora. At the time of writing this assessment, there are no known future mines proposed within the Shire of Moora or any proposals submitted for assessment by the EPA. The cumulative impact assessment considers the historical impacts from the surrounding land use, proposals within the Shire of Moora, the Moora Mine and the North Kiaka impacts. Table 10.2 includes locations of DWER native vegetation clearing permit information such as approvals and offsets and EPA referrals within the Shire of Moora.

Table 10.2 Commonwealth and State referrals/ approvals within the Shire of Moora

Reference	Title	Valid date/ Duration	Stage/ Status	Proposed clearing (ha)/ Impact	Outcome
Referrals under the EPBC Act (Commonwealth) – impacts to MNES					
2021/8894	Co-Operative Bulk Handling Limited/ Transport - Land/ corner of Bindoon-Moora Road and Wheatbin Road, Moora/ Western Australia/ Moora Grain Receival Site - Out-loading Project, WA	4/03/2021	Assessment Approach/ Assessment Method Determined	Decision: Controlled Action NVCP application for clearing under Part V of the EP Act. 1.6 ha of Wheatbelt Woodlands TEC, 1.7 ha of poor quality Black Cockatoo foraging habitat, 27 Black Cockatoo habitat trees.	The CBH Moora Grain receival site is located two km south of Moora and over 16 km from North Kiaka. Given the low emissions from CBH and distance between the site and North Kiaka they have not been considered further in this CIA. The CBH projects do not involve clearing of Coomberdale TEC. The involve clearing of remnant vegetation (combined amount of 10.65 ha). This has not been used in the CIA separately as the historical trends data has been used to assess clearing impacts.
2020/8661	Cooperative Bulk Handling Group/ Agriculture and Forestry/ Wheatbin Road, Moora/Western Australia/Moora Grain Receival Site, Moora	10/06/2020	Assessment Approach/ Assessment Method Determined	Decision: Controlled Action 1.05 ha of native vegetation within the disturbance footprint, two potential Black Cockatoo breeding trees.	
2016/7761	Main Roads Western Australia/ Transport - Land/Shires of Moora and Dalwallinu/ Western Australia/Great Northern Highway, Muchea to Wubin Upgrade Stage 2-Walebing to Wubin	11/08/2016	Post-Approval/ Condition variation being considered	Decision: Controlled Action 30 ha of Carnaby's Black Cockatoo habitat and 15 ha of Eucalypt Woodlands TEC.	Cumulative impacts from the two main roads projects are not expected given the nature of the projects and their age. As these are long established operations it is anticipated that the statewide clearing statistics have included these projects.
2012/ 6700	Main Roads Western Australia/ Transport - land/ Approximately 35 km east of Moora/WA/Great Northern Highway Upgrade - Bindi Bindi to Lyons Road East	24/12/2012	Completed/ Referral Decision Made	Decision: Not a Controlled Action 27 ha comprised of 21 a of pastoral land, 3.6 ha of native vegetation and the remainder as planted vegetation.	
DWER licences under Part V of the EP Act (WA)					
L5214/1993/11	Moora Wastewater Treatment Plant (Lot 10 Drummond Street, Moora) – Shire of Moora – Category 54: Sewage facility – Category 61: Liquid waste facility	06/10/2013 – 05/10/2032	Operational	No further clearing required.	Any previous clearing has been assumed to have been included in the recent 2022 export of state-wide clearing statistics to estimate cumulative impacts.
L6149/1988/8	Moora Quartzite Mine Site	05/10/2021 – 04/10/2032	Operational	Clearing of up to 1ha of native vegetation to	

Reference	Title	Valid date/ Duration	Stage/ Status	Proposed clearing (ha)/ Impact	Outcome
	(Midlands Road, Moora) - SIMCOA			construct the abandonment bund	
L7287/1998/12	Watheroo Rubbish Tip (Railway Road) – Shire of Moora – Class II putrescible landfill stie (600 tonnes per annual period)	24/02/2014 – 23/02/2025	Operational	No further clearing required.	
L7288/1998/11	Moora Tip (Airstrip Road, Moora) – Shire of Moora – Category 62 – Solid waste depot – Category 64 – Class II or III putrescible landfill site	19/01/2015 – 18/01/2029	Operational	No further clearing required.	
L8235/2008/2	Narrabie Farm (Moora) – Private owners Category 61A – Solid waste facility	08/07/2013 – 07/07/2030	Operational	No clearing required – biosolid application to cleared agricultural land.	
L8330/2008/2	Annadale Farm (Bulbarnet Road, Koojan) – Annadale Pty Ltd – Category 61A – Solid waste facility	12/02/2014 – 11/02/2029	Operational	No clearing required – biosolid application to cleared agricultural land.	
L8821/2014/1	Wandena Quarry (Lot 500 on Deposited Plan 56200, Walebing) – Spinifex Crushing and Screening Services Pty Ltd – Category 12 – Screening of material	14/07/2014 – 13/07/2031	Operational	No further clearing required.	
DWER Works Approvals under Part V of the EP Act (WA)					
W5580/2014/1	Wandena Quarry (Lot 500 on Deposited Plan 56200, Walebing) – Spinifex Crushing and Screening Services Pty Ltd – Category 12 – Screening of material	17/03/2017 – 16/03/2019	Expired	L8821/2014/1	Any previous clearing has been assumed to have been included in the recent statewide clearing statistics to estimate cumulative impacts.
W6391/2020/1	Moora Quartzite Mine (M70/191,	07/08/2020 – 06/08/2025	Current	Dewatering to the Kyaka Brook.	Included in the existing Moora Mine impacts.

Reference	Title	Valid date/ Duration	Stage/ Status	Proposed clearing (ha)/ Impact	Outcome
	G70/91, G70/92, G70/93, M70/1292, Moora) – SIMCOA – Category 6 – Mine dewatering				
DWER clearing permits under Part V of the EP Act (WA)					
Multiple	Clearing permits in the Shire of Moora	Multiple	550 Current permits	Mechanical clearing	Up to 11.2ha of clearing permitted, but no permits within North Kiaka DE and Moora Mine DE.
Projects assessed under Part IV of the EP Act					
A search of the EPA proposal website did not identify any active proposals within the Shire of Moora that are being considered by the EPA.					

Broadscale agriculture will continue to be the dominant land use in the area into the future. Given the land use within the surrounding area, the key cumulative impacts on EPA Environmental Factors for this Revised Proposal are outlined in .

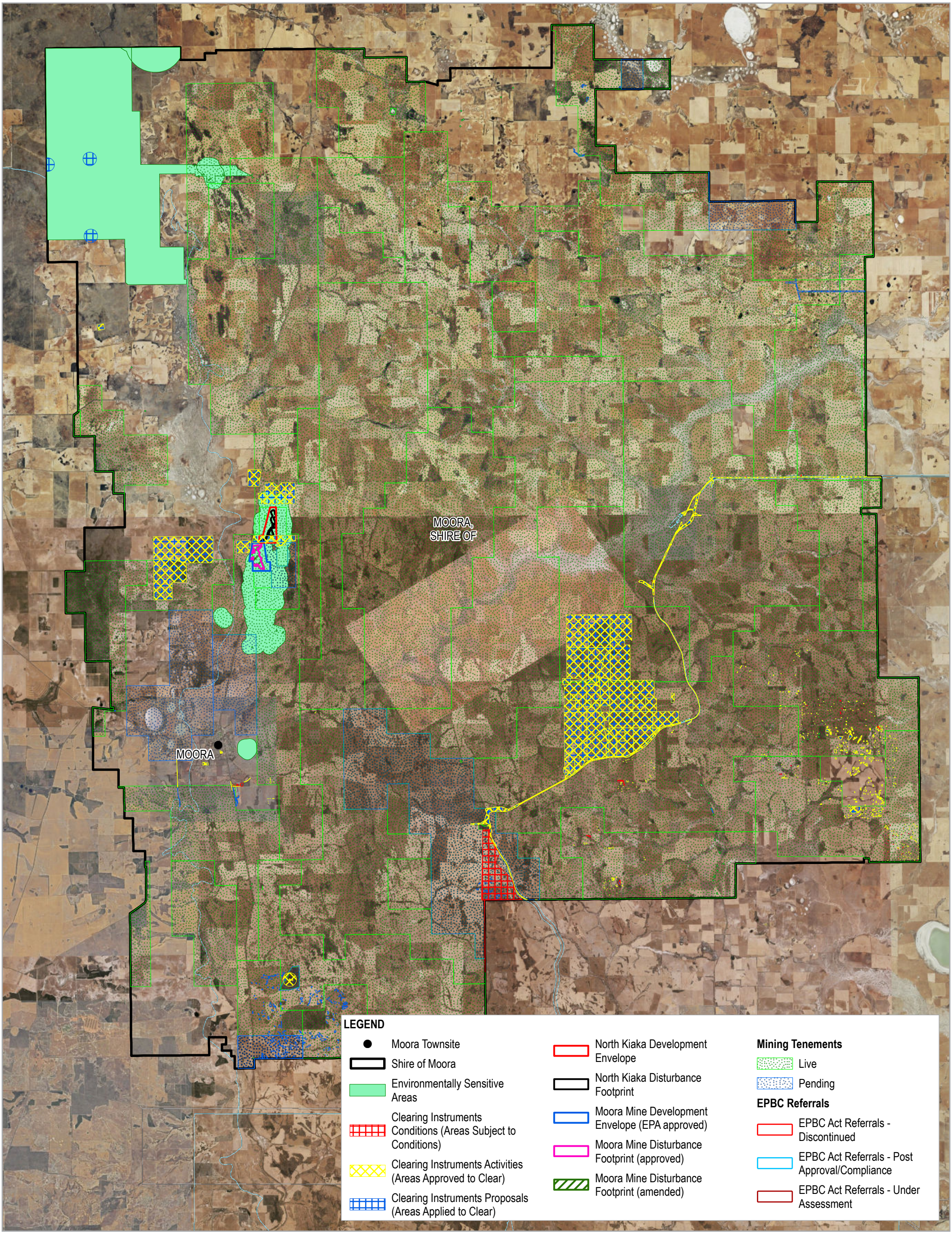
Table 10.3 Cumulative Impact Assessment of EPA Environmental Factors

