



West Musgrave Copper and Nickel Project

May 2021

EPA Section 38 Referral Supporting Document Appendix K Management Plans



West Musgrave Copper and Nickel Project

EPA Section 38 Referral Supporting Document

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APPENDIX K. MANAGEMENT PLANS



West Musgrave Copper and Nickel Project
EPA Section 38 Referral Supporting Document

Appendix K1. Cultural Heritage Management Plan



West Musgrave Copper and Nickel Project

June 2021

Cultural Heritage Management Plan



West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

VERSION CONTROL

Version	Authorisation	Position	Signature	Date
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West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

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NOTE ON CURRENCY

Where possible, information contained in this Document is up to date as at June 2021. This was not possible for all supporting appendices, and information based on those appendices, which were prepared by third parties (as discussed in the second paragraph in the Disclaimer above) prior to the Document being finalised.

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West Musgrave Copper and Nickel Project

Cultural Heritage Management Plan

FOREWORD

This Cultural Heritage Management Plan (CHMP) has been developed to meet the requirements of the *Environmental Protection Act, 1986 (WA)* (EP Act). It is noteworthy, that while this CHMP is intended to meet the requirements of a CHMP under the EP Act, a more fulsome, operational CHMP will be developed in collaboration with the Ngaanyatjarra Council and Ngaanyatjarra People through the Mining Agreement Process.

This CHMP has been developed in consultation with the Ngaanyatjarra Council and takes into consideration:

- The outcomes of discussion with Ngaanyatjarra People as formalised through Heritage Survey Reports issued to OZ Minerals by the Ngaanyatjarra Council to support the West Musgrave Project (WMP).
- The expectation of the Ngaanyatjarra Council that the 'intent, content, effect and spirit' the Ngaanyatjarra Council CHMP – West Musgrave Project 2021 Exploration and Studies Program (Appendix A; Ngaanyatjarra Council, 2021), is reflected.
- Considerations for cultural heritage protection as detailed in the Exploration Deed of Agreement between the Ngaanyatjarra Land Council (Aboriginal Corporation) (the lessee of the Aboriginal Reserves), Yarnangu Ngaanyatjarraku Parna (Aboriginal Corporation) RNTBC (the registered native title body corporate in respect of the Ngaanyatjarra Lands) and OZ Minerals. The Ngaanyatjarra Council acts as agent for the Ngaanyatjarra Land Council and Yarnangu Ngaanyatjarraku Parna, including for the purposes of the Exploration Deed of Agreement. The Exploration Deed of Agreement is the legally binding agreement between these parties and defines the conditions and requirements of the parties to conduct business within the defined exploration area.
- Numerous discussions between OZ Minerals, the Ngaanyatjarra Council and subject matter experts relating to the content of this CHMP (Appendix C and OZ Minerals, 2021; Appendix A5).
- A detailed review of this CHMP by the Ngaanyatjarra Council.
- A detailed independent peer review of this CHMP by Gavin Jackson Cultural Management Services (GJCMS) (Appendix B).

All relevant feedback from the Ngaanyatjarra Council and GJCMS, as it pertains to the requirement of the EPA, has been considered in the development of this CHMP.



West Musgrave Copper and Nickel Project

Cultural Heritage Management Plan

SUMMARY

A summary of the key Environmental Management Plan (EMP) information is presented in Table 1.

Table 1: Summary of Key EMP Information

Project Information	Description
Proposal Name	West Musgrave Copper and Nickel Project
Proponent Name	OZ Minerals
Ministerial Statement No/s and Condition/Clauses	<p>The Proposal is currently being assessed by the Government of Western Australia's Environmental Protection Authority (EPA). The EPA has proposed that a Cultural Heritage Management Plan (CHMP) will be a condition of approval of the proposed project.</p> <p>A Ministerial Statement and associated conditions are yet to be issued.</p>
Purpose of the EMP	<ul style="list-style-type: none">To support the assessment, approval and implementation of the Proposal under Part IV of the <i>Environmental Protection Act, 1986</i> (WA) (EP Act).The Proposal is being assessed by the EPA under Part IV of the EP Act, through Assessment of Referral Information (ARI). A CHMP was requested as part of the ARI s40(2)(a) notice requiring additional information.This CHMP has been prepared to provide management, mitigations and monitoring actions to ensure there are no incidents of unauthorised land disturbance or access to identified cultural heritage sites.
Key Environmental Factor	Social Surroundings
Objective	<p><i>To protect social surroundings from significant harm.</i></p> <p>The social surroundings of people are their aesthetic, cultural, economic and social surroundings to the extent that those surroundings directly affect or are affected by their physical or biological surroundings (EPA, 2020b)</p>
Key Provisions of the MP	See Section 2
Proposed Construction Timing	Commencing 2022, progressing to 2024
EMP Required Pre-construction?	Yes, prior to issuing of Ministerial Statement
Proposed Operations Timing	26 years from date of commissioning

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1 SCOPE, CONTEXT, AND RATIONALE

1.1 Scope

This Cultural Heritage Management Plan (CHMP) has been prepared by OZ Minerals to support the assessment, approval, and implementation of the West Musgrave Project (WMP) Proposal under Part IV of the *Environmental Protection Act, 1986* (WA) (EP Act). The Ngaanyatjarra Council has provided considerable feedback and input to this CHMP. In the interest of co-operation, collaboration, and shared value outcomes all feedback, as it pertains to the requirements of the Government of Western Australia's Environmental Protection Authority (EPA), provided by the Ngaanyatjarra Council has been incorporated into this CHMP.

Aboriginal Cultural Heritage in Western Australia is primarily governed by the *Aboriginal Heritage Act, 1972* (WA) (AH Act). In addition to the AH Act, the following guidance statements and legislation were considered in the development of this CHMP:

- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2020b)
- EPA Environmental Factor Guideline – Social Surroundings (EPA, 2016)
- *Aboriginal Affairs Planning Authority Act, 1972* (WA) (AAPA Act)
- *Native Title Act, 1993* (Cth)
- *Aboriginal and Torres Strait Islander Heritage Protection Act, 1984* (Cth) (ATSIHPA)
- *Environment Protection and Biodiversity Conservation Act, 1999* (Cth) (EPBC Act)

This CHMP addresses the Notice Requiring Information for Assessment, received from the EPA on 14 April 2021 (the Notice). The Notice requires OZ Minerals to:

Provide a Cultural Heritage Management Plan detailing the application of the mitigation hierarchy concerning avoidance and minimisation of impact to potential cultural heritage sites. The Plan should include a framework for consultation with relevant stakeholders including Traditional Owners, during the life of the proposal. The Cultural Heritage Management Plan is to be developed on advice of the appropriate knowledge holders and may be reviewed by a suitably qualified independent person. The Plan may include detail of cultural management strategies and methodologies for pre-clearance surveys. The Plan should detail provisions for land access and include management actions to be undertaken where additional heritage sites are identified.



West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

This CHMP applies to all works undertaken by OZ Minerals within the lease areas shown in Table 2 and Figure 1, and any future leases that form part of the WMP.

Table 2: Tenements for the WMP

Tenement	Area (ha)	Grant Date	Expiry Date
M 69/72	790	30/11/2001	29/11/2022
M 69/73	1,000	30/11/2001	29/11/2022
M 69/74	1,000	30/11/2001	29/11/2022
M 69/75	1,000	30/11/2001	29/11/2022
L 69/42	13,539	24/07/2019	23/07/2040
L 69/44	1,467	8/05/2019	7/05/2040
E 69/1505	17,834	20/04/2000	19/04/2021*
E 69/1530	21,601	8/09/2000	07/09/2021
E 69/2201	21,455	13/04/2007	12/04/2021*
E 69/3156	1.0 (BL)	22/08/2019	21/08/2024
E 69/3163	30 (BL)	15/12/2014	14/12/2024
E 69/3164	1,480	14/05/2014	13/05/2024
E 69/3412	44 (BL)	01/11/2016	31/10/2021
E 69/3535	26,185	19/02/2019	18/02/2024
E 69/3169	1 (BL)	15/12/2014	14/12/2024
E 69/3157	11 (BL)	22/08/2019	21/08/2024
E 69/3165	2 (BL)	14/05/2014	13/05/2024

*Renewal applications under assessment, expiry dates will be updated upon granting of renewal application

An independent peer review of this CHMP has been undertaken (Appendix B), of which all feedback as it pertains to the requirements of the EPA has been addressed and incorporated into this CHMP.

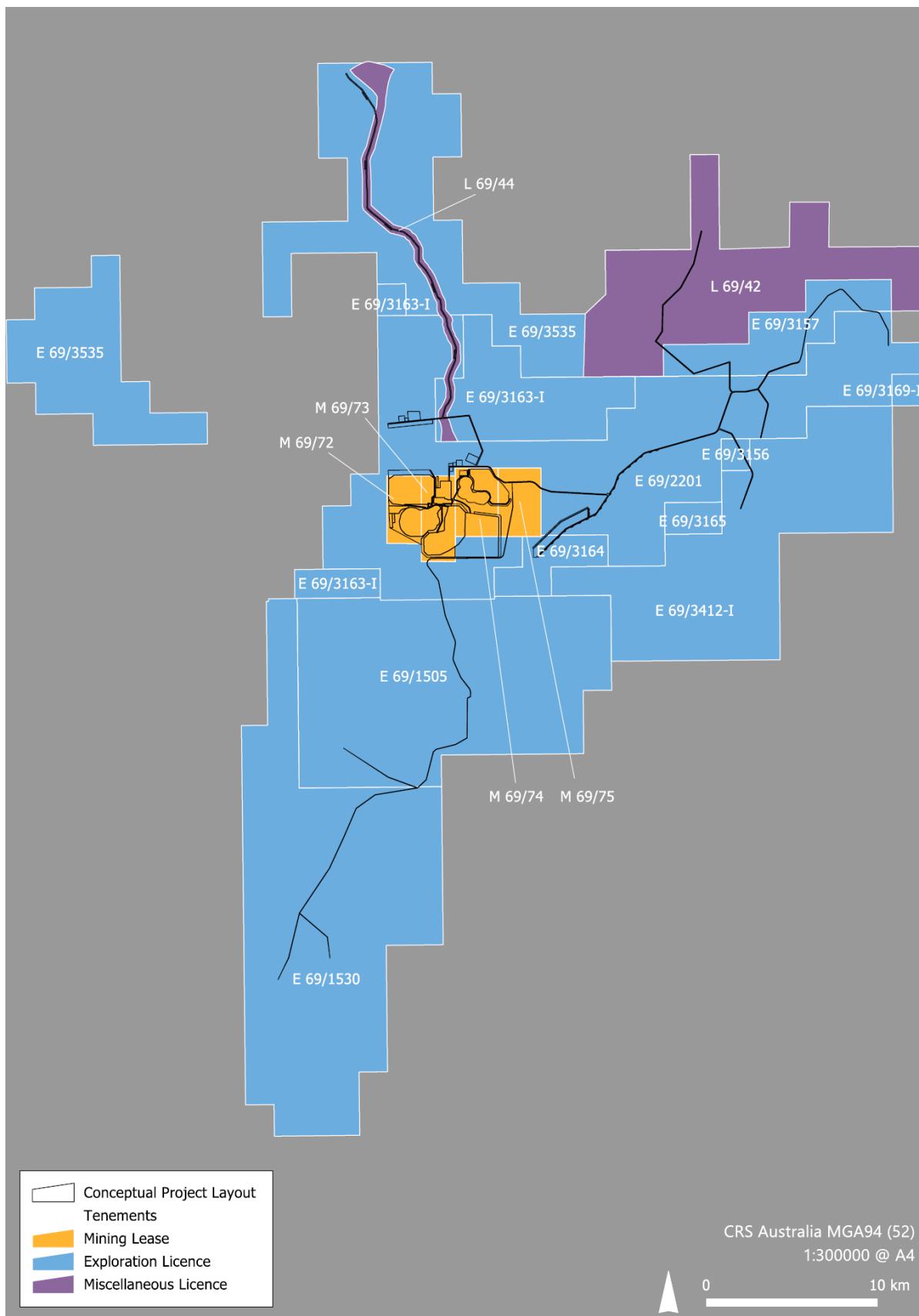


Figure 1: Tenements for the WMP

1.2 Context and Rationale

The WMP currently operates under an Exploration Deed of Agreement between the Ngaanyatjarra Land Council (Aboriginal Corporation) (the lessee of the Aboriginal Reserves), Yarnangu Ngaanyatjarraku Parna (Aboriginal Corporation) RNTBC (the registered native title body corporate in respect of the Ngaanyatjarra Lands) and OZ Minerals. Ngaanyatjarra Council acts as agent for the Ngaanyatjarra Land Council and Yarnangu Ngaanyatjarraku Parna, including for the purposes of the Exploration Deed of Agreement. The Exploration Deed of Agreement is the legally binding agreement between these parties and defines the conditions and requirements of the parties to conduct business within the defined exploration area, in particular the Exploration Deed of Agreement defines processes for cultural heritage protection and pre-clearance surveys. The Exploration Deed of Agreement, and its associated conditions will remain in place until such time that a Mining Agreement has been agreed. While the existing provisions relating to cultural heritage protection relate substantially to exploration works, the key requirements for heritage protection detailed in the Exploration Deed of Agreement are likely to be substantially adopted in the Mining Agreement. A revision to this management plan will be made following the registration of the Mining Agreement to include any updates to provisions relating to cultural heritage protection.

In addition to the conditions for cultural heritage protection in the Exploration Deed of Agreement, the Ngaanyatjarra Council has prepared a Cultural Heritage Management Plan (Ngaanyatjarra Council, 2021) that will come into legal effect after the Mining Agreement has been agreed. The Ngaanyatjarra Council CHMP defines the minimum standard for the protection of cultural heritage at the WMP during the exploration and studies phase of the project (see Appendix A). The requirements of the Ngaanyatjarra Council CHMP have, where relevant to respond to the requirements of the EPA, been incorporated into this CHMP. A key principle of the Ngaanyatjarra Council CHMP is the four overarching 'Golden Rules' that must be complied with by project personnel to manage potential risks to cultural heritage sites, these include:

1. Do not start ground disturbing or non-ground disturbing work without an approved Land Disturbance Permit (LDP) (for ground disturbing activities) or Permit to Work (PTW) (for non-ground disturbing activities).
2. Never leaving designated work areas, accommodation areas or transport areas, unless in the case of an emergency.
3. If you are unsure about whether you're operating or traversing through an approved work area, or if you think you've found cultural heritage material or skeletal remains, stop all works within a 50 m radius and tell your supervisor.
4. In the case of a breach of the 'Golden Rules', or what is thought may be a breach, tell your supervisor immediately. OZ Minerals and the Ngaanyatjarra Council must be notified as soon as practicable to determine next steps.

The Ngaanyatjarra Council and Ngaanyatjarra People have noted their preference not to publicly disclose the location of sites and exclusions zones, and as such, no specific details of sites and exclusions zones have been provided in this CHMP. All cultural heritage sites as identified by Ngaanyatjarra People relevant to the WMP are detailed in 'commercial in confidence' cultural heritage survey reports as issued to OZ Minerals by the Ngaanyatjarra Council (OZ Minerals 2021; Appendix J1 and J2).

1.3 OZ Minerals Corporate Governance

Sustainability management including social performance and cultural heritage protection is integrated into OZ Minerals' Corporate Governance framework. This framework consists of OZ Minerals':

- Strategy
- Performance Standards, that set the minimum benchmarks and expectations of performance for global assets
- Process Standards, that support the operation of the business
- company policies, that show the overarching intent within the business and enable our stakeholders to hold us to account
- the annual business planning process, which sets priorities.

Further details relating to OZ Minerals' governance framework can be found at www.ozminerals.com/about/corporate-governance.

OZ Minerals' Social Performance Standards directly relate to this CHMP and can be found at www.ozminerals.com/sustainability/performance-standards/Social-Performance. OZ Minerals' performance against corporate governance is reported in our Annual and Sustainability Reports, which can be found at www.ozminerals.com/media/reports/annual.

1.4 Proposal

The WMP is located in the West Musgrave Ranges of Western Australia. The WMP is located approximately 1,300 km north-east of Perth near to the border of South Australia and the Northern Territory. The WMP is within the Ngaanyatjarra Native Title determination, and Class A Reserve No. 17614 (for the Use and Benefit of Aboriginal Inhabitants). The nearest towns include the Indigenous Communities of Jameson (Mantamaru) 26 km north, Blackstone (Papulankutja) 50 km east, and Warburton (Milyirrtjarra) 110 km west of the project (Figure 2).

The project, with a current expected life of approximately 26 years, will consist of:

- Mining of copper and nickel ore from two open cut mine pits using conventional blast, load and haul methods
- Placement of mine waste into permanent waste rock dumps (WRDs) and dedicated tailings storage facility (TSF) adjacent to mine pit voids
- Milling and processing of ore using floatation to produce two separate copper and nickel concentrates
- On-site power supply using a combination of renewable power infrastructure (photovoltaic solar panels, wind turbines and battery storage) supported by backup thermal power generation
- Development of a process/potable water supply borefield that may include a combination of overland and/or underground pipelines for use during construction and operations
- Miscellaneous infrastructure, including stormwater management infrastructure (bunds and drains), internal roads and service tracks, a dedicated site access road, accommodation village (approximately 450 beds during operations and 1,200 during construction), airstrip, wastewater treatment, landfill and other supporting infrastructure including offices, warehouses and workshops
- Concentrate will be transported to Esperance via existing roads and rail networks.

A summary of the key project characteristics is presented in Table 3.

Table 3: Key Project Characteristics

Elements	Location	Proposed Extent Authorised
Physical Element		
Mine and associated infrastructure	Figure 3	Clearing of up to 3,830 ha of native vegetation within a Development Envelope of 20,852 ha
Operational Element		
Mining voids	Figure 3	Below water table mining Nebo pit void to be backfilled above water table post-closure Babel pit void to be a permanent and episodic pit lake post-closure
Mining waste (waste rock)	Figure 3	Placement of waste rock into permanent WRDs
Ore processing waste (tailings)	Figure 3	Disposal of tailings into a TSF and/or Nebo pit void
Power supply	Figure 3	Up to 60 MW (instantaneous load requirement) of fossil fuel electricity generation Up to 100 MW of photovoltaic solar electricity generation Up to 100 MW of wind electricity generation
Water supply	Figure 3	Abstraction of up to 7.5 GL/a of groundwater from the Borefield and through mine pit dewatering



Figure 2: Site Location

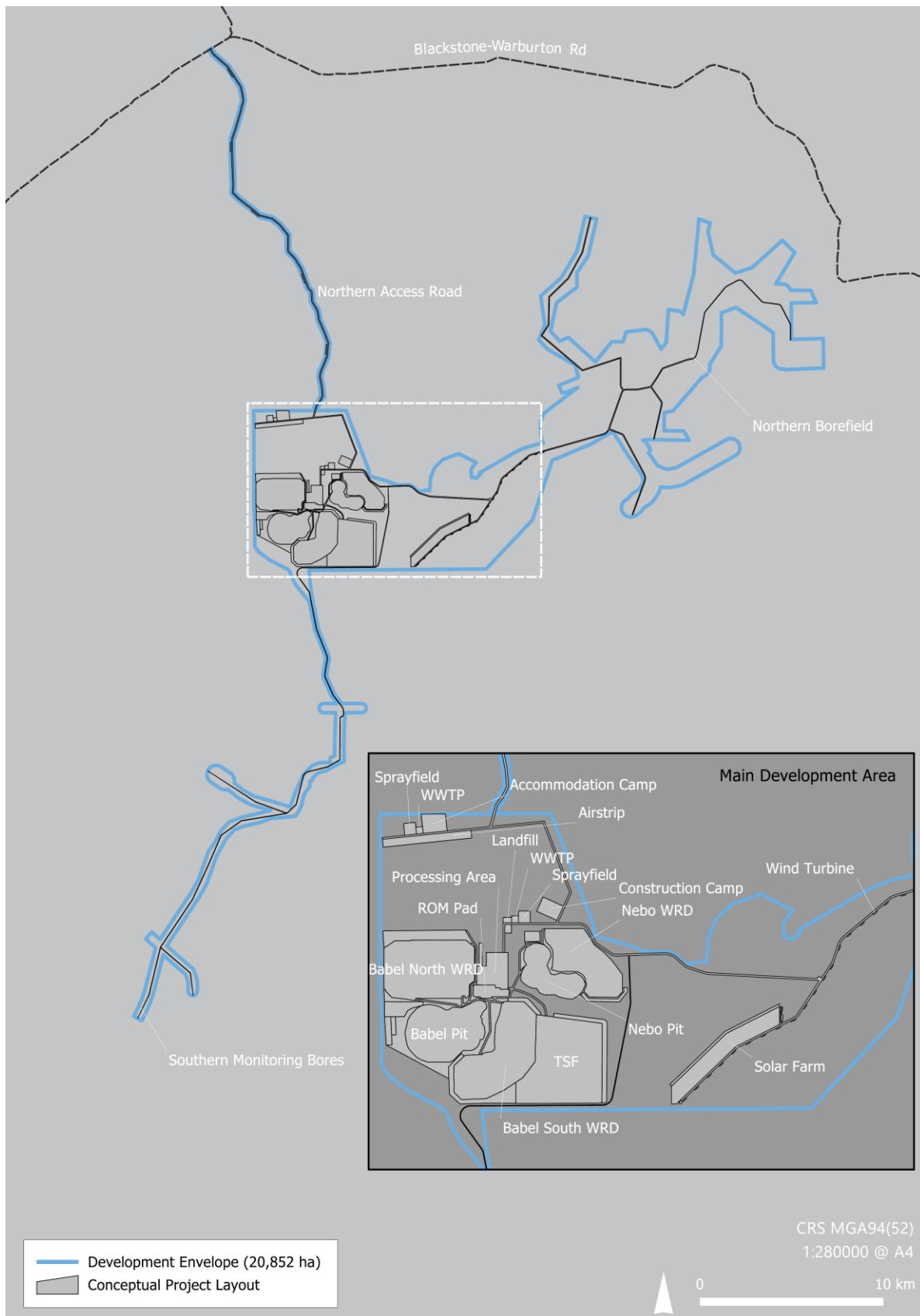


Figure 3: Location of Key Physical and Operational Elements

1.5 Key Environmental Factor

This CHMP specifically relates to the Social Surroundings factor guidelines. The EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020b) lists the following as their objective for Social Surroundings:

To protect social surroundings from significant harm

1.5.1 Proposal Activities that May Affect the Key Environmental Factor

In compliance with the Notice provided by the EPA, this management plan applies to the avoidance and minimisation of impact to potential cultural heritage sites, to the extent that the interaction of the project may negatively impact cultural heritage sites such that the EPA objective may not be achieved. To this end the following credible events have been identified with the potential to result in negative impacts to cultural heritage sites, specifically:

- Project activities result in direct and unauthorised impacts to cultural heritage sites (i.e., Tjukurrpa sites) and archaeological sites (including dreaming sites, waterholes, important stands of trees, isolated outcrop features, human remains/grave sites or artefacts/artefact scatters) as a result of project-related land disturbance and clearing of ground
- Project layout or activities, constrain or otherwise change the nature of land access to cultural heritage sites, or areas of the landscape used for customary uses by Traditional Owners
- Project activities result in indirect impacts to cultural heritage sites through:
 - The deposition of unacceptable levels of dust
 - Reduced amenity associated with noise
 - Changes to visual amenity
 - Disturbance as a result of the introduction of project-related night-time lighting
- Drawdown of groundwater negatively impacts sensitive receptors including, Linton Bore, Mantamaru (Jameson) water supply and/or vegetation species that are culturally important; two specific areas of vegetation have been identified including a stand of desert oaks, and a specific stand of Mulga. Also, general reduction in the health of trees outside of known ethnographic sites (particularly within, or in proximity to dreaming trails) may also be perceived as a potential impact due to the all-encompassing nature of the way Traditional Owners value the landscape. This particular risk event is covered by the WMP Groundwater Monitoring and Management Plan (GMMP) and is not discussed further in this CHMP.
- Loss of access to, or reduction in abundance of culturally important fauna. This particular risk event is discussed in the Terrestrial Fauna Management Plan and is not discussed further in this CHMP.

The Ngaanyatjarra Council CHMP (Appendix A; Ngaanyatjarra Council, 2021) identifies four risks to be managed through the implementation of this CHMP, specifically:

- Non-compliance with OZ Minerals' commitments pertaining to the protection and management of Aboriginal heritage
- Non-compliance with conditions/recommendations arising from the outcome of heritage surveys and negotiations/consultations with Ngaanyatjarra about the project
- Impacting Tjukurrrpa and other heritage sites in the conduct of the project
- Non-compliance with Ngaanyatjarra's rules and expectations pertaining to the protection and management of their cultural heritage.

1.5.2 Site Specific Environmental Values

The project is situated in the remote Ngaanyatjarra Lands of Western Australia within the Shire of Ngaanyatjarraku. Ngaanyatjarra Traditional Owners and traditional knowledge holders maintain deep, and serious cultural obligations to care for country and to protect cultural heritage sites. Arising from these obligations is a requirement from Ngaanyatjarra People that OZ Minerals, in seeking to use Ngaanyatjarra Lands, foster a culture of compliance, cooperation and collaboration in relation to the management of cultural heritage.

The key environmental values relevant to this CHMP are cultural heritage sites, and the broader landscape in which these sites reside.

Significant cultural heritage survey effort has been undertaken in and near to the project's Development Envelope, in partnership with the Ngaanyatjarra Traditional Owners and Ngaanyatjarra Council, to identify cultural heritage sites. These sites have been documented in cultural heritage reports developed by the Ngaanyatjarra Council anthropologists and issued to OZ Minerals (OZ Minerals, 2021; Appendix J1 and Appendix J2). Cultural Heritage survey effort is described further in Section 1.7.1.

1.6 Condition Requirements

A Ministerial Statement and associated conditions are yet to be issued.

1.7 Rationale and Approach

This CHMP details how the mitigation hierarchy will be used to avoid and mitigate impacts to potential cultural heritage sites. In addition, this CHMP outlines a mechanism to ensure ongoing consultation with relevant Ngaanyatjarra People relating to cultural heritage management throughout the project life, and details of cultural heritage management strategies for pre-clearance surveys (where required). The approach to cultural heritage management detailed in this plan recognises:

- The Exploration Deed of Agreement defines the legally binding conditions and requirements of the relevant parties operating within the defined lease area, in particular the processes for cultural heritage protection and pre-clearance surveys. While cultural heritage protection provisions within the Exploration Deed of Agreement relate to exploration works they are likely to be substantially adopted in the Mining Agreement.
- The requirements, where relevant to the requirements of the EPA, of the Ngaanyatjarra Council CHMP (Ngaanyatjarra Council, 2021) which sets minimum standards for the protection of cultural heritage at the WMP. Similarly, to the Exploration Deed of Agreement, the Ngaanyatjarra Council CHMP relates to exploration and study phase activities. It is assumed (subject to reasonable and workable terms) that provisions within the Ngaanyatjarra Council CHMP will be substantially similar to what may be required for construction and operations phases of the project. The Ngaanyatjarra Council CHMP would come into legal effect when the Mining Agreement has been agreed.
- OZ Minerals' Global Performance Standards, which enable the effective management of material sustainability risks that are common across OZ Minerals (Section 1.3).
- OZ Minerals' significant focus during project design to avoid and minimise impacts by carefully designing the Development Envelope to avoid cultural heritage sites where possible, and through careful siting of project infrastructure.

This CHMP applies to all activity on OZ Minerals' controlled tenements and leases that relate to the Proposal. This CHMP outlines management objectives, actions and processes that apply to all OZ Minerals' personnel, including contractors.

1.7.1 Survey and Study Findings

1.7.1.1 Cultural Heritage Surveys

Dedicated project-specific cultural heritage surveys and associated consultation activities have been undertaken since April 2018, to identify cultural heritage sites in the Project Area (OZ Minerals, 2021; Appendix J1 and Appendix J2). These cultural heritage surveys were coordinated by the Ngaanyatjarra Council and included up to 50 Ngaanyatjarra Traditional Owners, male and female Ngaanyatjarra Council anthropologists (with over 40 years collective experience in the Ngaanyatjarra Lands), and participants from OZ Minerals. The project-specific cultural heritage surveys covered an area of over 70,000 ha, including most of the Development Envelope (Figure 4). In addition, many smaller area clearances have occurred as part of historical and ongoing exploration and project studies. While these exploration and project study area clearances have contributed to knowledge of the locations of cultural heritage in the area, and the broader cultural heritage context, these clearances were not specific to the proposed mining activities and have therefore not been directly considered as part of the current assessment. It is noted that one small gap in the Northern Borefield is yet to be surveyed for cultural heritage sites (Figure 4). A cultural heritage survey in this area is planned for the second half of 2021. No works in this area would progress without appropriate pre-clearances and issuing of a cultural heritage survey report from the Ngaanyatjarra Council.

During cultural heritage surveys, several cultural heritage sites and dreaming trails of importance were identified. Cultural heritage sites have been identified in cultural heritage survey reports issued by the Ngaanyatjarra Council to OZ Minerals as exclusion zones including offset distances around the physical site (OZ Minerals, 2021; Appendix J1 and Appendix J2).

While all cultural heritage sites have been excluded from the Development Envelope, two exclusion zones along linear infrastructure alignments are still intersected by the Development Envelope. To minimise direct conflict between the project and cultural heritage sites and exclusion zones the Ngaanyatjarra Council cultural heritage survey reports have provided prescriptive conditions (e.g. namely the definition of minimum offset distances, or where the project intersects the two exclusion zones a corridor width has been defined) to allow project activities to occur while minimising the risk of direct interaction with these cultural heritage sites.

While cultural heritage sites have been identified and excluded, Ngaanyatjarra Council's Principal Anthropologist (Brooks pers comm, 2020) has noted 'that while the immediate proposed Development Envelope is largely free of Tjukurrpa, Ngaanyatjarra People can still struggle to find solutions that minimize the chance of conflict with the Tjukurrpa environment, as many Tjukurrpa beings are thought to travel in different directions in and around these regions' (OZ Minerals, 2021; Appendix J5). As such considerations to minimizing impacts to the broader landscape have been considered, for example by keeping the required cleared areas to the minimum needed to support project activities.

Figure 4 provides an overview of areas that have been subject to cultural heritage surveys in the Project Area, and those areas covered by Ngaanyatjarra Council issued cultural heritage survey reports. It is noted, that while cultural heritage surveys have occurred across these areas, there is a higher degree of confidence in some areas (e.g., the Main Development Area) compared to others (e.g., the Northern Borefield), and as such the Ngaanyatjarra Council's cultural heritage survey reports have identified conditions relating to further pre-clearance surveys in some areas once further project definition has been established (e.g., location of borefield lines and service tracks).