EPA Factor	Cumulative Impact Assessment
Flora and Vegetation	*Regional scale – IBRA subregion* Based on the GoWA (2019) (current to April 2019) dataset the clearing of 18.12 ha associated with the development of the Revised Proposal will result in a cumulative impact to Pre-European Vegetation Associations (Beard, 1979) of: – A reduction in Vegetation Association 1041 which represents less than 3% of the current extent remaining in the State. – A reduction Vegetation Association 142 which represents less than 0.001% of the current extent remaining in the State. <u>10 km buffer from North Kiaka Development Envelope</u> An assessment of the extent of native vegetation present within a 10 km buffer of North Kiaka DE was undertaken. The DPIRD native vegetation extent layer indicates that there is currently 15% (5,975 ha) native vegetation within the 10 km buffer. The clearing of up to of 18.12 ha within the will result in less than 0.3% loss of native vegetation in the surrounding 10 km. Furthermore, the loss will result in a 0.82 % reduction is Beard Association 1041 within the 10 km buffer area. *Vegetation* The North Kiaka DE (216.42 ha) is located within agricultural land and 124.83 ha of the DE has historically been cleared. Remnant vegetation is found in small fragments, with 87.57 ha of native vegetation present, representing approximately 40% of the North Kiaka DE. Only 17.12ha is proposed to be cleared within the DF for the Revised Proposal, representing less than 20% of the remnant vegetation in the North Kiaka DE. Construction of the abandonment bund will require an additional 0.95 ha of native vegetation. This additional clearing represents approximately 1% of the remnant vegetation within the Moora Mine DE. The combined impact on vegetation in the location area is 18.12ha or a combined impact of under 10% of the remaining vegetation in the SIMCOA mining DE's. Remnant native vegetation that is localised to rocky outcrops within the North Kiaka DE was surveyed in 2012 and 2018 by Trudgen et al. *Threatened Ecological Community* All known occurrences of the Coomberdale TEC occur in the Shire of Moora along the Noondine Chert Hills. The Recovery Plan (DPAW, 2013b) identified 65 occurrences, which total an approximate 785 ha. These occurrences have been identified on a variety of landholdings (based on data available from 2013): – 192 ha (~ 24%) on land managed for conservation (National Park or Nature Reserve) – 382.6 ha (~ 49%) on private land covered by mineral tenements – 183 ha (~ 23%) on private freehold land not within mineral tenements – 15.6 ha (~ 2%) on a water reserve

EPA Factor	Cumulative Impact Assessment
	– 11.8 ha (~ 1.5%) on Unallocated Crown Land, currently under pastoral / grazing lease. Surveys undertaken by ME Trudgen and Associates (1985; 2006; 2012; Trudgen, 2018) followed those originally defined by Griffin (1992, 1994) recognised the distinctiveness of these vegetation types both within the Coomberdale Floristic Region and when compared to other floristic regions. The original description of the Coomberdale Chert TEC was based on limited information and was updated by Trudgen et al. (Trudgen, Morgan, & Griffin, 2006) when they surveyed plant communities occupying the outcropping areas of the Noondine Chert (Coomberdale Chert). Based on the work (Trudgen, Morgan, & Griffin, 2006), the Coomberdale Chert TEC was reviewed by the Western Australian Threatened Ecological Community Scientific Committee (TECSC) which recommended that the Coomberdale Chert TEC be renamed and the interim recovery plan be updated this was further update in 2022 when the TEC was changed to critically endangered under the BC Act. The above calculations of regional extent are based on 2013 data which has been verified by survey data (Trudgen et al 2012, 2018) and, as such, while there is some uncertainty on the current extent of the TEC, particularly those areas within freehold land we are assuming these values above are current. Therefore, the development of the Revised Proposal will result in clearing of 18.12 ha made up of: – Clearing of 16.45 ha of Coomberdale TEC (CR under the BC Act) vegetation alliances for the Project: • 16.03 ha of core vegetation associated with vegetation alliances 13, 15,16 and 17, which represents approximate 2.09% reduction of the total recorded Coomberdale TEC core vegetation associations (Table 5.13). • 0.42 ha of buffer vegetation associated with vegetation alliances 9 and 11, which represents less than 0.07% reduction of the total recorded Coomberdale TEC buffer vegetation associations (Table 5.14). – Clearing of up to 1ha of native vegetation for the abandonment bund at Moora Mine: • 0.60 ha of Coomberdale TEC (Core and Buffer) (CR under the BC Act) • 0.35 ha of other vegetation The most significant impacts on the TEC are coming from existing agricultural practices including grazing, spray drift from cropping and weed intrusion. None of these impacts are caused by the operation of the Revised Proposal. This Cairn Hill and Cairn Hill North Class-A reserves provide sufficient area of TEC representative vegetation to consider the cumulative impact on the TEC to be adequately counter-balanced. *Flora* As the area has historically been cleared for agriculture there is little data available on the extent of cumulative losses for individual species. Given that most of the clearing within the North Kiaka DF occurs within vegetation associated with the Coomberdale TEC it is likely that the habitat range of the flora species affected is also similar to the extent of the TEC. On this basis, it is reasonable to assume that the offsets provided for this TEC will also provide future conservation for the impacted flora species. Clearing of up to 17.12 ha of native vegetation within the 44.59 ha North Kiaka DF includes the following: – Threatened flora species listed under the Commonwealth EPBC Act and State BC Act: • *Acacia aristulata* (EN, EN) – 6 populations (16 individuals) which represents a 1.5 % reduction of individuals within the regional extent of the Coomberdale TEC. • *Daviesia dielsii* (EN, EN) – 4 populations (15 individuals) which represents a 4.1 % reduction of individuals within the regional extent of the Coomberdale TEC. These species are known from within protected areas (Cairn Hill and Cairn Hill North) and exist in significant numbers. – DBCA Priority listed flora species: • *Diuris recurva* (Priority 4) – 2 populations (3 individuals) which represents a 6.5 % reduction of number of stands of this species within the regional extent of the Coomberdale TEC. • *Regelia megacephala* (Priority 4) – 1 population (number of individuals unknown) which represents a 1.4% reduction of number of stands of this species within the regional extent of the Coomberdale TEC. Clearing of up to 1 ha of native vegetation within the Moora Mine amended DF includes the following: – *Acacia aristulata* (EN, EN) – 1 population (1 individuals).
Landforms	

EPA Factor	Cumulative Impact Assessment
Other – Subterranean Fauna	Of the two geological units occurring within the DE, the Noondine Chert formation is likely to provide suitable habitat for subterranean fauna. The Noondine Chert formation outcrops across a 150 km stretch between Moora and Three Springs as north-north-west trending parallel ridges which are elevated approximately 75 m above the adjacent valleys. Due to the rocky nature of the Noondine Chert formation, no future impacts to this landform (and any subterranean fauna utilising the habitat this formation provides), are expected to occur from broadacre agriculture (the primary land use for the region). However, quartzite mineral (the resource) is uniquely associated with the Noondine Chert geological formation, hence any future quartzite mines in the region are likely to target this formation. North Kiaka will impact <1% of the total mapped extent of the Noondine Chert Formation. At the time of writing this assessment, there are no known future mines proposed within the Shire of Moora or any proposals submitted for assessment by the EPA, hence cumulative impacts to landforms and subterranean fauna from development of the Revised Proposal are expected to be minimal. SIMCOA has previously relinquished interest in Cairn Hill, allowing the 152.01 ha area to be transferred to a A-Class reserve for nature conservation. SIMCOA has also relinquished interest in Cairn Hill North (58.34 ha) for nature conservation. Both offset sites comprise Coomberdale TEC which is known to be geographically restricted to the exposed quartzite ridges of the Noondine Chert Formation. Hence the protection of these two sites as offsets, also offers protection to Subterranean Fauna that may utilise habitat provided by the Noondine Chert Formation.
Terrestrial Fauna including SREs	The Revised Proposal will result in the direct loss of up to 15.58 ha within the North Kiaka DF of Carnaby's Black Cockatoo foraging habitat. As shown for the Flora and Vegetation factor the estimated cumulative loss of vegetation/ habitat is less than 1% of the current extent at the IBRA subregion, Shire of Moora and within 10 km buffer. Large scale clearing for agriculture in the Western Australian Wheatbelt has removed or fragmented much of the birds habitat. *Habitat loss, breeding/ foraging/ roosting through land clearing* As detailed in Section 5.5, based on an estimate of the extent of Black Cockatoo foraging habitat within the surrounding 40 km, North Kiaka will result in a reduction of 0.02% of foraging habitat. The cumulative impacts on fauna from the Revised Proposal and the existing environment are considered minimal, and the provision of offsets has been proposed to address residual impacts to fauna. The cumulative impact on fauna from future developments is unknown, as there are no other known proposed developments within the local area. Cumulative impacts of SRE's are linked to vegetation clearing. Given the small extent of clearing that occurs annually within the region and the expected approvals / offset requirements for future clearing, cumulative impacts to SRE's is expected to be minimal.
TEQ Inland Waters	The Revised Proposal is located in a region where the primary land-use is broadacre agriculture. Nearby mining operations are limited to SIMCOA's Moora Mine, immediately south of the North Kiaka DE. It is expected that smaller quarries exist in the region; however, the location of these sites (and operational status) is unknown based on publicly available information. At the time of writing this assessment, there are no known future mines proposed within the Shire of Moora or any proposals submitted for assessment by the EPA. The introduction of agriculture to the region has resulted in broad-scale impacts to the environment (including salinization of surface waters and degradation of soil health). While mine development has the ability to place additional pressure on the environment, given there are no other mine developments known to be planned for the region, and the small scale of the footprint proposed (particularly when compared to past impacts from broad-acre agriculture), cumulative impacts on terrestrial environmental quality and inland waters is expected to be minimal.
Social Surroundings Air Quality	Mine operations in the local area are limited to Moora Mine. While development of the Project has the potential to impact nearby human receptors (i.e. impacts to air quality, visual amenity, and general nuisance from noise and vibrations), these impacts are not likely to be additional to approved (MS 813) impacts from Moora Mine. The background dust emissions from surrounding land uses including farming will stay consistent across the operations. SIMCOA intend to transition from mining at Moora Mine, to mining within the Project once the required approvals have been obtained. Even during concurrent operation of the Revised Proposal, the quantity of ore mined, and quartzite product transported to Kemerton Smelter will remain unchanged.

EPA Factor	Cumulative Impact Assessment
Greenhouse Gas Emissions	The GHG assessment has been undertaken to examine the potential environmental impacts of the Revised Proposal relating to emissions of GHG. Based on a quantitative assessment of emissions, the annual Scope 1 and 3 emissions from construction of the Project (5,821 t CO_2-e) will only contribute minor emissions to the Scope 1 and Scope 2 GHG emissions resulting from the implementation of the proposed operations are estimated to be 511,721 t CO_2-e/yr (pre-the Project construction) to 425,024 t CO2-e/yr (post-the Project construction). Development of a GHGMP (Appendix U) and implementation of the associated decarbonisation strategies will result in SIMCOA 's Revised Proposal contributing less to both State and National emissions on an annual basis.



Paper Size ISO A3

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

GHD

Simcoa Operations Pty Ltd
Simcoa Environmental Approvals s40AA ERD

DWER Native Vegetation Clearing Permit Information - Shire of Moora (GoWA, 2023)

Project No. **12518217**
Revision No. **0**
Date **05/03/2024**

FIGURE 10-1

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Print date: 05 Mar 2024 - 15:27

Data source: Simcoa: Mining Development Shape Areas is derived from client recieved 2020; Langate: Slip Imagery - April 2017 to November 2018 (accessed - 20191023), River, Road - 20180601. Created by: dchan3

11.

11. Conclusion

The Revised Proposal is located in a region where the dominant land use is broadscale agriculture (cropping and livestock), hence the landscape is largely cleared of native vegetation.

The Key Environmental Factors were identified for the Revised Proposal:

- Flora and vegetation (unavoidable clearing of TEC, Threatened and Priority flora)
- Landforms (unavoidable impact to the Noondine Chert formation)
- Terrestrial environmental quality (potential impacts from the Tonkin WRD)
- Terrestrial fauna (clearing of suitable foraging habitat for Carnaby's Black Cockatoo)
- Inland waters (altered drainage pathways and concentration of surface flows from diversion around the mine pit, Tonkin WRD and support infrastructure areas, as well as close proximity of Kyaka Brook)
- Social surroundings (permanent alteration of the landscape through direct impact to the Noondine Chert outcropping and associated TEC, increased traffic on Kiaka Road, proximity of sensitive receptors)
- Air quality (generation of dust from mining, transport, crushing and screening of material, proximity of sensitive receptors)
- Scope 1 and 3 emissions from construction of the Project (5,821 t CO_2-e) will only contribute minor emissions to the scope 1 and 2 operational GHG net emissions from 511,721 t CO_2-e/yr (pre-the Project construction) to 425,024 t CO_2-e/yr (post-the Project construction)

Other Environmental Factors identified include:

- Subterranean fauna (unavoidable impact to the Noondine Chert formation which supports suitable habitat)

Nearby mining operations are limited to SIMCOA's Moora Mine, immediately south of the North Kiaka DE. It is expected that smaller quarries exist in the region; however, the location of these sites (and operational status) is unknown based on publicly available information. At the time of writing this assessment, there are no known future mines proposed within the Shire of Moora or any proposals submitted for assessment by the EPA. Broadscale agriculture will continue to be the dominant land use in the area into the future, hence cumulative impacts from the Revised Proposal are expected to be minimal.

Clearing required to develop the Project is expected to result in the following significant residual impacts:

- Direct loss of up to 17.12 ha of Coomberdale TEC including core and buffer vegetation alliances in Very Good to Degraded condition)
- Direct loss of up to 15.80 ha of fauna habitat including potential SRE habitat
- Direct loss of up to 15.58 ha of potential foraging habitat for Carnaby's Black Cockatoo (*Zanda latirostris*) [species listed Endangered under EPBC Act]
- Direct loss of 16 Watheroo Wattle (*Acacia aristulata*) Threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under EPBC Act]
- Direct loss of 15 *Daviesia dielsii* Threatened flora individuals in habitat that is of 'good to poor' condition [species listed Endangered under EPBC Act].

Clearing required to develop the abandonment bund is expected to result in the following significant residual impacts:

- 0.60 ha of Coomberdale TEC (Core and Buffer) (CR under the BC Act)
- Direct loss of 1 Watheroo Wattle (*Acacia aristulata*) Threatened flora individuals

SIMCOA has existing offset agreements in place which more than meet the offset requirements for the Revised Proposal, to counterbalance any significant residual impacts. This includes the protection of 152.01 ha of Coomberdale TEC at Cairn Hill A-Class nature reserve, and the protection of 58.34 ha of Coomberdale TEC at Cairn Hill North conservation reserve. The proposed offsets (in particular the A-Class nature reserve) have high certainty (low risk of loss) and have support from DBCA. SIMCOA has also provided funding to fence and maintain these reserves, and to undertake regional flora surveys, as well as conduct their own rehabilitation trials to establish Threatened and Priority flora species at Moora Mine.

Through the implementation of mitigation measures (as presented in Section 5 and Section 6) and offsets for significant residual impacts as previously described in Section 7, it is expected that the Revised Proposal can meet the EPA's objectives for the identified environmental factors.

Having operated Moora Mine in the region for more than 30 years, SIMCOA is familiar with the local environment. SIMCOA has undertaken long-term rehabilitation trials and monitoring at Moora Mine and has developed a rehabilitation method which achieves successful re-establishment of flora species contiguous with the Coomberdale TEC. SIMCOA won a DMIRS Golden Gecko award in 2002[3,4] for their long-term mining strategy for resource access and biodiversity conservation (refer to Section 7), including commitments to undertake rehabilitation trails at Moora Mine using Threatened and Priority flora species where practicable.

SIMCOA has a good relationship with the landowners of M70/1292, and a proven procedure for recording feedback or complaints, and implementing corrective actions. SIMCOA are confident the Revised Proposal can be implemented with minimal environmental and social impact.

[3] DMIRS Golden Gecko Awards (Previous Winners): https://www.dmp.wa.gov.au/About-Us-Careers/Golden-Gecko-Awards-previous-23511.aspx
[4] DMIRS Media Statement: https://www.mediastatements.wa.gov.au/Pages/Gallop/2002/04/Golden-Geckos-endorse-resource-industry's-environmental-commitment-(South-West).aspx

12. References

ABS. (2021). *Census.* Australian Bureau of Statistics.

Actis. (2011). *Proposed Discharge Evaluation: Coonderoo River Wetlands.* Unpublished report prepared for SIMCOA Operations Pty Ltd.

ANZECC & ARMCANZ. (2000). *Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Water Quality Guidelines.* Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

ANZG. (2018). *Australian and New Zealand guidelines for fresh and marine water quality.* Australian and New Zealand governments.

Bamford. (2001). *Terrestrial Fauna Assessments Moora Mine.* Unpublished report prepared for SIMCOA Operations Pty Ltd.

Beard, J. (1979). *Vegetation Survey of Western Australia. The Vegetation of the Hill River and Moora Areas Western Australia. Explanatory Notes and Map Sheet, 1:250000 series. Vegetation Survey of Western Australia, map and explanatory memoir 1:250,000 series.* Applecross: Vegmap Publications.

Bennelongia. (2023). *Moora Quartz Subterranean Fauna Baseline Survey Report.* Unpublished Report for Simcoa Operations Pty Ltd.

BoM. (2023). *Climate statistics for Australian locations - Badgingarra Research Station number 9037.* Retrieved from http://www.bom.gov.au/climate/averages/tables/cw_009037.shtml

Brad Goode and Associates. (2019). *Report of an Aboriginal heritage survey for SIMCOA Operations Pty Ltd for the proposed North Kiaka Quartzite Mine located North of Moora, Western Australia.*

Brad Goode and Associates. (2022). *Report on Archaeological Investigations into the Locations of the Kiaka Brook 1 And Koolera Well Artefact Scatters, North of Moora, Western Australia.*

Commonwealth of Australia. (2018). *National Waste Policy: Less waste more resources.* Commonwealth of Australia.

CSIRO. (2019). *Australian Soil Resource Information System (ASRIS) National ASS Atlas.* Commonwealth Scientific and Industrial Research Organisation. Retrieved 2019, from https://asris.csiro.au/

CUBE. (2020). *Simcoa Operations Life of Mine Design and Mine Plan.* Unpublished report for SIMCOA Operations Pty Ltd.

DAWE. (2022). *Referral guideline for 3 WA threatened black cockatoo species Carnaby's Cockatoo (Zanda latirostris), Baudin's Cockatoo (Zanda baudinii) and the Forest Red-tailed Black-cockatoo (Calyptorhynchus banksii naso).* Department of Agriculture, Water and the Environment.

DBCA. (2013). *Threatened Ecological Community Fact Sheet: Vegetation alliances on ridges and slopes of the chert hills of the Coomberdale floristic region.* GoWA.