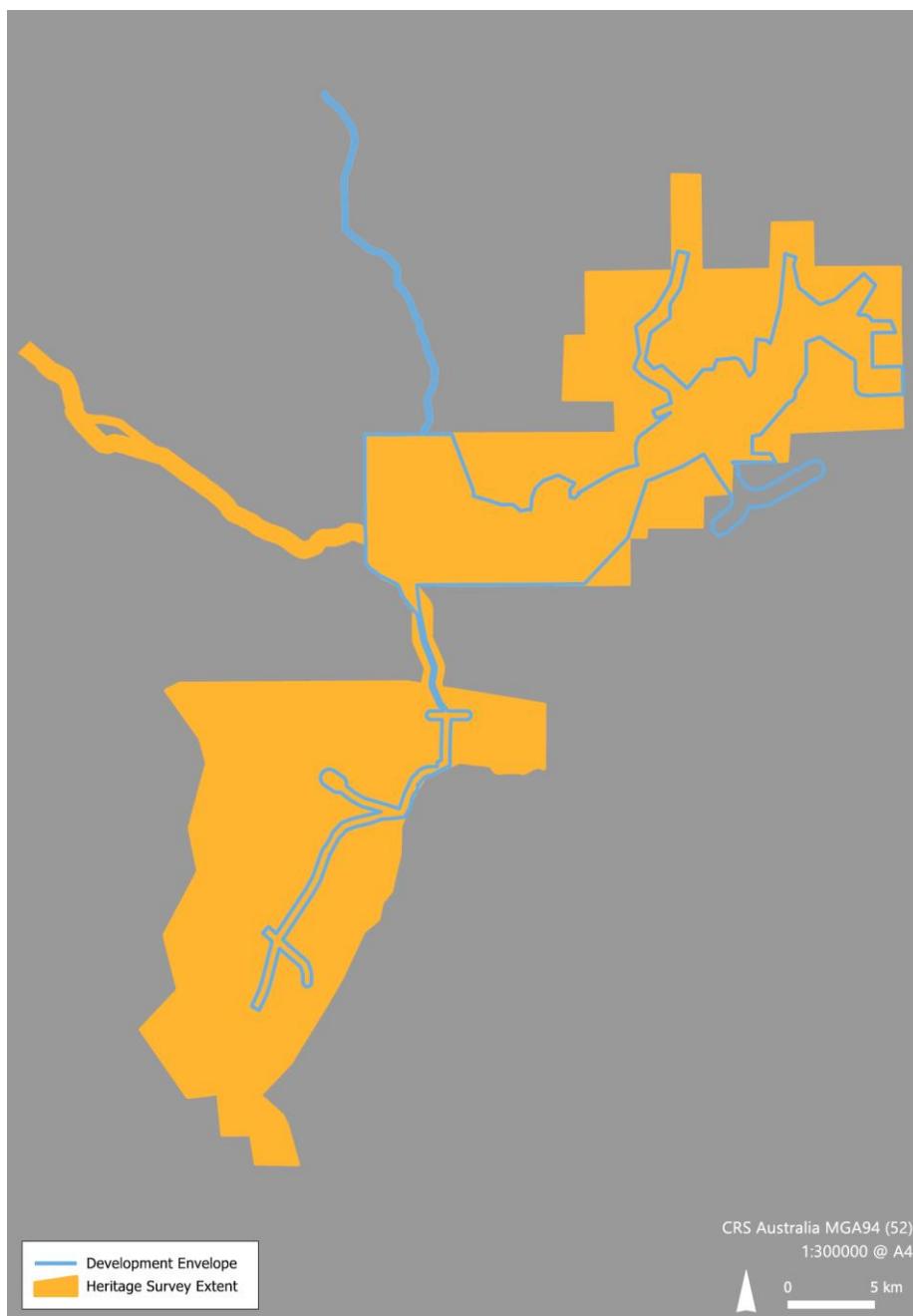


Figure 4: Cultural Heritage Survey Extent for the West Musgrave Project

1.7.1.2 Archaeological Surveys

Archaeology surveys were undertaken across the Development Envelope, with a detailed survey focussed in the Main Development Area, TSF and Renewable Power Area and inspection level surveys in the main access road, Northern Borefield and Southern Monitoring Bores area of the Development Envelope (OZ Minerals, 2021; Appendix J4). The purposes of the archaeological surveys were to identify any archaeological sites that may be defined as 'sites' under the AH Act, and if, where necessary, undertake both detailed recordings of sites and consultation with Traditional Owners to ascertain the importance of these sites.

The archaeological surveys and inspections found that the majority of the Development Envelope contains few features that would have attracted Aboriginal occupation. Detailed searches on foot have been undertaken at several claypans, chalcedony scree or sub-crop, depressions or deflations in sand dunes, and other ephemeral water sources. These searches found very few artefacts and no traditional campsites. This is strong evidence that there was infrequent occupation of this land and any visits were brief. This confirms the comments of the Traditional Owners made during surveys, that people traditionally camped at the gnammas (rock holes) beyond the Development Envelope.

Sixteen potential archaeological sites were identified in the Development Envelope, of which 15 are in the Main Development Area; including the renewables area. These areas included knapping centres where stone tools were made from chalcedony, grinding patches on sub-crops where seeds were processed and areas that contained small areas of flaked stone tools, or the debris from making them.

These sites may meet the criteria for an Aboriginal heritage site under the AH Act, however some may not, subject to a determination to be made by the Aboriginal Cultural Material Committee (ACMC) based on submission of related scientific information and consultation records.

1.7.1.3 Direct Impacts

OZ Minerals has worked closely with Ngaanyatjarra Council anthropologists and Traditional Owners to survey the Development Envelope and its surroundings for cultural or heritage sites. Several ethnographic sites have been identified, often forming parts of dreaming trails or story lines. Each cultural site has been assigned an exclusion zone by the Ngaanyatjarra Council Anthropologists in consultation with Traditional Owners. These prescriptive exclusion requirements have been issued to OZ Minerals and form an integral part of this management plan, the Mining Agreement process and future operational philosophy.

In response to the identification of cultural heritage sites and exclusions zones, the project's Development Envelope has been reduced and reoriented to avoid all cultural heritage sites and where possible identified exclusion zones. All but two identified exclusion zone has been entirely excluded from the Development Envelope, and as such, the risk of direct impacts to these sites is significantly reduced.

Two proposed linear alignments to support roads and borefields intersect exclusion zones, however, avoids specific cultural heritage sites. Cultural heritage surveys, and their accompanying cultural heritage survey reports have defined a limited disturbance footprint through these exclusion zone to avoid potential direct impacts to the nearby sites. Further opportunities are currently being explored with the Traditional Owners and Ngaanyatjarra Council to further avoid one of these exclusion zones by rerouting linear infrastructure. This potential amendment to the current plan will be subject to further confirmation with the Traditional Owners and attainment of the relevant regulatory approvals.

1.7.1.4 Indirect Impacts

It is acknowledged that while all identified cultural heritage sites have been excluded from the Development Envelope and the risk of direct impacts to these is significantly reduced, there remains the potential for these cultural heritage sites to be impacted by indirect means.

Indirect impacts may occur to cultural heritage sites as a result of interaction with various indirect sources from the project. Table 4 outlines the potential indirect sources that have the potential to impacts cultural heritage sites to the degree that the Social Surroundings objective may be compromised.

The management actions detailed in Section 2 have been specifically designed to ensure the project meets the EPA's objective for People (Social Surroundings) (Section 1.5). As such, they focus on the avoidance and minimisation of direct impacts to cultural heritage sites and the minimisation of indirect impacts. Table 5 provides a list of the indirect impact mitigations listed in the EPA Section 38 Referral (OZ Minerals, 2021) to minimise indirect impacts.

Table 4: Potential Indirect Impacts to Identified Cultural Heritage Sites

Potential Impact	Potential Level of Impact
Dust deposition	<p>A single ethnographic site may experience some indirect impacts resulting from the settlement of project-generated dust. This ethnographic site is located within 200 m of a highly trafficked unsealed road. Due to the generation of wheel-generated dust, visible dust may be observed at this site from time to time should no mitigations be put in place.</p> <p>In addition, people visiting this site along the main access road may experience a deprovision to privacy when visiting, and or undertaking cultural practices at this site.</p> <p>No other ethnographic sites are expected to experience notable levels of dust deposition.</p>
Reduced cultural amenity associated with nuisance noise	<p>Noise may be heard at a number of the ethnographic sites, however, this noise is expected to be well below a level that would result in health-related impacts. The main sources of noise that may be heard at these locations include movement of heavy vehicles (reverse beepers, horns and possibly engine noise) and noise from periodic blasting. This noise will become less notable as the mine pits get deeper, and WRDs are constructed. These mine-related structures will act as a noise screen, effectively attenuating the noise to varying degrees prior to reaching the ethnographic sites.</p> <p>One ethnographic site is located about 3.5 km from the proposed airstrip, and as such may experience periodic increases in noise associated with aircraft operating into and out of the airstrip.</p> <p>Operational noise levels will cease following the completion of mining activities.</p>
Changes to visual amenity	<p>Due to the significant height of infrastructure, particularly wind electricity generators at up to 250 m, project infrastructure would be visible from nearly all identified cultural heritage sites.</p> <p>A body of consultation efforts has been undertaken relating to visual impacts, including site visits to another mine and the use of animations and virtual reality visualisations. As a result of these consultation activities there have been no significant concerns raised from the community relating to visual impacts. However, it is acknowledged that until the proposed impact of visual obstructions are in place, it may be challenging to ascertain how these impacts may be perceived and felt by Ngaanyatjarru People, especially in relation to Tjukurpa sites.</p>

Potential Impact	Potential Level of Impact
Constraints on physical access	<p>The current east to west access track (old Warburton to Blackstone Road) would need to be modified to restrict access to the Main Development Area and avoid potential for safety interactions with large mining fleet. To retain access to identified cultural heritage sites this road will need to be rerouted around the main project area to avoid the potential for safety incidents.</p> <p>Through consultation with Traditional Owners in September 2020 it was agreed that an alternate access road (in most cases following existing tracks) to access sites both east and west of the project would be made and would therefore mitigate potential cultural heritage site access restrictions.</p>
Disturbance as a result of the introduction of project-related night-time lighting	<p>Due to the significant height of infrastructure, particularly wind electricity generators at up to 250 m, project infrastructure, and therefore project-related lighting, would be visible from nearly all ethnographic sites, with those nearer to the Main Development Area being more impacted than those further away. A 'glow' associated with the lighting might be visible from nearly all sites identified in project heritage surveys.</p>
Loss of cultural amenity and/or cultural associations	<p>Development of the project may result in changes to cultural amenity and/or cultural associations – the presence of the project in the landscape, its proximity to ethnographic sites, and the cumulative indirect impacts of dust, noise, night-time light, water-related impacts, visual obstructions or intrusions to privacy may change the way Ngaanyatjarra People metaphysically or spiritually connect with some sites and the environment nearby to the project.</p>
Drawdown of groundwater negatively impacts sensitive receptors including, Linton Bore, Mantamaru (Jameson) water supply and/or vegetation species that are culturally important	<p>Drawdown of groundwater resulting from borefield water abstraction, or mine pit dewatering has the potential to impact culturally important vegetation. Two areas of vegetation have been identified as culturally important and include a stand of desert oaks, and a specific stand of Mulga. Both of these vegetation areas occur outside the numerical modelled extent of groundwater impacts.</p> <p>General reduction of tree health outside of known ethnographic sites may also be perceived as a potential impact due to the all-encompassing nature of the way Traditional Owners value the landscape.</p> <p>A separate GMMP has been developed to address matters relating to potential impacts to groundwater values.</p>

Table 5: Mitigation Measures for Indirect Impacts to Cultural Heritage

Potential Impact Pathway	Mitigation
Dust	<ul style="list-style-type: none"> • Vehicles would not be permitted to leave access tracks or cleared areas without approval from the site General Manager and in consultation with the Community Liaison Officer • Vehicles would be required to travel at safe operating speeds on unsealed roads and would be restricted from accessing rehabilitated surfaces except for management purposes • Discussions with Traditional Owners around a desire to seal a section of the main access road near to one of the cultural heritage sites would be undertaken and adhered to if necessary, or an alternative road alignment may be considered (subject to relevant regulatory approvals) • Land clearing would be kept to the minimum necessary for development of the project, reducing exposed areas subject to wind erosion • Undertaking of photo-point monitoring for all cultural heritage sites (including archaeology sites) to within 3 km of the main development area (and control sites) to undertake comparative analysis of dust accumulation. • Where practicable, land clearing would be undertaken progressively with the amount of active disturbance minimised • Progressive rehabilitation would be undertaken on disturbed areas as they become available • Topsoil and vegetation (including woody debris) would be re-spread over rehabilitated areas to act as a seed source and to protect the soil from erosion • Dust would be managed by watering unsealed roads with a water cart or with fixed sprays as required • During high winds, topsoil and overburden stripping and other high dust generating activities would be restricted if risk-based assessment measures determine that dust cannot be adequately controlled • Spilt ore and materials outside of the ore processing areas would be regularly cleaned up • Bulk products would be transported in covered containers • Vehicle hygiene measures would be adopted for the concentrate storage shed
Noise	<ul style="list-style-type: none"> • Machinery would be maintained in accordance with original equipment manufacturers (OEMs) requirements to minimise nuisance noise • Where necessary equipment would be enclosed to reduce nuisance noise • Airstrip would be oriented to ensure the ethnographic sites are not within the approach and take-off angles unless otherwise agreed with Traditional Owners • Equipment design would be specified to be within Australian Standard noise limits

Potential Impact Pathway	Mitigation
Visual Amenity	<ul style="list-style-type: none"> Permanent landforms such as WRDs and TSFs would be similar in height to surrounding natural landforms (e.g. <60 m) Progressive rehabilitation would be undertaken on disturbed areas as they become available Wind turbines and masts would be removed at closure, or as agreed with the Traditional Owners Lights would be strategically placed and designed to shine towards plant operations and minimise light spill to the environment
Lighting	<ul style="list-style-type: none"> Design of lighting arrangements with consideration to AS4282-1997: Control of the obtrusive effects of outdoor lighting Before arriving at the final lighting design, consideration would be given to alternative lighting systems with respect to their capability of fulfilling both the functional and environmental design objectives When there is some flexibility about where an illuminated area/activity can be sited, it would be located and oriented where it would have the least effect on ethnographic sites, taking into account any screening which may be provided by the surrounding topography or other physical features such as trees or sand dunes The selected light fixtures would have a light output distribution appropriate for the application and would not emit excessive light outside the property boundaries Where necessary, consideration would be given to adding louvres, baffles or shields to floodlights to control spill light where this did not significantly influence the performance of the lighting system Floodlight locations are often determined by the nature of the activity for which the lighting is provided. Small departures from the recommended positions will be considered if this results in a greater degree of control of the spill light
Groundwater	Defined in the Groundwater Monitoring and Management Plan
Hydrology (surface water)	None required to manage cultural heritage-related risks

1.7.2 Key Assumptions and Uncertainties

This CHMP has been developed using all relevant and available information at the time of preparation. The key assumptions and uncertainties associated with the current CHMP are described in Table 6.

Table 6: Key Assumptions and Uncertainties Associated with the WMP CHMP

ID	Assumptions/Uncertainty	Description
A1	Survey effort	<ul style="list-style-type: none"> Cultural heritage surveys undertaken to date accurately report the location of known cultural heritage sites within and near to the Development Envelope The cultural heritage survey team including Ngaanyatjarra Council anthropologists and large groups of senior Traditional Owner knowledge holders were appropriate to ensure qualified results
A2	Exploration Deed of Agreement	The Exploration Deed of Agreement represents the legally binding agreement between the Ngaanyatjarra Land Council (the legal entity of the Aboriginal Reserves), Ngaanyatjarra Council (as agent for the Ngaanyatjarra Land Council) and OZ Minerals and defines the conditions and requirements of the parties to conduct business within the defined lease area; in particular the Exploration Deed of Agreement defines a process for cultural heritage protection and pre-clearance surveys. The Exploration Deed of Agreement, and its associated conditions will remain in place until such time that a Mining Agreement has been agreed. While the existing pre-clearance conditions relate substantially to exploration works the key requirements for pre-clearance surveys detailed in the Exploration Deed of Agreement are likely to be substantially adopted in the Mining Agreement.
A3	Intangible direct and indirect impacts	The EPA Section 38 Referral to the EPA (OZ Minerals, 2021) recognised that although the reorientation of the Development Envelope to avoid all cultural heritage sites, the presence of the project in the landscape may change the way that Ngaanyatjarra People metaphysically connect to cultural heritage sites nearby to the project and the environment in the immediate areas surrounding the project (i.e. impact to cultural amenity and/or cultural associations). Apart from a no-project option, the impact of changes to people's appreciation of the general landscape (cultural amenity) is challenging to mitigate, and as such will form an inclusion in the Mining Agreement and consent process with the land rights holders, as will other somewhat unavoidable impacts such as visual impacts and normal levels of operational light and noise.

ID	Assumptions/Uncertainty	Description
U1	Aboriginal Heritage Act, 1972 (WA) amendments	<p>The Government of Western Australia's Department of Planning, Lands and Heritage released a draft Aboriginal Cultural Heritage Bill 2020 (the Bill) in September 2020. The Bill has undergone public consultation, and is yet to be finalised.</p> <p>This new legislation is proposed to replace the outdated <i>Aboriginal Heritage Act, 1972 (WA)</i> concluding more than two years of consultation with Aboriginal people, industry representatives, heritage professionals and the Western Australian community.</p> <p>The Bill aims to establish a modern approach to protecting Aboriginal cultural heritage in Western Australia that will reset the relationship between land users and Traditional Owners and transform how Aboriginal cultural heritage is identified, managed and conserved. To date, it is unclear how the revised Bill may impact on regulations under the Social Surroundings Environmental Factor considered by the EP Act.</p>
U2	Ngaanyatjarra Council CHMP	<p>The Ngaanyatjarra Council have prepared a CHMP (the Ngaanyatjarra Council CHMP) (Ngaanyatjarra Council, 2021) which defines a standard for the protection of cultural heritage at the WMP for the exploration and studies phase of the project (see Appendix A). While this CHMP seeks to incorporate relevant aspects of the Ngaanyatjarra Council CHMP, the Ngaanyatjarra Council CHMP currently pertains to exploration activities and does not yet have legal effect. An updated version of the Ngaanyatjarra Council CHMP is expected to form an attachment to the Mining Agreement subject to fair and reasonable terms, and at which time it will gain legal effect.</p>
U3	Quantification of indirect impacts	<p>The degree to which the Ngaanyatjarra Traditional Owners feel 'impacted' by indirect impacts and changes to cultural amenity is challenging to quantify and may only be fully understood following development of the project. This uncertainty will be dealt with through the Mining Agreement consent process. Indirect impacts will continue to be considered through adaptive management approaches, which will result in continuous refinement of this management plan in response to stakeholder needs.</p>
U4	Cultural heritage confidence	<p>Ngaanyatjarra Council anthropologists, in consultation with the Traditional Owners, have noted that some of the heritage cleared areas have higher or lower levels of confidence. For example, the Main Development Area (containing mine pits, WRDs, TSFs and process plant infrastructure) have a high degree of confidence due to an extensive history of land disturbance clearances and visitation. However, the Northern Borefield area has a lower degree of confidence around cultural heritage sites. As such, Ngaanyatjarra Council issued cultural heritage survey reports have noted the requirement for further heritage survey activities once further project definition is understood.</p>

ID	Assumptions/Uncertainty	Description
U5	Cultural heritage chance finds	OZ Minerals, Ngaanyatjarra Traditional Owners and Ngaanyatjarra Council have commissioned several archaeological surveys and cultural heritage surveys within the Development Envelope. The purpose of these surveys was to identify all known cultural heritage sites in the project area. However, it remains possible that previously unknown cultural heritage sites or cultural material may be identified during ground disturbing works.
U6	Mining Agreement process	OZ Minerals and the Ngaanyatjarra Council are presently negotiating a Mining Agreement under the <i>Native Title Act, 1994</i> (Cth) and the <i>Aboriginal Affairs Planning Authority Act, 1972</i> (WA). There exists some uncertainty regarding the relationship between the management actions described in this CHMP and the legislative and negotiated provisions of the Mining Agreement. To the extent of any inconsistency between the provisions of this CHMP and the Mining Agreement, the Mining Agreement shall take precedence. Where necessary, any relevant provisions agreed in the Mining Agreement will be incorporated into subsequent revisions of this CHMP.

1.7.3 Management Approach

The management approaches discussed in this document are based and developed around the mitigation hierarchy of avoidance and minimisation of impacts to potential cultural heritage sites to reduce the potential for impacts to as low as reasonably practicable. Management actions detailed in this CHMP have been specifically designed to ensure the project meets the EPA's objective for Social Surroundings (Section 1.5) as it pertains to potential impacts to cultural heritage.

The management approaches discussed in this document are based on the following:

- The mitigation hierarchy of avoid and minimise to ensure impacts to the environment have been avoided or reduced to as low as reasonably practicable.
- The Exploration Deed of Agreement which defines the legally binding conditions and requirements of the relevant parties operating within the defined lease area. This agreement and its provisions will remain in place until such time that a Mining Agreement is in place.
- The Ngaanyatjarra Council CHMP (Appendix A; Ngaanyatjarra Council, 2021) which sets minimum standards for the protection of cultural heritage at the WMP.
- OZ Minerals' Global Performance Standards, which enable the effective management of material sustainability risks that are common across OZ Minerals including cultural heritage management (Section 1.3).

1.7.4 Rationale for Choice of Management Targets

The provisions included in this CHMP are objective-based as they relate to specific management actions.



2 MANAGEMENT ACTIONS AND MONITORING

Management objectives, actions and targets focused on achieving the EPA's objective for Social Surroundings as they relate to the protection of potential cultural heritage sites are presented in Table 7. These objectives, actions and targets focus the greatest management effort on project activities that have the highest likelihood of causing adverse impact on potential cultural heritage sites.

Table 7: Objective-Based EMP for Cultural Heritage

<p>EPA Factor: Social Surroundings</p> <p>Key Environmental Values: Cultural heritage sites, and to the degree possible the broader landscape in which these sites reside</p> <p>Key Impacts and Risks:</p> <ul style="list-style-type: none"> • Direct and unauthorised impacts to cultural heritage sites (e.g. Tjukurrpa sites) • Constrain or otherwise changes the nature of land access to cultural heritage sites or areas of the landscape used for customary uses by Traditional Owners • Indirect impacts to cultural heritage sites through: <ul style="list-style-type: none"> ◦ The deposition of unacceptable levels of dust ◦ Reduced amenity associated with noise. 			
Management Action	Management Target(s)	Monitoring	Reporting
<p>Management Objective: Avoid and minimise direct impacts to potential cultural heritage sites</p>			
<ul style="list-style-type: none"> • Compliance with the Exploration Deed of Agreement and all directions of Ngaanyatjarra Council issued cultural heritage survey reports, and the Ngaanyatjarra Council CHMP once it comes into effect through the Mining Agreement • Where cultural heritage survey gaps exist undertake heritage surveys in accordance with the requirements of the Exploration Deed of Agreement (or Mining Agreement once in effect) • Confirmation that a Permit to Work (PTW) for non-ground disturbing works and a Land Disturbance Permit (LDP) procedure has been developed and agreed to by relevant Ngaanyatjarra stakeholders, and has been recorded within the WMP document control system (Aconex or equivalent) • Implement a PTW or LDP Procedure to ensure that site activities avoid direct impacts on cultural heritage sites. • cultural heritage exclusion zones, and/or areas considered at high-risk of containing cultural heritage sites, and related obligations, to be maintained in the project GIS database for use in infrastructure design and layout planning • Where disturbance of a cultural heritage site is required, and agreed to by relevant Traditional Owners, all requirements of the <i>Aboriginal Heritage Act, 1972</i> (WA) would be adhered to 	<p>Total project-related land disturbance is to be within the approved Development Envelope and not to exceed the approved area</p> <p>No unauthorised direct impacts to cultural heritage sites including archaeological sites</p> <p>Minimise direct impacts on yet to be identified cultural heritage sites (i.e., chance finds)</p>	<ul style="list-style-type: none"> • Annual review of survey data and aerial imagery • All activities undertaken for the project must have an approved PTW or LDP before activities commence. Each PTW and LDP will clearly identify the conditions under which the activities can be executed. These conditions will ensure compliance with any directions given in the Exploration Deed of Agreement (or subsequent Mining Agreement), Ngaanyatjarra Council issued cultural heritage survey reports and the Ngaanyatjarra Council CHMP • Annual review of internal land disturbance register and spatial data against exclusion zones and the requirements of Ngaanyatjarra Council issued cultural heritage survey reports • No less than 20% of all issued LDPs are to be audited for those years where LDPs are issued • Quarterly reconciliation of cleared areas against Ngaanyatjarra Council issued cultural heritage survey reports during construction, and annually thereafter. Reports to provide details of any 'chance finds' and the subsequent actions taken. Reports to be signed off by WMP General Manager 	<ul style="list-style-type: none"> • Internal Land Disturbance Register • Quarterly heritage clearance reconciliation reports during construction to be provided to appropriate representatives of the Ngaanyatjarra People • Annual heritage clearance reconciliation reports during operations to be provided to the appropriate representatives of the Ngaanyatjarra People • Mining Rehabilitation Fund (MRF) annual reporting • Where breaches of these management actions are identified, an incident report will be developed and communicated with the relevant Ngaanyatjarra People with agreed remedial actions (Section 3.2.7) • A summary of audit numbers will be provided in the WMP Compliance Assessment Report, and a description of any non-conformances to these management actions
<p>Management Objective: Maintain access to cultural heritage sites, or areas of the landscape used for customary uses by Traditional Owners</p>			
<ul style="list-style-type: none"> • In consultation with Traditional Owners develop and/or maintain access that enable safe and ongoing access to identified cultural heritage sites and areas of the landscape used for customary practices by Traditional Owners 	<p>Agreed access plan with the Ngaanyatjarra People</p>	<p>As-built track observation</p>	<p>WMP Compliance Assessment Report</p>

Management Action	Management Target(s)	Monitoring	Reporting
Management Objective: Avoid and minimise indirect impacts to potential cultural heritage sites			
<ul style="list-style-type: none"> Implement the mitigation measures for indirect impacts to cultural heritage sites detailed in Table 5 	Implementation of the indirect impact mitigation and management measures described in Table 5	Review and document the status of implementation of the indirect impact mitigation measures until such time as all the committed mitigation measures have been implemented or are otherwise considered no longer relevant	A summary of the outcomes of the review is to be provided in the WMP Compliance Assessment Report
Management Objective: Increase project team cultural awareness and of the requirements for cultural heritage protection at the West Musgrave Project			
<ul style="list-style-type: none"> Develop a site induction package that addresses key requirements of this CHMP, that has been developed and agreed by relevant stakeholders, and has been recorded within the WMP document control system (Aconex or equivalent) Implement a site induction package that addresses key requirements of this CHMP Develop a cultural awareness package that addresses key requirements of this CHMP, and other elements that contribute to cultural competency of WMP workforce. The package is to be coordinated by OZ Minerals in consultation with relevant knowledge holders and recorded within the WMP document control system (Aconex or equivalent) Implement a cultural awareness training program for all permanent workforce (Note: permanent is defined for the purpose of this management plan as a person (employee or contractor) that attends site more than three times, or plans to reside onsite for a period of greater than three months) 	All project personnel remain within designated cleared areas as defined in Ngaanyatjarru Council issued cultural heritage survey reports	<ul style="list-style-type: none"> Induction records confirm that all personnel are inducted prior to the commencement of site-based work, for all persons attending the WMP Training records confirm that all permanent site based workforce, which includes employees, contractors, and sub-contractors associated with the WMP have undertaken the cultural awareness training program within six (6) months of commencement of employment at WMP 	<ul style="list-style-type: none"> A summary of the number of people inducted will be provided in the WMP Compliance Assessment Report A summary of the number of people who have undertaken the cultural awareness training will be provided in the WMP Compliance Assessment Report
	Build cultural awareness within project personnel		
	No breaches of this CHMP	Note: permanent is defined for the purpose of this management plan as a person that attends site more than three times, or plans to reside onsite for a period of greater than three months.	

3 METHODS FOR HERITAGE SURVEYS AND CULTURAL MANAGEMENT STRATEGIES

An Exploration Deed of Agreement exists between the Ngaanyatjarra Land Council (the legal entity of the Aboriginal Reserves), Ngaanyatjarra Council (as agent for the Ngaanyatjarra Land Council) and OZ Minerals. The Exploration Deed of Agreement is the legally binding agreement between these parties and defines the conditions and requirements of the parties to conduct business within the defined exploration area, in particular the Exploration Deed of Agreement defines a process for cultural heritage protection and pre-clearance surveys. The Exploration Deed of Agreement, and its associated conditions will remain in place until such time that a Mining Agreement has been agreed.

In addition to those conditions for heritage protection specified in the Exploration Deed of Agreement the Ngaanyatjarra Council have issued to OZ Minerals a CHMP (Ngaanyatjarra Council, 2021) that defines a minimum standard for the protection of cultural heritage at the WMP during the exploration and studies phase of the project. While the Ngaanyatjarra Council CHMP will only come into legal effect when the Mining Agreement has been agreed, this CHMP, required to support assessment under the EP Act has adopted many of the relevant provisions for heritage protection from the Ngaanyatjarra Council CHMP, including:

- The adoption of the overarching Golden Rules for heritage protection (Section 1)
- The expectation of a register of sites (Section 3.2.1)
- Adoption of a LDP and PTW system (Section 3.2.2)
- The invitation of, and use of, Ngaanyatjarra cultural heritage monitors during first disturbance activities (Section 3.2.3)
- Protocol for chance finds and skeletal remains (Section 3.2.4)
- Details of induction and cultural awareness programs (Section 3.2.5)
- Considerations for demarcation of sites (Section 3.2.6)
- Processes for incident reporting and management (Section 3.2.7)
- Definitions of accountability for this plan (Section 3.2.8)
- The development and maintenance of a compliance register (Section 3.2.9)
- Information management and record keeping (Section 3.2.10)
- Process for continuous improvement (through adaptive management) (Section 3.2.11)
- Where impacts cannot be avoided, offsets or cultural maintenance activities may be enacted (Section 3.2.12)
- A process for ongoing consultation based on regular, transparent and open communications (Section 3.3)

- Process for CHMP audit and evaluation (Section 4.1)
- Process for review of this CHMP (Section 4.2).

The following sections outline methods for pre-clearance surveys and other cultural heritage management as described above.