DBCA. (2015). *Phytophthora Dieback Interpreters Manual for Land.* Government of Western Australia.

DBCA. (2019, November). *Phytophthora Dieback Map.* Retrieved from https://www.dpaw.wa.gov.au/management/pests-diseases/phytophthora-dieback

DBCA. (2020). *Phytophthora Dieback Management Manual.* Government of Western Australia.

DBCA. (2022). *Vegetation alliances on ridges and slopes of the chert hills of the Coomberdale floristic region - Threatened Ecological Community nomination form.* Department of Biodiversity, Conservation and Attractions.

DBCA. (2023a). *NatureMap: Mapping Western Australia's Biodiversity.* Department of Biodiversity, Conservation and Attractions. Retrieved January 2019, from Parks and Wildlife Services: https://naturemap.dpaw.wa.gov.au/

DBCA. (2023b). *Threatened and Priority Flora (TPFL) and Western Australian Herbarium Specimen (WAHERB) databases - 15 km buffer.* Department of Biodiversity, Conservation and Attractions. Retrieved from Department of Biodiversity, Conservation and Attractions.

DCCEEW. (2017). *Policy Statement: Advanced environmental offsets under the Environmental Protection and Biodiversity Conservation Act.* Canberra.

DCCEEW. (2020). *Australia's National Greenhouse Accounts, National Inventory by Economic Sector .*

DCCEEW. (2022). *Referral guideline for 3 WA threatened black cockatoo species.* Canberra: Government of Australia.

DCCEEW. (2022a). *Australian National Greenhouse Accounts Factors For Individuals and organisations estimating greenhouse gas emissions.* Department of Climate Change, Energy, the Environment and Water.

DCCEEW. (2023a). *Acacia aristulata in Species Profile and Threats Database, Department of the Environment.* Department of Climate Change, Energy, the Environment and Water. Retrieved from https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64822

DCCEEW. (2023b). *Daviesia dielsii in Species Profile and Threats Database.* Department of Climate Change, Energy, the Environment and Water. Retrieved from https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=19617
DCCEEW. (2023c). *EPBC Protected Matters Search Tool.* Retrieved from Department of Climate Change, Energy, the Environment and Water: https://www.dcceew.gov.au/environment/epbc/protected-matters-search-tool
DCCEEW. (2023d). *Interim Biogeographic Regionalisation for Australia, Version 7*. Retrieved from Department of Climate Change, Energy, the Environment and Water: https://www.dcceew.gov.au/environment/land/nrs/science/ibra/australias-bioregions-maps
DER. (2015a). *Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes.* Department of Environment Regulation.
DER. (2015b). *Treatment and management of soil and water in acid sulfate soil landscapes.* Perth: Department of Environmental Regulation.
DER. (2016). *Draft Guideline on Environmental Noise for Prescribed Premises.* Perth: Department of Environment Regulation. Retrieved from https://www.der.wa.gov.au/images/documents/our-work/consultation/guideline-environmental-noise/draft_Guideline_on_Environmental_Noise_for_Prescribed_Premises.pdf
DER. (2016). *Environment Protection and Biodiversity Conservation Act 1999 Outcomes based conditions policy.*
Dieback Working Group. (2008). *What is Phytophthora Dieback. Accessed November 2019.* Retrieved from https://www.dwg.org.au/what-is-phytophthora-dieback
DIIS. (2011). *A guide to leading practice sustainable development in mining.* Department of Industry, Innovation and Science.
DISER. (2021b). *National Greenhouse Accounts Factors.* Department of Industry, Science, Energy and Resources.
DISER. (2022). *Australia's emissions projections 2022.* Australian Department of Industry, Science, Energy and Resources.
DMIRS. (2023a). *Mining Proposal Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mining Proposals (Version 4.0) .* Government of Western Australia.
DMIRS. (2023b). *Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans.* Government of Western Australia.
DoE. (2006). *Air Quality Modelling Guidance Notes .* Government of Western Australia.
DoE. (2013). *Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999.* Canberra: Department of Environment.
DoE. (2016). *Eucalypt Woodlands of the Western Australian Wheatbelt: a nationally protected ecological community.* Department of the Environment.
DotE. (2015). *Referral guideline for 14 birds listed as migratory species under the EPBC Act [Draft].* Department of the Environment.
DoW. (2010). *Water Quality Protection Note 52 Stormwater management at industrial sites.* Department of Water.
DoW. (2013a). *Water Quality Protection Note 26 Liners for containing pollutants, using synthetic membranes.* Department of Water.
DoW. (2013b). *Water Quality Protection Note 27 Liners for containing pollutants, using engineered soils.* Department of Water.
DoW. (2016). *Water Quality Protection Note 70 Wastewater treatment and disposal - domestic systems.* Department of Water.
DoW. (2018). *Water Quality Protection Note 56 Tanks for fuel and chemical storage near sensitive water resources.* Department of Water and Environmental Regulation.
DPAW. (2013a). *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan.* Government of Western Australia.
DPAW. (2013b). *Interim Recovery Plan 2013 – 2018, Interim Recovery Plan No. 338 – Heath dominated by one or more of Regelia megacephala, Kunzea praestans and Allocasuarina campestris on ridges and slopes of the chert hills of the Coomberdale Floristic Region.* Government of Western Australia.
DPLH. (2013). *Aboriginal Heritage – Due Diligence Guidelines. Version 3.0 .* Government of Western Australia.
DPLH. (2015, Accessed November 2019). *Guidelines for the Engagement of Aboriginal Heritage Monitors.* Retrieved from https://www.wa.gov.au/sites/default/files/2019-06/Guidelines%20for%20the%20engagement%20of%20Aboriginal%20heritage%20monitors.pdf
DPLH. (2019). *State Planning Policy 5.4: Road and Rail Noise (SPP 5.4).* Perth: Western Australian Planning Commission.
DSEWPAC. (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy.*
DWER. (2019). *Draft Air Emissions Guideline.* Government of Western Australia.
DWER. (2021). *Draft Dust Emissions Guidelines.* Government of Western Australia.
Ecoscape Australia. (2012). *Moora Quartzite Mine Rehabilitation Plan - Final.* Unpublished report prepared for SIMCOA Operations Pty Ltd.

EPA. (2000). *Position Statement No. 2: Environmental Protection of native Vegetation in Western Australia: Clearing of Native Vegetation, with Particular Reference to the Agricultural Area.* Environmental Protection Authority.
EPA. (2006). *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) Rehabilitation of Terrestrial Ecosystems No. 6.* Government of Western Australia.
EPA. (2016a). *Environmental Factor Guideline: Subterranean Fauna.* Environmental Protection Authority.
EPA. (2016b). *Environmental Factor Guideline: Flora and Vegetation.* Government of Western Australia.
EPA. (2016c). *Environmental Factor Guideline: Terrestrial Environmental Quality.* Government of Western Australia.
EPA. (2016d). *Environmental Factor Guideline: Terrestrial Fauna.* Government of Western Australia.
EPA. (2016e). *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment.* Government of Western Australia.
EPA. (2016f). *Technical Guidance: Sampling of Short Range Endemic (SRE) Invertebrate Fauna.* Government of Western Australia.
EPA. (2018a). *Environmental Factor Guideline: Inland Waters.* Government of Western Australia.
EPA. (2018b). *Environmental Factor Guideline: Landforms.* Government of Western Australia.
EPA. (2020a). *Technical Guidance: Terrestrial vertebrate fauna surveys for Environmental Impact Assessment.* Government of Western Australia.
EPA. (2020b). *Environmental Factor Guideline: Air Quality.* Government of Western Australia.
EPA. (2020c). *Environmental Factor Guideline: Greenhouse Gas Emissions.* Government of Western Australia.
EPA. (2021a). *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual Requirements under the Environmental Protection Act 1986.* Environmental Protection Authority.
EPA. (2021b). *Instructions on how to prepare an Environmental Review Document.* Government of Western Australia.
EPA. (2021c). *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans.* Government of Western Australia.
EPA. (2021d). *Instructions: Referral of a proposal under section 38 of the Environmental Protection Act 1986.* Government of Western Australia.
EPA. (2021e). *Template: How to identify the content of a proposal.* Government of Western Australia.
EPA. (2021f). *Technical Guidance: Subterranean Fauna Surveys for environmental impact assessment.* Environmental Protection Authority.
EPA. (2022b). *Assessment under Section 40 (2) A Request for further information (RFI).* Government of Western Australia.
EPA. (2023). *INTERIM Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage, Environmental Protection Authority 2023.* Government of Western Australia.
EPA. (2023a). *Environmental Factor Guideline Greenhouse Gas Emissions.* Government of Western Australia.
EPA. (2023b). *Statement of Environmental Principles, Factors and Objectives and Aims of EIA.* Government of Western Australia.
EPA. (2023c). *Technical Guidance - Environmental impact assessment of Social Surroundings - Aboriginal cultural heritage.* Western Australia: EPA.
EPA. (2023d). *Request for further information on the Draft ERD under s40 (AA) of the EP Act.* Government of WA.
EPA. (2023e). *Environmental Factor Guideline: Social Surroundings.* Government of Western Australia.
Frith, H. J. (1959). Breeding of the mallee-fowl, Leipoa ocellata Gould (Megapodiidae). *CSIRO Wildlife Research, 4*, 31–60.
Geoscience Australia. (2023, March). *Critical Minerals at Geoscience Australia*. Retrieved from https://www.ga.gov.au/scientific-topics/minerals/critical-minerals#heading-1
GHD. (2019). *North Kiaka Approvals and Supporting Studies - Geotechnical Desktop Study.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2020a). *North Kiaka Approvals and Supporting Studies – Air Quality assessment.* Unpublished Report Prepared for Simcoa.
GHD. (2020b). *North Kiaka Approvals and Supporting Studies – Noise Assessment.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2020c). *North Kiaka Proposed Mine Expansion - Materials Characterisation Assessment Report.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2021a). *North Kiaka Proposed Mine Expansion Fauna Assessment Report.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2021b). *Pit Lake Recovery Assessment.* Unpublished Report prepared for Simcoa Operations Pty Ltd.
GHD. (2022). *Greenhouse Gas Assessment - SIMCOA North Kiaka Mine Section 38 Referral.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2023a). *Greenhouse Gas Management Plan: Simcoa Operations.* Unpublished Report prepared for SIMCOA Operations Pty Ltd.

GHD. (2023b). *Moora Quartz Mining Operations Mine Closure Plan.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2023c). *Desktop Assessment of Groundwater Dependent Ecosystems of Moora Quartzite Mine.* Unpublished Report prepared for SIMCOA Operations Pty Ltd.
GHD. (2023d). *North Kiaka Mine Hydrogeological Assessment.* Unpublished Report prepared for SIMCOA Operations Pty Ltd.
GHD. (2023e). *North Kiaka Mine Hydrological Assessment.* Unpublished Report prepared for SIMCOA Operations Pty Ltd.
GHD. (2023f). *Materials Characterisation North Kiaka Mine.* Unpublished Report Prepared for SIMCOA Operations Pty Ltd.
GHD. (2023g). *Environmental Management Plan for North Kiaka Project.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2023z). *North Kiaka Mining Operations Mine Closure Plan.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GHD. (2024). *SIMCOA Offsets Strategy.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
GoWA. (1999). *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1999 .* Government of Western Australia.
GoWA. (2011). *WA Environmental Offsets Policy.* Government of Western Australia.
GoWA. (2014). *WA Environmental Offsets Guidelines.* Government of Western Australia.
GoWA. (2019). *2018 Statewide Vegetation Statistics incorporating the CAR (Full Report). Current as of March 2019.* WA Department of Biodiversity, Conservation and Attractions. Retrieved from https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics
GoWA. (2020). *Western Australian Climate Policy .* Government of Western Australia.
GoWA. (2023). *Spatial datasets*. Retrieved from data.wa.gov.au: https://catalogue.data.wa.gov.au/dataset
Great Southern Bio Logic. (2022). *Phytophthora Dieback Management Plan. Simcoa Moora Mine Site and North Kiaka Proposal.* Unpublished report prepared for Simcoa Operations Pty Ltd.
Griffin , E. A. (1992). *Floristic survey of remnant vegetation in the Bindoon to Moora area.* Department of Agriculture Western Australia.
Griffin, E. A. (1994). *Floristic survey of Northern Sandplains between Perth and Geraldton.* Department of Agriculture Western Australia.
Invertebrate Solutions. (2019a). *Desktop Assessment of Short Range Endemic Fauna for the North Kiaka Quartzite Mine, Moora.* Unpublished report prepared for Simcoa Operations Pty Ltd.
Invertebrate Solutions. (2019b). *Desktop Assessment of Subterranean Fauna for the North Kiaka Quartzite Mine, Moora, Western Australia.* Unpublished report prepared for SImcoa Operations Pty Ltd.
ISO. (2018). *ISO 14064-1:2018 Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals.* International Standardisation Organisation.
ISO. (2019a). *ISO 14064-2:2019 Greenhouse Gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of GHG emission reductions or removal enhancements.* International Standardisation Organisation.
ISO. (2019b). *ISO 14064-3:2019 Greenhouse Gases – Part 3: Specification with guidance for the verification and validation of greenhouse gas statements.* International Standardisation Organisation.
Johnson. (2019). *Report of an Archaeological Aboriginal Heritage Survey for the proposed SIMCOA North Kiaka Quartzite Mine, Moora, Western Australia.* Unpublished report prepared for GHD on behalf of Simcoa Operations Pty Ltd.
Johnstone and Storr. (2004). *Handbook of Western Australian Birds: Volume 2: Passerines (Blue-winged Pitta to Goldfinch).* Perth: Western Australian Museum.
Kee and Quartermaine. (1985). *Report of the Survey for Aboriginal Sites at the Area Proposed for a Quarry Development by Cliffs International Ltd, Moora, WA.* Unpublished report prepared for Simcoa Operations Pty Ltd.
Keighery, B. J. (1994). *Bushland Plant Survey: A Guide to Plant Community Survey for the Community.* Perth: Wildflower Society of Western Australia (Inc.).
Knott and Goater . (2005). *Moora Quartzite Mine, stygofauna pilot survey.* Unpublished report prepared for Simcoa Operations Pty Ltd.
M.E. Trudgen, B. Morgan and E.A Griffin. (2006). *A flora survey, floristic analysis and vegetation survey of the Coomberdale Chert TEC.* Perth: Unpublished report prepared for Simcoa Operations Pty Ltd.
Marchant, S., & Higgins, P. J. (Eds.). (1993). *Handbook of Australian, New Zealand and Antarctic Birds* (Vol. 2: Raptors to Lapwings). Melbourne: Oxford University Press.
Maron, M. E. (2021). *Better offsets for Western Australia's black-cockatoos.* Brisbane: NESP Threatened Species Recovery Project 5.1 : Research findings factsheet.
Mine Earth. (2018). *Moora Quartz Mining Operations Mine Closure Plan 2018 - Rev 0.* Unpublished report prepared for SIMCOA Operations Pty Ltd.

Morcombe, M. (2004). *Field Guide to Australian Birds.* Archer Field: Steve Parish Publishing.
NEPC. (2021). *National Environment Protection (Ambient Air Quality) Measure.* National Environment Protection Council, Australian Government.
NlbES. (2020). *Australia's National Greenhouse Accounts, National Inventory by Sector .*
NSW EPA. (2022). *Approved methods for the sampling and analysis of air pollutants in NSW.* State of NSW and the NSW Environment Protection Authority.
NWC. (2012). *Australian groundwater modelling guidelines.* Published by the National Water Commission.
Saprolite. (2022). *Moora Quartzite Mine - Annual Monitoring Report .* Unpublished report prepared for Simcoa Operations Pty Ltd.
Saprolite Environmental. (2012). *Moora Quartzite Mine - Phase 2 Hydrogeological Investigations.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
Saunders. (1982). The breeding behaviour of the short-billed form of the White-tailed Black Cockatoo Calyptorhynchus funereus. *Ibis - International Journal of Avian Science, 124*(4), 422 -455.
Saunders, D. A. (1977). *Effect of Agricultural Clearing on the Breeding Success of the White-tailed Black Cockatoo.* Emu - Austral Ornithology. doi:10.1071/MU9770180
Saunders, D. A. (1986). Breeding season, nestling success and nestling growth in Carnaby's Black-Cockatoo, Calyptorhynchus funereus latirostris, over 16 years at Coomallo Creek, and a method for assessing the viability of populations in other areas. *Australian Wildlife Research*, 261 - 273.
Saunders, D.A and Ingram, J.A. (1987). Factors affecting survival of breeding populations of Carnaby's Cockatoo, Calyptorhynchus latirostris in remnants of native vegetation. In S. e. al, *Nature Conservation: the Role of Remnants of Native Vegetation.* (pp. 249 - 528). Surrey: Chipping Norton.
SIMCOA . (2022b). *2022 Moora Quartz Mining Operations Annual Environmental Report.* Unpublished report.
SIMCOA. (2021b). *Moora Quartz Mining Operations Annual Environmental Report 2021.* SIMCOA Operations Pty Ltd.
SIMCOA. (2022a). *Kemerton Silicon Smelter Annual Environmental Report 2021.* SIMCOA Operations Pty Ltd.
Snowden. (2012). *Kiaka Hills Mine Development Plan.* Upublished report prepared for SIMCOA Operations Pty Ltd by Snowden Mining Industry Consultants.
Soilwater Consultants. (2019). *North Kiaka Soil Characterisation.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
Standards Australia. (2012). *AS/NZS 1547:2012 On-site domestic wastewater management.* Standards Australia.
Standards Australia. (2017). *AS 1940:2017 The Storage and Handling of Flammable and Combustible Liquids.*
Storr, G. (1991). *Birds of the South-west Division of Western Australia:* (Vol. 35). Records of the Western Australian Museum.
Trudgen. (1985). *A Report on the Vegetation and Flora of the Proposed Moora Silica Minesite.* Prepared for Cliffs International Inc.
Trudgen. (1988). *A Report on the Flora and Vegetation of the Port Kennedy Area.* West Perth: Unpublished report prepared for Bowman Bishaw and Associates.
Trudgen. (2008). *A vegetation and flora survey of two small areas on the SIMCOA smelter property at Kemerton.* Unpublished report prepared for Simcoa Operations Pty Ltd.
Trudgen. (2018). *Comparison of the flora and vegetation of the proposed North Kiaka Mine Area to other parts of the Coomberdale Chert Threatened Ecological Community.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
Trudgen. (2023). *A report on the rehabilitation of mine waste at the Simcoa Moora Chert Mine based on monitoring in December 2022.* Internal report for Simcoa by M.E Trudgen and Associates.
Trudgen et al. (2012). *An extension of a flora survey, floristic analysis and vegetation survey of areas of the Coomberdale Chert TEC to include a further area.* Unpublished report prepared for SIMCOA Operations Pty Ltd.
Trudgen, M. E. (2024). *Flora and Vegetation Survey at North Kiaka.* Unpublished Report prepared for SIMCOA Operations Pty Ltd.
Trudgen, M. E., Morgan, B., & Griffin, E. A. (2006). *A flora survey, floristic analysis and vegetation survey of the Coomberdale Chert TEC.* Perth: Unpublished report prepared for Simcoa Operations Pty Ltd.
UKDEFRA. (2022). *Greenhouse gas reporting: conversion factors 2021 - revised January 2022.* United Kingdom Department for Environment, Food and Rural Affairs.
USEPA. (2022). *Emission Factors for Greenhouse Gas Inventories.* United States Environmental Protection Agency .
WAPC. (2007). *Visual Landscape Planning in Western Australia a manual for evaluation, assessment, siting and design.* Government of Western Australia.
World Resources Institute & World Business Council for Sustainable Development. (2013). *Greenhouse Gas Protocol – Technical Guidance for Calculating Scope 3 Emissions (version 1.0).*
World Steel Association. (2021). *Sustainability Indicators 2021 and Our Sustainability Journey .*
WRI. (2004). *The Greenhouse Gas Protocol.* World Resources Institute.