3.1 Methods for Pre-Clearance Surveys

A process for pre-clearance has been identified in the existing Exploration Deed of Agreement. While these pre-clearance conditions relate substantially to exploration works the key requirements for pre-clearance surveys detailed in the Exploration Deed of Agreement are likely to be substantially adopted in the Mining Agreement. A revision to this CHMP will be made following the registration of the Mining Agreement to include any changes or updates to this process, however the methods for ongoing pre-clearance activities will nominally follow the Screening and Clearance provisions of the Exploration Deed of Agreement (Section 8 of the Deed), a summary of these are provided below:

- To protect areas of significance, OZ Minerals must request clearance from the Ngaanyatjarra Land Council before proceeding with any works (which have not already been screened and cleared for a particular activity). The form of the request to the Ngaanyatjarra Land Council would come in the form of a formal heritage request, and must include:
 - Maps, plans and photographs where appropriate
 - Proposed means of access and locations of access for people and equipment
 - The location where work will be conducted and an estimated timeframe, scope and techniques to undertake the activity
 - The items of equipment to be used
 - Details of the location, and structures that may be erected
 - The identity of any contractors that may be used and minimum and maximum numbers of people to be involved, including their roles.
- Following the receipt of notice, the Ngaanyatjarra Land Council and OZ Minerals will undertake (at an agreed expense covered by OZ Minerals) the organisation and implementation of a screening/clearance program by the Scouting Team of the required areas.
- The tasks of the scouting team may include:
 - Determine whether proposed activities are likely to damage, disturb or encroach upon or interfere with areas of significance
 - Provide OZ Minerals advanced warning to enable relocation of work areas to avoid sites of significance
 - To make every reasonable endeavour to proceed with the work at a rate that will avoid standby.
- The scouting team shall consist of the following:

- Two anthropologists employed or engaged by the Ngaanyatjarra Land Council and agreed to by OZ Minerals
- A liaison officer engaged by the Ngaanyatjarra Land Council
- Four male and four female Traditional Owners (total of eight); or as otherwise agreed between the parties
- The supervising anthropologist shall be responsible for the coordination of the scouting team.
- OZ Minerals shall appoint a representative to work in association with the scouting team, whose duties include:
 - Accompanying the scouting team to the proposed work areas
 - Identifying the relevant work area locations
 - Providing suitable maps of proposed work areas
 - Relocating infrastructure as needed to avoid significant areas
 - Communicate with the Ngaanyatjarra Land Council's supervising anthropologist.
- The Ngaanyatjarra Land Council's appointed supervising anthropologist's duties include:
 - Identifying appropriate Traditional Owners to accompany the scouting team.
 - Coordinate the work of the scouting team
 - Mark-up all sets of maps so that work areas cleared, or not cleared are designated
 - Act as a point of contact to the OZ Minerals representative.
- OZ Minerals must direct any variations to plans to the Ngaanyatjarra Land Council appointed supervising anthropologist.
- Upon completion of screening and clearance of work areas, or any part thereof by the scouting team and notification by the Ngaanyatjarra Land Council, OZ Minerals are entitled to commence operations without being required to obtain any further clearance, unless further modifications to the cleared area are required (in which case a variation to the heritage clearance request must be issued to the Ngaanyatjarra Land Council).
- Where a work area, or part thereof has been screened or cleared subject to compliance with conditions specified by the Ngaanyatjarra Land Council, OZ Minerals may only conduct activities in accordance with these conditions.
- Within seven days of the completion of the scouting tour the Ngaanyatjarra Land Council will notify OZ Minerals in writing by providing maps, indicating the scouting team's decision concerning acceptability or otherwise of the proposed locations of activities. This notification should be countersigned by an OZ Minerals representative. The notification will specify the proposed locations which have been screened and cleared for use by OZ Minerals and any conditions of use.
- OZ Minerals shall not carry out activities on any part of the Lands unless:
 - Within a defined work area screened and cleared by the scouting team
 - Until notification has been received relating to the screening and clearance, and

- In accordance with the conditions (if any) included in the notification.
- OZ Minerals shall be absolutely entitled to rely on the clearances notified by the Ngaanyatjarra Land Council.
- Neither the Ngaanyatjarra Land Council nor any member of the scouting team are required to disclose to OZ Minerals the actual locations of areas of significance or any associated cultural information relating to an area of significance.

3.2 Cultural Heritage Management Strategies

While the above identified pre-clearance surveys (Section 3.1) have provided a fair and reasonable framework for the identification and protection of areas of significance, a number of other cultural heritage management strategies have been defined to further reduce conflict in relation to the potential impacts to areas of significance during the construction and implementation of the project, these are detailed in Sections 3.2.1 to Section 3.2.12.

3.2.1 Register of Sites

In collaboration with relevant cultural heritage custodians, a register of identified tangible cultural heritage features and intangible cultural heritage features and values within the project area will be developed and maintained. This register will be the primary source of consideration when undertaking Land Disturbance Permitting.

3.2.2 Land Disturbance Permit and Permit to Work Process

A Land Disturbance Permit (LDP) and Permit to Work (PTW) process will be developed in consultation with relevant Ngaanyatjarra stakeholders.

The LDP process will ensure that project-related land disturbance will only be undertaken on land that has been the subject of a cultural heritage surveys (screening and clearance survey) and where a cultural heritage survey report (notification) has been issued by the Ngaanyatjarra Council. The PTW process will ensure non-ground disturbing activities including, but not limited to, seismic surveys or scientific environmental surveys are only undertaken in areas where access has been granted, and to avoid the potential for inadvertent interaction with cultural heritage sites.

The LDP and PTW process will be implemented as an additional layer of protection to control individual disturbance activities associated with the construction and operation of the project. The LDP and PTW will require any proposed disturbing or non-disturbing activity to apply for a LDP or PTW prior to the planned event. The LDP or PTW will include details of the proposed location and nature of activities to be performed at that location. The LDP or PTW permit issuer will review the proposed disturbance request against Ngaanyatjarra Council cultural heritage survey report conditions, and the database of

exclusion zones before issuing a permit to the requester. The LDP or PTW will define the areas to which the proposed work can occur, and the conditions to which the disturbance must adhere (including a standard suite of conditions such as those that pertain to 'chance-finds'). The LDP or PTW will include a sign-off process of relevant persons to acknowledge understanding and commitment to the LDP or PTW.

Land disturbance activities will be regularly audited to ensure compliance with the LDP conditions. This will be especially so in areas with lower levels of confidence or closer proximity to known cultural heritage sites.

3.2.3 Ngaanyatjarra Monitors

Up to two monitors will be invited to be present when ground is disturbed for the first time, and to help physically demarcate approved work areas prior to the commencement of works.

The Ngaanyatjarra Council has acknowledged that this monitoring may be impractical to implement due to the availability of Ngaanyatjarra People to perform these duties and other constraints. As such, while there is strong intent to implement this monitoring program, the involvement of Ngaanyatjarra monitors is not a strict compliance requirement, however, inviting Monitors to attend is expected.

Monitors would be arranged through the Ngaanyatjarra Council's Land and Culture Manager to ensure appropriate persons are selected and used for this work.

3.2.4 Chance Find Protocol (Including Skeletal Remains)

Through the course of land disturbance activities, sites that have not been previously identified in organised cultural heritage surveys may be encountered or become exposed through the process of excavation. These may include artefacts, skeletal remains or other manifestations of the Tjukurpa. To minimise potential conflict with such sites a chance find protocol will be developed and implemented with relevant Ngaanyatjarra stakeholders. The chance find protocol is likely to include the following provisions:

- Define the types of sites that may be encountered through the process of clearing and ensure that this is included in the site induction and cultural awareness program.
- The process to follow if a potential new cultural heritage sites are identified in the course of work. Nominally, this process may include:
 - All work in the immediate vicinity of the remains will cease until further notice, and the OZ Minerals representative will be notified as soon as reasonably possible who will issue a Stop Work Order.
 - The OZ Minerals representative will notify the Ngaanyatjarra Council as soon as reasonably possible.

- Reasonable efforts to protect the remains will be made. Note that the site should not be interfered with or disturbed further, and buffer zones or temporary barriers will be established.
- Work may continue at a reasonable distance from the site as determined by the Ngaanyatjarra Council and OZ Minerals.
- All workforce at the site will be advised that it is an offence to damage sites or interfere with human remains.
- Where necessary local Police/Coroner's office will be notified (i.e., in the event that the identified chance find consists of human remains).
- A process for resolution will then be agreed between the Ngaanyatjarra Council and OZ Minerals, including written permission to re-commence with operations.
- Ngaanyatjarra cultural heritage monitors will be invited to be present when ground is disturbed for the first time and when otherwise agreed between OZ Minerals and the Ngaanyatjarra Council (acting as Agent for the Ngaanyatjarra People).
- Should a cultural heritage site be identified by chance, reviews of infrastructure design and location would be undertaken in consultation with the Traditional Owners with the objective of avoiding or otherwise minimising direct impacts where possible.

3.2.5 Training and Competency

OZ Minerals, in consultation with relevant Ngaanyatjarra stakeholders, will coordinate the development of a cultural induction program and a cultural awareness program to:

- Clearly specify the requirements of this CHMP and its role in the protection cultural heritage sites, and the consequences of non-compliance to this plan
- Build an increased cultural awareness of the Ngaanyatjarra People and the land to which the project resides.

A Cultural Induction Program will be delivered to all workforce attending the WMP. The content of the cultural awareness training will be coordinated by OZ Minerals in consultation with the appropriate knowledge holders, and may include:

- The significance of cultural heritage to Ngaanyatjarra stakeholders
- Relevant cultural heritage legislation
- Obligations under this CHMP and Mining Agreement, specifically their responsibilities regarding the protection of identified cultural heritage sites and chance finds
- Types of cultural heritage objects and how to identify them
- Procedures for reporting new cultural heritage sites and objects.

A Cultural Awareness Training program will be delivered to all members of the workforce associated with the WMP. The content of the cultural awareness training will be developed in consultation with the appropriate knowledge holders, nominally the Cultural Awareness Program may include:

- Cultural awareness
- The significance of cultural heritage to Ngaanyatjarra stakeholders
- Relevant cultural heritage legislation
- Obligations under this CHMP and Mining Agreement, specifically their responsibilities regarding the protection of identified cultural heritage sites and chance finds
- Types of cultural heritage objects and how to identify them
- Procedures for reporting new cultural heritage sites and objects
- A broader understanding of Aboriginal history and the impacts of colonisation, historical legislation and key events that have impacted on Aboriginal societies.

3.2.6 Demarcation of Sites

Work Areas: Physical demarcation (where necessary) of work sites will take the form of installing visible markers at regular intervals, so that the boundary of approved work areas can be easily ascertained, and to ensure that no encroachment into identified cultural heritage exclusion zones occurs.

Identified Cultural Heritage Sites: In-field demarcation of cultural heritage sites and places of high cultural value will only be demarcated in accordance with the wishes of Traditional Owners (and as documented in Ngaanyatjarra issued cultural heritage survey reports), or upon advice from relevant Traditional Owners or knowledge holders.

3.2.7 Incidents, Issues, Complaints and Grievance

In the event of a non-compliance with the requirements of this CHMP resulting from monitoring activities or legitimate complaint from a Ngaanyatjarra community member the following incident investigation process is proposed:

- The OZ Minerals representative will notify the Ngaanyatjarra Council (nominally the General Manager for Land and Culture) as soon as reasonably possible with details of the incident or complaint (within 12 hours)
- Depending on the seriousness of the incident or claim, OZ Minerals and the Ngaanyatjarra Council may jointly investigate the incident (a decision to be confirmed by Ngaanyatjarra Council; nominally the General Manager for Land and Culture)
- Where required, OZ Minerals and the Ngaanyatjarra Council will jointly investigate the incident within 48 hours and a report will be issued within 60 hours of receiving the initial incident notification

- The progress of the investigation will be communicated on a daily basis to other people as nominated by the Ngaanyatjarra Council and OZ Minerals
- Immediately after issuing the investigation report, corrective actions will commence to improve processes to mitigate the risk of another incident
- If negligence or purposeful misconduct is identified through the incident investigation disciplinary action may be taken
- In addition, an issues, complaints and grievance system shall be developed to assist with documenting, investigating and responding to complaints made by community groups and stakeholders, and all stakeholder issues and concerns will be proactively addressed.

3.2.8 Accountability

The accountability for the implementation of this CHMP resides with the West Musgrave asset's most senior operational manager, namely the General Manager of the West Musgrave Operations.

It is an expectation that all OZ Minerals workforce adhere to the requirements of this CHMP. The requirements of this CHMP will form flow-down provisions in all third-party contracts for contractors working at the WMP.

3.2.9 Compliance Register

OZ Minerals will maintain a compliance register detailing all legislative commitments that OZ Minerals has made in relation to cultural heritage management, this will include requirements of this CHMP, the Exploration Deed of Agreement (to be replaced by the Mining Agreement once in effect) and any recommendations made in cultural heritage surveys that are signed and countersigned by relevant parties.

3.2.10 Information Management

OZ Minerals can only rely on data pertaining to cultural heritage (site locations and cultural heritage survey boundaries) supplied by relevant Ngaanyatjarra personnel (nominally the Ngaanyatjarra Council's General Manager for Land and Culture). This is particularly true for information and data concerning areas that are 'cleared' for work and 'not cleared' for work.

Geospatial data and other information pertaining to the location of exclusion zones and areas cleared for work will be maintained and document controlled in a document control system (Aconex or equivalent). All data generated as part of this CHMP will also be document controlled in a document control system (Aconex or equivalent).

It is noted that data pertaining to cultural heritage is of a confidential nature, and as such will only be made available to nominated persons within OZ Minerals who have signed confidentiality statements.

3.2.11 Continuous Improvement

OZ Minerals recognises that Ngaanyatjarra Traditional Owners and traditional knowledge holders maintain a deep, and serious cultural obligation to care for country and to protect cultural heritage sites. At this relatively early stage of the project, it may be hard for Traditional Owners to fully grasp the magnitude of change and their personal response to this change. As such, a program of ongoing consultation has been proposed to ensure the rights and interests of Traditional Owners are regularly considered, and that an adaptive management approach to the management of potential risks to cultural heritage sites is taken.

3.2.12 Support for Cultural Maintenance Activities

OZ Minerals acknowledges that the presence of the project in the landscape may change the way people relate to the cultural landscape in proximity to the WMP, and as such has the potential to impact People's relationship to the landscape, for example, changes to cultural amenity and/or cultural associations. It is recognised that if the WMP is to be developed, there is little that can be done to directly avoid or manage these 'cultural amenity and cultural association' impacts, and as such they would need to be compensated through support programs that may seek to maintain cultural connections and/or maintenance of nearby sites. Compensation and offset provisions to manage impacts to cultural amenity and cultural associations will be further developed as part of the Mining Agreement between the Traditional Owners, the Ngaanyatjarra Council and OZ Minerals.

3.3 Framework for Ongoing Consultation

The consultation framework relating to this CHMP is predicated on a co-operative and collaborative approach to cultural heritage management and protection. The consultation framework follows the following principles:

- Engagement with Ngaanyatjarra People is culturally fit for purpose and in accordance with the relevant social norms of the community
- Where requested by the Ngaanyatjarra People and/or their authorised appointed agents, accurate and relevant information in relation to the project's activities are provided in a timely manner
- The Ngaanyatjarra People are involved in decision-making processes on issues that may impact them
- All Ngaanyatjarra People and other stakeholder issues and concerns are proactively addressed
- An issues, complaints and grievance system shall be developed to assist with documenting, investigating, and responding to complaints made by community groups and stakeholders.

3.3.1 General

Consultation is undertaken with relevant stakeholders, including but not limited to regulatory authorities and Ngaanyatjarra People throughout the project development process. Consultation prior to the commencement of development is aimed at identifying all cultural heritage values and concerns so that they can be considered during the planning process. Consultation during and upon completion of the WMP seeks to inform stakeholders of outcomes and to gather feedback on the process to inform adaptive management processes (Section 4).

OZ Minerals will provide ongoing, regular and timely communication to the Ngaanyatjarra People about the WMP as required and otherwise as nominated in the Exploration Deed of Agreement (and/or subsequent Mining Agreement). The provision of up-to-date information will ensure that relevant stakeholders are appropriately informed when making decision on issues that may impact them.

3.3.2 CHMP Consultation

The key objective of consultation relating to this plan is:

Regular, open and transparent communication between relevant stakeholders (namely the Ngaanyatjarra People) and OZ Minerals pertaining to the management and protection of culture and heritage and the implementation of the CHMP to facilitate 'continuous improvement'.

Central to consultation relating to this CHMP is the establishment of an Advisory Committee or equivalent (as is defined in the Exploration Deed of Agreement and/or subsequent Mining Agreement) of relevant stakeholders. One role of the Advisory Committee will be to ensure the regular flow of information pertaining to the implementation of the CHMP (and other matters). The frequency of meetings regarding this CHMP will be determined by a combination of need and mutual agreement. In the event of a serious breach of the provisions of this CHMP, an emergency meeting of the Advisory Committee may be called.

Consultation with Ngaanyatjarra stakeholders to this CHMP will occur both at key milestones and at a schedule agreed by the Advisory Committee throughout the life of the project. These milestones include:

- Change of project phases (exploration and studies, construction, operations and closure)
- At an ongoing schedule to be agreed by the Advisory Committee (and as defined in the Mining Agreement)
- Ongoing through the incidents, issues, complaints and grievances process.

Reporting of consultation outcomes will include:

- A record of meeting minutes of meetings relating to this CHMP

- Annual reporting to the Board of the Ngaanyatjarra Council by the Advisory Committee regarding the status of this CHMP
- The incidents, issues, complaints and grievance register
- All consultation records will be recorded in a document management system (e.g., Landfolio Land Management System, or equivalent).

A nominal standing agenda for Advisory Committee Meetings relating to the management of cultural heritage (including this plan) includes:

- Apologies, confirmation of attendees, confirmation of minutes
- Health and safety
- Action review
- Review of LDPs issued, status etc.
- Chance finds, discovery of potential skeletal remains, Tjukurrrpa event
- Incidents, breaches, concerns raised
- Compliance register review
- Confirmation of actions arising, allocation of tasks and due dates
- Other business
- Next meeting.

4 ADAPTIVE MANAGEMENT

4.1 Overview

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of management actions, and consultation with relevant stakeholders. Specifically, adaptive management in relation to this CHMP includes:

- Defining the risks and management objectives, and developing the CHMP to address these (i.e. this document)
- Implementing the management actions described in this CHMP (Section 2)
- Monitoring and evaluating the applied management and mitigation against the outcomes and objectives, and in collaboration with relevant stakeholders (as per the monitoring program outlined in Section 2)
- Adjusting the management actions and monitoring (if required) to meet the outcome or objective, based on what is learnt from:
 - evaluation of monitoring data
 - evaluation of the effectiveness of applied mitigation measures
 - review of assumptions and uncertainties
 - review of stakeholder feedback (including incidents and complaints)
 - re-evaluation of risk assessment
 - external changes during the life of the project (e.g. technical advances or innovation, additional cultural heritage discoveries, changes in project scale or configuration etc.).

4.2 Cultural Heritage Management Plan

Notwithstanding the framework described in Section 2 of this CHMP; the management actions contained herein, shall be monitored, reviewed, and updated with consideration to the following:

- EPA and decision-making authorities (DMAs) comments during the approval process
- If a significant incident occurs related to the protection of cultural heritage
- If Traditional Owners request that a review is undertaken due to a relevant concern (subject to the outcomes of an incident/complaint investigation)
- If relevant State or Commonwealth legislation or policy requirements are updated or amended in relation to Aboriginal Heritage

- If the project scale and/or configuration changes in such a way that it materially changes the existing risk profile of the project and/or introduces additional potential impacts not previously considered/assessed.

4.3 Independent Peer Review

This CHMP may be independently audited or peer reviewed from time to time to validate the effectiveness of this CHMP, and to make suggestions for improvement within the scope of the EP Act.

5 STAKEHOLDER CONSULTATION

5.1 Consultation Outcomes

Extensive consultation has been undertaken as part of the Section 38 Referral under Part IV of the EP Act, and as part of ongoing discussions relating to a Mining Agreement with the Ngaanyatjarra People. Details of these consultations are provided in Section 3, Section 6.1.3, Appendix A4 and Appendix A5 of the EPA Section 38 Referral (OZ Minerals, 2021).

Through consultation with Traditional Owners, the following areas were identified as areas of concern to Ngaanyatjarra People relating to cultural heritage management. These matters have been specifically considered in this CHMP:

- The proposed mine is surrounded by areas with high ethnographic significance, including sites that form part of dreaming trails, waterholes, important stands of trees and isolated outcrop features. Direct and indirect impacts to these sites are recognised as a critical concern, including indirect impacts associated with project-generated dust, groundwater drawdown or change in surface water flows.
- Change and restriction of access to the land as a result of mining activities, in particular restricted access to sites of high ethnographic significance, hunting areas and to allow for ritualistic cultural maintenance activities. The change of access to country has the potential to interrupt the transfer of knowledge and cultural associations which are integral to the Traditional Owners carrying out their duties as the custodians of the land.
- In the three consultation activities between an independent archaeologist, the Ngaanyatjarra Council and Ngaanyatjarra People, Ngaanyatjarra People have noted a generally limited cultural interest in archaeological sites and demonstrated little or no concept of archaeological scientific significance. Based on the results of three dedicated consultation activities relating to archaeological cultural heritage sites it was noted that Traditional Owners were less interested in these types of sites compared with ethnographic sites at the West Musgrave Project. However, further consultations as part of the Mining Agreement and any requirements of the AH Act will be ongoing.

The Ngaanyatjarra Council, in their role as Agent for the Ngaanyatjarra People, has provided significant feedback and input to this. All relevant feedback, as it pertains to the requirement of the EPA, has been considered in the development of this CHMP.

A specific register relating to consultation events relating to this CHMP is provided in Appendix C.



West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

6 UPDATES TO THE EMP

This section is not applicable to the first version of the CHMP but will be updated in future revisions.

7 GLOSSARY OF TERMS

Term	Definition
AAPA Act	<i>Aboriginal Affairs Planning Authority Act, 1972 (WA)</i>
ACMC	Aboriginal Cultural Material Committee. Established under the <i>Aboriginal Heritage Act, 1972 (WA)</i> . The ACMC advises the Minister for Indigenous Affairs on matters relating to Aboriginal cultural heritage
AH Act	<i>Aboriginal Heritage Act, 1972 (WA)</i>
Areas of Significance	An area of land according to aboriginal tradition is of cultural, social or spiritual significance to Aboriginal persons and includes land that, under law of the Commonwealth or Western Australia is registered or declared as being of cultural, social or spiritual significance to Aboriginal Persons according to Aboriginal Tradition
CHMP	Cultural Heritage Management Plan
Cultural Heritage Site	An site according to aboriginal tradition is of cultural, social or spiritual significance to Aboriginal persons and includes land that, under law of the Commonwealth or Western Australia is registered or declared as being of cultural, social or spiritual significance to Aboriginal Persons according to Aboriginal Tradition
DPLH	Department of Planning, Lands and Heritage
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act, 1986 (WA)</i>
Exploration Deed of Agreement	the Exploration Deed of Agreement between the Ngaanyatjarra Land Council (Aboriginal Corporation) (the lessee of the Aboriginal Reserves), Yarnangu Ngaanyatjarraku Parna (Aboriginal Corporation) RNTBC (the registered native title body corporate in respect of the Ngaanyatjarra Lands) and OZ Minerals
Exclusion Zone/ Exclusion Area	A buffer area as defined by anthropologists, in consultation with Traditional Owners, demarcated around a cultural heritage site which forms an area of exclusion to third parties unless explicate caveats are defined. The purpose of these exclusion zones are to provide added protection to identified cultural heritage sites
GJCRM	Gavin Jackson Cultural Resource Management Pty Ltd

Term	Definition
Heritage Survey	<p>A heritage survey may include one of the following:</p> <ul style="list-style-type: none"> • Work Program Clearance – where a proposed work program can be adapted based on portions of the work program being deemed Cleared or Not Cleared, depending on the presence/absence of heritage sites and/or areas of cultural concern • Work Area Clearance – where proposed works within a broader area can be adapted based on portions of the work area being deemed Cleared or Not Cleared, depending on the presence/absence of heritage sites and/or areas of cultural concern • Site Avoidance – where information recorded includes an accurate extent of each site, and a broad characterisation of the site, that enable proponents to avoid heritage sites • Site Identification – where sites are recorded in sufficient detail for a statement of significance to be provided for each site
Knowledge Holders	Aboriginal people who may have cultural and/or historical associations with an area or place that bestows upon them certain intra group rights, such as authority to speak for the area and be involved in decisions regarding land use in the area. Knowledge Holders may have been granted custodianship over certain places or parts of the area by the Traditional Owners and/or native title claimants/holders
Mining Agreement	Mining Agreement refers to an agreement to the terms of land access for mining between the project proponent, the relevant Traditional Owners, and their Agent, the Ngaanyatjarra Council. A Mining Agreement is required under both the <i>Native Title Act, 1993</i> (Cth), and the <i>Aboriginal Affairs Planning Authority Act, 1972</i> (WA). The reference to Mining Agreement within this document refers to a Mining Agreement that would meet the requirements under both of these Acts. Mining at West Musgrave cannot commence until a Mining Agreement between the above-mentioned parties has been reached.
Ngaanyatjarra Person	Any Ngaanyatjarra, Pitjantjatjara or Pintubi person who in accordance with Aboriginal tradition has social, economic and spiritual affiliations with and responsibilities for the Lands or any part of them
Ngaanyatjarra Council	Ngaanyatjarra Council (Aboriginal Corporation)
Ngaanyatjarra Council CHMP	CHMP prepared by the Ngaanyatjarra Council for the purpose of Exploration and Studies Program
Pre-clearance Survey	Pre-clearance survey is a term used by the EPA in relation to heritage surveys. In this regard a pre-clearance survey is analogous to a heritage survey
Traditional Owners	Aboriginal people who assert, and are recognised by their peers, to be members of a local descent group from a particular area of land or sea, who have responsibilities and rights in relation to that area, based on traditional, cultural and/or spiritual affiliations with the area. Traditional Owners may or may not be part of a native title group
WMP	West Musgrave Project

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West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

APPENDICES



West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

Appendix A. Ngaanyatjarra Council CHMP

Cultural Heritage Management Plan
West Musgrave Project 2021 Exploration and Studies Program

Document Version	Document Version Date	Document Author	Reviewed by	Approved by	Issued to	Issued by	Date of Issue	Purpose for Issue
1	7 January 2021	Ben Garwood, Consultant Advisor to Ngaanyatjarra Council (NGC)	NA	NA	John Thurtell, Ngaanyatjarra West Musgrave Project Negotiation Lead, NGC	Ben Garwood	7 January 2021	1 st draft for review by NGC
2	12 January 2021	Ben Garwood	John Thurtell and David Brooks [Principal Anthropologist (NGC)]	NA	John Thurtell	Ben Garwood	12 January 2021	2 nd draft for issue to OZ Minerals
3	20 January 2021	Ben Garwood	Bryony Nicholson, NGC Manager Land and Culture	NA	John Thurtell	Ben Garwood	20 January 2021	Updated draft including Bryony Nicholson's comments and change in some terminology to align with OZ Minerals terminology
4	26 January 2021	Ben Garwood			John Thurtell	Ben Garwood	26/1/21	Issued for NGC review
5	01/02/21	B Garwood			John Thurtell	Ben Garwood	02/02/21	Post 28/1/21 NGC meeting draft
6	04/02/21	B Garwood	B Nicholson and D Brooks		JT, BN, DB, DG	BG	04/02/21	Updated with B Nicholson and D Brooks feedback
7	05/02/21	B Garwood	D Brooks		JT, BN, DB, DG	BG	05/02/21	Updated with D Brooks feedback
8	06/02/21	B Garwood	J Thurtell		JT	BG	06/02/21	Updated with JT feedback

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Purpose

This is the Ngaanyatjarra Council's (**NGC**) Cultural Heritage Management Plan (**CHMP**) for the OZ Minerals West Musgrave Project (**WMP**) 2021 Exploration and Studies Program (**Program**). The NGC requires OZ Minerals to comply with this plan at all times during the Program.

The Ngaanyatjarra Council "represents the interests of around 2,000 Ngaanyatjarra, Pintupi and Pitjantjatjara Traditional Owners (Yarnangu) who reside in the twelve member communities of the Ngaanyatjarra Council"¹. Mantamaru, approximately 30 kilometres away from the WMP, is one such community.

Scope

This CHMP applies to:

1. The WMP 2021 Exploration and Studies Program only. This includes all ground disturbing and non-ground disturbing work that will be carried out during the Program.
2. All personnel involved with the Program, being OZ Minerals their project partners and all Program contractors.

Terminology

The term 'OZ Minerals' means OZ Minerals, their partners and all contractors working on the Program.

The terms 'work programs', 'work', 'Program' and 'WMP 2021 Exploration and Studies Program' are used interchangeably throughout this document, and mean ground disturbing and non-ground disturbing works associated with the Program unless stated otherwise.

The terms 'Ngaanyatjarra', 'Ngaanyatjarra people' and the 'Ngaanyatjarra Council' are used throughout this document, sometimes interchangeably. For the sake of clarity, the Ngaanyatjarra Council "represent the interests" of the Ngaanyatjarra people¹ and acts for and on behalf of the Ngaanyatjarra people.

Background

OZ Minerals is planning to undertake various works to define the WMP mineral resource. This will involve a comprehensive drilling program and other studies commencing in early January 2021 by approximately [80] people for approximately [8] months across multiple work fronts². The results of the Program will inform OZ Minerals Final Investment Decision (**FID**) to construct and operate the WMP mine. FID is expected in early 2022 and is predicated on the agreement of the Ngaanyatjarra people to the WMP mine:

¹ <https://www.ngaanyatjarra.org.au>

² Further information about the WMP 2021 Exploration and Studies Program can be found at https://www.ozminerals.com/uploads/media/201209_AX_Release_West_Musgrave_PFSU.pdf

"To enable the project to proceed, an agreement must be negotiated with the title holders, the Ngaanyatjarra People who are represented by the Ngaanyatjarra Council Aboriginal Corporation"³

Never before has a program of this scale been undertaken on the Ngaanyatjarra Lands, nor has such an intensive program of works been undertaken in close proximity to highly significant Tjukurrpa. This necessitates a WMP 2021 Exploration and Studies Program CHMP, to ensure that OZ Minerals understands and complies with Ngaanyatjarra expectations and instructions pertaining to the protection of Tjukurrpa and Ngaanyatjarra culture and heritage.

In issuing this CHMP, the NGC and the Ngaanyatjarra people are seeking to work closely with OZ Minerals and their contractors in the spirit of cooperation, compliance and collaboration, so that all parties associated with the Program abide by Ngaanyatjarra's rules and procedures to ensure that Tjukurrpa and other cultural heritage sites are protected during the Program. This will serve to build a relationship through which the Ngaanyatjarra people can trust OZ Minerals to leave the smallest possible footprint in the lead up to the WMP FID, and to operate in a manner that respects and supports Ngaanyatjarra people to manage and protect Tjukurrpa and to fulfil their cultural obligations.

Regulatory Context

Global

OZ Minerals has committed to "Operate in accordance with the principles of the United Nations Declaration of the Rights of Indigenous Peoples (UNDRIP)"⁴ of which the NGC and the Ngaanyatjarra people support.

Article 32 (1) of the UNDRIP states that "Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources"⁵. The NGC and the Ngaanyatjarra people see this CHMP as an important component of the Ngaanyatjarra people determining and developing these priorities and strategies for land use and the Ngaanyatjarra peoples' 'free, prior and informed consent' for the WMP.

National

At the national level, the protection of Aboriginal heritage and the involvement of Aboriginal people in land use and planning is regulated through the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHPA) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- The purpose of the ATSIHPA is "... the preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition."⁶
- The Objects of the EPBC Act are in part to "... provide for the protection and conservation of heritage ... promote a co-operative approach to the protection and management of the

³ p55 at https://www.ozminerals.com/uploads/docs/201209_ASX_Release_West_Musgrave_MROR.pdf, West Musgrave Project Nebo-Babel Deposits, 2020 Mineral Resource and Ore Reserve Statement and Explanatory Notes As at 9 December 2020)

⁴ OZ Minerals Global Performance Standards. p27.

https://www.ozminerals.com/uploads/docs/OZ_Minerals_Global_Performance_Standards.pdf

⁵ United Nations Declaration of the Rights of Indigenous Peoples. https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf

⁶ Aboriginal and Torres Strait Islander Heritage Protection Act 1984, Clause 4, <https://www.legislation.gov.au/Details/C2015C00255>

environment involving governments, the community, land-holders and indigenous peoples ... recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity ... promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.”⁷

Of importance to the national regulatory environment is also the Interim Report of the Joint Standing Committee (JSC) on Northern Australia Inquiry into the destruction of caves at the Juukan Gorge in the Pilbara region of Western Australia.

Of particular note for the WMP and this CHMP is the JSC's recommendation “That all mining companies operating in Western Australia whether or not on Native Title land ... Work with Traditional Owners to ensure better access to country ... Commit to a voluntary moratorium on applying for new Section 18 permissions, pending either the passage of stronger heritage protections in Western Australia or *the negotiation of a protocol with relevant Traditional Owners to establish an improved process for site surveys, cultural protection and work area clearances based on the principle of avoiding damage wherever possible*”⁸ (emphasis added).

State

The Western Australia *Aboriginal Heritage Act 1972* (AHA) makes “... provision for the preservation on behalf of the community of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendants ...”⁹.