WRI. (2011). *Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.* World Resources Institute.
WRI. (2022). *Greenhouse Gas Protocol Scope 3 Evaluator.* World Resources Institute.

Appendices

Appendix A

Requests for Further Information

2023 Request for Further Information

Table 12.1 2023 Additional Information

EPA Factor / Source of request	Work/ Actions Required	Section in the ERD
Flora and Vegetation - Department of Water and Environmental Regulation (DWER) (also see comments from the Department of Biodiversity, Conservation and Attractions)	Provide information on the Priority flora targeted and whether "possibly occurring" significant flora species were targeted in the survey by Trudgen (2012, 2018).	Section 5.2 of the ERD updated to note that Threatened and Priority Flora were searched.
	Where data are not available, conduct a survey targeting threatened and priority species, as well as other significant species noted in the draft ERD. The additional targeted survey for flora and vegetation should be undertaken in accordance with *EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment.*	Section 5.2 and Table 5.5 of the ERD note how the 2018 surveys were undertaken and that they were in line with the 2016 Technical Guidelines
	Provide current data for significant flora and analysis of direct, indirect, and cumulative impacts to flora and vegetation in a local and regional context. Revise the cumulative impact assessment to include analysis of existing and historical impacts, using current data.	Section 10 of the ERD has been updated to further describe the potential cumulative impact
	Provide information on the occurrence or avoidance of Moodjar trees within the DE.	Section 5.2 in the ERD and described in the Project EMP in Appendix C
	The EPA requires biodiversity survey reports and their underlying data to be submitted to the Index of Biodiversity Surveys for Assessments (IBSA). Biodiversity survey reports and data should be submitted to IBSA via IBSA Submission Form and the instruction for IBSA can be accessed via: Instructions for preparing data packages for the Index of Biodiversity Surveys for Assessments (IBSA). IBSA package should be submitted, and reference number received on submission should be provided. Any survey report and data that are revised after their initial acceptance into IBSA should be updated in IBSA and ibsa@dwer.wa.gov.au should be contacted for assistance in such cases.	-
Flora and Vegetation - Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Provide an updated flora and vegetation survey for the proposed proposal area. Specifically, provide an updated targeted assessment regarding impacts on the following MNES: Watheroo Wattle (*Acacia aristulata*) – Endangered Diels' Daviesia (*Daviesia dielsii*) – Endangered	The ERD section 5.2 will be updated to reflect the survey information
	Provide an updated flora and vegetation survey that is consistent with *EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (Western Australian EPA, 2016).	The ERD section 5.2 will be updated to reflect the updated figures and the survey effort and results will be included in Appendix G.
Terrestrial Fauna (Vertebrate) - DWER	Clarify if a search of the Great Cocky Count database was undertaken.	Section 5.5 of the ERD notes the source of the data (including the great cocky count information)
	Provide a clear map illustrating fauna habitats, the DE, and direct impact areas as the base layer, with survey and significant fauna locations.	Figure 5.18 in Section 5.5 of the ERD
Terrestrial Fauna (Vertebrate) - DCCEEW	Provide an updated fauna survey for the proposed proposal area. Specifically, provide an updated targeted assessment regarding impacts on the Carnaby's Black Cockatoo (*Zanda latirostris* listed as *Calyptorhynchus latirostris*) – Endangered. A further targeted assessment for Black Cockatoos has been planned for April 2024 to collect information on the presence and quality of	Section 5.5 of the ERD

EPA Factor / Source of request	Work/ Actions Required	Section in the ERD
	foraging vegetation. Although this is outside of season for the Moora region, zoologists have confirmed that the foraging species can be readily identified and the evidence of usage by Black Cockatoos will still be evident at this time.	
	Ensure that the updated survey is consistent with the Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2 (Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010).	Section 5.5 of the ERD
Terrestrial Fauna (Invertebrate) - DWER	If additional fauna surveys are undertaken, invertebrate specimens should be retained appropriately to confirm identification by persons with relevant expertise and using available techniques (e.g. genetic analysis).	-
	Quantify the impacts on potential and confirmed SRE habitat and provide a map of SRE taxa in relation to their preferred habitat.	Section 5.5.4.1.6 of the ERD Figure 5.19
	Discuss the significance of impacts to SRE habitat.	Section 5.5.7.1.3 of the ERD
Air Quality - DWER	Provide an updated air quality modelling assessment prepared in accordance with the Air quality modelling guidance notes 2006.	Section 5.9 of the ERD
	Include all dust emission sources from the Moora mine and all gaseous emissions from diesel generators in air quality modelling and assessment.	Section 5.9 of the ERD
	Provide information on dust composition for the Moora Mine operation, noting that crystalline silica dust may be produced due to the nature of the mined mineral.	Section 5.9 of the ERD
	Assess the potential cumulative impacts of the proposed operation, including existing emission sources from the Moora mine and background pollution levels, by incorporating these factors into the air quality modelling assessment	Section 5.9 of the ERD
	Assess the potential significance of dust composition for Moora Mine operation and consider additional measures to mitigate potential impacts on sensitive receptors, particularly those immediately adjacent to the DE.	Figure 5-26 in section 5.9 of the ERD
	Consider utilizing other regional data as a proxy or utilize global modelling data such as CAMS global reanalysis (EAC4) if local particle monitoring data is unavailable.	Section 5.9.5.2.1 of the ERD
	Provide additional evidence on the selection of representative year in the updated air quality assessment.	Section 5.9.5.2.1 of the ERD
Social Surroundings (Noise) – DWER	Provide the 2018 Moora Noise Survey report for review.	Appendix R of the ERD
	Provide an explanation for the higher LA10 noise levels observed at night.	Section 5.7 of the ERD
	Clearly demonstrate compliance with noise regulation at all times, including during the 6:00 am to 7:00 am period.	Section 5.7 of the ERD
	Conduct noise monitoring during the operation of the existing Moora site to verify the noise modelling for the proposed project and demonstrate compliance with noise regulations.	Section 5.7 of the ERD
Greenhouse Gas - DWER	The GHGMP should be updated and submitted for consideration as part of the assessment of this proposal. Guidance and instructions for the GHGMP can be accessed at: *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*.	Section 5.8 of the ERD
	Ensure that emission estimates and scopes align with the EP Act 'proposal' boundaries. Include NGER Act data to provide emission estimates, adapting them to meet EP Act requirements if there are difference between NGER Act and EP Act estimates or scopes.	Section 5.8 of the ERD

EPA Factor / Source of request	Work/ Actions Required	Section in the ERD
	Verify that GWP factors are consistent with the most recent NGER Act and IPCC publications. In the case of any discrepancies, estimates applying both factors should be provided.	Section 5.8 of the ERD
	Confirm the feasibility of an additional charcoal retort at the Kemerton Smelter expected to achieve 90 percent reduction in scope 1 emission and provide clear information regarding the feasibility of the assessment.	Section 5.8 of the ERD
	Provide the confidential benchmarking report for review. The proponent can request confidentiality for the benchmarking information/report if provided separately.	Section 5.8 of the ERD
	Conduct an independent expert review of best practices and design approaches focusing on emission sources, source data, calculation methodologies, emission baseline, review of best practice emissions reduction technologies (from implementation through operation), and relevant considerations and assumptions for GHG emissions throughout the project lifetime.	Section 5.8 of the ERD
	Clarify the mitigation measures for Scope 2 emissions, particularly in the event that SWIS does not meet its decarbonisation trajectory. In addition, provide additional information for addressing Scope 2 emissions uncertainty.	Section 5.8 of the ERD
Offsets - DCCEEW	Provide an offset strategy for the following protected matters, listed as Endangered under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): – Carnaby's Black Cockatoo – Watheroo Wattle – Diels' Daviesia Ensure that the proposed offset strategy is consistent with the *EPBC Act Environmental Offsets Policy* (Department of Sustainability Environment, Water, Population, and Communities, 2012). The offset strategy should be prepared in accordance with *Environmental offsets under the EPBC Act - DCCEEW* and *Offsets assessment guide - DCCEEW*.	Section 7 of the ERD and Appendix T
	Assess the potential need for an additional offset and take necessary steps to meet the requirements of the *EPBC Environmental Offsets Policy* (2012).	Section 7.3.4 of the ERD
	Provide evidence that the Cairn Hill site has approval from the legislating party (State government and/or Commonwealth government) to be removed as an offset component of the other project (EPA 1783) it was being used for to establish it as an offset component for the proposed action.	Section 7.2 of the ERD and Appendix T
Offsets – Department of Biodiversity, Conservation and Attractions (DBCA)	That once the proposed offset measures are determined by DWER to meet WA environmental offsets policy and guidelines, DBCA is provided with the opportunity to comment on possible conservation offset measures aimed at mitigating the residual impacts of the proposal on threatened flora, threatened fauna and TECs	No change required
Threatened Ecological Community (Coomberdale Chert Hills) - DBCA	Undertake further steps to avoid, minimise and mitigate potential impacts (direct and indirect) of the proposal on the Coomberdale Chert Hills Threatened Ecological Community (TEC).	Section 5.2 of the ERD
	Provide further information in the draft documentation on the monitoring of potential indirect impacts of the proposal on the Coomberdale Chert Hills TEC	Section 5.2 of the ERD
	Update the draft ERD to reflect the conservation status /ranking of the Coomberdale Chert Hills TEC as critically endangered.	Section 5.2 of the ERD
	Update the draft ERD to note the requirement for the proponent to seek Ministerial authorisation under section 45 of the BC Act for the	Section 5.2 of the ERD