The principal mechanism through which this ‘preservation’ is achieved under the AHA is that no works that may result in the excavation, destruction, damage, alteration or concealment of an Aboriginal site are permitted without the consent of the WA Minister for Indigenous Affairs.

OZ Minerals is not seeking to impact any Aboriginal sites through the WMP 2021 Exploration and Studies Program.

The Western Australian Government is currently seeking to introduce new heritage management/protection legislation that will seek a more collaborative approach between Aboriginal people and project proponents in relation to the management of Aboriginal cultural heritage.¹⁰

Local Approach and Guiding Principles

Ngaanyatjarra Traditional Owners and knowledge holders have very real, deep and serious cultural obligations to care for country and protect Tjukurrpa. Arising from these obligations is a requirement from Ngaanyatjarra people that all companies seeking to use Ngaanyatjarra land, in this case OZ Minerals and their partners and contractors, comply with the existing heritage protection and management framework and this CHMP to foster a culture of compliance, cooperation and collaboration.

The existing cultural heritage protection and management framework comprises:

⁷ EPBC Act, Clause 3, <https://www.legislation.gov.au/Details/C2014C00506>

⁸ Joint Standing Committee (JSC) on Northern Australia Inquiry into the destruction of caves at the Juukan Gorge in the Pilbara region of Western Australia, Interim Report, https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Northern_Australia/CavesatJuukanGorge/Interim_Report

⁹ Western Australia Aboriginal Heritage Act 1972, https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrttitle_3_homepage.html

¹⁰ Review of the WA Aboriginal Heritage Act, <https://www.dplh.wa.gov.au/aha-review>

- An exploration agreement negotiated between Ngaanyatjarra Traditional Owners, the Ngaanyatjarra Council and OZ Minerals, that includes cultural heritage management and protection provisions.
- Reports prepared by the Ngaanyatjarra Council and issued to OZ Minerals of heritage surveys undertaken by Ngaanyatjarra people. These reports include clear recommendations as to the protection of Tjukurrpa and the management of culture and heritage considering the potential risks posed to Tjukurrpa and cultural heritage by the WMP.
- Through Ngaanyatjarra's existing relationship and work with OZ Minerals, a clear understanding between both parties and commitment to foundational good heritage protection and management practice. This includes no work being undertaken without the Ngaanyatjarra people, through the Ngaanyatjarra Council, having completed a heritage survey, compliance with the heritage survey outcomes, and heritage clearances being given by the Ngaanyatjarra Council prior to works commencing. This relationship is one of regular and transparent communication and partnership, an important heritage framework that must be protected and built on through the course of all phases of the WMP.
- The commitments that OZ Minerals has made in the company's referral to the EPA pertaining to the protection of Tjukurrpa and the management of heritage associated with the WMP.
- The public commitments that OZ Minerals has made in relation to the protection and management of Aboriginal heritage, its approach to 'host community' relations and that OZ Minerals has committed "To enable the project to proceed, an agreement must be negotiated with the title holders, the Ngaanyatjarra People who are represented by the Ngaanyatjarra Council Aboriginal Corporation".²

With this in mind the key principles that have guided this CHMP and form the regulatory environment are:

1. OZ Minerals and their partners and contractors in the conduct of the WMP 2021 Exploration and Studies Program will be operating and are guests on Ngaanyatjarra country, over which the Ngaanyatjarra people have cultural obligations to protect and manage Tjukurrpa and other sites and legal rights as to control of access.

The Ngaanyatjarra people hold exclusive possession native title rights, the highest form of native title rights. Under Part III of the Western Australia *Aboriginal Affairs Planning Authority Act 1972 (AAPA Act)*, Ngaanyatjarra have rights of control over their reserved lands (section 30), to which trespass provisions also apply (section 31).

Further, 'post Juukan Gorge', there is an increased emphasis from 'host communities' (in this case the Ngaanyatjarra people), land users and regulators of 'host community' 'free, prior and informed consent' to projects and strong host community involvement in managing project risk and participating in regulatory process. The Ngaanyatjarra people and the NGC strongly support this changing regulatory landscape and rising community expectation. This is particularly pertinent to the WMP because under the AAPA Act it is likely that Ministers of State will approve the WMP and will no doubt seek the views of the Ngaanyatjarra people through the NGC during their decision making.

In summary, the value to OZ Minerals and the Ngaanyatjarra people, of OZ Minerals and their partners and contractors being able to access and use Ngaanyatjarra country in a manner that is cooperative and collaborative, so that Tjukurrpa is protected and disturbance minimised, is immeasurable. To the Ngaanyatjarra people this is what a relationship of 'mutual benefit' and a 'social licence to operate' looks like, underpinned by formal agreement making.

No doubt such an approach will also be of benefit to OZ Minerals as the company navigates regulatory process in the context of this emerging push to ‘free, prior and informed consent’ and strong host community involvement in managing project risk.

2. OZ Minerals have interests and wish to conduct works on Ngaanyatjarra country. Ngaanyatjarra people are not opposed to these works, conditional on the works being conducted in a manner that is compliant with this CHMP, the rights and interests that the Ngaanyatjarra people hold over their country and the heritage management framework outlined above.
3. The Ngaanyatjarra people see the WMP 2021 Exploration and Studies Program as an opportunity for OZ Minerals, its partners and contractors and the Ngaanyatjarra people to build a trustful, cooperative and collaborative approach to the protection and management of Ngaanyatjarra culture and heritage, as the parties embark on mining agreement negotiations. This will help underpin the approach to cultural heritage protection and management across all phases of the WMP – construction, operation and closure. OZ Minerals also holds other tenure on Ngaanyatjarra country, no doubt with longer term aspirations to discover and develop other resource bodies, an endeavour made easier if founded on a relationship of trust, collaboration and cooperation with the Ngaanyatjarra people pertaining to heritage protection and management.

Risk and Opportunity

This CHMP principally seeks to mitigate any risk of OZ Minerals:

1. Non-compliance with their own commitments pertaining to the protection and management of Aboriginal heritage.
2. Non-compliance with conditions/recommendations arising from the outcome of heritage surveys and negotiations/consultations with Ngaanyatjarra about the WMP.
3. Impacting Tjukurpa and other heritage sites in the conduct of the WMP 2021 Exploration and Studies Program.
4. Non-compliance with Ngaanyatjarra’s rules and expectations pertaining to the protection and management of their cultural heritage.

These and other risks arising from the WMP 2021 Exploration and Studies Program will be discussed and managed during CHMP Coordination Committee meetings (refer below ‘CHMP Coordination Committee’ section).

Economic opportunities arising from the WMP 2021 Exploration and Studies Program, such as employment, training and contracting opportunities for Ngaanyatjarra people, are the subject of separate discussions between the NGC and OZ Minerals. This is also further discussed in the Offsets section below.

Objectives and Key Performance Indicators

The objectives of this CHMP are:

1. No impacts to Tjukurpa or heritage sites.
2. The WMP 2021 Exploration and Studies Program is undertaken strictly within work areas ‘cleared’ by NGC.

3. All WMP 2021 Exploration and Studies Program personnel remain within designated accommodation areas/rest and relaxation areas and transport routes ‘cleared’ by the NGC.
4. All WMP 2021 Exploration and Studies Program personnel are granted individual permits to enter Ngaanyatjarra lands through the existing permit system.
5. The WMP 2021 Exploration and Studies Program is conducted in compliance with:
 - a. This CHMP.
 - b. The commitments that OZ Minerals has made pertaining to the protection and management of Aboriginal heritage.
 - c. The recommendations/conditions stipulated in heritage survey reports issued to OZ Minerals by Ngaanyatjarra pertaining to the WMP and arising from discussions/negotiations between OZ Minerals and Ngaanyatjarra.
 - d. The exploration agreement between OZ Minerals and the Ngaanyatjarra people.
6. All staff working on the WMP 2021 Exploration and Studies Program have an awareness of and respect for the Ngaanyatjarra people, the obligations that Ngaanyatjarra people have to protect Tjukurrpa and care for country, take seriously their responsibilities under this CHMP and are held accountable for their compliance with this CHMP.
7. Timely and decisive action is taken by the NGC and OZ Minerals to investigate, learn from and hold accountable those involved in any non-compliance with this CHMP.
8. Regular, open and transparent communication between the NGC and OZ Minerals pertaining to the management and protection of culture and heritage and the implementation of this CHMP to facilitate ‘continuous improvement’.
9. In the event of a ‘chance find’ of cultural heritage material or skeletal remains, there is strict compliance with the associated procedures to ensure this material is managed in accordance with the wishes of the Ngaanyatjarra people.

Plan

To meet the objectives, the following plan will be implemented.

Decision Making

The RAPID model will be used in making decisions that may have implications for the protection and management of Tjukurrpa and cultural heritage. That is:

- **R**, there will be a Recommendation for decision.
- **A**, that recommendation will be Agreed by people accountable for specific aspects/disciplines that relate to the decision and the implementation of decision.
- **P**, the decision will be enacted, Performed, by people with delegated responsibility to do so.
- **I**, Input to the recommendation and decision will be provided by subject matter experts; and
- **D**, The final Decision will be made by a single person accountable for managing the issue at hand.

The NGC expects that the Exploration Manager is the principal decision maker as the most senior on-site representative during the 2021 Exploration and Studies Program. Further, irrespective of the level of involvement of the NGC in the decision making process, OZ Minerals remains fully accountable for

complying with all aspects of this plan and for ensuring that the 2021 Exploration and Studies Program does not disturb Tjukurrpa or any other cultural heritage.

With the exception of some work programs [see ‘Land Disturbance Permit (LDP) and Permits to Work (PTW)’ section below], the NGC and the Ngaanyatjarra people will at least have an Input role to OZ Minerals decisions that may have implications for the protection and management of Ngaanyatjarra cultural heritage.

This will take the form of OZ Minerals inviting NCG’s Input to these decisions by way of email sent to NGC’s Manager Land and Culture with NGC’s WMP Lead Negotiator and Principal Anthropologist in copy. Except for decisions that need to be made in the case of an emergency (in which the NGC should still be asked for Input), OZ Minerals will provide the NGC with at least five working days to provide Input. If the NGC has not provided Input to the decision within this five working day period, OZ Minerals can proceed to make that decision in the absence of Input from the NGC unless otherwise agreed with the NGC Manager Land and Culture or their delegate.

In some circumstances the NGC will require an Agree, Recommend or a Decision making role and will discuss this with OZ Minerals when invited to provide Input.

The complexity concerning the implementation of plans such as this necessitates a flexible approach to NGC’s involvement in decision making, however OZ Minerals, their partners and contractors will not make unilateral decisions concerning any aspect of the 2021 Exploration and Studies Program that may have a direct or indirect impact on the protection and management of Ngaanyatjarra culture and heritage, without at least input from the NGC.

Ngaanyatjarra Involvement

The Ngaanyatjarra people wish to be involved in the implementation of this CHMP. This will take the form of, but does not have to be limited to, the Ngaanyatjarra people being involved in:

- Monitoring; refer Monitoring section below.
- Environmental and other studies as informants (if relevant) or to provide logistics support by transporting studies teams around Ngaanyatjarra country for example.
- Attending inductions, pre-start meetings/toolbox talks to meet workers and to provide input to these events.
- The presentation of cultural awareness training.
- Showing workers, by way of on-country tours, the boundary of ‘cleared’ transport routes, accommodation/recreation areas and work areas.

It is noted that Ngaanyatjarra people will not be available to participate in these sorts of activities from time to time, however, as is a theme throughout this CHMP, the involvement of the Ngaanyatjarra people must be invited by OZ Minerals, to give the Ngaanyatjarra people the opportunity to be involved.

Awareness

To ensure that all staff are aware of their responsibilities under this plan and that the management and protection of cultural heritage is always ‘front of mind’ for WMP 2021 Exploration and Studies Program personnel, the following will be implemented:

1. The WMP 2021 Exploration and Studies Program induction will include a detailed briefing on this CHMP, wherever possible by involving Ngaanyatjarra people and/or NGC staff, with a particular emphasis on compliance with the 'Golden Rules' that are set out below.
2. Cultural heritage management will be a standing agenda item at each WMP 2021 Exploration and Studies Program pre-start and 'Toolbox' meeting, with:
 - a. A check and positive confirmation that works will be undertaken in an area within which a Land Disturbance Permit is in place.
 - b. A reminder of the procedure in the event that there is a 'chance find', the uncovering of skeletal remains or a change management occurrence.
 - c. Reiteration of the heritage 'cleared' WMP 2021 Exploration and Studies Program areas, accommodation/recreation areas and travel routes.
 - d. A request from the supervisor whether any of the work team has questions pertaining to cultural heritage management/protection.

The NGC/Ngaanyatjarra people will invited to attend these meetings.

3. Cultural Awareness Training (CAT) that must be completed by all Program personnel.

Compliance

CHMP 'Golden Rules'

Four simple CHMP 'Golden Rules' will be adopted, reiterated and complied with at all times by all Program personnel.

OZ Minerals, their partners, contractors and all staff will be held accountable for their compliance with the Golden Rules by the NGC. Any breach of the Golden Rules will be investigate by OZ Minerals and the NGC and will likely result in the termination of employment, revocation of Ngaanyatjarra entry permit(s), demobilisation from site, a financial compensation claim(s) on OZ Minerals by the NGC, and in the case of a contractor, the cessation of the contract or other penalties.

The Golden Rules are:

1. Do not start ground disturbing or non-ground disturbing work:
 - a. Without an approved Land Disturbance Permit (LDP) (for ground disturbing activities) or Permit to Work (**PTW**) (for non-ground disturbing activities). A copy of these permits work supervisor and the NGC.
 - b. For ground disturbing works, until your work area has been physically demarcated with pickets and pink flagging and the area has been checked against the Land Disturbance Permit by the works supervisor and/or an NGC representative. In the case of non-ground disturbing works, until your team is fully aware of the PTW conditions and the conditions have been positively communicated.
2. Never leave your designated work area, accommodation area or transport area, unless in the case of a life-threatening emergency.

3. If you are unsure about whether you're operating in an approved work area, traversing through a designated transport route, in a designated accommodation/recreation area or if you think you've found cultural heritage material or skeletal remains, stop what you're doing immediately and tell your supervisor.
4. In the case of a breach of the 'Golden Rules', or what is thought may be a breach, tell your supervisor immediately. OZ Minerals and the NGC must also be immediately notified.

The key NGC and OZ Minerals contacts in the case of a breach or suspected breach of the 'Golden Rules', or the discovery of what is thought to be cultural material, are:

- NGC Manager Land and Culture, Bryony Nicholson, bryony.nicholson@ngcouncil.org.au. Telephone: 0408 723 210.
- OZ Minerals Manager - Operations WMP, Zoran Seat, Zoran.Seat@ozminerals.com
- Telephone: 0403 454 416

Procedures

To support the implementation of the Golden Rules, the following procedures will be implemented by the NGC and OZ Minerals

Land Disturbance Permit (LDP) and Permits to Work (PTW)

With reference to the Decision Making section above, OZ Minerals will invite the Ngaanyatjarra people, through the NGC, to provide input as to:

1. Whether permits should be issued for ground disturbing (LDP) and non-ground disturbing works (PTW).
2. The conditions on which works should proceed, including where the works should proceed and the involvement of the Ngaanyatjarra people in those works through monitoring or assisting studies teams for example.
3. Any review of the permits, including compliance reviews.
4. The close out of those permits.
5. The compliance monitoring of those permits.

OZ Minerals does not have to invite such input from the NGC for work activities in areas that have previously been 'cleared' by the NGC. For example, the NGC has already 'cleared' drilling programs within specific areas in the Babel and Nebo tenements. As such, OZ Minerals does not have to invite the NGC's input as to the continuation of the drill program in these areas, including for new drill holes. However, should OZ Minerals change the work program from drilling to bulk sampling in these 'cleared' areas, because the nature of work has changed to a potentially more impactful activity, OZ Minerals will invite the NGC's input per points 1-5 above.

Prior to the commencement of any work program:

- OZ Minerals will invite the NGC to physically demarcate the boundary of the work program for ground disturbing work. Physical demarcation will take the form of installing pickets with pink flagging placed at regular intervals, so that the boundary of the approved work area can be easily ascertained.
- The works supervisor will acknowledge, through signing the LDP/PTW, that they understand and will comply with the conditions of the permit.

The most critical matter here is, with the exception noted in the paragraph above, the NGC is invited by OZ Minerals to have input into OZ Minerals decisions pertaining to works permits and is invited to monitor and provide assurance as to compliance.

It is noted that this CHMP will be finalised after the commencement of the 2021 Exploration and Studies Program. As such, OZ Minerals will send a copy of all current permits/permissions for the 2021 Exploration and Studies Program to the NGC. If the NGC has any comments as to the efficacy of those permits, OZ Minerals will consider and action those comments in consultation with the NGC.

Change Management

The risk of breaches to this CHMP and inadvertent impacts to Ngaanyatjarra culture and heritage can arise from poorly managed change process. As such, OZ Minerals will have in place a Change Management procedure that will comprise, but does not have to be limited to, the following:

1. OZ Minerals will notify the NGC, through a Management of Change Notice (**MOCN**), the nature of the change to the WMP 2021 Exploration and Studies Program, when the change will occur, how the change will be managed, by whom and the potential risks arising from the change. The MOCN must also attach copies of the LDP(s) and PTW(s) that will be impacted by the change.
2. The NGC will review the MOCN and provide input into how the change should be managed.
3. OZ Minerals will have regard to and implement NGC's input. Otherwise, OZ Minerals will discuss with the NGC the practicality of NGC's input and discuss alternative ways that NGC's concerns can be addressed.
4. The changes will be clearly communicated to all personnel through daily pre-start meetings/toolbox meetings after the MOCN has been approved with consideration to NGC's comments.

Skeletal remains

In the event that skeletal remains are discovered, or what are thought to be skeletal remains, the following steps will be taken:

1. Upon the discovery, works must stop immediately and all machinery and other equipment left in-situ and not moved under any circumstance until receiving NGC written approval.
2. An NGC representative must be contacted immediately along with the work program supervisor if they are not present at the time of the discovery.
3. An area comprising a 50 metre radius from the potential remains must be physically demarcated immediately with bright red flagging tape and pickets. The location of the potential remains must be recorded using a GPS.
4. NGC will notify the WA Police and the Registrar of Aboriginal sites, in that order. OZ Minerals and the NGC will follow Police directions.
5. The NGC will inspect the area without any disruption whatsoever to the site of the potential remains.
6. Work must not proceed, and equipment must remain in-situ until such time that the NGC provides OZ Minerals with written permission to commence works in accordance with the Change Management Procedure, the original LDP or a newly issued LDP.

Chance Find

From time-to-time objects thought to be Aboriginal cultural objects such as artefacts may be found. In the event of a ‘chance find’, the same procedure will be followed pertaining to the identification of potential human remains (see above) with the exception of Step 4.

Circumstances may also arise whereby, through the conduct of a works program, it is discovered that disturbance to Tjukurrpa has occurred. This is because Tjukurrpa has physical and intangible manifestations, and below ground manifestations that cannot be identified through heritage surveys. There have been past occurrences of such issues arising, namely the installation of subsurface infrastructure that led to the uncovering and disturbance of Tjukurrpa and a subsequent settlement between the project manager and the Ngaanyatjarra people.

This reiterates the importance of having Ngaanyatjarra people monitor the works where possible, particularly in areas where Tjukurrpa is considered more likely to be present. This also reiterates the importance of NGC’s input to LDP’s/PTW’s and decision making that may lead to heritage management and protection implications.

Should a situation such as this arise, in the absence of NGC having been invited to provide input into the decisions that gave rise to situation, this will be considered by the NGC as a breach of the highest degree and will result in serious consequences for the relationship between the Ngaanyatjarra people and OZ Minerals and a likely NGC financial compensation claim on OZ Minerals. This also applies to non-ground disturbing work programs.

Breach event, incident or complaint

In the event of an incident or what is thought to be an incident, a breach of this CHMP or a complaint from a Ngaanyatjarra community member about the WMP 2021 Exploration and Studies Program or Program personnel, the following will be enacted:

1. The NGC and OZ Minerals will be immediately notified by way of telephone in the first instance and then by way of a report detailing the particulars of the issue. NGC Lead Negotiator for the WMP, NCG Manager Land and Culture, NGC Principal and/or Senior Anthropologist must be immediately notified by telephone and sent a copy of the initial incident report. The report must be sent within 12 hours of the time of the potential incident.
2. The NGC and OZ Minerals will immediately and jointly investigate the incident, CHMP breach or complaint. The investigation will be led by OZ Minerals Mine Access Agreement/Non-Government External Relations Lead and NGC’s Lead Negotiator for the WMP.
3. The progress of the investigation will be communicated on a daily basis to other people as nominated by the NGC and OZ Minerals.
4. The investigation will be completed within 48 hours of the initial incident report and issued to the NGC and OZ Minerals within 60 hours of the receipt of the initial incident report.
5. Immediately after issuing the investigation report, corrective actions will commence to improve processes to mitigate the risk of another incident. Disciplinary action will also be taken to ensure that personnel and contractors are held to account for any breach of process/misconduct and the NGC will likely progress financial compensation claims against OZ Minerals depending on the severity of the incident and the nature of its impact.

Compliance Register

CHMP Compliance will be managed through the WMP CHMP Compliance Register.

The Compliance Register is at Attachment 1 and lists all of the commitments that OZ Minerals has made in relation to the management of cultural heritage, Ngaanyatjarra recommendations arising from heritage survey reports to enable the WMP 2021 Exploration and Studies Program, obligations arising from the Ngaanyatjarra/OZ Minerals Exploration Agreement and other commitments that OZ Minerals and Ngaanyatjarra have made to each other pertaining to the protection and management of cultural heritage.

The CHMP Coordination Committee will monitor and action the compliance register during their regular meetings, as a standing agenda item.

Contractor Management

The WMP 2021 Exploration and Studies Program will largely be undertaken by OZ Minerals contractors. As such, OZ Minerals will require all contractors working on the Program, whether they are contracting directly to OZ Minerals or sub-contractors, to comply with this CHMP through formal contractual provisions. Penalties will apply for any non-compliance. Should those penalties involve a financial penalty, OZ Minerals will agree with the NGC how the receipt of that penalty will be used to compensate the Ngaanyatjarra people or offset the non-compliance issue.

Regular, Transparent and Open Communication

This CHMP is predicated on a cooperative and collaborative approach to cultural heritage management and protection by OZ Minerals and the Ngaanyatjarra people. Central to this approach is the establishment of a CHMP Coordination Committee to ensure the regular flow of communication and discussion about the implementation of the CHMP.

The CHMP Coordination Committee will meet monthly at a mutually convenient time, in person whenever possible and otherwise by teleconference/video conference. Members of the CHMP Coordination Committee will be:

- NGC:
 - o Manager Land and Culture (Chair) [TBC]
 - o CHMP Coordinator (Secretary)
 - o Liaison Officer
 - o Traditional Owner(s)
 - o Principal Anthropologist
 - o WMP Lead Negotiator
- OZ Minerals
 - o OZ Minerals Mine Access Agreement/Non-Government External Relations Lead
 - o Community and Heritage Lead - West Musgrave
 - o Exploration Manager

Standing Agenda:

- Apologies, confirmation of attendees, confirmation of minutes
- Health and Safety
- Actions arising
- Induction, pre-start/toolbox meeting, Cultural Awareness Training
 - o Attendees
 - o Issues and opportunities

- WMP 2021 Exploration and Studies Program update, look ahead and potential issues/risks arising
- Monitoring update
- Current (live) Permits to Work
- Land Disturbance Permit applications and progress
- Management of Change Notices
- Change Finds/discovery of potential skeletal remains/Tjukurrrpa event
- Incidents/breaches/concerns raised
- Compliance register review
- Confirmation of actions arising, allocation of tasks and due dates
- Other business
- Next meeting

Monitoring

Monitoring CHMP implementation and compliance is a critical component protecting and managing cultural heritage in relation to the WMP 2021 Exploration and Studies Program.

Monitoring will take place through:

- 1. The installation of In-Vehicle Monitoring Systems in all light vehicles.**

Responsibility: OZ Minerals Mine Access Agreement/Non-Government External Relations Lead/Exploration Manager.

- 2. The installation of GPS/alarm systems in machinery to ensure all machines operate within approved work areas.**

Responsibility: OZ Minerals Mine Access Agreement/Non-Government External Relations Lead/Exploration Manager.

- 3. The appointment of Ngaanyatjarra Program Monitors.**

It is intended that up to two monitors will be on-site at all times for the duration of the Program, including through a job share arrangement. Monitors will be invited by OZ Minerals to be present when ground is disturbed for the first time by the WMP 2021 Exploration and Studies Program, to attend all surveys/studies, particularly (but not limited to) environmental studies, and to help physically demarcate approved work areas prior to the commencement of works.

It is acknowledged that this monitoring program may be impractical to implement due to the availability of Ngaanyatjarra people to perform these duties and other constraints. As such, while there is strong intent to implement this monitoring program, the involvement of Ngaanyatjarra monitors is not a strict CHMP compliance requirement, however, inviting Monitors to attend is a strict requirement of this CHMP.

Monitors will be arranged through the NGC Land and Culture Manager and the monitoring program coordinated by the NGC WMP Liaison Officer and OZ Minerals Community and Heritage Lead - West Musgrave. OZ Minerals is required to pay for all costs associated with the Monitoring program including the provision of a vehicle(s) for Monitors.

4. Appointment of an NGC Heritage Coordinator, who will report to the NGC Land and Culture Manager, will oversee the implementation of this CHMP, and support the CHMP Coordination Committee. This position will be funded by OZ Minerals.

Resourcing

Reference is made throughout this document to:

- The involvement of Ngaanyatjarra people, particularly Traditional Owners, in monitoring, supporting logistics and in the CHMP Coordination Committee.
- The appointment of an NGC Heritage Coordinator, who will report to the NGC Land and Culture Manager and oversee the implementation of this CHMP for the NGC.

For the sake of clarity these resources, together with the time that NGC staff spend on the implementation of the CHMP, and the time that Traditional Owners will have to spend considering ‘clearances’ (in the southern water area for example), will be paid for by OZ Minerals.

For example, NGC’s Land and Culture Manager and Principal Anthropologist will by necessity have to remain involved at a strategic/management level in the implementation of this CHMP, in addition to the NGC Coordinator who will implement this CHMP on a day to day basis. The services of the NGC Land and Culture Manager and the Principal Anthropologist will be charged on a per hour consultancy basis.

The fee that OZ Minerals will pay to Traditional Owners will be per the schedule of rates in the exploration agreement, or at the rate of a works supervisor, whichever is the higher.

Offsets

The WMP 2021 Exploration and Drilling Program is the most significant of its kind on Ngaanyatjarra country. Considering that a program of this nature and scale has never taken place on Ngaanyatjarra country and constitutes a high level of impact, the Ngaanyatjarra people expect that OZ Minerals ‘offsets’ these impacts by way of:

1. Protecting Tjukurpa. No impacts to Tjukurpa or any other cultural heritage.
2. Compliance with this plan and accountability for its implementation.
3. Providing employment and business opportunities throughout the Program for the Ngaanyatjarra people and community.
4. Purchasing goods and services from the Mantamaru community and hiring community facilities.
5. Engaging member(s) of the Mantamaru community to document the Program through film, photography and audio so that information about the WMP and the Program can be shared with the Mantamaru community constantly, through the Ngaanyatjarra people who can gather this information.
6. Inviting Traditional Owners to visit the Program from time to time to share information about the Program, the priorities of the Ngaanyatjarra people and to share a meal and build relationships.
7. Where possible, for milestone events, presentations and celebrations, commission gifts from the Mantamaru community.
8. Support essential Mantamaru community services such as health, utilities, infrastructure, roads, sports and the administration of the community.
9. Minimise environmental impact and be open and transparent with the Ngaanyatjarra people about impacts and the management of them.
10. Financial compensation to be negotiated between the NGC and OZ Minerals.
11. Advocacy into government and other partners to help the Ngaanyatjarra people:

- a. Build and support their community through grants and the like.
- b. Negotiate with the WA State Treasurer, under the provisions of the *WA Aboriginal Affairs Planning Authority Act 1972*, to have that the ‘offsets’ that OZ Minerals is required to pay for the Program and the WMP, flow to the Ngaanyatjarra people as the ‘Authority’ holding and managing the Reserved Lands.

12. Refer to the ‘Ngaanyatjarra Involvement’ section above.

Accountability and Waiver

Fundamental to the successful implementation of any plan is clarity on who is accountable for CHMP implementation and compliance. Overall accountability for the implementation of this CHMP sits with:

- OZ Minerals Mine Access Agreement/Non-Government External Relations Lead for OZ Minerals Obligations under this plan.
- NGC WMP Lead Negotiator for the NGC’s obligations under this plan.

OZ Minerals is fully accountable for ensuring that the 2021 Exploration and Studies Program does not disturb Tjukurrpa or any other cultural heritage and is undertaken in compliance with this plan.

This CHMP does not in any way waive the rights of the Ngaanyatjarra people to respond to approvals processes concerning the WMP. This includes the Ngaanyatjarra people appealing approvals or objecting to approval applications and the like.

Deviation

There will be no deviation from this plan without written approval from NGC Lead Negotiator for the WMP or delegate. Any deviation will only be considered when managed in accordance with the Management of Change Procedure.

Information Management

Confidentiality

All information pertaining to this plan, the plan itself and information arising from this plan is strictly confidential to OZ Minerals and the NGC and must be managed and protected as such.

Geospatial and Other Information

A principle guiding factor in the provision and management of information associated with this plan is that OZ Minerals can only rely on heritage related data and information that is issued by the NGC Manager Land and Culture. This is particularly true for information and data concerning areas that are ‘cleared’ for work and ‘not cleared’ for work, whether that be ground disturbing or non-ground disturbing activities.

OZ Minerals has sent to the NGC a copy of all current and historical geospatial and other information that OZ Minerals holds pertaining to the management of cultural heritage in the context of the WMP. Finalising how this data will be stored, administered and sorted will be undertaken by the NGC Cultural Geography Project that OZ Minerals has agreed to support.

Geospatial and other information that is generated from the implementation of this CHMP will be held by OZ Minerals and the NGC and will be sent by each party to the other as the information is generated.

Excluded from this requirement is any information that is confidential in nature to the Ngaanyatjarra people.

All information will be version controlled to ensure that OZ Minerals and the NGC are working from the same, current, accurate and approved information.

CHMP Review

This CHMP will be reviewed by the CHMP Coordination Committee in June 2021, with a new version of the CHMP being issued no later than 31 July 2021, should changes to the CHMP be required.

The CHMP will be reviewed bi-annually thereafter with new versions of the plan being issued before 31 January and 31 July, sooner if a change to the Scope of the CHMP is required.

A full review of this CHMP will also be undertaken when the WMP transitions from the 2021 Exploration and Studies Program phase to the WMP Construction Phase and later to the WMP Operations Phase and Closure Phase.

CHMP Reporting and Record Keeping

Reporting against the requirements of this CHMP will take the following form:

1. Monthly reporting through the CHMP Coordination Committee, as recorded in the minutes of the CHMP Coordination Committee.
2. Annual reporting to the Board of the NGC by the CHMP Coordination Committee.

CHMP Audit and Evaluation

The CHMP Coordination Committee will commission an independent audit and evaluation of the effectiveness of the CHMP from time to time, but no less than every two years or prior to the CHMP being updated for a new WMP operating phase (exploration, construction, operation, closure).

The report of the independent evaluation will be sent to the NGC and OZ Minerals Board concurrently.

Continuous Improvement

The NGC and OZ Minerals are committed to adopting a ‘continuous improvement’ approach with regard to the content and implementation of this CHMP.