EPA Factor / Source of request	Work/ Actions Required	Section in the ERD
	modification of an occurrence of a TEC. Contact DBCA's Species and Communities Program to discuss requirements under section 45 of the BC Act.	
	Clarify/update the inconsistency in the total area of native vegetation proposed for clearing. Clarify the reasons behind the misalignment between the total fauna habitat and area of vegetation to be cleared.	Section 5.2 of the ERD
Threatened Flora - DBCA	Provide additional targeted threatened flora surveys to inform a clear assessment of potential impacts (direct, indirect and cumulative) on threatened flora, at a local and regional scale.	Section 5.2 and Section 5.5 of the ERD
	Provide additional information in the draft ERD on the management and monitoring of potential impacts of the proposal on threatened flora.	Section 5.2 of the ERD
	Update draft ERD to note the requirement for the proponent to seek Ministerial authorisation under section 40 of the BC Act for the take of threatened flora.	Section 5.2 of the ERD
	Contact DBCA's Species and Communities Program to discuss requirements under section 40 of the BC Act.	
Priority Flora - DBCA	Undertake additional targeted survey to inform a clear assessment of potential impacts (direct, indirect and cumulative) on all priority flora, including an assessment of the number of known individuals, at both a local and regional scale.	Section 5.2 of the ERD
Threatened Fauna: Zanda latirostris (Carnaby's cockatoo)	Provide additional targeted surveys to inform a clear assessment of the potential impacts (direct, indirect and cumulative) on threatened fauna, at both a local and regional scale.	Figure 5.18 in Section 5.5 of the ERD
Threatened Short Range Endemics (SREs) - DBCA	Provide additional targeted surveys to determine the presence of Idiosoma species and assess any potential impacts on the species.	Section 5.5 of the ERD
Phytophthora dieback	Amend the draft ERD to provide a comprehensive Phytophthora dieback assessment, map and updated management plan.	Section 5.2 of the ERD
Other - DWER	Include the assessment number (2346) on the cover page.	Cover Page
	Include an invitation for the public to make a submission in the ERD. The invitation should be printed on different coloured paper. The ERD template can be accessed via Invitation to make a submission - ERD.	
	Provide a diagram of the links between environmental factors or values in the holistic impact assessment of the proposal on the environment	Section 9 of the ERD

2021 Request for Further Information

Table 12.2 2021 Additional Information

Key Environmental Factor	Additional Information	Source/Date	Section
Flora and Vegetation	The survey provided in the Flora and Vegetation Assessment - Appendix F submitted in June 2022, does not meet the EPA guidance for targeted flora surveys and vegetation assessment. Provide the report prepared in accordance with *EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment*. The vegetation classification and descriptions are comprehensive and suitable for assessment: however, the surveys were undertaken prior to the publication of the EPA's technical guidance, and as such, they do not meet the guideline requirements. The assumptions and conclusions derived from data representing the number of locations where species were recorded, rather than counts of individuals.	RFI	Refer to Table 5.7 and Section 5.2 which include information regarding survey timing and limitations. This information provides justification that the existing vegetation and flora surveys are consistent with EPA guidance.
	A survey targeting DBCA threatened and priority species database search, other significant species described in the EPA's Technical Guidance, and those noted in the Flora and Vegetation Assessment (Appendix F, Table 5) is required.	RFI	
	The extent of likely impacts on threatened flora is unclear. The significant flora occurring outside the disturbance footprint should be documented and likely direct and indirect impacts to these species should be considered.	RFI	Refer to Figure 5-7 and Section 5.2.5 for comparison of direct and potential indirect impacts.
	The Coomberdale TEC (Threatened Ecological Community) has been nominated for listing as Critically Endangered under the *Biodiversity Conservation Act 2016* (BC Act), warranting in depth technical consideration and precautionary evaluation to evaluate impacts from the proposal.	RFI	Refer to Section 5.2.5 for potential impacts, and Section 5.2.7, 5.2.6.3 for assessment and significance of residual impacts
	If the above information is not provided, or if surveys determine risk of impact on significant flora and vegetation species, Environmental Management Plans detailing the management and mitigation of impacts on significant flora and vegetation should be prepared in accordance with *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* and submitted for assessment. This should include a commitment to avoid or minimise impacts to significant flora and vegetation species and consideration of offsets for any significant residual impacts to TEC and threatened flora.	RFI	The Environmental Management Plan is provided as Appendix C.
Terrestrial Fauna	The Figure 2 (Appendix M) should be revised to label the individual species rather than their listing status and Figure 3 should clearly illustrate fauna habitats.	RFI	GHD's (2021a) Fauna Report included in Appendix M. Figure 2 (updated) shows individual species. Figure 4 (Fauna Habitats) shows all fauna habitats so no change has made
	Targeted desktop search for any known locations of breeding or nesting sites of Carnaby's Black Cockatoo within 12 kilometres (km) of the Development Envelope (DE) should be undertaken and must be included in the referral documents.	RFI	Section 5.5.4.1.5 Desktop search of Cockatoo Roosting and Breeding sites is

Key Environmental Factor	Additional Information	Source/Date	Section
			shown in Figure 5.19 (12 km buffer)
	The information on Short Range Endemics (SRE) are incorrectly discussed under 'other environmental factors' in section 4 of the referral supporting document. It should be noted that the SREs are a component of EPA's Environmental Factor Guideline - Terrestrial Fauna and should be correctly discussed.	RFI	Section 5.5.4.1.6 has been included within the Terrestrial fauna section
	The predicted distribution range of *Bothriembryon* and *Antichiropus* species and their percentage of habitat likely to be lost due to proposal should be assessed and discussed.	RFI	Section 5.5.4.1.6 Broader mapping or assessment has not been completed
	Genetic analysis needs to be conducted to confirm whether the spider specimen collected is the same species *Kwonkan wonganensis* or a new species.	RFI	Specimen not retained to be tested
	The presence of Eucalypt woodlands of the Western Australian Wheatbelt Priority Ecological Community (PEC) should be recognised and discussed in referral supporting document. EPA notes that PEC have been identified to occur within the DE.	RFI	Addressed in Flora and Vegetation Section 5.2.4.5.4.1
	The assessment of the distribution and quality of, and potential impacts on the PEC should be undertaken.	RFI	Addressed in Flora and Vegetation Section 5.2.5
	Offsets that are required for the clearing of Carnaby's Black Cockatoo foraging habitat should be determined.	RFI	Offset Section 7.3 Figure 7.2 showing Cockatoo Roosting and Breeding sites around the Offset sites
	If the above information is not provided, or if surveys determine risk of impact on significant terrestrial fauna species, Environmental Management Plans detailing the management and mitigation of impacts on significant terrestrial fauna should be prepared in accordance with *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* and submitted for assessment. This should include a commitment to avoid or minimise impacts to significant terrestrial fauna and consideration of offsets for any significant residual impacts to terrestrial fauna.	RFI	The Project Environmental Management Plan is provided as Appendix C
Landforms	No further changes requested	-	N/A
GHG	GHG included as Key Environmental Factor and new calculations and GHG management plan provided for SIMCOA (including North Kiaka, Moora Mine and Kemerton) – Proponent will need to identify preliminary key environmental factors relevant to Kemerton Smelter and Moora Mine (i.e. greenhouse gas emissions,) – supporting information/studies will need to be suitable for the EPA to assess significance of impact. – A Greenhouse Gas Management Plan prepared in accordance with EPA draft review of Greenhouse Gas Factor Guideline. *Environmental Factor Guideline – Greenhouse Gas Emissions* | EPA Western Australia – EPA is not able to comment on future studies required until the revised Referral Information is assessed	Meeting with EPA 16/09/2022	Section 5.8 Appendix U
Air Quality	Air Quality included as Key Environmental Factor relevant to Kemerton Smelter and Moora Mine (supporting information/	Meeting with EPA 16/09/2022	Section 5.9

Key Environmental Factor	Additional Information	Source/Date	Section
	studies will need to be suitable for the EPA to assess significance of impact). Electronic copies of the Air Quality Modelling to be provided.		
Social Surroundings	Social Surroundings included as Key Environmental Factor relevant to Kemerton Smelter and Moora Mine (supporting information/studies will need to be suitable for the EPA to assess significance of impact) Kemerton and Moora sites included in the discussion, in addition to the Proposal	Meeting with EPA 16/09/2022	Section 5.7
TEQ	No additional information required	-	N/A
Inland Waters	No additional Information required	-	N/A
All	In addition, Existing conditions of MS 813 will be reviewed to make sure they are contemporary and updated to include conditions specific to the proposal (North Kiaka)	Meeting with EPA 16/09/2022	Table 12.3
All	Proponent should refer to EPA Guidance and Procedures for further information regarding information requirements for 'significant amendments to an approved proposal'.	Meeting with EPA 16/09/2022	Whole document

Review of Ministerial Statement 813 Conditions

As the EPA is considering the Revised Proposal "as an amendment to an existing approved proposal under s40(AA) of the EP Act" in accordance with the EPA's Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA, 2021a), the current conditions of MS 813 have been reviewed to assess adequacy (see Table 12.3). Comment has been provided on whether these conditions are likely to need revising as part of the significant amendment application.