Continuous improvement will be achieved through meetings of the CHMP Coordination Committee, CHMP review, audit and evaluation.



West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

Appendix B. Peer Review of OZ Minerals CHMP



West Musgrave Copper and Nickel Project Cultural Heritage Management Plan Peer Review

CULTURAL HERITAGE MANAGEMENT PLAN PEER REVIEW

As part of the Government of Western Australia's Environmental Protection Authority's (EPA) S40(2)(a) Notice Requiring Information for Assessment for the West Musgrave Copper and Nickel Project (WMP), the EPA requested 'The Cultural Heritage Management Plan... may be reviewed by a suitably qualified independent person'.

With agreement from Ngaanyatjarra Council, an independent peer review of the WMP Cultural Heritage Management Plan (CHMP) was undertaken by Patricia Ryan, Jeremy Maling and John Marrell of Gavin Jackson Cultural Resource Management (GJCRM); archaeologist and anthropologists with decades of industry experience and relevant experience reviewing CHMPs for Western Australian mining projects. The review can be found at CHMP 1, of which all feedback, as it pertains to the requirements of the EPA, has been addressed and incorporated into the final version of the West Musgrave CHMP.

The review provided in-text suggestions and ten final recommendations. Based on addressing these, the review concluded:

We suggest that if OZ Minerals address the recommendations in this document, they will have a CHMP that both fulfills the specified requirements of the Notice and is a robust document for the management of cultural heritage.

Where appropriate, OZ Minerals has engaged with Ngaanyatjarra Council to ascertain their preferences in relation to the GJCRM recommendations before implementing them. A summary of such consultation is provided in the CHMP Consultation Register appendix.

A summary of the final recommendations and suggestions from GJCRM, and details of how OZ Minerals' has actioned them, is provided in Table 1 below:

Table 1: Summary of Actions for Peer Review Recommendations

ID	Gavin Jackson Recommendation	OZ Minerals Action	Where in Plan is this addressed
R1	Consult with and provide the WMP CHMP to the NGC and Ngaanyatjarra people for direct input into the development (as well as implementation) of the WMP CHMP	<p>Significant consultation with the Ngaanyatjarra People and Ngaanyatjarra Council has occurred as part of the development of the Environment Review Document submitted to the EPA in December 2020, including a dedicated-on country consultation relating to the outcomes of the impact assessment. During this consultation event the Ngaanyatjarra People provided their endorsement for the submission and for assessment of the project by the EPA (Consultation notes can be found at OZ Minerals 2021, Appendix A4).</p> <p>In addition, several consultation activities with Traditional Owners and the Ngaanyatjarra Council have occurred to discuss relevant cultural heritage protections related to identified cultural heritage sites. A summary of these consultations is provided within the consultation register (OZ Minerals 2021, Appendix A5).</p> <p>Through the development of this CHMP a number of dedicated discussions occurred with the Ngaanyatjarra Council to ensure their inputs have been appropriately considered in the development of the CHMP. These included:</p> <ul style="list-style-type: none"> • Meeting to discuss the requirements of the Section 40 notice from the EPA, and any immediate expectations and interests of the Ngaanyatjarra Council for the requested Management Plans- 20 April 2021 • Directive from the Ngaanyatjarra Council to ensure that the WMP CHMP reflects the intent, content, effect and spirit of the Ngaanyatjarra Council CHMP Exploration and Studies CHMP requirements in-so-far as meeting the requirements under the EP Act. - 03 May 2021 • OZ Minerals have provided a draft of the OZ Minerals CHMP to Ngaanyatjarra Council for review. OZ Minerals has subsequently incorporated the requirements of the Ngaanyatjarra Council's review where relevant to the requirements of the EPA into the final document- 03 May 2021 • Meeting between the Ngaanyatjarra Council and OZ Minerals to better understand the scope of the EPA CHMP compared to the requirements of a more fulsome operational CHMP as might be required as a component of a Mining Agreement- 7 May 2021 • Meeting between Ngaanyatjarra Council (and their legal advisor) and OZ Minerals (and their legal advisor) to align on the scope of the EPA CHMP compared to the requirements of a more fulsome operational CHMP as might be required as a component of a Mining Agreement- 7 May 2021 • Meeting between the Ngaanyatjarra Council and the EPA to confirm and understand further the scope of the EPA CHMP compared to the requirements of a more fulsome operational CHMP as might be required as a component of a Mining Agreement – 20 May 2021 • Meeting between the Ngaanyatjarra Council and confirm support for appending the Ngaanyatjarra Council CHMP to the WMP CHMP submission to EPA, confirm that the Ngaanyatjarra Council preferences in relation to the GJCRM recommendations relating to the disclosure of cultural heritage site details, and details of specific recommendations relating to the protection of sites from the cultural heritage survey reports issued to OZ Minerals by the Ngaanyatjarra Council- 02 June 2021 	Have generated a "foreword" that provides evidence of consultation undertaken in the development of this Plan, and a consultation Appendix (Appendix C) providing details of consultation relating to this CHMP, and updated the master consultation register at OZ Minerals 2021; Appendix A5.
R2	Expand the WMP CHMP to apply to the Project Area and identify the tenements to which this applies	Table and Figure has been added to identify the WMP CHMP scope area including a table of all lease areas.	Section 1.1 Scope
R3	Subject to consent from the NGC and Ngaanyatjarra people, identify all sites (or exclusion zones where the information may be sensitive) located within the Project Area and include them on the WMP CHMP maps	The Ngaanyatjarra Council have confirmed that they do not want this information publicly disclosed. The following wording has been provided in the WMP "The Ngaanyatjarra Council and Ngaanyatjarra People have noted their preference to not publicly disclose the location of sites and exclusions zones, and as such no specific details of sites and exclusions zones have been provided in this CHMP. All cultural heritage sites as identified by Ngaanyatjarra People relevant to the WMP are detailed in 'commercial confidence' cultural heritage survey reports as issued to OZ Minerals by the Ngaanyatjarra Council (see OZ Minerals 2021, Appendix J1 and J2)".	Section 1.2 Context and Rationale
R4	Provide definitions for exclusion zones, areas of significance and pre-clearance surveys	A glossary of terms has been added including the definition of exclusion zones, areas of significance and pre-clearance surveys which combines those from GJCMS and the Exploration Deed.	Section 7
R5	In consultation with the NGC and Ngaanyatjarra people, identify from heritage survey reports and any site specific mitigative and management recommendations and list these in the WMP CHMP	<p>The disclosure of specific conditions in heritage reports may provide information (implied or otherwise) about the nature and location of cultural heritage sites near to the WMP. The Ngaanyatjarra Council and Ngaanyatjarra People have noted their preference to not publicly disclose the location of sites and exclusions zones, and as such no specific details of sites and exclusions zones have been provided in this CHMP.</p> <p>All cultural heritage sites as identified by Ngaanyatjarra People relevant to the WMP are detailed in 'commercial confidence' cultural heritage survey reports as issued to OZ Minerals by the Ngaanyatjarra Council (see OZ Minerals 2021, Appendix J1 and J2).</p> <p>In addition, a management action listed in Table 7 states "Compliance with the Exploration Deed of Agreement and all directions of Ngaanyatjarra Council issued cultural heritage survey reports, and the Ngaanyatjarra Council CHMP once it comes into effect through the Mining Agreement". This management action will be enforceable by law should EPA condition this management plan (or parts of) in the Ministerial Statement.</p>	Table 7.
R6	In consultation with the NGC and Ngaanyatjarra people, identify from the Groundwater Monitoring and Management Plan any specific management requirements as these apply to cultural heritage	A reference to the Groundwater Monitoring and Management Plan is in Section 1.5.1 including a reference to these alternate plans	Section 1.5.1

ID	Gavin Jackson Recommendation	OZ Minerals Action	Where in Plan is this addressed
R7	In consultation with the NGC and Ngaanyatjarra people, identify from other Environmental Management Plans any specific management requirements as these apply to the Project Area	A reference to the Groundwater Monitoring and Management Plan is in Section 1.5.1 including a reference to these alternate plans	Section 1.5.1
R8	In consultation with the NGC and Ngaanyatjarra people, identify from the Mine Closure Plan any specific management requirements (such as rehabilitation requirements) as these apply to the Project Area	While we are committed to consulting mine closure planning with the Ngaanyatjarra People and Ngaanyatjarra Council, and will-so in the near future; the Mine Closure Plan has not been requested as a requirement of the EPA. The Mine Closure Plan will form a component of the Mining Proposal which is yet to be developed finalised and agreed. The Mining Proposal and associated Mine Closure Plan will be developed in consultation with the Ngaanyatjarra Council and Ngaanyatjarra People as necessary.	N/A
R9	Remove existing statements relating to the potential significance of archaeological sites in the Development Envelope	No justification is provided in the peer-review for this request. We maintain the use of "potential" archaeology sites based on the following quote from Waru Consulting in the archaeology report (OZ Minerals, 2021; Appendix J4) "These sites may meet the criteria for an Aboriginal heritage site under the AH Act, however some may not, subject to a determination to be made by the Aboriginal Cultural Material Committee (ACMC) based on submission of related scientific information and consultation records". If the peer-review is referring to where we have used the terms 'sites of cultural heritage significance', we have since updated these references to concur with relevant heritage language i.e. 'sites of cultural heritage significance' have been amend to 'cultural heritage sites' throughout	Changed 'sites of cultural heritage significance' to 'cultural heritage sites' throughout
R10	Review and update the WMP CHMP in consultation with the NGC and the Ngaanyatjarra people obtaining their free, prior and informed consent for its use	This document has been developed based on numerous discussions with Traditional Owners relating to the identification and management of cultural heritage, and in collaboration with the Ngaanyatjarra Council, as described in R1. Specifically, A dedicated program of on-land consultation with the Ngaanyatjarra People and Ngaanyatjarra Council has occurred relating to the content of the environmental characterisation and impact assessment required by the Part IV process (September 2021 see OZ Minerals, 2021; Appendix A3). The Ngaanyatjarra People and Ngaanyatjarra Council have provided their direct endorsement of the submission and assessment of this information under the EPA Part IV Process. Ultimate prior and informed consent for the project will be an ongoing process and will ultimately be attained prior to the voting and consent process associated with the Mining Agreement between the Ngaanyatjarra People, Ngaanyatjarra Council and OZ Minerals. Ongoing consultation with Ngaanyatjarra Stakeholders relating to this plan (and others) will occur during the EPA's three-week public consultation process will all feedback considered and incorporated into this plan (and others) as necessary.	Have generated a "foreword" that provides evidence of consultation undertaken in the development of this Plan, and a consultation register in Section 5 of the WMP CHMP.



West Musgrave Copper and Nickel Project Cultural Heritage Management Plan Peer Review

CHMP 1. CHMP Peer Review

A review of the West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

For Oz Minerals

May 2021 | Patricia Ryan, Jeremy Maling and John Marrell



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- ii. for any purpose relating to the *Aboriginal Heritage Act 1972* (WA) and or the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth).

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DISCLAIMER

Whilst every effort has been made to ensure that all relevant data has been presented, the authors are not accountable for omissions and inconsistencies that may result from information which may come to light in the future but which was not forthcoming at the time of this research.

The results, conclusions and recommendations within this report are based on information available at the time of its preparation.



LIST OF TERMS

Term	Definition
AACAI	Australian Association of Consulting Archaeologists Inc.
ACMC	Aboriginal Cultural Material Committee. Established under the <i>Aboriginal Heritage Act 1972</i> (WA). The ACMC advises the Minister for Indigenous Affairs on matters relating to Aboriginal cultural heritage.
AH Act	<i>Aboriginal Heritage Act 1972</i> (WA)
AHIS	Aboriginal Heritage Information System
CHMP	Cultural Heritage Management Plan
DPLH	Department of Planning, Lands and Heritage
DPLH ID	Identification number for sites listed on the AHIS maintained by DPLH
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986</i>
GIS	Geographic Information System.
GJCRM	Gavin Jackson Cultural Resource Management Pty Ltd
Knowledge Holders	Aboriginal people who may have cultural and/or historical associations with an area or place that bestows upon them certain intra group rights, such as authority to speak for the area and be involved in decisions regarding land use in the area. Knowledge Holders may have been granted custodianship over certain places or parts of the area by the Traditional Owners and/or native title claimants/holders.
NGC	Ngaanyatjarra Council (Aboriginal Corporation)
NGC Exploration and Studies Program CHMP	CHMP prepared by the NGC for the purpose of Exploration and Studies Program
The Notice	Notice Requiring Information for Assessment issued by the EPA
Ngaanyatjarra people	Ngaanyatjarra Lands (Part A) (WCD2005/002) Determination Area native title holders
Registrar	The Registrar of Aboriginal Sites (Registrar) is appointed under the <i>Aboriginal Heritage Act 1972</i> (WA) to administer the day to day operations of the ACMC and also to perform other functions as allocated to the Registrar under the <i>Aboriginal Heritage Act 1972</i> (WA).
Section 18 Consent	Consent given by the Minister for Indigenous Affairs following a Section 18 Notice.
Section 18 Notice	If a landowner wishes to use land in a manner likely to impact an Aboriginal site that might be on the land, the landowner may give notice



	to the ACMC. The notice culminates in the Minister for Indigenous Affairs determining whether to consent to such use.
Traditional Owners	Aboriginal people who assert, and are recognised by their peers, to be members of a local descent group from a particular area of land or sea, who have responsibilities and rights in relation to that area, based on traditional, cultural and/or spiritual affiliations with the area. Traditional Owners may or may not be part of a native title group.
WMP CHMP	CHMP prepared by Oz Minerals and the subject of this review



EXECUTIVE SUMMARY

- Oz Minerals engaged Gavin Jackson Cultural Resource Management Pty Ltd (GJCRM) to conduct a review of a draft West Musgrave Copper and Nickel Project Cultural Heritage Management Plan (WMP CHMP), in response to a Notice Requiring Information for Assessment (the Notice) issued by the Environmental Protection Authority (EPA).
- The West Musgrave Project is located in the West Musgrave Ranges in Western Australia, approximately 1,300 km northeast of Perth and 100 km west of the intersection of the borders of Western Australia, the Northern Territory and South Australia. The Development Envelope is located across tenements E69/2201, E69/3156, E69/3157, E69/3163, E69/3164, E69/3412, E69/3535, E69/3552, P69/68, M69/72, M69/73, M69/74 and M69/75.
- The West Musgrave Project is located entirely within the Ngaanyatjarra Indigenous Protected Area and the Ngaanyatjarra Lands (Part A) (WCD2005/002) Determination Area. The Ngaanyatjarra Council (Aboriginal Corporation) (NGC) represents the interests of the Ngaanyatjarra, Pintupi and Pitjantjatjarra Traditional Owners (Yarnangu) (the Ngaanyatjarra people).
- The WMP CHMP was prepared by Oz Minerals personnel Justin Rowntree, Jim Hodgkison, Michael Wood and Matt Reed.
- The WMP CHMP addresses the key environmental concern of ‘social surroundings’ and the ‘mitigation hierarchy concerning avoidance and minimisation of impact to potential cultural heritage sites’.
- There are no sites registered with the DPLH located within the Development Envelope.
- According the WMP CHMP, there are at least sixteen (16) archaeological sites and one (1) ethnographic site located within the Development Envelope.
- NGC have also prepared a CHMP (NGC Exploration and Studies Program CHMP) for the Oz Minerals West Musgrave Project 2021 Exploration and Studies Program. Elements of the NGC Exploration and Studies Program CHMP have been included in the WMP CHMP. The WMP CHMP indicates that an updated NGC Exploration and Studies Program CHMP is expected to be attached to the Mining Agreement currently being negotiated.
- An Exploration Deed of Agreement exists between OZ Minerals and the Ngaanyatjarra Land holding entities. This Agreement has not been provided to GJCRM.
- Although GJCRM have been provided the NGC Exploration and Studies Program CHMP, only the WMP CHMP has been reviewed as per the requirements of the Notice.
- In this review document, we suggest that although Oz Minerals have largely addressed the key environmental concern, a small number of revisions and some additional detail should be added to the WMP CHMP, including, but not limited to:



- further consultation with the NGC and Ngaanyatjarra people, specifically consulting with them and providing them the WMP CHMP for direct input into the development (as well as the implementation) of the WMP CHMP;
- expanding the WMP CHMP to apply to the Project Area and identification of the tenements to which this applies;
- identification of all cultural heritage sites and areas of cultural concern (including Exclusion Zones and / or Areas of Significance) located within the Project Area;
- the inclusion of definitions for some terms;
- revision of the statements regarding potential significance of archaeological sites; and
- the inclusion of site specific mitigative actions, management actions and any other actions required by the NGC and Ngaanyatjarra people.



RECOMMENDATIONS

It is recommended that Oz Minerals:

1. Consult with and provide the WMP CHMP to the NGC and Ngaanyatjarra people for direct input into the development (as well as implementation) of the WMP CHMP;
2. Expand the WMP CHMP to apply to the Project Area and identify the tenements to which this applies;
3. Subject to consent from the NGC and Ngaanyatjarra people, identify all sites (or exclusion zones where the information may be sensitive) located within the Project Area and include them on the WMP CHMP maps;
4. Provide definitions for exclusion zones, areas of significance and pre-clearance surveys;
5. In consultation with the NGC and Ngaanyatjarra people, identify from heritage survey reports and any site specific mitigative and management recommendations and list these in the WMP CHMP;
6. In consultation with the NGC and Ngaanyatjarra people, identify from the Groundwater Monitoring and Management Plan any specific management requirements as these apply to cultural heritage;
7. In consultation with the NGC and Ngaanyatjarra people, identify from other Environmental Management Plans any specific management requirements as these apply to the Project Area;
8. In consultation with the NGC and Ngaanyatjarra people, identify from the Mine Closure Plan any specific management requirements (such as rehabilitation requirements) as these apply to the Project Area;
9. Remove existing statements relating to the potential significance of archaeological sites in the Development Envelope; and
10. Review and update the WMP CHMP in consultation with the NGC and the Ngaanyatjarra people obtaining their free, prior and informed consent for its use.



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INTRODUCTION

Oz Minerals engaged Gavin Jackson Cultural Resource Management Pty Ltd (GJCRM) to conduct a review of a draft West Musgrave Copper and Nickel Project Cultural Heritage Management Plan (WMP CHMP), in response to a Notice Requiring Information for Assessment (the Notice) issued by the Environmental Protection Authority (EPA).

The West Musgrave Project is located in the West Musgrave Ranges in Western Australia, approximately 1,300 km northeast of Perth and 100 km west of the intersection of the borders of Western Australia, the Northern Territory and South Australia. The Development Envelope is located across tenements E69/2201, E69/3156, E69/3157, E69/3163, E69/3164, E69/3412, E69/3535, E69/3552, P69/68, M69/72, M69/73, M69/74 and M69/75.

The West Musgrave Project is located entirely within the Ngaanyatjarra Indigenous Protected Area and the Ngaanyatjarra Lands (Part A) (WCD2005/002) Determination Area. The Ngaanyatjarra Council (Aboriginal Corporation) (NGC) represents the interests of the Ngaanyatarrwa, Pintupi and Pitjantjatjara Traditional Owners (Yarnangu) (the Ngaanyatjarra people).

The CHMP was prepared by Oz Minerals personnel Justin Rountree, Jim Hodgkison, Michael Wood and Matt Reed.

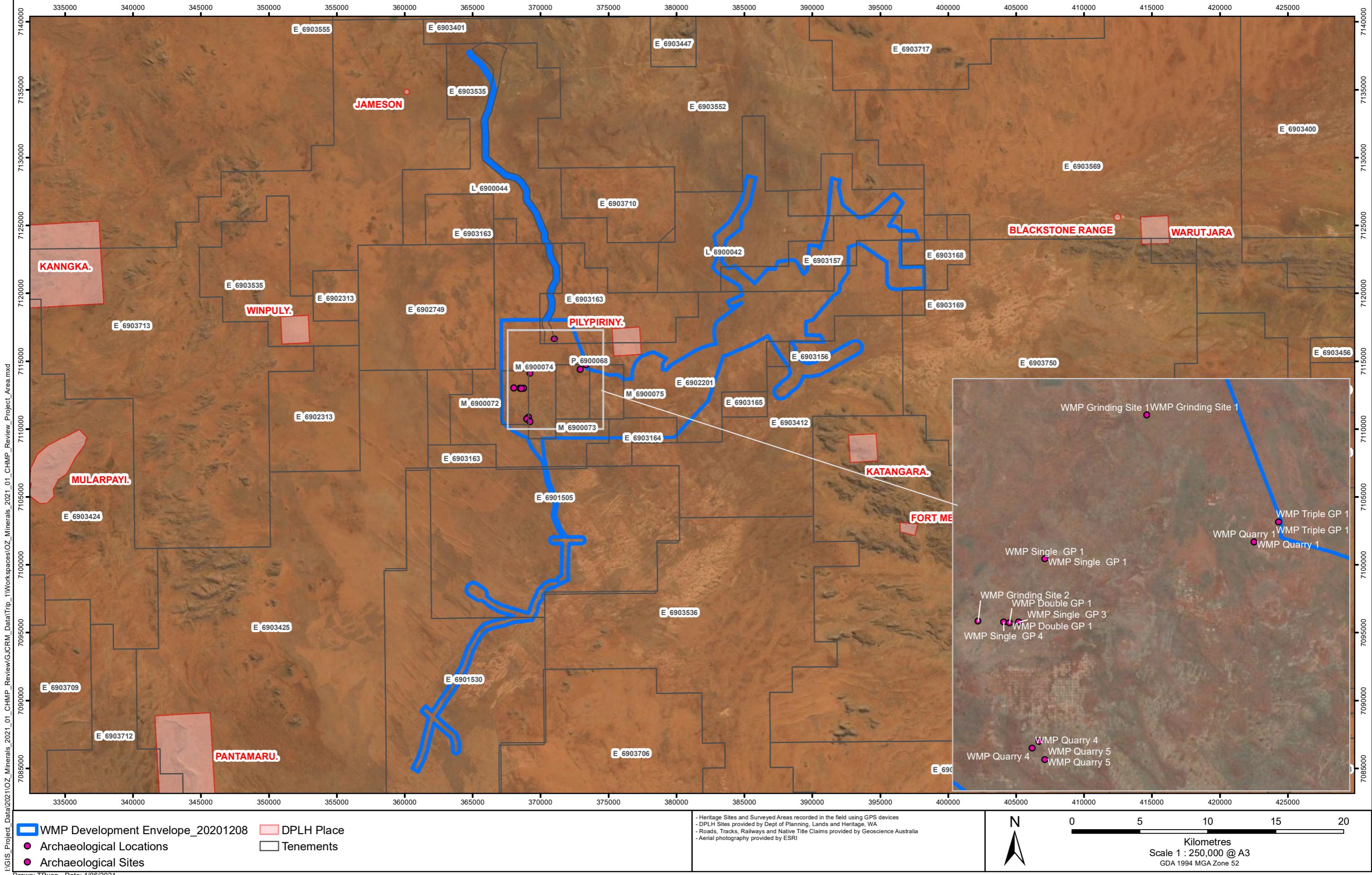
The CHMP addresses the key environmental concern of ‘social surroundings’ and the ‘mitigation hierarchy concerning avoidance and minimisation of impact to potential cultural heritage sites’.

There are no sites registered with the DPLH located within the Development Envelope.

According to the WMP CHMP, there are at least sixteen (16) archaeological sites and one (1) ethnographic site located within the Development Envelope.

This review document suggests some revisions to the draft WMP CHMP and includes recommendations on further consultation with the NGC and Ngaanyatjarra people for equivalent involvement and direct input into the compilation of a collaborative WMP CHMP.





CHMP PURPOSE

The WMP CHMP has been prepared in response to a Notice Requiring Information for Assessment (the Notice), issued on the 14th April 2021, by the Environmental Protection Authority (EPA). The Notice requires Oz Minerals to:

Provide a Cultural Heritage Management Plan detailing the application of the mitigation hierarchy concerning avoidance and minimisation of impact to potential cultural heritage sites. The Plan should include a framework for consultation with relevant stakeholders including Traditional Owners, during the life of the proposal. The Cultural Heritage Management Plan is to be developed on advice of the appropriate knowledge holders and may be reviewed by a suitably qualified independent person. The Plan may include detail of cultural management strategies and methodologies for pre-clearance surveys. The Plan should detail provisions for land access and include management actions to be undertaken where additional heritage sites are identified.

It should be noted that the WMP CHMP is not currently sufficient for application to a mine development. Mine development CHMPs are typically developed and completed as part of, and prior to execution of, a Mine Agreement between relevant parties under the *Native Title Act 1993* (Cth). Although the WMP CHMP is required by the EPA before approval and implementation of the West Musgrave Project Proposal, this should not detract from the need for a full and final CHMP as part of a Mine Agreement. If Oz Minerals intend to compile an additional CHMP for mine development, this could be clearly specified, and the proposed process outlined, in the WMP CHMP.



CONSULTATION

As noted above, the WMP CHMP has been prepared in response to the Notice and not specifically as part of the Mine Agreement process. Nevertheless, any CHMP should be developed and finalised in collaboration with the relevant Traditional Owners and / or Representative Body (in this instance, the NGC and Ngaanyatjarra people). Although it appears that Oz Minerals have undertaken substantial consultation with the NGC and the Ngaanyatjarra people, the nature and duration of this consultation could be more clearly stated (e.g. the date the Deed of Exploration Agreement was executed, the frequency of meetings). Additionally, it is not clear whether the NGC and the Ngaanyatjarra people have had direct input into the WMP CHMP. The NGC Exploration and Studies Program CHMP specifies NGC's expectations regarding free, prior and informed consent in consultations with Oz Minerals (Ngaanyatjarra Council 2021, 6). It is probable, therefore, that they would have the same expectation regarding the development and use of the WMP CHMP. Although Oz Minerals have adopted some aspects of the NGC Exploration and Studies Program CHMP, the WMP CHMP should ultimately be compiled in direct collaboration with the NGC and Ngaanyatjarra people. Indeed, the Ministerial Notice states that the WMP CHMP is to be developed 'on the advice of the appropriate knowledge holders'. This should involve direct input from the NGC and Ngaanyatjarra people and not just be based on outcomes from heritage surveys and adopting elements of the NGC Exploration and Studies Program CHMP. If this assumption is incorrect and NGC have had direct involvement with the development of the WMP CHMP, then we would suggest outlining the nature and extent of this involvement in the CHMP.



LOCATION AND TERMINOLOGY

LOCATION OF THE WMP DEVELOPMENT ENVELOPE

The WMP CHMP currently applies to an outlined Development Envelope. However, no tenements are listed in the CHMP and no co-ordinates are indicated on the included maps. Preferably, the WMP CHMP would apply to Oz Mineral's tenure for the project and potential future ancillary tenure, with all tenements stated (the Project Area), as this is a standard feature of most CHMPs. Regardless, we suggest that the WMP CHMP lists the tenements it applies to (which may be updated as necessary).

HERITAGE SURVEYS AND HERITAGE SITES

Although the area that has not yet been subject to survey is identified as the northern borefield area, this is not labelled in the relevant map (Figure 3). Furthermore, none of the archaeological sites or the ethnographic sites (albeit recorded as exclusion zones) are indicated on any of the maps.

We suggest that, subject to consent from the NGC and Ngaanyatjarra people, at least the following details should be included for any cultural heritage sites (archaeological and / or ethnographic) or exclusion zones.

- an identifying name / label
- a boundary (potentially with a added buffer)
- a physical description; and
- a statement regarding whether it is significant to the Ngaanyatjarra people.

Eleven archaeological sites have been identified from the report attached to the EPA Referral (Mattner 2020) and included in the map in this document (see Map 1). It should be noted that the distinction Mattner has made between 'archaeological sites' and 'archaeological locations' may not be upheld by the DPLH.

DEFINITIONS AND TERMINOLOGY

We suggest some of the terminology in the WMP CHMP is not consistent with heritage industry language and could be revised or defined for clarity. This could be done by providing a list of defined terms (such as the one in this document) or by defining the terms within the document.

CHMP or EMP

The WMP CHMP has been prepared in response to the Notice issued by the EPA. Oz Minerals have therefore used the EPA's *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*, and the included template, in the preparation of their WMP CHMP. It should be noted that, while the other requirements of the Notice specifically reference use of the *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*, the requirement for a CHMP does not.

Therefore, while the WMP CHMP is (appropriately) broader than outlined in these guidelines, we suggest that the references throughout the document to an EMP should be removed. Indeed, the WMP CHMP is a document primarily for the management of cultural heritage and appears largely to have been compiled as such.



Cultural Heritage Sites

The term ‘cultural heritage sites’ is used throughout the WMP CHMP and there appears to be a distinction made between these and archaeological sites. Typically, cultural heritage sites applies to both archaeological and ethnographic sites. While it may be appropriate to draw attention to important sites (e.g. Tjukurrpa / Dreaming sites), especially where these have unique management requirements, we suggest that ‘cultural heritage sites’ be applied to both archaeological and ethnographic sites.

Additionally, we suggest the removal of the attachment of significance to this term (e.g. ‘cultural heritage sites of significance’, ‘significant cultural heritage sites’) unless this is directly relevant to management actions in which case other specific terms should be used and defined. For example, Oz Minerals may make project design decisions based on the designation of significance by the NGC and Ngaanyatjarra people and may identify this in the management actions for specific sites. Additionally, specific management (e.g. avoidance) may be a requirement following assessment of cultural heritage sites by the ACMC.

Exclusion Zones

It is our assumption that exclusion zones are areas that Oz Minerals have agreed, in consultation with the NGC and Ngaanyatjarra people, to not conduct any activity. We suggest a clear definition and an indication of their location on the WMP CHMP maps would assist in understanding the requirements (e.g. restricted access, impact monitoring) that apply to these zones.

Areas of Significance

The term ‘Areas of Significance’ is first mentioned on page 30 of the WMP CHMP. Although this may be defined in the Exploration Deed of Agreement, a definition should also be provided in the WMP CHMP (and possibly an explanation as to how these differ from Exclusion Zones) for it to be used as a stand-alone document.

Pre-Clearance Surveys

We suggest ‘pre-clearance surveys’ should not be used in relation to heritage surveys as, although this is a term used by the EPA, it is a broad term that potentially has different implications when applied to heritage surveys. We suggest the method required for survey (as identified in consultation with the NGC and Ngaanyatjarra people) is used instead.

Typically, there are four different types of Aboriginal heritage surveys undertaken in Western Australia:

1. **Work Program Clearance** (where a proposed work program can be adapted based on portions of the work program being deemed Cleared or Not Cleared, depending on the presence/absence of heritage sites and/or areas of cultural concern);
2. **Work Area Clearance** (where proposed works within a broader area can be adapted based on portions of the work area being deemed Cleared or Not Cleared, depending on the presence/absence of heritage sites and/or areas of cultural concern);
3. **Site Avoidance** (where information recorded includes an accurate extent of each site, and a broad characterisation of the site, that enable proponents to avoid heritage sites); and



4. **Site Identification** (where sites are recorded in sufficient detail for a statement of significance to be provided for each site).

The choice of survey type may be decided by the following considerations:

1. The likelihood of Aboriginal heritage sites existing on the land;
2. The nature of the proposed activity on the land;
3. The likelihood of the proposed activity causing disturbance to, or destruction of, any Aboriginal heritage site on the land;
4. The requirement to obtain professional advice adequate for purpose(s); and
5. The requirement of the native title claimant groups to protect their rights and interests pertaining to Aboriginal heritage sites such that only the information necessary to fulfil the proponent's obligations under the *Aboriginal Heritage Act 1972* (WA) is disclosed.

Additionally, Native Title Representative Bodies may have specific method requirements for purposes of protection and management of sites. These **Customised Surveys** may have a variety of names (e.g., Cultural Mapping Survey, Impact Assessment Survey) and are survey methods likely to be employed for purposes of developing and/or implementing a CHMP.

An additional post-survey method, for the purpose of ensuring Aboriginal heritage is adequately protected during ground disturbing activities, is Monitoring. Monitoring is generally only undertaken in very particular circumstances, often as a result of a recommendation by heritage consultants and / or Ngaanyatjarra people. Monitoring occurs **while** ground disturbing construction works are being conducted. Monitoring is generally reserved for instances where surveys have already been conducted and there is considered to be continued potential risk to Aboriginal heritage.

Both the NCG CHMP and the WMP CHMP identify the requirement for monitoring when 'ground is disturbed for the first time'.



SITE SPECIFIC MITIGATIVE AND MANAGEMENT ACTIONS

HERITAGE SITES

The WMP CHMP does not currently contain any site specific mitigative or management recommendations. There are at least sixteen archaeological sites (as cited on page 18) and, it is presumed, one anthropological site (the exclusion zone cited on page 19) within the Development Envelope. The WMP CHMP suggests that heritage sites will ‘largely be avoided’ by the development footprint. We suggest that this needs to be more specific. As well as showing the location of cultural heritage sites on the WMP CHMP maps, we suggest references to, for example, ‘one ethnographic site’ should specify the relevant site name / label. As noted above, we suggest that each cultural heritage site (or Exclusion Zone, where appropriate) should include the following:

- an identifying name / label
- a boundary (potentially with added buffer)
- a physical description; and
- a statement regarding whether it is significant to the Ngaanyatjarra people

Additionally, there are likely to be some actions required by the Ngaanyatjarra people that apply to these sites. Some of these are already broadly identified (e.g. demarcation of sites) and are assumed to apply to all sites and there are some that apply to specific sites (e.g. sealing a section of road near ‘one of the cultural heritage sites’ on page 22). However, the specific sites should be named (so it is possible to ensure measures have been developed in detail and with the appropriate consultation and consent from the NGC and Ngaanyatjarra people) and it would be preferable to have a list or table of actions that identifies the requirements for each site.

These may include such things as:

- further site recording and / or analysis (e.g. photographs / video, cultural landscape mapping, residue analysis)
- monitoring sites for potential impact
- restricted access (e.g. related to gender / cultural safety)
- cultural fire management
- cultural / systematic salvage
- excavation

Stating the actions required for specific sites also helps ensure that these actions are taken, with the correct actions applied to the correct sites, ensuring mitigative measures required under the CHMP are implemented and, by extension, Oz Mineral’s obligations met.

CHANCE FINDS

We suggest including a protocol (developed in consultation with the NGC and Ngaanyatjarra people) regarding the management of chance finds (especially human remains) following any required investigation. For example, Ngaanyatjarra people may wish human remains to be repatriated/reburied or discussions may be required on a case-by-case basis.



OTHER IDENTIFIED PLACES OF CULTURAL IMPORTANCE

The WMP CHMP identifies two areas of vegetation (a stand of desert oaks and a specific stand of mulga) that have been identified to be of cultural importance (e.g. Oz Minerals 2021, 21). It is stated that the drawdown of groundwater should not impact on these two areas of vegetation (Oz Minerals 2021, 13). There may, however, be additional management actions required for these (such as monitoring impacts by the Ngaanyatjarra people) that could be included in the WMP CHMP.

Additionally, Mattner (2020, 66) discusses seven scarred trees within the area. Five of these are located adjacent to the Old Warburton Blackstone Road. It is not clear why these were not recorded as a site and it is not clear as to whether the ‘stand of mulga’ and these scarred trees are one and the same. Regardless, there are management actions, to be determined in consultation with the NGC and the Ngaanyatjarra people, that may apply to all of these, such as:

- demarcation and avoidance
- photographs / recording
- salvage / relocation

These management actions should be outlined in the WMP CHMP.

WATER MANAGEMENT

The WMP CHMP identifies that there is a specific Groundwater Management and Monitoring Plan. It is not clear whether the NGC and Ngaanyatjarra people have been involved in the compilation of this plan and we suggest, if not, that their direct involvement should be considered or that they should otherwise be involved in a review of the Groundwater Management and Monitoring Plan as part of the development of the Mine Agreement. A brief summary of any relevant management points / commitments to monitoring and restoring water flow etc should then be included in the WMP CHMP. There may be management actions required, as determined through consultation with the NGC and Ngaanyatjarra people, such as periodic monitoring, and any such actions should be outlined in the WMP CHMP.

ENVIRONMENTAL MANAGEMENT

The NGC Exploration and Studies Program CHMP identifies the requirement for Ngaanyatjarra people to be involved in ‘environmental and other studies as informants (if relevant)...’. As with the Groundwater Management and Monitoring Plan, there may be some management actions required, as determined through consultation with the NGC and Ngaanyatjarra people, such as periodic cultural burning, and any such actions should be outlined in the WMP CHMP.

REHABILITATION

It is not clear if the NGC and Ngaanyatjarra people have been consulted regarding the proposed rehabilitation methods and the Mine Closure Plan for the project. If not, such consultations should be undertaken and any relevant results from these outlined in the WMP CHMP.



HERITAGE SURVEYS

The WMP CHMP identifies further heritage survey work is required in some areas of the Development Envelope and heritage reports from the NGC that have further requirements relating to heritage survey (Oz Minerals 2021, 16). We suggest that these requirements are specified and updated in the WMP CHMP as they are completed and that these requirements be completed prior to a Mine Agreement CHMP. The WMP CHMP should additionally outline a process for future surveys within the Project Area, with the WMP CHMP updated as these are undertaken.

ARCHAEOLOGICAL SURVEYS

The WMP CHMP suggests few artefacts, and no traditional campsites, were identified during archaeological surveys. This is somewhat contradicted by the presence of sixteen archaeological sites (some containing thousands of artefacts). We suggest this section list the sites that have been identified and whether these are likely to be impacted by the proposed activity. As discussed above, it also would be preferable if these locations were included in a list or table of actions that identifies the requirements for each of the sites. For example, avoidance in the event the site will not be impacted, or, if it is likely to be impacted, appropriate management actions i.e., salvage, further recording etc. Furthermore, given that fifteen (15) of the sixteen (16) sites are located in the Main Development Area, there may need to be additional consideration given to access issues and active site management approaches, seeing as there is likely to be an increased risk of direct and indirect impacts on sites in near proximity to operational areas. For example, regular (annual or biennial basis) monitoring of sites within 3 km of dust generating activities to ensure dust-borne sediments (as a result of mining activities) are not accumulating over the top of archaeological assemblages. Such an action could be included in Table 6 with the management action already outlined for dust deposition monitoring. Discussions around site significance should be restricted to the reports and determined by the NGC, Ngaanyatjarra people in conjunction with a suitably qualified archaeologist, and additionally by the ACMC. If required, a table of sites with suggested significance (from the relevant heritage reports) may be provided here instead. Any survey results should be disclosed at the discretion of the NGC.

ETHNOGRAPHIC SURVEYS

The NGC may wish to compile a section on the conduct, purpose and results of any ethnographic surveys that have taken place to date. The results of these should be disclosed at the discretion of the NGC.

Additionally, although the WMP CHMP discusses the establishment of an Advisory Committee, it is not currently clear what access the NGC and Ngaanyatjarra people will have to the Project Area for the purposes of ensuring their satisfaction with the implementation of the CHMP.

CONTINUED ACCESS

In addition to heritage surveys and monitoring, the Ngaanyatjarra people should, where possible, have access to places and traditional resources within the West Musgrave Project so cultural activities can continue to take place. This requirement for access should be determined in consultation with the NGC and Ngaanyatjarra people and may be broader than the access to ‘identified cultural heritage sites’ currently stated in the WMP CHMP (Oz Minerals 2021, 47).



CONCLUSION

Oz Minerals have compiled their WMP CHMP in response to the Notice issued by the EPA. It is our view that the EPA requirement for peer review is to ensure that the WMP CHMP is in line with equivalent industry CHMPs and we have therefore made a series of recommended additions and / or revisions on this basis.

Additionally, we suggest that some of these recommendations are requirements of the Notice as outlined below.

REQUIREMENTS OF THE NOTICE

Mitigation hierarchy concerning avoidance and minimisation of impact to potential cultural heritage sites

As outlined above, we suggest Oz Minerals provide details (including indicating the location of cultural heritage sites and / or Exclusion Zones on the maps) of specific sites within the Development Envelope, and greater Project Area, and include details of mitigative and management actions that apply to these.

Cultural Heritage Management Plan is to be developed on advice of the appropriate knowledge holders

We suggest that the NGC and Ngaanyatjarra people have direct input into the development of the WMP CHMP beyond the incorporation of elements of the NGC Exploration and Studies Program CHMP and consultation during heritage surveys. The WMP CHMP should be a collaborative document with the NGC and the Ngaanyatjarra people agreed with their free, prior and informed consent.

We suggest that if Oz Minerals address the recommendations in this document, they will have a CHMP that both fulfills the specified requirements of the Notice and is a robust document for the management of cultural heritage.



FINAL RECOMMENDATIONS

It is recommended that Oz Minerals:

1. Consult with and provide the WMP CHMP to the NGC and Ngaanyatjarra people for direct input into the development (as well as implementation) of the WMP CHMP;
2. Expand the WMP CHMP to apply to the Project Area and identify the tenements to which this applies;
3. Subject to consent from the NGC and Ngaanyatjarra people, identify all sites (or exclusion zones where the information may be sensitive) located within the Project Area and include them on the WMP CHMP maps;
4. Provide definitions for exclusion zones, areas of significance and pre-clearance surveys;
5. In consultation with the NGC and Ngaanyatjarra people, identify from heritage survey reports and any site specific mitigative and management recommendations and list these in the WMP CHMP;
6. In consultation with the NGC and Ngaanyatjarra people, identify from the Groundwater Monitoring and Management Plan any specific management requirements as these apply to cultural heritage;
7. In consultation with the NGC and Ngaanyatjarra people, identify from other Environmental Management Plans any specific management requirements as these apply to the Project Area;
8. In consultation with the NGC and Ngaanyatjarra people, identify from the Mine Closure Plan any specific management requirements (such as rehabilitation requirements) as these apply to the Project Area;
9. Remove existing statements relating to the potential significance of archaeological sites in the Development Envelope; and
10. Review and update the WMP CHMP in consultation with the NGC and the Ngaanyatjarra people obtaining their free, prior and informed consent for its use.



REFERENCES CITED

- Mattner J. 2020. *Archaeological investigations & site recording at the West Musgrave Project east of Warburton on Ngaanyatjarra Lands*, Unpublished Report Prepared for Oz Minerals Ltd & Cassini Resources Ltd.
- Ngaanyatjarra Council. 2021. *Cultural Heritage Management Plan. West Musgrave Project 2021 Exploration and Studies Program (V_17, 6th February 2021)*, Unpublished Report Prepared for Oz Minerals.
- Oz Minerals. 2021. *West Musgrave Copper and Nickel Project: Cultural Heritage Management Plan (V_3)*, Unpublished Report Prepared for the EPA.





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West Musgrave Copper and Nickel Project Cultural Heritage Management Plan

Appendix C. Consultation Register

Stakeholder Group	Stakeholder Individuals/Attendees	Date	Engagement Details	Issues/Topics Raised	Proponent Response/Outcome
West Musgrave Steering Committee Ngaanyatjarra Council and Ngaanyatjarra Traditional Owners	OZ Minerals Representatives Jim Hodgkison – Mining Agreement Lead Zoran Seat – West Musgrave Site Manager John Isgar – Community and Heritage Lead Justin Rountree – Environment and Approvals Lead Ngaanyatjarra Council Frances Nicholson – Manager Land and Culture Deborah Grant – Ranger Coordinator John Thurtell – Mining Agreement Lead Bryony Nicholson – Anthropologist Bush trip Attendees Approximately 50 Traditional Owner attendees	21/09/20 to 24/09/20	In person presentations and bush trips on Ngaanyatjarra Lands	Consultation activities associated with the content of the planned Part IV, Section 38 Referral submission to the EPA. Detailed issues and topics were raised and discussed – refer to the Consultation-specific appendix located within the Group A Appendices of the Main Report. At the conclusion of on-country consultation activities described above Traditional Owners were informed that the EPA would be reviewing the environmental study program and impact assessment provided by OZ Minerals to ensure that no unacceptable impacts to environmental factors would eventuate as a result of the proposed project, that the EPA would consider any of the concerns and worries that they had raised, and that consultation relating to environmental impacts and other matters will be ongoing. Traditional Owners were reassured that the Part IV approval did not mean that mining could commence, and that even with the Part IV approval in place a Mining Agreement between Traditional Owners and OZ Minerals would still be required before any mining related activities could commence. Traditional Owners were asked whether they held any objections to the submission and assessment of the proposal to EPA to which no objections were received and support for this submission was given.	Detailed issues and topics were raised and discussed – refer to the Consultation-specific appendix located within the Group A Appendices of the Main Report for the responses and outcomes to the discussion topics.
Ngaanyatjarra Council	OZ Minerals Representatives Jim Hodgkison – Mining Agreement Lead John Isgar – Community and Heritage Lead Justin Rountree – Environment and Approvals Lead Rachel Farrugia – Environment Consultant David Winterburn- Environment Consultant Elise Nazzari – Community Relations Advisor Matt Read – General Manager Projects Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator Bryony Nicholson: NgC Anthropologist & Land and Culture Manager Ben Garwood: NgC Heritage Consultant Lisa Adams: NGC Environment Consultant Deborah Grant: Project Management Assistant	20 April 2021	Email and Teams Conference (and use of Mural collaboration board)	The Notice from the EPA under s40(2)(a) – West Musgrave – further information required for assessment was shared with the Ngaanyatjarra Council and an initial meeting was held to confirm those areas that they were interested in providing comment. The Ngaanyatjarra Council provided some preliminary views on those areas of interest for inclusions in the Management Plans and noted that they were most interested in: <ul style="list-style-type: none"> • Cultural Heritage Management Plan • Terrestrial Fauna Management Plan, and • Groundwater Monitoring and Management Plan. The Ngaanyatjarra Council shared a list of specific areas of interest, and it was agreed that OZ Minerals would provide a draft of each of these Management Plans for Ngaanyatjarra Council review. The Ngaanyatjarra Council review was to ensure that the plans appropriately reflect the Ngaanyatjarra Council's interests, and addressed those interests that had been communicated by Ngaanyatjarra People during ongoing consultation activities.	OZ Minerals to provide the Ngaanyatjarra Council a draft of the following three management plans for comment: <ul style="list-style-type: none"> • Cultural Heritage Management Plan • Terrestrial Fauna Management Plan and • Groundwater Monitoring and Management Plan. Subsequently the Ngaanyatjarra Council would provide reviews of these management plans to OZ Minerals to ensure that they have appropriately reflected the Ngaanyatjarra Council and Ngaanyatjarra People's interests as had been reflected by Ngaanyatjarra People through ongoing consultation activities.
Ngaanyatjarra Council	OZ Minerals Representatives Jim Hodgkison – Mining Agreement Lead Justin Rountree – Environment and Approvals Lead Elise Nazzari – Community Relations Advisor Matt Read – General Manager Projects Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator	03 May 2021	Email	Email from the Ngaanyatjarra Council noting an expectation that the OZ Minerals CHMP should reflect the intent, content, effect and spirit of the Ngaanyatjarra Council CHMP prepared by the Ngaanyatjarra Council to support heritage protection associated with the exploration and study phase of the project, and with an expectation that this Ngaanyatjarra Council CHMP is further updated and included in the planned Mining Agreement	OZ Minerals CHMP to reflect the intent, content, effect and spirit of the Ngaanyatjarra Council CHMP in-so-far as meeting the requirements under the EP Act.
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rountree – Environment and Approvals Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator Lisa Adams: NGC Environment Consultant	03 May 2021	Email	OZ Minerals provided the following management plans to Ngaanyatjarra Council for review: <ul style="list-style-type: none"> • Cultural Heritage Management Plan • Terrestrial Fauna Management Plan, and • Flora Management Plan OZ Minerals also requested confirmation from the Ngaanyatjarra Council that they support a peer review of the OZ Minerals CHMP by Gavin Jackson Cultural Resource Management, and provided CVs.	Ngaanyatjarra Council agreed to review and provide feedback to ensure that it reflects the interests of the Ngaanyatjarra People. The review of the environmental plans was to be undertaken by ELA on behalf of the Ngaanyatjarra Council, and the CHMP was to be reviewed by Ben Garwood on behalf of the Ngaanyatjarra Council John Thurtell agreed to consider GJCRM as a peer-reviewer of the CHMP

Stakeholder Group	Stakeholder Individuals/Attendees	Date	Engagement Details	Issues/Topics Raised	Proponent Response/Outcome
Ngaanyatjarra Council	OZ Minerals Representatives Jim Hodgkison – Mining Agreement Lead Justin Rountree – Environment and Approvals Lead Elise Nazzari – Community Relations Advisor Matt Read – General Manager Projects John Isgar – Community and Heritage Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator Bryony Nicholson: NgC Anthropologist & Land and Culture Manager Ben Garwood: NgC Heritage Consultant	06 May 2021	Teams teleconference	Alignment on the scope of the EPA required CHMP.	Agreed actions included: <ul style="list-style-type: none"> Gain alignment from the legal team on the nuances of the EP Act and whether it precludes a more fulsome CHMP. Ngaanyatjarra Council to gain alignment from the EPA re: expectations of the CHMP, and their reaction to the inclusion of a more fulsome CHMP, and/or something that doesn't align with their table. Ngaanyatjarra Council to provide OZ Minerals feedback on the Draft EPA CHMP highlighting the key gaps/omissions (we are very open to adopting what we can and what you see to be of critical importance)
Ngaanyatjarra Council	OZ Minerals Representatives Jim Hodgkison – Mining Agreement Lead Justin Rountree – Environment and Approvals Lead Elise Nazzari – Community Relations Advisor Matt Read – General Manager Projects John Isgar – Community and Heritage Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator Francis Burt Stephen Wright (Ngaanyatjarra Council Legal Counsel) DLA Piper Rhys Davies (OZ Minerals Legal Counsel)	7 May 2021	Teams teleconference	Gain alignment from the legal team on the nuances of the EP Act and whether it precludes a more fulsome CHMP.	Agreement that the EPA CHMP would be completed to meet the needs of the EP Act, however a more fulsome CHMP would be included as part of the Mining Agreement process
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rountree – Environment and Approvals Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator Lisa Adams: NGC Environment Consultant	17 May 2021	Email	Ngaanyatjarra Council provide OZ Minerals with a review memo of the <ul style="list-style-type: none"> Terrestrial Fauna Management Plan 	OZ Minerals to update the Management Plan in consideration of the Ngaanyatjarra Council review
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rountree – Environment and Approvals Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator Lisa Adams: NGC Environment Consultant	17 May 2021	Email	OZ Minerals provided the following management plans to Ngaanyatjarra Council for review: <ul style="list-style-type: none"> Groundwater Management and Monitoring Plan 	Ngaanyatjarra Council agreed to review and provide feedback to ensure that it reflects the interests of the Ngaanyatjarra People. The review of the environmental plans was to be undertaken by ELA on behalf of the Ngaanyatjarra Council.
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rountree – Environment and Approvals Lead Jim Hodgkison – Mining Agreement Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator	20 May 2021	Email	Ngaanyatjarra Council provide OZ Minerals with a review of the <ul style="list-style-type: none"> Cultural Heritage Management Plan 	OZ Minerals to update the Management Plan in consideration of the Ngaanyatjarra Council review
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rountree – Environment and Approvals Lead Jim Hodgkison – Mining Agreement Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator Lisa Adams: NGC Environment Consultant	25 May 2021	Email	Ngaanyatjarra Council provide OZ Minerals with a review memo of the <ul style="list-style-type: none"> Groundwater Management and Monitoring Plan 	OZ Minerals to update the Management Plan in consideration of the Ngaanyatjarra Council review
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rountree – Environment and Approvals Lead Ngaanyatjarra Council Representatives John Thurtell: NgC Lead Negotiator	25 May 2021	Email	Ngaanyatjarra Council provide OZ Minerals email advice noting that the flora management plan is not of specific interest to the Ngaanyatjarra People's concerns as matters relating to potential GDEs are covered by the GMMP.	

Stakeholder Group	Stakeholder Individuals/Attendees	Date	Engagement Details	Issues/Topics Raised	Proponent Response/Outcome
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rowntree – Environment and Approvals Lead	25 May 2021	Phone	John Thurtell notified OZ Minerals that they are happy to proceed with Gavin Jackson Cultural Resource Management for a peer-review of the OZ Minerals CHMP	
Ngaanyatjarra Council	OZ Minerals Representatives Justin Rowntree – Environment and Approvals Lead	2 June 2021	Phone and email	OZ Minerals seeking confirmation from Ngaanyatjarra Council on the following three areas: <ul style="list-style-type: none"> • Confirm that Ngaanyatjarra Council support the appending of the Ngaanyatjarra Council CHMP to the WMP CHMP submission to EPA. • Confirmation from Ngaanyatjarra Council that they do not want to include details of cultural heritage sites in the EPA CHMP as requested in the Gavin Jackson Cultural Management Services Peer-Review (and to confirm wording used by OZ Minerals in the EPA submission) • Confirmation from Ngaanyatjarra Council that they do not want to include details of specific cultural heritage report mitigation requirements in the EPA CHMP as requested in the Gavin Jackson Cultural Management Services Peer-Review (and to confirm wording used by OZ Minerals in the EPA submission) 	Ngaanyatjarra Council provided written response that: <ul style="list-style-type: none"> • They support the inclusion of the Ngaanyatjarra Council CHMP in the WMP CHMP submission to EPA. • They supporting the wording used in the WMP CHMP relating to 'not disclosing details of cultural heritage sites, or details of management measures specified in cultural heritage survey reports issued from the Ngaanyatjarra Council to OZ Minerals.

The logo for OZ Minerals. It features the letters "OZ" in a large, bold, black font. A diagonal white line starts from the bottom left and extends through the center of the letter "O". To the right of "OZ", the word "MINERALS" is written in a smaller, black, sans-serif font.

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West Musgrave Copper and Nickel Project
EPA Section 38 Referral Supporting Document

Appendix K2. Groundwater Monitoring and Management Plan



West Musgrave Copper and Nickel Project

June 2021

Groundwater Monitoring and Management Plan



West Musgrave Copper and Nickel Project

Groundwater Monitoring and Management Plan

VERSION CONTROL

Version	Authorisation	Position	Signature	Date
Final For Initial Approval	Justin Rowntree	Environment and Approvals Lead – West Musgrave		1 June 2021
	Michael Wood	General Manager – West Musgrave		1 June 2021
	Matt Reed	Acting Chief Commercial Officer – OZ Minerals		1 June 2021



West Musgrave Copper and Nickel Project Groundwater Monitoring and Management Plan

DISCLAIMER

This Management Plan and associated appendices for the West Musgrave Copper and Nickel Project (Document) has been prepared for submission to the Government of Western Australia's Environmental Protection Authority acting on behalf of the Minister for the Environment under the *Environmental Protection Act, 1986* (WA) and no one other than the Minister, or their delegate, should rely on the information contained in this Document to make, or refrain from making, any decision.

In preparing this Document, OZ Minerals Limited (OZ Minerals) has relied on information provided by specialist consultants, government agencies and other third parties. OZ Minerals has not fully verified the accuracy or completeness of that information, except where expressly acknowledged in this Document.

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NOTE ON CURRENCY

Where possible, information contained in this Document is up to date as at May 2021. This was not possible for all supporting appendices, and information based on those appendices, which were prepared by third parties (as discussed in the second paragraph in the Disclaimer above) prior to the Document being finalised.

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West Musgrave Copper and Nickel Project

Groundwater Monitoring and Management Plan

SUMMARY

A summary of the key Environmental Management Plan (EMP) information is presented in Table 1.

Table 1: Summary of Key EMP Information

Project Information	Description
Proposal Title	West Musgrave Copper and Nickel Project
Proponent Name	OZ Minerals
Ministerial Statement No/s and Condition/Clauses	The Proposal is currently being assessed by the Government of Western Australia's Environmental Protection Authority (EPA). The EPA has proposed that a Groundwater Monitoring and Management Plan (GMMP) will be a condition of approval of the proposed project. A Ministerial Statement and associated conditions are yet to be issued.
Purpose of the EMP	To provide a management framework for groundwater, specifically to avoid, where possible, otherwise minimise direct and indirect impacts to groundwater dependant ecosystems and beneficial users resulting from the implementation of the West Musgrave Project.
Key Environmental Factor	Inland Waters
Objective (as relevant to this management plan)	<i>To maintain the hydrological regimes and quality of groundwater...so that environmental values are protected</i>
Key Provisions of the EMP	See Section 2
Proposed Construction Timing	Commencing 2022, progressing to 2024
EMP Required Pre-construction?	Yes, prior to issuing of Ministerial Statement
Proposed Operations Timing	26 years from date of commissioning



West Musgrave Copper and Nickel Project Groundwater Monitoring and Management Plan

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West Musgrave Copper and Nickel Project Groundwater Monitoring and Management Plan

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1 CONTEXT, SCOPE AND RATIONALE

This Groundwater Monitoring and Management Plan (GMMP) has been prepared by OZ Minerals to support the assessment, approval and implementation of the Proposal under Part IV of the *Environmental Protection Act, 1986 (WA)* (EP Act). Inland waters are protected under the following State legislation:

- *Environmental Protection Act, 1986 (WA)*
- *Rights in Water and Irrigation Act, 1914 (WA)*
- *Country Areas Water Supply Act, 1947 (WA)*.

In addition to State legislation, the following policy and guidance statements were considered in the development of this GMMP:

- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2020b)
- EPA Environmental Factor Guideline – Inland Waters (EPA, 2018)
- Water and Rivers Commission (WRC), Environmental Water Provisions Policy for WA (WRC, 2000).

This GMMP addresses the Notice Requiring Information for Assessment, received from the EPA on 14 April 2021 (the Notice). The Notice requires OZ Minerals to:

Provide a Groundwater Monitoring and Management Plan which describes how impacts to groundwater levels, groundwater quality and health of Groundwater Dependent Ecosystems (GDEs) will be managed in accordance with the EPA mitigation hierarchy. The plan should be prepared in accordance with the Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA, 2020a). Please provide spatial data defining the 2 metre (m) groundwater drawdown contour, the location of the Linton Bore, and the location of the total area of GDEs impacted by the <2 m (sic; greater than 2 m) drawdown as detailed in table 7-19 of the referral documentation.

1.1 Proposal

The West Musgrave Copper and Nickel Project (WMP) is located in the West Musgrave Ranges of Western Australia. The WMP is located approximately 1,300 km north-east of Perth near to the border of South Australia and the Northern Territory. The WMP is within the Ngaanyatjarra Native Title determination, and Class A Reserve No. 17614 (for the Use and Benefit of Aboriginal Inhabitants). The nearest towns include the Indigenous Communities of Jameson (Mantamaru) 26 km north, Blackstone (Papulankutja) 50 km east, and Warburton (Milyirrtjarra) 110 km west of the project (Figure 1).

The project, with a current expected life of approximately 26 years, will consist of:

- Mining of copper and nickel ore from two open cut mine pits using conventional blast, load and haul methods
- Placement of mine waste into permanent waste rock dumps (WRDs) and a dedicated tailings storage facility (TSF) adjacent to mine pit voids
- Milling and processing of ore using floatation to produce two separate copper and nickel concentrates
- On-site power supply using a combination of renewable power infrastructure (photovoltaic solar panels, wind turbines and battery storage) supported by backup thermal power generation
- Development of a process/potable water supply borefield that may include a combination of overland and/or underground pipelines for use during construction and operations
- Miscellaneous infrastructure, including stormwater management infrastructure (bunds and drains), internal roads and service tracks, a dedicated site access road, accommodation village (approximately 450 beds during operations and 1,200 during construction), airstrip, wastewater treatment, landfill and other supporting infrastructure including offices, warehouses and workshops
- Concentrate transport to Esperance via existing roads and rail networks.

A summary of the key project characteristics is presented in Table 2.

Table 2: Key Project Characteristics

Elements	Location	Proposed Extent Authorised
Physical Element		
Mine and associated infrastructure	Figure 2	Clearing of up to 3,830 ha of native vegetation within a Development Envelope of 20,852 ha
Operational Element		
Mining voids	Figure 2	Below water table mining Nebo pit void to be backfilled above water table post-closure Babel pit void to be a permanent and episodic pit lake post-closure
Mining waste (waste rock)	Figure 2	Placement of waste rock into permanent WRDs
Ore processing waste (tailings)	Figure 2	Disposal of tailings into a TSF and/or Nebo pit void
Power supply	Figure 2	Up to 60 MW (instantaneous load requirement) of fossil fuel electricity generation Up to 100 MW of photovoltaic solar electricity generation Up to 100 MW of wind electricity generation
Water supply	Figure 2	Abstraction of up to 7.5 GL/a of groundwater from the Borefield and through mine pit dewatering



Figure 1: Site Location

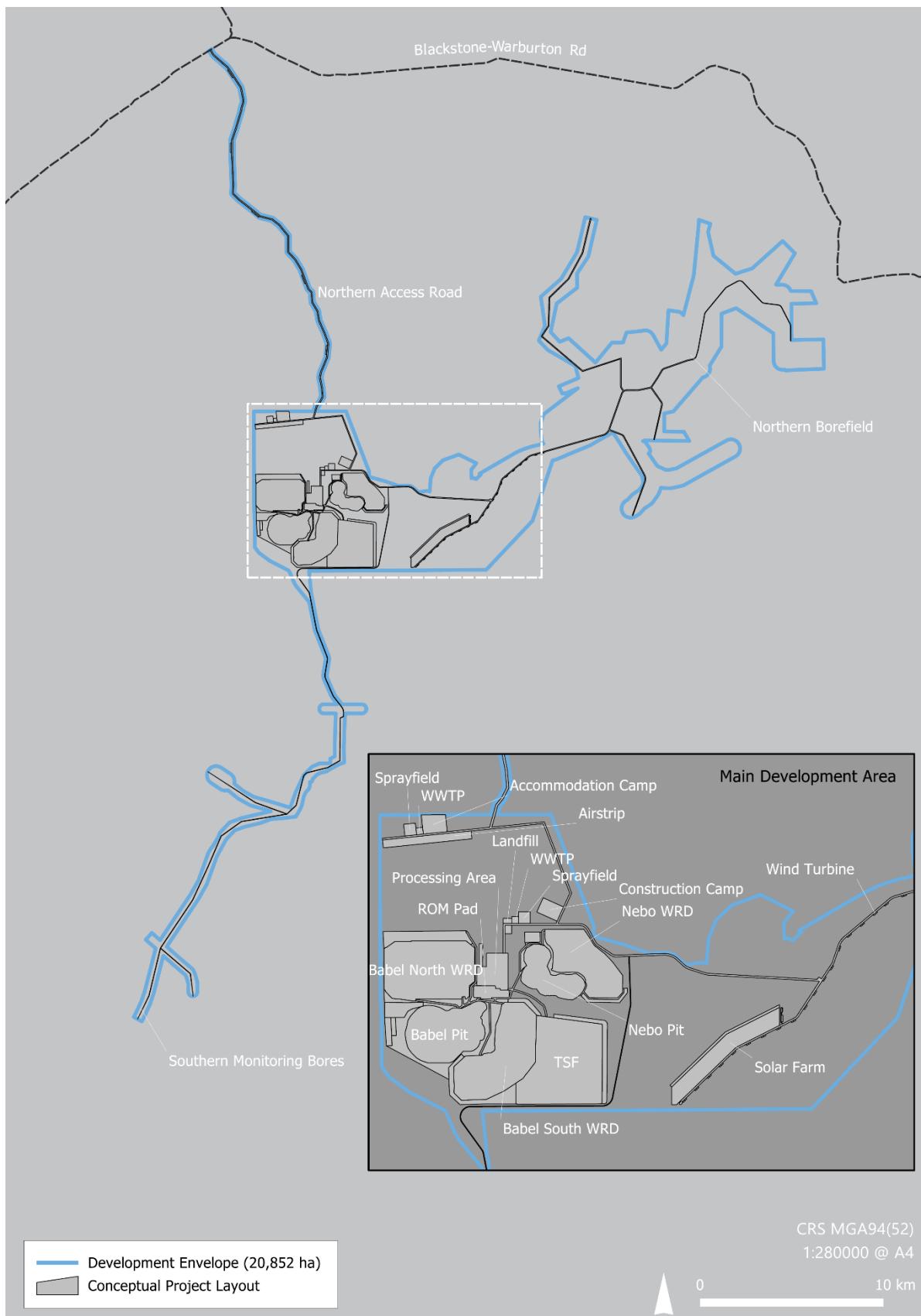


Figure 2: Location of Key Physical and Operational Elements



West Musgrave Copper and Nickel Project

Groundwater Monitoring and Management Plan

1.2 Key Environmental Factor

This GMMP specifically relates to the Water (Inland Waters) factor guidelines. The EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020b) lists the following as their objective for Inland Waters (as is relevant to groundwater):

To maintain the hydrological regimes and quality of groundwater...so that environmental values are protected

1.2.1 Proposal Activities that May Affect the Environmental Objective

This management plan applies to the management of groundwater to the extent that the interaction of the project may have a negative impact such that the EPA objective may not be achieved. To this end the following credible events have been identified with the potential to result in negative impacts to groundwater, specifically:

- Groundwater abstractions from water supply borefield(s) may result in reduced availability and access to groundwater for beneficial groundwater users, and potential terrestrial groundwater dependent ecosystems (GDEs)
- Mine dewatering during operations may result in reduced availability and access to groundwater for beneficial groundwater users, and potential terrestrial GDEs
- Long-term evaporative loss of groundwater from pit voids that remain after closure may result in reduced availability and access to groundwater for beneficial users, and potential GDEs
- Seepage from waste landforms may impact on groundwater quality to the extent that beneficial uses are compromised
- Long-term interaction between potentially poor-quality pit void water bodies (that form after closure) and groundwater may impact groundwater quality to the extent that beneficial uses are compromised
- Accidental spills of potentially hazardous materials may impact on groundwater quality to the extent that beneficial uses are compromised.