Table 12.3 Review of Ministerial Statement 813 Conditions

Condition	Sub-Condition	Adequacy of existing condition for this Proposal
1. Proposal Implementation	**Condition 1-1:** – The proponent shall implement the proposal as assessed by the EPA and described in schedule 1 of this statement subject to the conditions and procedures of this statement.	Suitable, no change required
2. Proponent Nomination and Contact Details	**Condition 2-1:** - The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.	Amend to refer to conditions under S40
	Condition 2-2: - The proponent shall notify the Chief Executive Officer of the Department of Environment and Conservation (CEO) of any change of name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.	Suitable, no change required
3. Time Limit of Authorisation	**Condition 3-1:** - The authorisation to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.	Suggest that this condition is removed as the Revised Proposal is substantially commenced.
	Condition 3-2: - The proponent shall provide the CEO with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years form the date of this statement.	Suggest that this condition is removed as the Revised Proposal is substantially commenced.
4. Compliance Reporting	**Condition 4-1:** - The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the CEO.	Suitable, no change required
	Condition 4-2: - The proponent shall submit to the CEO, the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance assessment report required by condition 4-6. - The compliance assessment plan shall indicate: 1. The frequency of compliance reporting; 2. The approach and timing of compliance assessments; 3. The retention of compliance assessments; 4. Reporting of potential non-compliance and corrective actions taken; 5. the table of content of compliance assessment reports; and	Suggest that condition is modified to just reflect the North Kiaka elements of the Revised Proposal. A Compliance Assessment Plan is already in place for the Kemerton Smelter and Moora Mine elements of the Revised Proposal.

Condition	Sub-Condition	Adequacy of existing condition for this Proposal
	6. Public availability of compliance reports	
	Condition 4-3: - The proponent shall assess compliance with condition in accordance with the compliance assessment plan required by condition 4-1.	Suitable, no change required
	Condition 4-4: - The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO.	Suitable, no change required
	Condition 4-5: - The proponent shall advise the CEO of any potential non-compliance as soon as practicable.	Suitable, no change required
	Condition 4-6: - The proponent shall submit a compliance assessment report annually from the date of issue of the Implementation Statement addressing the previous twelve-month period or other period as agreed by the CEO. - The compliance assessment report shall: 1. Be endorsed by the proponent's Vice-President or a person, approved in writing by the CEO, delegated to sign on the Vice-President's behalf; 2. Include a statement as to whether the proponent has complied with the conditions; 3. Identify all potential non-compliances and describe corrective and preventative actions taken; 4. Be made publicly available in accordance with the approved compliance assessment plan; and 5. Indicate any proposed changes to the compliance assessment plan required by condition 4-1.	Suitable, no change required
5. Performance Review and Reporting	**Condition 5-1:** - The proponent shall submit to the CEO Performance Review Reports at the conclusion of the second and fourth years after the commencement of operation of the fourth submerged arc furnace and then, at such intervals as the CEO may regard as reasonable, which address: 1. The environment risks and impacts; the performance objectives, standards and criteria related to these; the success of risk reduction/impact mitigation measures and results of monitoring related to the management of the risks and impacts; 2. The level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable; and 3. Improvements gained in environmental management which could be applied to this and other similar projects.	Suggest that this condition is modified to reflect the North Kiaka aspect of the Revised Proposal. Performance Review Reports have historically been submitted for the Kemerton Smelter and the Moora Mine elements of the Revised Proposal. Suggest that the frequency is 5 yearly to align with updates on the status of the GHG MP.
	Condition 5-2:	Suitable, no change required

Condition	Sub-Condition	Adequacy of existing condition for this Proposal
	- The proponent shall make the Performance Review Reports required by Condition 5-1 publicly available in a manner approved by the CEO.	
6. Flora	**Condition 6-1:** - Except to the extent that the proponent has been or is granted all required statutory approvals to disturb or take the following flora, the proponent shall manage mining activities such that there are no discernible detrimental changes in the following flora: 1. The Coomberdale Chert Threatened Ecological Community; 2. Populations of *Regelia megacephala*; and 3. Other Priority and threatened (Declared Rare) flora species	Request discussion with the EPA about a condition that reflects the fact that the community and flora can be detrimentally impacted by factors outside of Simcoa's control, such as climate change, feral animal predation, bush fire
	Condition 6-2: - The proponent shall provide annual reports to the CEO on mining activities, indicating those areas cleared, and shall advise the CEO within seven days of the event that detrimental effects on any of the above-mentioned flora is observed. Close liaison with the Department of Environment and Conservation (DEC) should take place.	Consider removal or modification of the condition as replication of information reported annually to DMIRS in relation to SIMCOA's tenements.
7. Mining and Conservation Strategy	**Condition 7-1:** - Prior to expansion of mining into the Eastern Ridge area, the proponent shall revise and update the Mining and Conservation Strategy required under Condition 20 of Statement 575, in co-operation with the DEC, and to the requirements of the Minister for Environment on advice of the DEC. - The objective of this strategy is to ensure that conservation of biodiversity values is achieved whilst maintaining long-term access to the chert resource. - The Mining and Conservation Strategy shall address the following matters: 1. Additional reconnaissance exploration to identify other parts of the Coomberdale Chert formation, both within and outside current lease areas G70/91, G70/92, G70/93 and M70/101, which may contain sufficiently high grade quartz in areas where the chert-associated vegetation is already absent or degraded; 2. Provision of support (subject to negotiation) to the DEC for regional flora surveys to identify and map other parts of the Coomberdale Chert formation which may contain the same or other significant flora associated with the chert; 3. Based on the outcomes of 7-1 and 7-1-2 above, and in cooperation with the DEC, development of the best strategy to ensure both access to high grade quartz and conservation, in secure reserves, of the flora of the Coomberdale Chert formation; 4. Additional conservation offsets such as the Cairn Hill North area and other areas of significant vegetation identified by 7-1-2, whether part of reserves or other properties,	Suggest removal of this condition. The condition has not been triggered to date (MS 813) and Simcoa is highly unlikely to expand mining into the Eastern Ridge area. Cairn Hill has been accepted as an offset area and is now part of a reserve. Potential to acknowledge Cairn Hill North as an offset.

Condition	Sub-Condition	Adequacy of existing condition for this Proposal
	and, during the operation life of the mine, provision of resources for conservation management. 5. Provision for fencing, to the requirements of the DEC, of areas of significant vegetation identified by 7-1-2, whether part of the reserves or other properties, and, during the operational life of the mine, provision of resources for conservation management.	
	Condition 7-2: - The proponent shall implement the Mining and Conservation Strategy required by condition 7-1 in liaison with the DEC.	Remove. As above
8. Rehabilitation	**Condition 8-1:** - Prior to the commencement of ground-disturbing activities in an area to be mined, the proponent shall conduct surveys of the area to collect baseline information on the following: 1. pre-mining soil profiles: 2. groundwater levels: 3. surface water flows: 4. vegetation complexes: and 5. landscape and landforms.	Remove or amend to apply to North Kiaka only and reflect that multiple baseline studies have already been completed to inform the content of this ERD.
	Condition 8-2: - The proponent shall conduct/commence rehabilitation trails within one calendar year oft eh commencement of ground disturbing activity to determine criteria for successful re-growth, using local native flora species, including Priority and Threatened (Declared Rare) flora species, to the requirements of the CEO and the Director General of the Department of Mines and Petroleum (DMP).	Remove or amend to reflect that baseline studies have been completed for the Moora Mine and outcomes are highly likely to be applicable to the North Kiaka element of the Revised Proposal. Alternative option is the development of a Mine Closure Plan for North Kiaka to be submitted to DMIRS.
	Condition 8-3: - The proponent shall progressively rehabilitate the mine site area in accordance with the following: 1. Re-establishment of vegetation in the rehabilitation area to be comparable in species composition with that of the pre-mining vegetation such that the following criteria are met: i. Revegetation to achieve the re-establishment of an area of vegetation coverage (not including weed species) of not less than 70 percent of the rehabilitation area as defined in Schedule 1; ii. Weed coverage less than 10 percent; and iii. Within a time frame specified in the rehabilitation schedule required Conditions 8-3-2. 2. A schedule of the rate of rehabilitation acceptable to the CEO.	Amendment required to condition 8-3 - The proponent shall progressively rehabilitate the mine site area in accordance with the North Kiaka Mine Closure Plan. The following criteria will be adopted in the MCP: 1. Re-establishment of vegetation in the rehabilitation area to be stable vegetation composed of local native plant species on waste dumps and other areas effected by mining such that the following criteria are met: i. revegetation to achieve the re-establishment of an area of vegetation coverage (not including weed species) of not less than 60 percent of the rehabilitation area as defined in Schedule 1;

Condition	Sub-Condition	Adequacy of existing condition for this Proposal
		ii. manage weeds in accordance with the MCP
	Condition 8-4: In liaison with the DEC and DMP, the proponent shall monitor annually the performance of rehabilitation required by condition 8-3.	Suggest removal as reported to DMIRS annually.
	Condition 8-5: The proponent shall submit annually a report of the rehabilitation performance monitoring required by condition 8-4 to the CEO.	Suggest removal and reporting function to DMIRS
9. Greenhouse Gas Abatement	**Condition 9-1:** - The proponent shall prepare and submit to the Minister for Environment, within 18 months of commencement of ground-disturbing activities, a Greenhouse Gas Abatement Report which meets the objectives set out in condition 9-2, as determined by the Minister for environment.	GHG MP will be submitted to the EPA with the North Kiaka ERD. Amend to refer to update on progress against GHG MP on a 5 yearly basis or if significant change proposed.
	Condition 9-2: - The objectives of the Greenhouse Gas Abatement Report required by condition 9-1 are to: 1. Demonstrate that maximising energy efficiency and opportunities for future energy recovery have been given due consideration in the design of the third and fourth submerged electric arc furnaces; 2. Ensure that the “greenhouse gas” intensity (”greenhouse gas” intensity through silicon produced) is equivalent to, or better than, benchmarked world’s best practice; and 3. Achieve continuous improvement in “greenhouse gas” intensity through triennial review, and if practicable, adoption of advances in technology and process management.	Remove condition.

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