1.2.2 Site Specific Environmental Values

Two environmental values have been identified in the project area, these are:

- Beneficial use – drinking water supplies (groundwater) provided by Jameson (Mantamaru) community bores and Linton Bore
- Potential terrestrial GDEs.

The location and spatial distribution of these environmental values are presented in Figure 3. Other potential environmental values that have been considered but found not to be present in the project area are described in OZ Minerals (2021).

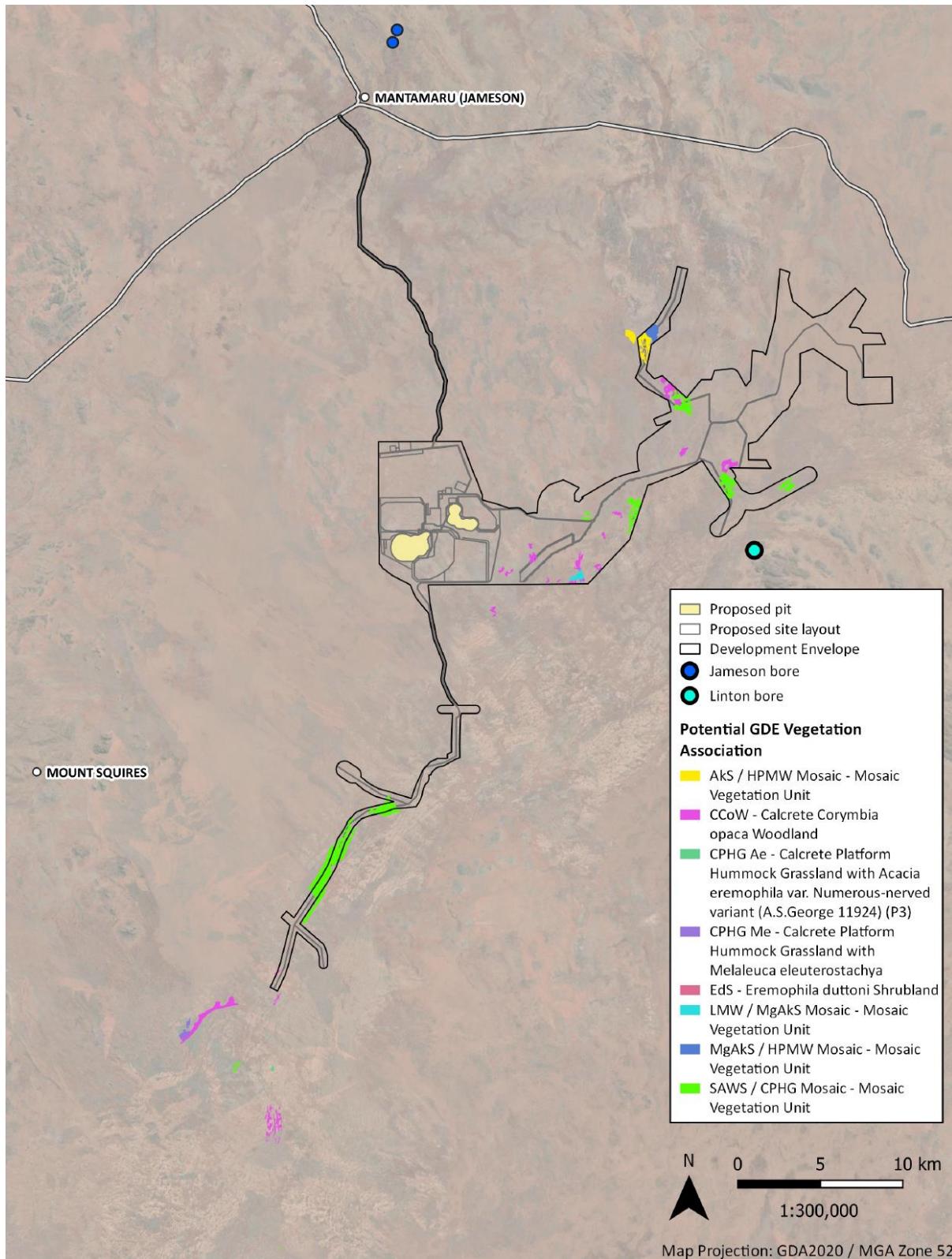


Figure 3: Location of Identified Groundwater Related Environmental Values



1.3 Condition Requirements

A Ministerial Statement and associated conditions are yet to be issued.

1.4 Rationale and Approach

This GMMP outlines how groundwater levels, groundwater quality and the health of potential terrestrial GDEs will be managed and where relevant monitored, to verify the effectiveness of the management measures and to ensure potential impacts associated with the proposed construction and operation of the WMP are minimised. The approach taken includes consideration of:

- Baseline studies relating to hydrogeology, flora and vegetation, terrestrial GDEs and a groundwater effects assessments (OZ Minerals, 2021; Appendices B1, B2, D2 and D4)
- Hydrogeological numerical modelling (OZ Minerals, 2021; Appendix D3)
- Hydrochemical numerical modelling (OZ Minerals, 2021; Appendix D7 and Appendix D12)
- Relevant assumptions and uncertainties.

1.4.1 Survey and Study Findings

Several studies and surveys have been undertaken to systematically characterise the West Musgrave hydrogeological regime (including hydrostratigraphy, groundwater quantity and quality, identification of groundwater-related environmental values, and assessing the effects of mine-related water affecting activities that have the potential to impact on these environmental values. These studies are summarised in the following sections and are provided in detail in the EPA Section 38 Referral (OZ Minerals, 2021; Appendix D).

1.4.1.1 Mine-Related Water Affecting Activities

Mine-related water affecting activities relevant to the project include:

- Mine pit development – interruption of groundwater systems
- Mine dewatering – abstraction of groundwater to provide safe access to the Nebo and Babel deposits. This water would be used to meet mine and process water demands
- Mine and process water supply – abstraction of groundwater from abstraction bores to supplement water supply sourced from dewatering
- Materials storages (e.g., TSF, WRDs, topsoil, ore stockpiles) – potential sources of contaminants that may enter the water table
- Supporting facilities – accommodation, airstrip, renewable energy infrastructure.

1.4.1.2 Groundwater Conceptualisation

The project is located within the Musgrave Geological Province. The key aquifers of the project area are associated with the Tertiary sediments of the Kadgo Paleovalley (Table 3). The Kadgo Paleovalley is represented by a main arterial paleovalley with multiple smaller tributaries along its length (Figure 4) that are incised into weathered and fractured basement rocks. A detailed hydrogeological baseline assessment is provided in the EPA Section 38 Referral (OZ Minerals, 2021; Appendix D2).

Table 3: Key Hydrostratigraphy Summary (Youngest to Oldest)

Formation	Description
Calcrete	Often occurs above the water table or only partially saturated. Typically 1 to 15 m thick.
Garford aquifer and aquitard	Unconfined to semi-confined, interbedded fine sands, silts and clay, thick basal clay sequence separating unit from deeper Pidinga aquifer. Up to 90 m thick.
Pidinga aquifer	Confined, sands and gravels with interbedded fine sediments, occurs only in deeply incised sections of Kadgo Paleovalley and is absent in tributary branches. Typically more than 60 m thick.
Basement aquifer and aquitard	Typically gabbro regolith and fractured rocks, degree of weathering and fracturing reduces with depth. Drains to paleovalley aquifers.

Groundwater flows generally from the north to the south, where it discharges to the Officer Basin groundwater system approximately 50 km from the Main Development Area. The depth to the water table typically ranges between four and nine metres, depending on topography, and groundwater quality is fresh to brackish with salinity (as electrical conductivity) ranging between 950 and 4,500 $\mu\text{S}/\text{cm}$.

Nitrate concentrations in groundwater are naturally high compared to other parts of WA, ranging between 20 and 130 mg/L. Although suitable for livestock (ANZECC, 2000), these concentrations of nitrate may mean groundwater is unsuitable for human consumption without treatment (NRMMC, 2021). Groundwater drawn from the Jameson (Mantamaru) bores (Figure 3) has equally high nitrate levels and, as such, is not suitable for human consumption. A reverse osmosis plant is used to treat water that is then supplied to the community. Median concentrations of copper, nickel and zinc in groundwater are below drinking water guideline values (ANZECC, 2000) at 0.002, 0.001 and 0.02 mg/L, respectively.

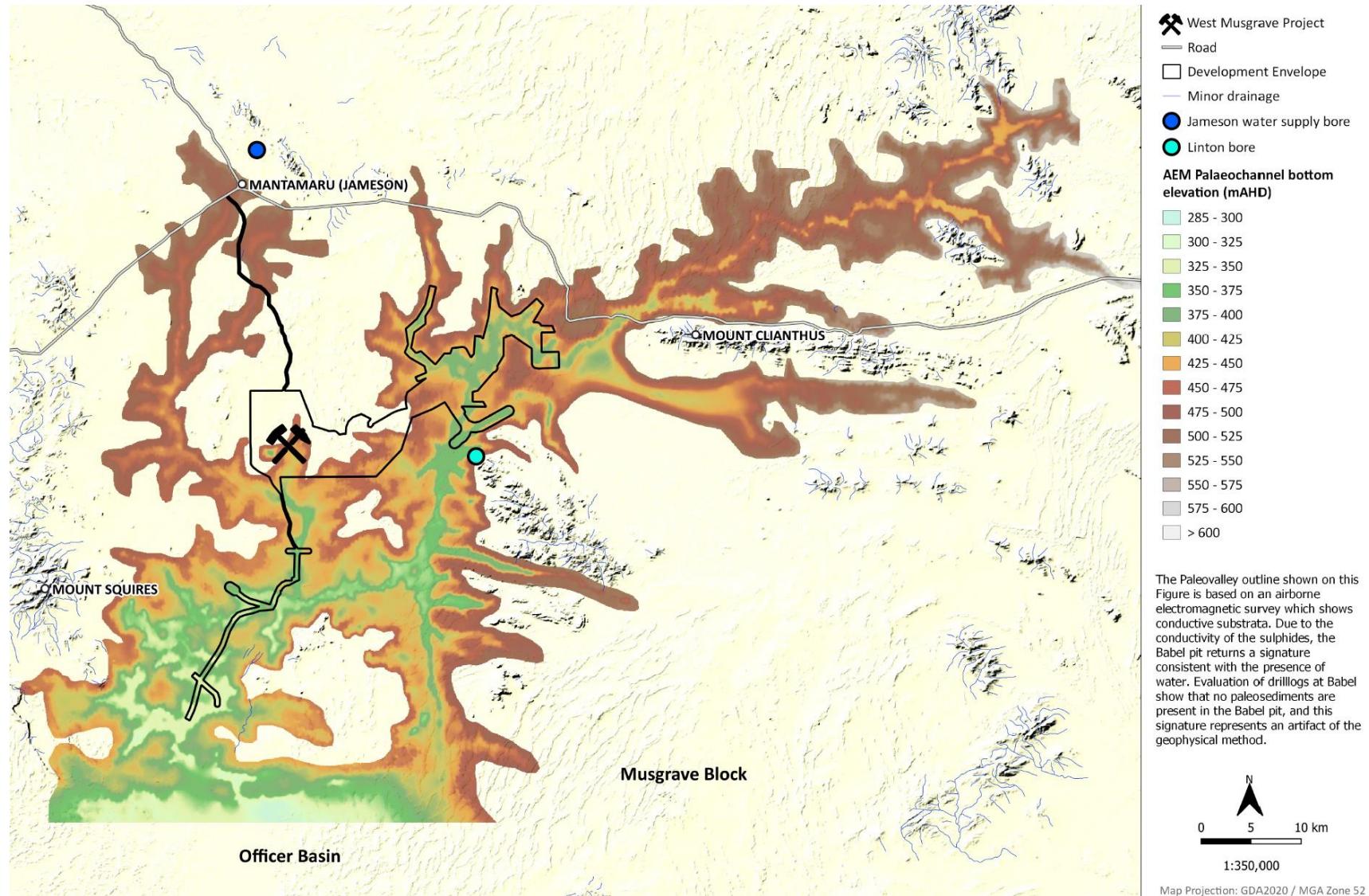


Figure 4: Kadgo Paleovalley

1.4.1.3 Interactions Between the Project and Groundwater

Groundwater Abstractions

The proposed mine water supply borefield (the Northern Borefield) would be located within the Kadgo Paleovalley. Production bores would be constructed to draw water from the deeper (confined) Pidinga paleochannel aquifer. Depressurisation of the Pidinga aquifer may induce leakage of some groundwater from the shallower Garford paleochannel aquifer (predominantly from the basal clay sequence) as well as from the regolith and fractured bedrock into which the paleovalley is incised, resulting in some drawdown of the water table around the Northern Borefield. Figure 5 presents the spatial extent of the predicted 2 m water table drawdown contour around the Northern Borefield during mining. The maximum predicted water table drawdown within the borefield area is approximately 5 m at the site of abstraction bores. Groundwater in the borefield has been modelled to return to within 10% of pre-mine levels within 10 to 20 years following the cessation of borefield abstraction.

The orebodies targeted by mining of the Nebo pit and Babel pit occur below the water table and therefore require active dewatering to allow safe and efficient access to the ore. The following briefly describes the dewatering process and provides a description of the effects (see OZ Minerals, 2021; Section 7.3.3.2):

- The western half of the proposed Nebo pit is located on a minor tributary of the Kadgo Paleovalley and will intersect up to 90 m of the Garford water table aquifer at this location. The eastern portion of the pit is located adjacent to this minor tributary and will not intersect paleovalley sediments. Mining at Nebo pit will require dewatering of the Garford aquifer to allow access to the orebody. As the Garford aquifer and adjacent / underlying orebody becomes depressurised due to dewatering, groundwater from the Garford aquifer (upstream and downstream) and basement rocks will move toward the pit creating a 'cone' of water table drawdown around the pit. After mining of Nebo is completed, the pit will be backfilled to above the pre-mine water table with waste materials, allowing groundwater to recover to around pre-mine levels and prevent ongoing evaporative losses that would occur if the pit were to be left open.
- The Babel pit is located entirely outside of the Kadgo Paleovalley within the regolith and fractured basement rock. This material will also need to be dewatered, also causing a cone of water table drawdown around the pit, which will combine with the cone of drawdown caused by dewatering of the Nebo pit. After mining, Babel pit will remain open resulting in ongoing evaporative losses of groundwater from the basement rocks.

OZ Minerals' strives to minimise water use and add value when we do, as such OZ Minerals will minimise the potential for water wastage through utilising dewatered water from two open pits and minimise the total water abstraction requirements from the Northern Borefield. In particular, the sequencing of dewatering and mining Nebo pit, which contains most of the mine pit dewatering needs, has been



West Musgrave Copper and Nickel Project Groundwater Monitoring and Management Plan

purposefully scheduled to coincide with the operation of the processing facility to make best use of Nebo pit dewatered water.

Figure 5 presents the spatial extent of the predicted long-term (post-mining) 2 m water table drawdown contour around the former mine pits. Further detail regarding this assessment can be found in Appendix D3 and Appendix D4 of the EPA Section 38 EP Referral (OZ Minerals, 2021).

Mine Waste Management

Geochemical and physical characterisation of waste rock and tailings has been undertaken to assist in understanding the water-related risks associated with long-term mine waste management. The studies show that tailings are unlikely to generate problematic leachate¹ and that waste rock has generally low levels of potentially acid forming materials. The studies have informed the design of the tailings storage facility (TSF) and waste rock dumps (WRDs) to ensure mine wastes are appropriately contained to minimise any environmental impact.

Hydrochemical numerical modelling has also been undertaken (OZ Minerals, 2021; Appendix D7 and Appendix D12) to assess the fate and transport of any leachate arising from waste storages that may reach the water table. The modelling adopted a number of very conservative assumptions, and predictions relating to effects are also considered conservative. The results show the concentrations of leachate constituents attenuate to guideline levels within short distances of the TSF and WRDs (i.e. within tens to hundreds of metres).

¹ Problematic leachate is defined as leachate with concentrations of Constituents of Concern in excess of adopted guideline values.

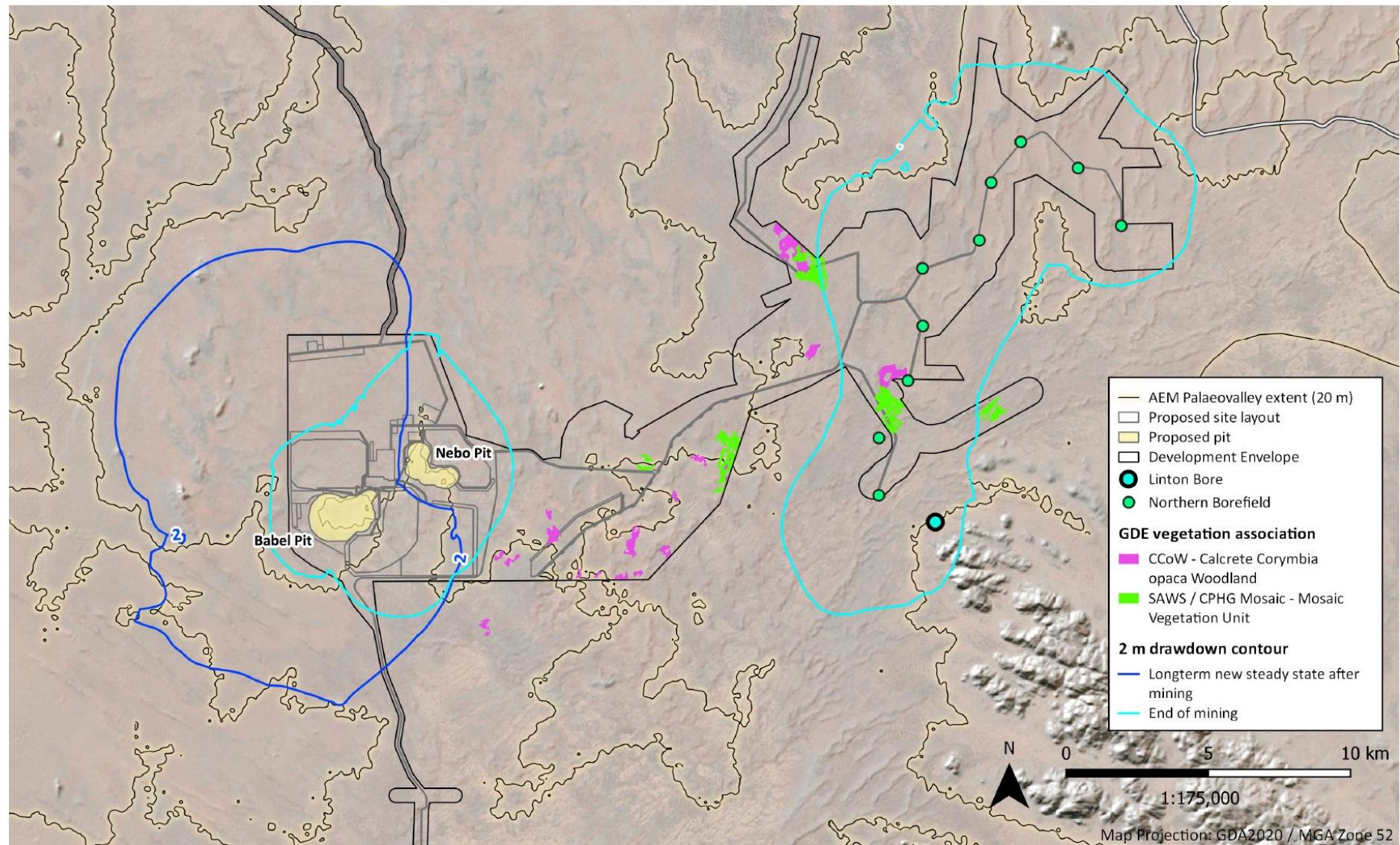


Figure 5: Estimated Modelled Extent of the 2 m Water Table Drawdown Contour

1.4.1.4 Interactions Between the Project and Environmental Values

Community Water Supplies

Groundwater is utilised to meet some or all of community water supply requirements in the broader project area. Community water at the nearest community to the project, Jameson (Mantamaru), is drawn from the community bores approximately 26 km north of the proposed mine. Prior to reticulation for community use, the community bore water is treated using reverse osmosis to remove naturally occurring nitrates. Linton Bore is located approximately 3 km south-west of the most southern production bore of the Northern Borefield and is used from time to time by the community when visiting the area for cultural activities. The locations of these community water bores are shown on Figure 3. Community water supplies are discussed in more detail in the groundwater baseline assessment undertaken for the EPA Section 38 EP Referral (OZ Minerals, 2021; Appendix D2).

The Jameson (Mantamaru) bores occur approximately 20 km north of the predicted 2 m water table drawdown contours associated with mine-related activities (Figure 5). Publicly available data indicates that the Jameson bores are hosted within fractured rock aquifers which represents a different hydrogeological system to those of the project water supply and dewatering bores. Linton Bore is located within the life-of-mine 2 m water table drawdown contour that is predicted to develop around the Northern Borefield (Figure 5). It is likely that Linton Bore intersects paleovalley sediments, similar to those that will be accessed by the Northern Borefield production bores and the Nebo dewatering bores. It is assessed that Linton Bore water levels may be drawn down by between 2 m and 3 m as a result of project water abstraction. For further detailed discussion, refer to the Groundwater Effects Assessment undertaken for the EPA Section 38 EP Referral (OZ Minerals, 2021; Appendix D4).

Potential Terrestrial GDEs

An assessment of potential terrestrial GDEs in the West Musgrave area has been conducted (OZ Minerals, 2021; Appendix B2). The assessment reviewed the results of a detailed survey of vegetation associations and mosaics, the physical setting where terrestrial GDEs might exist, including landscape, soils and available water sources (soil water as well as groundwater), and an extensive literature review (see OZ Minerals, 2021; Appendix B2). A conceptualisation of groundwater use by potential terrestrial GDEs provides the context for their level of sensitivity to altered groundwater conditions arising from groundwater abstraction and dewatering of mine pits. The approach to assessing whether potential terrestrial GDEs will be adversely affected by mine-related water affecting activities involved the following assumptions:

- Plants will use soil water, when available, in preference to groundwater

- There are no impediments (such as hardpans) to depth of rooting (however, the geological database does indicate calcrete platforms are commonplace throughout the project area which limit tree rooting depth)
- A typically restricted soil water zone (as evidenced by shallow water tables) combined with an arid climate suggests some degree of groundwater dependence may occur in larger plant species, at least during prolonged drought periods
- Larger tree species will likely have larger environmental water requirements than smaller tree and shrub species, and grasses.

Based on the potential terrestrial GDE assessment (OZ Minerals, 2021; Appendix B2) and the assumptions outlined above, Table 4 lists vegetation associations and mosaics comprising key vegetation species that have been identified as potentially reliant to some degree on groundwater. Figure 3 presents the spatial distribution of these associations/mosaics across the project area. While all potential terrestrial GDE associations identified in the survey area are considered widespread in the landscape, they do not include species or communities of conservation significance. A reduction in health and/or death of vegetation as a result of project-related water-affecting activities, however, may be perceived as an impact to the cultural landscape from the perspective of Traditional Owners.

Table 4: Potential Terrestrial Groundwater Dependent Ecosystems

Vegetation Association/Mosaic	Abbreviation	Located within 2 m Water Table Drawdown Contour
<i>Acacia kempeana</i> Shrubland and Hard pan Mulga Woodland	AkS/HPMW mosaic	No
Calcrete <i>Corymbia opaca</i> Woodland	CCoW	Yes
Calcrete Platform Hummock Grassland Hummock Grassland with <i>Acacia eremophila</i>	CPHG Ae	No
Calcrete Platform Hummock Grassland Hummock Grassland with <i>Melaleuca eleuterostachya</i>	CPHG Me	No
<i>Eremophila duttoni</i> Shrubland	Eds	No
Low Mallee Woodland and <i>Melaleuca glomerata</i> <i>Acacia kempeana</i> Shrubland	LMW/MgAkS mosaic	No
<i>Melaleuca glomerata</i> <i>Acacia kempeana</i> Shrubland and Hard pan Mulga Woodland	MgAKS/HPMW mosaic	No

Vegetation Association/Mosaic	Abbreviation	Located within 2 m Water Table Drawdown Contour
Sand plains with Wattles other than Mulga over Spinifex and Calcrete Platform Hummock Grassland	SAWS/CPHG mosaic	Yes

The most significant risk posed to terrestrial GDEs (should they be confirmed to be present) in the project area associated with mine-related water affecting activities is removal of access to groundwater for meeting environmental water requirements, i.e. water table drawdown arising from groundwater supply development and mine dewatering. OZ Minerals has relied upon Froend and Loomes (2005) in regard to adopting a threshold for assessing effects of drawdown magnitude on terrestrial phreatophytic vegetation. The threshold assumes that a groundwater drawdown of more than 2 m, regardless of the rate of change, may result in a discernible change to the ecological integrity and biological diversity of these potential terrestrial GDEs. Table 4 and Figure 3 present the vegetation associations/mosaics that are likely to have key species that may have some form of groundwater dependence and are exposed to reduced groundwater access based on this 2 m drawdown threshold. Table 5 presents details identifying the areas of potential GDEs (vegetation associations/mosaics) that may be impacted by water table drawdown in excess of 2 m in the broader project area and within the 2 m drawdown contour (where drawdown of more than 2 m is predicted).

Table 5: Potential Terrestrial Groundwater Dependent Ecosystems Located Within Those Areas Where More Than 2 m Drawdown is Predicted

Vegetation Association/ Mosaic	Total Mapped Area (ha)	Area Potentially Impacted (ha)	Proportion of Potentially Impacted Area to Mapped Area (%)
CCoW	455.3	41.5	11
SAWS/CPHG mosaic	775.9	97	15

1.4.2 Key Assumptions and Uncertainties

This GMMP has been developed using all relevant and available information at the time of preparation. The key assumptions and uncertainties associated with this current GMMP are described in Table 6.

Table 6: Key Assumptions and Uncertainties Associated with WMP Groundwater Management

ID	Assumption/Uncertainty	Description
A1	Groundwater conceptualisation	The Development Envelope and surrounds have been the subject of several groundwater studies and investigations. It is assumed that these investigations and studies have adequately characterised the hydrogeological regimes in terms of quantity, quality and potentially dependent environmental values in the project area; and estimated, through hydrogeological and hydrochemical numerical modelling, the drawdown associated with mine pit dewatering and borefield abstractions, and water quality effects of potential leachate migration away from waste landforms. The assumption is supported by the hydrogeological numerical model independent peer-review.
A2	Impact assessment	The conceptual groundwater model has adequately assessed the effect of Northern Borefield groundwater abstractions from the deep Pidinga aquifer on Garford aquifer water table elevation and drawdown extent, and the dewatering effects on Garford aquifer and basement water table elevations and drawdown extent. The assumption is supported by the hydrogeological numerical model independent peer-review.
A3	Ecosystem health	It is assumed that, for the purposes of this GMMP, ecosystem health is related to access to appropriately defined Environmental Water Provisions (EWP) (WRC, 2000) represented by water table depth and groundwater quality.
A4	Terrestrial GDE assessment	The terrestrial GDE assessment identified the presence of 138.5 ha of potential terrestrial GDEs inside the 2m water table drawdown contour that may be affected by the project water affecting activities.
U1	Location of the 2 m drawdown contour	The hydrogeological numerical model has been informed by data collected from 13 groundwater test bores and geophysical methods. Some uncertainty remains relating to the homogeneity of the aquifer system between these test bores, and as such the configuration of the borefield may vary (i.e. number and exact location of bores). Any material variation to the configuration of the borefield has the potential to alter the location of the predicted 2 m water table drawdown contour. This uncertainty will be further reduced through an additional drilling campaign prior to project operations and subsequent refinement of the hydrogeological numerical model if required.
U2	Vegetation survey effort	While flora and vegetation surveys have been undertaken in much of the area encompassing the predicted 2 m drawdown contour, some areas remain unsurveyed largely due to cultural heritage access restrictions. As a result, there may be some additional areas of potential terrestrial GDEs that remain unsurveyed within the predicted 2 m drawdown contour. Table 7 documents additional work planned to reduce this uncertainty. Results from this additional work will inform future updates to this management plan.

ID	Assumption/Uncertainty	Description
U3	Terrestrial GDE assessment	The terrestrial GDE assessment has relied on literature, remote-sensing imagery and professional judgement to identify vegetation associations/mosaics that may represent terrestrial GDEs that could be impacted by the project. Field studies (e.g. measurements of leaf water potentials, etc) could supplement this data to further reduce uncertainty. Table 7 highlights additional work planned to reduce this uncertainty. Results from this additional work will inform future updates to this management plan.
U4	Vegetation-specific Environmental Water Provisions	Further studies, coupled with ongoing monitoring, is required to better understand the tolerance of terrestrial GDEs to water table drawdown, and thereby inform the EWP required to sustain ecosystem function. Table 7 highlights additional work planned to reduce this uncertainty. Results from this additional work will inform future updates to this management plan.

To provide assurance on our current understanding of potential GDEs, and the approach to further reduce uncertainties, a review was undertaken by AQ2 (OZ Minerals, 2021; Appendix B2 Addendum 1) and is also provided here as Appendix A. The review was undertaken to confirm the adequacy of the approach taken, and to assist with identifying the appropriate next steps to reduce uncertainty associated with the potential presence of GDEs at WMP.

The review concluded that in a number of regards the existing assessment may have identified larger areas of GDEs than may be the case. In addition, the review has identified a number of further actions to reduce uncertainties associated with the existing GDE assessment. These additional actions are considered in this GMMP. Table 7 identifies a number of studies proposed to reduce the level of uncertainty relating to the presence of potential terrestrial GDEs, and responses in vegetation to changes in environmental water availability. These studies have been developed as environmental objectives (management objectives) and their output would be used to inform ongoing monitoring and management initiatives and where necessary any updates to trigger criteria and threshold criteria proposed in this GMMP.

Table 7: Terrestrial Groundwater Dependent Ecosystem Uncertainty Studies

Uncertainties identified in Table 6	EPA Factor: Inland Waters Objective: To maintain the hydrological regimes and quality of groundwater...so that environmental values are protected Key Environmental Values: Ecosystem health of potential groundwater dependent terrestrial vegetation and beneficial use of groundwater Key Impacts and Risks: <ul style="list-style-type: none"> • Change to groundwater quality and quantity adversely impacts beneficial use and ecosystem health. The changes may arise due to: <ul style="list-style-type: none"> ◦ Groundwater drawdown associated with groundwater supply development and mine dewatering ◦ Evaporative losses of groundwater from final pit voids, and interaction between pit void(s) and groundwater 		
Uncertainty	Management Actions	Monitoring	Timing
Uncertainty 2: While flora and vegetation surveys have been undertaken in much of the area encompassing the predicted 2 m drawdown contour, some areas remain unsurveyed largely due to cultural heritage access restrictions. As a result, there may be some additional areas of potential terrestrial GDEs that remain unsurveyed within the predicted drawdown contours.	<ul style="list-style-type: none"> • Map and report previously unmapped vegetation associations within all water table drawdown contours, including areas previously inaccessible due to heritage related restrictions (this may require reliance on the use of high-resolution imagery). 	Vegetation mapping using high-resolution aerial imagery, and where necessary, and where access allows, ground truthing using the establishment of vegetation survey quadrates.	Prior to the commencement of mine dewatering and borefield abstraction.
Uncertainty 3: The terrestrial GDE assessment has relied on literature, remote-sensing imagery and professional judgement to identify vegetation associations/mosaics that may represent terrestrial GDEs that could be impacted by the project. Field studies (e.g. measurements of leaf water potentials, etc) could supplement this data to further reduce uncertainty.	<ul style="list-style-type: none"> • Undertake field-based terrestrial GDE assessments to identify the degree of groundwater dependence (if any) of key plant species within vegetation associations and mosaics identified as possible terrestrial GDEs to determine environmental water requirements. 	Conduct the following analysis on a minimum of 10 potential terrestrial GDE trees (or as otherwise agreed with EPA or an appropriately qualified ecohydrology specialist) within each identified potential terrestrial GDE (as described in Table 4): <ul style="list-style-type: none"> • Leaf water potential (LWP) measurements • Stand/stem basal area calculation • Measure isotopic composition of groundwater, soil water and plant (xylem) water 	Prior to the commencement of mine dewatering and borefield abstraction.
Uncertainty 4: Further studies, coupled with ongoing monitoring, is required to better understand the tolerance of terrestrial GDEs to water table drawdown, and thereby inform the EWP required to sustain ecosystem function. Note: ongoing assessment of EWP would only be required should the baseline assessment (detailed in Uncertainty 3) confirm that identified potential terrestrial GDE associations, are groundwater dependent.	<ul style="list-style-type: none"> • Assess environmental water requirements of potential terrestrial GDEs and quantify suitable EWPs for all identified terrestrial GDEs identified within the impacted area (i.e. within the 2 m drawdown contour). • Based on these studies refine water table drawdown and groundwater quality EWP that are considered protective of ecosystem health and update trigger criteria, threshold criteria and management within this GMMP as required. 	Undertake ongoing seasonal monitoring, for a period adequate to reduce uncertainty, comprising: <ul style="list-style-type: none"> • LWP • Water table depth (continuous data collection using a transducer or similar) 	Ongoing seasonal monitoring to be undertaken quarterly following the commencement of mine dewatering and borefield abstraction.

1.4.3 Management Approach

The management approaches discussed in this document are based and developed around the mitigation hierarchy of avoid and minimise to ensure impacts to environmental values have been avoided or reduced to as low as reasonably practicable. In particular the management approach is based on the following actions:

- A baseline monitoring and trigger-location bore network
- Establishing appropriate environmental criteria for trigger and threshold levels (provisional triggers are provided, to be confirmed after further input from the Water Branch of Government of Western Australia's Department of Water and Environmental Regulation (DWER))
- Periodic reviews of the hydrogeological numerical modelling and groundwater monitoring based on operational data
- Ongoing refinement of uncertainty through further information gathering and test-work where necessary
- Adaptive management of the water abstraction infrastructure (pumping locations and rates) to meet the trigger and threshold levels
- Delaying or avoiding certain abstraction regions to comply with trigger and threshold levels.

This GMMP uses outcome-based provisions to ensure the EPA's objectives for Inland Waters is achieved.

1.4.4 Rationale for Choice of Environmental Criteria

Site-specific environmental criteria are based on the following rationale.

Impact of groundwater drawdown on potential terrestrial GDEs: Potential terrestrial GDEs and their locations in the landscape have been identified from flora and vegetation surveys and a semi-quantitative review of the vegetation's potential reliance on groundwater (OZ Minerals, 2021; Appendix B2). The most significant risk posed to potential terrestrial GDEs in the project area associated with mine-related water affecting activities is removal of access to the water table (capillary fringe) for meeting environmental water requirements i.e., water table drawdown arising from groundwater supply development and mine dewatering. A trigger level of 68% of the predicted drawdown expected to impact potential terrestrial GDEs is proposed², whereby trigger-reporting, increased monitoring and further assessments are activated.

Impact of groundwater drawdown on beneficial groundwater users: Hydrogeological assessments predict that existing groundwater users accessing Jameson (Mantamaru) community Bore and Linton Bore will not be impacted by groundwater drawdown (OZ Minerals, 2021; Appendix D). However, a

² 68% represents one standard deviation from the mean of the baseline level

precautionary approach is adopted whereby triggers are used to validate these assumptions. Proposed provisional triggers are based on modelled water table drawdown contours.

Validating hydrochemistry numerical modelling outputs: Hydrochemistry assessments indicate that existing groundwater users will not be impacted by potential groundwater contamination arising from waste landforms. However, a precautionary approach is adopted whereby triggers are used to validate model assumptions. A hydrochemical study (OZ Minerals, 2021; Appendix D7 and Appendix D12) conducted to assess the fate of potential contaminants in groundwater that may arise from waste landform seepage identified three key constituents of concern (copper, nickel and sulfate) that could occur at concentrations in seepage waters that exceed adopted guidelines for protection of water quality (NRMMC, 2021). Proposed provisional triggers are based on the hydrochemistry numerical modelling and baseline water quality data and include copper, nickel and sulfate as well as salinity (as electrical conductivity). Table 8 presents the adopted trigger and threshold criteria.

Table 8: Proposed Trigger Criteria and Threshold Criteria for Water Quality

Parameter	Garford Aquifer		Basement Hydrostratigraphic Unit (HSU)	
	Trigger ^[1]	Threshold ^[2]	Trigger ^[1]	Threshold ^[2]
Electrical conductivity ($\mu\text{S}/\text{cm}$)	2,600	3,000	1,500	1,700
Copper (mg/L)	2	3	0.5	4
Nickel (mg/L)	0.9	3	0.5	4
Sulfate (mg/L)	250	270	120	150

Notes: 1. Based on 80th percentile for reported values for all water samples collected from specific HSU
2. Based on maximum reported value for all water samples collected from specific HSU

1.4.5 Rationale for Choice of Trigger Level Actions and Threshold Contingency Actions

Site specific management targets are based on the following rationale.

Impact of groundwater drawdown on potential terrestrial GDEs: Proposed provisional triggers are based on the hydrogeological numerical model predictions. A trigger level of 68% of the predicted drawdown is proposed, whereby trigger-reporting, increased monitoring and further assessments are activated along with early contingency actions (if deemed necessary). A threshold level equal to the predicted drawdown is proposed as a provisional level for pre-emptive impact-mitigation measures.

Example mitigation and contingency measures, should these triggers and thresholds be met, are shown in Table 9.



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Impact of groundwater drawdown on beneficial groundwater users: Proposed provisional triggers are based on the hydrogeological numerical model predicted water table drawdowns. Triggers are based on comparison of regional-response data.

Example mitigation and contingency measures should these triggers and thresholds be met are shown in Table 9. If unexpected drawdown impacts to existing groundwater users accessing Jameson (Mantamaru) community Bore and Linton Bore are identified, OZ Minerals would provide alternative water sources.

Validating hydrochemistry numerical modelling outputs: To confirm that hydrochemistry impact extent is no greater than that predicted by the hydrochemistry numerical model:

- A trigger criteria equal to the 80th percentile reported concentration for each identified analyte (see Table 8) and evidence of an increasing trend is proposed for groundwater samples collected from individual monitoring bores at the extent of the hydrochemical numerical model. Reaching this trigger criteria would activate increased monitoring and further assessments.
- A threshold criteria of 100% of the maximum reported concentration for each identified analyte (see Table 8) and evidence of an increasing trend is proposed for groundwater samples collected from individual monitoring bores at the extent of the hydrochemical numerical model. A threshold level equal to 100% of the maximum concentration is proposed as a provisional level for pre-emptive impact-mitigation measures.

Example mitigation and contingency measures, should these triggers and thresholds be met, are shown in Table 9.

Table 9: Nominal Mitigation and Contingency Measures

Criteria Type		Example Mitigation and Remedial Measures
Trigger	Water Quantity	<ul style="list-style-type: none"> • Initiate implementation of the contingency measures within 2 weeks of the exceedance being identified • Perform QA/QC check, re-sample and confirm criteria have been exceeded, if exceedance confirmed: <ul style="list-style-type: none"> ◦ Increase frequency of monitoring to understand trend, continue with this until sufficient information and data available to revert to previous frequency ◦ Implement early intervention if trend analysis indicates threshold criteria are likely to be exceeded (see below for examples) • Assess possible causes of criteria exceedance • Assess implications of exceedance and whether adverse threat is posed to Environmental Values (EV) <ul style="list-style-type: none"> ◦ Re-evaluate appropriateness of trigger and threshold criteria ◦ Adjust trigger and threshold criteria if required and amend this GMMP to reflect change
	Water Quality	<ul style="list-style-type: none"> • Recalibrate/refine numerical models (hydrogeological or hydrochemistry) to provide predictions of groundwater system response to project water affecting activities and early implementation of mitigation and remedial measures • Personnel training and awareness promotion in regard to the potential for adverse water management outcomes • Determine the need for early instigation of any of the following: <ul style="list-style-type: none"> ◦ Reduce pumping from individual production bores and redistribute pumping to other production bores where capacity exists and possible drawdown effects do not pose a risk to EV, and/or ◦ Lower pumps in community bores to access more available drawdown, and/or ◦ Replace shallow community production bore(s) with deeper bores to access deeper aquifer intersections (where available), and/or ◦ Provide alternate sources of water to replace community supplies.
	Potential terrestrial GDEs	<p>Should groundwater levels reach 68% of water table drawdown predicted in the hydrogeological assessment the following activities would be employed within 2 weeks of the exceedance being notified:</p> <ul style="list-style-type: none"> • Commence vegetation health assessments as detailed in Table 14 and Appendix B. • Should vegetation health assessments indicate a project derived impact to vegetation outside of the predicted 2 m drawdown contour, the contingencies listed below (in thresholds) would be employed as appropriate <p>Note: trigger actions relating to potential terrestrial GDEs would only occur in the event that baseline terrestrial GDEs assessments (see Uncertainty 3 above) confirm the presence of GDEs.</p>

Criteria Type		Example Mitigation and Remedial Measures
Threshold	General	<ul style="list-style-type: none"> • Perform QA/QC check, re-sample and confirm criteria have been exceeded • If exceedance confirmed, increase frequency of monitoring to demonstrate mitigation and remedial actions are effective • Maintain intervention until approval to cease is notified by appropriate regulatory agency
	Water Quantity	<ul style="list-style-type: none"> • Initiate implementation of the contingency measures within 48 hours of the exceedance being identified • Northern Borefield and Regional <ul style="list-style-type: none"> ◦ Reduce pumping from individual production bores and redistribute pumping to other production bores where capacity exists and possible drawdown effects do not pose a risk to EV, and/or ◦ Lower pumps in community bores to access more available drawdown, and/or ◦ Replace shallow community production bore(s) with deeper bores to access deeper aquifer intersections (where available), and/or ◦ Provide alternate sources of water to replace community supplies
	Water Quality	<ul style="list-style-type: none"> • Nebo dewatering borefield <ul style="list-style-type: none"> ◦ Optimise dewatering rates to achieve, rather than exceed, mining objectives ◦ Consider re-injection upstream or downstream to protect identified EV • Waste landforms <ul style="list-style-type: none"> ◦ Commission recovery borefields to manage water table rise and water quality decline, if required and appropriate • Recalibrate/refine numerical models (hydrogeological or hydrochemistry) to provide predictions of groundwater system response to mitigation and remedial measures
	Potential terrestrial GDEs	<p>Initiate implementation of the contingency measures within 48 hours of the exceedance being identified</p> <p>Should vegetation health assessments indicate a project derived impact to vegetation outside of the predicted 2 m drawdown contour, the contingencies listed above for Water Quantity would be employed as appropriate</p> <p>Note: trigger actions relating to potential terrestrial GDEs would only occur in the event that baseline terrestrial GDEs assessments (see Uncertainty 3 above) confirm the presence of GDEs.</p>

2 MANAGEMENT OUTCOMES

This GMMP has considered outcome-based criteria to measure the performance of hydrogeology and hydrochemistry assumptions and, where performance is not met based on the required trigger criteria and threshold criteria, adaptive management would be employed to avoid, or minimise potential impacts to environmental values, in as far as to ensure that EPA's inland water objectives are met. In addition, through the adaptive management approach, emerging research and technology will be continuously reviewed to identify further measures to proactively control and mitigate potential impacts to groundwater.

2.1 Environmental Criteria

Two levels of criteria are considered for the outcome-based component of this GMMP, they include:

- Trigger criteria which provide an early indicator metric to which further actions should be taken in advance of the environmental outcome being compromised.
- Threshold criteria which measure the achievement of the environmental outcome. A failure to meet threshold criteria signals the environmental outcome is possibly not being met and implies non-compliance.

Table 10: Environmental Criteria for Outcome-Based Management

Trigger Criterion	<ul style="list-style-type: none">• 68% of water table drawdown predicted in the hydrogeological assessment• P80 reported (baseline) concentrations for EC, Cu, Ni and SO₄ in groundwater sampled from Garford and fractured rock HSUs downstream of the TSF
Threshold Criterion	<ul style="list-style-type: none">• Water table drawdown equal to, or greater than, that predicted in the hydrogeological assessment• Maximum reported (baseline) concentrations for EC, Cu, Ni and SO₄ in groundwater sampled from Garford and fractured rock HSUs downstream of the TSF

2.2 Monitoring

This section describes how OZ Minerals will undertake monitoring to determine the performance against the environmental criteria. Table 11 describes monitoring provisions, Figure 6 presents a locality plan for the proposed monitoring network and Table 12 presents nominal completion details for individual monitoring bores comprising the proposed monitoring network. Table 13 provides the proposed framework to assess the health of potential terrestrial GDEs between the 2 m and 0.5 m water table drawdown contours should the outcome described for groundwater in Table 11 not be met. Further details of the monitoring parameters and approach can be found in Appendix B.

OZ Minerals will be responsible for monitoring, maintenance and upkeep of monitoring bores. Production bores will be fitted with a flow meter as per Government of Western Australia's Department



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of Water's (DoW) Measuring the taking of water (DoW, 2016). Meters will be properly maintained to ensure that accurate readings can be taken. Meter reading data will be reviewed for QA/QC purposes and maintained in a database.

Table 11: Outcome-based EMP for Groundwater

EPA Factor: Inland Waters Key Environmental Values: Ecosystem health of groundwater dependent terrestrial vegetation and beneficial use of groundwater Key Impacts and Risks: <ul style="list-style-type: none"> • Change to groundwater quality and quantity adversely impacts beneficial use and ecosystem health. The changes may arise due to: <ul style="list-style-type: none"> ◦ Groundwater drawdown associated with groundwater supply development and mine dewatering ◦ Evaporative losses of groundwater from final pit voids, and interaction between pit void(s) and groundwater ◦ Seepage from mine waste landforms (TSF and WRDs) ◦ Release of water or hazardous materials from potential contaminant sources (including WRDs, TSF, hazardous goods storage areas and equipment) 					
Outcome	Criteria	Response Action	Monitor	Frequency	Reporting
Outcome 1: Groundwater management infrastructure operates as per design to minimise adverse impacts to environmental values	Trigger Criteria: 68% of the predicted drawdown at 2 m water table drawdown contour and at a reference site near to Linton Bore over two consecutive monitoring events	See Table 9	<ul style="list-style-type: none"> • Indicator: Groundwater levels • Method: Field collection or automation of groundwater level using a transducer or manual dipping • Location (Figure 6): <ul style="list-style-type: none"> ◦ Monitoring bores at the 2 m water table drawdown contour (mine MMB-01 to MMB-04, Northern Borefield BMB-01 to BMB-04) ◦ Near Jameson (CMB-01) ◦ Near Linton Bore (CMB-02) 	Quarterly	<ul style="list-style-type: none"> • Annual compliance assessment report (if the Plan is conditioned under the EP Act) (DWER – Compliance Branch) • Annual Aquifer Assessment Report (DWER – Water Branch) • Triennial (every three years) Aquifer Review (DWER – Water Branch)
	Threshold Criteria: Equal to the predicted drawdown at 2 m water table drawdown contour or reference bores located near to Linton Bore or Jameson (Mantamaru) at any single monitoring event; and subsequent investigations determine that the impacts are likely a result of the implementation of the proposal				
Outcome 2: No adverse impacts to groundwater quality outside of assessed impact areas as a result of implementing the proposal	Trigger Criteria: An exceedance of groundwater quality guideline values (see Table 8) in comparison to reference sites over two consecutive monitoring events	See Table 9	<ul style="list-style-type: none"> • Indicator: Hydrochemistry concentrations • Method: Field sample collection and laboratory analysis • Location (Figure 6): <ul style="list-style-type: none"> ◦ Selected reference sites as ‘threshold locations’ downstream of key project infrastructure (TSF, WRD and processing plant) ◦ Selected reference sites as ‘control locations’ upstream from key project infrastructure 	Quarterly	
	Threshold Criteria: An exceedance of site-specific background threshold criteria in any single monitoring event in comparison to reference sites; and subsequent investigations determine that the impacts are likely a result of the implementation of the proposal				
Outcome 3: No adverse impact to confirmed terrestrial GDEs outside of the 2 m water table drawdown contour Note: This outcome would only be relevant should the baseline potential terrestrial GDE program confirm the presence of GDEs, and if confirmed, this outcome would only occur should the trigger criteria for Outcome 1 be triggered	Trigger Criteria: A statistically significant ³ difference in primary parameter (Appendix B) trends at sites of confirmed terrestrial GDEs between the 2 m and 0.5 m water table drawdown contours compared to baseline monitoring values over two consecutive monitoring events	See Table 9 and Table 13	<ul style="list-style-type: none"> • Indicator: Vegetation health and condition (Appendix B) • Method: Visual assessment of vegetation health (photos and visual assessment), collection of leaf water potential data, and/or NDVI. • Location (Figure 6): <ul style="list-style-type: none"> ◦ At locations of confirmed terrestrial GDEs between the 2 m and 0.5 m water table contours (TBA based on uncertainty surveys detailed in Table 7) ◦ Control sites away from key project infrastructure, and their potential impacts (if available) 	In the event that groundwater trigger criteria detailed in Outcome 1 are triggered, visual assessments and collection of leaf water potential would occur quarterly	<ul style="list-style-type: none"> • Annual compliance assessment report (if the Plan is conditioned under the EP Act) (DWER – Compliance Branch) • Exceedance reporting (on trigger and threshold criteria) (DWER – Compliance Branch) • Reporting on contingencies
	Threshold Criteria: A statistically significant ³ difference in primary parameter (Appendix B) trends at sites of confirmed terrestrial GDEs between the 2 m and 0.5 m water table drawdown contours compared to reference sites over four consecutive monitoring events; and subsequent investigation determine that the impacts are likely a result of the implementation of the proposal				

³ A statistically significant difference is determined objectively using accepted statistical techniques with significance (P) set at P<0.5

Table 12: Preliminary Details of Groundwater Monitoring Bores

Monitoring Bore	Nominal Completion Depth (mBGL)	HSU	Purpose
CMB-01	<18 m	Garford	Sentinel (early warning) community water supply monitoring bores, installed between mine water affecting activities and community water supply bores
CMB-02			
GDE-01	18 to 30 m	Basement	Near mine monitoring bore for GDE Ecological Water Requirements (EWR) and impact assessment
GDE-02			
GDE-03	18 to 30 m	Garford	
GDE-04			Near Northern Borefield monitoring bore for GDE EWR and impact assessment
GDE-05			
HC-01	12 to 18 m	Garford	Monitoring bore for assessment of groundwater system response (water quality) to potential leakage from mine waste facilities (TSF and WRD)
HC-02	18 to 36 m	Garford	
HC-03		Basement	
HC-04	12 to 18 m	Garford	
MMB-01	12 to 18 m	Basement	Monitoring bores for assessment of groundwater system response (water quantity) to mine dewatering and depressurisation, and check against numerical model predictions of 2 m drawdown extent
MMB-02		Garford	
MMB-03		Basement	
MMB-04		Garford	
BMB-01	12 to 18 m	Garford	Monitoring bores for assessment of groundwater system response (water quantity) to Northern Borefield abstractions, and check against numerical model predictions of 2 m drawdown extent
BMB-02			
BMB-03			
BMB-04			
BMB-05	18 to 42 m	Garford	Sentinel (early warning) monitoring bores installed within the Northern Borefield footprint for assessment of groundwater system response (water quantity) to borefield abstractions, and check against numerical model predictions of maximum drawdowns for validation purposes
BMB-06			
BMB-07			
BMB-08			
BMB-09			

2.3 Proposed Vegetation Health Assessment

Table 13: Summary of Potential Terrestrial Groundwater Dependent Ecosystem Health Monitoring

Vegetation	Sites	Design	Monitoring Parameters	Method	Monitoring Effort	Timing and Frequency
Confirmed obligate terrestrial GDEs identified between the 0.5 and 2 m water table drawdown contours	Confirmed terrestrial GDEs located between the 2 m and 0.5 m water table drawdown contours associated with mine dewatering and the borefield	<ul style="list-style-type: none"> Quadrates containing 10 mature sample trees in a representation of each GDE identified with the 2 m and 0.5 m contour Representation of each terrestrial GDE vegetation association present within all water table drawdown contours 	Groundwater level	Monitoring bores	Bores in close proximity to confirmed terrestrial GDEs (where available)	Quarterly
			Leaf water potential	Scholander pressure chamber	Three samples per tree, 10 trees per quadrat	
			Condition and health	Visual assessment (Appendix B) and Normalised Difference Vegetation Index (NDVI)	Assessment per site	

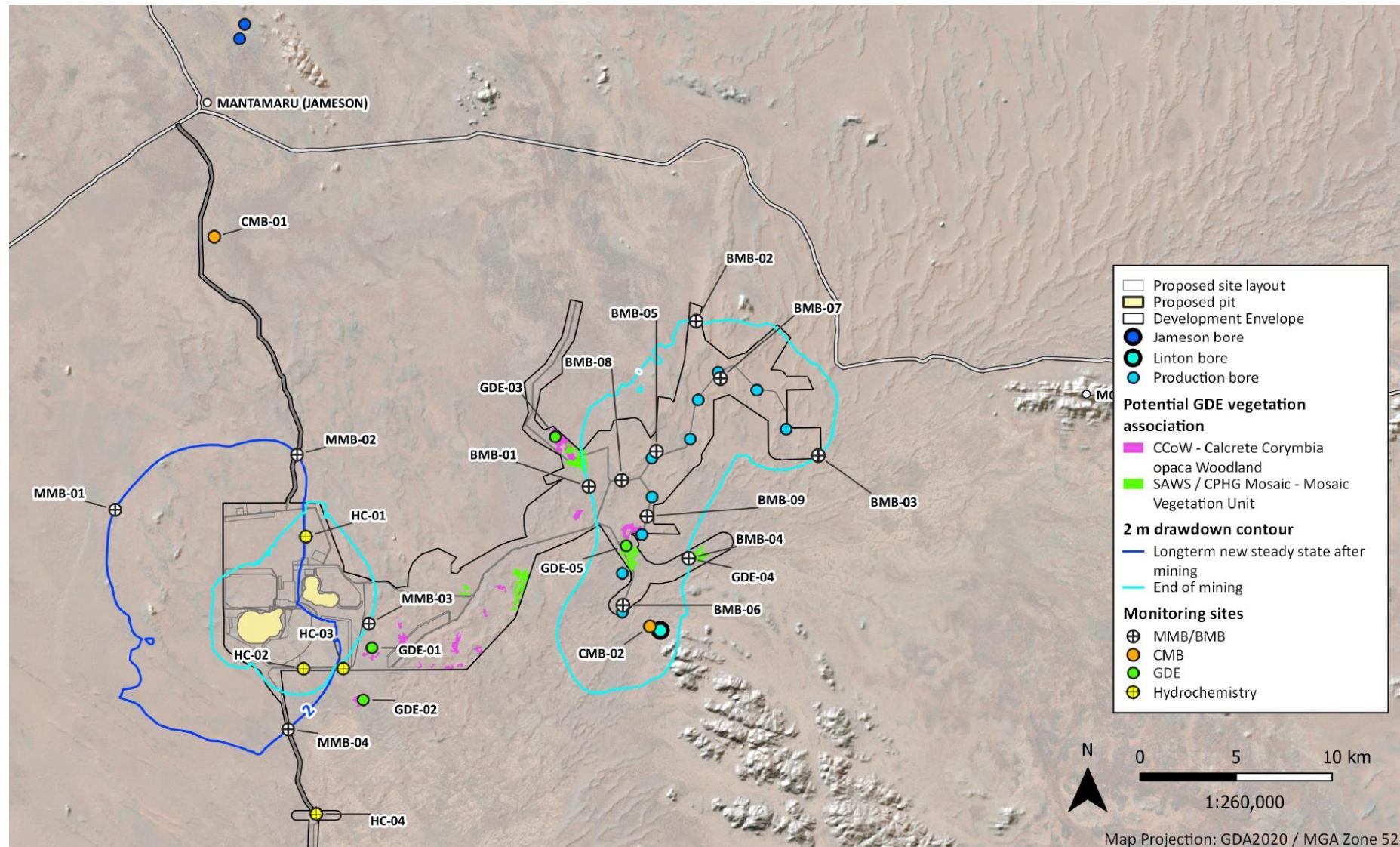


Figure 6: Proposed Groundwater Monitoring Network

2.4 Implementation of Trigger Criteria Actions

OZ Minerals has developed trigger criteria actions that would be implemented if the associated trigger criterion signals the need for increased mitigation or protection (Table 11). These trigger criteria actions will be implemented by OZ Minerals to mitigate and manage impacts attributable to the project so they once again will meet trigger criteria and safeguard threshold criteria.

2.5 Implementation of Threshold Criteria Contingency Actions

OZ Minerals has developed threshold criteria contingency actions that would be implemented if the associated threshold criteria signals that the environmental outcome may be exceeded (Table 11). The threshold criteria contingency actions will be implemented to manage aspects of the project and achieve the environmental outcome and manage any impacts attributable to the project to below trigger criteria and threshold criteria, thereby bringing OZ Minerals back into compliance.

2.6 Reporting

2.6.1 Ngaanyatjarra Council and Ngaanyatjarra People

All reporting discussed in this section will be made specifically available to the Ngaanyatjarra People through the Ngaanyatjarra Council, including where necessary periodic face-to-face meetings to discuss the results and outcomes of monitoring.

Where necessary training and support of relevant members of the Ngaanyatjarra People will be supported by OZ Minerals to ensure an understanding of monitoring results and their relevance. Further, opportunities for the involvement of Ngaanyatjarra People in the monitoring activities will continue to be explored as the project is developed.

2.6.2 Annual Reporting

A Compliance Assessment Report (CAR) will be submitted to the Compliance Branch at DWER at an agreed date. The CAR will document compliance with conditions of approval including assessment of compliance with management plan requirements where management plans form part of the approval conditions.

Where required, environmental outcomes will be reported against each calendar year in the CAR prepared in accordance with the Post Assessment Guideline for Preparing a Compliance Assessment Report, Post Assessment Guideline No. 3 (OEPA, 2012).



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If environmental performance criteria were exceeded during the reporting period, the CAR will include a description of the effectiveness of contingency responses that have been implemented to manage the impact, as well as an analysis of trends.

2.6.3 Annual and Triennial Aquifer Review

OZ Minerals will prepare annual and triennial (every three years) groundwater monitoring and management reports for submission to DWER (Water Branch). The annual and triennial groundwater monitoring and management reports will comply with Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence (DoW, 2009). The reports will include an assessment of compliance with the GMMP and may include recommendations for changes to the water management system to maintain compliance with the GMMP.

2.6.4 Reporting of Potential Non-Compliances

In the event that monitoring, tests, surveys or investigations indicate an exceedance of a threshold criteria in Table 11, OZ Minerals will report in accordance with the requirements of the relevant Ministerial Statement Condition(s).

3 ADAPTIVE MANAGEMENT

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of management actions, or the generation of new information. Adaptive management practices that will be assessed for this management plan include:

- Evaluation of the monitoring program, data and comparison to baseline data and reference sites on an annual basis, or more frequently depending on whether trigger or threshold criteria are exceeded, to verify whether responses to project activities are the same or similar to predictions.
- Evaluation of assumptions and uncertainties of the management and monitoring programs, in particular:
 - Review of results from additional groundwater drilling, and subsequent updates to hydrogeological numerical modelling and their influence on the groundwater drawdown predictions.
 - Review of additional terrestrial GDE work programs described in Table 7 including re-evaluation of threshold criteria and trigger criteria based on whether species are confirmed to be GDEs or not (i.e., Uncertainty 3) and/or demonstrate a statistically significant reduction in health in response to reduced water requirements of less than 2 m (i.e., Uncertainty 4). Should they be required, these changes would be adopted in subsequent revisions of this management plan.
- Re-evaluation of the risk assessment and revision of risk-based priorities resulting from monitoring outcomes (including any updates to the numerical hydrogeology model) as appropriate, including review and updates of trigger criteria and threshold criteria, as necessary.
- Review of data and information gathered over the review period that has increased understanding of the site environment in the context of the regional ecosystem.
- Review of management actions as the project matures and new management measures and technologies become available that may be more effective for environmental management.
- Assessment of changes which are outside the control of the project and the management measures identified (i.e. a new project within the area or region, or regional change that affects management).

In addition, through the adaptive management approach, emerging research and technology will be continuously reviewed to identify further measures to proactively control and mitigate potential impacts to groundwater.

A review of this GMMP will be undertaken following the review of the associated monitoring program and the corresponding results.



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3.1 Management Plan Review

This GMMP will nominally be reviewed at least every three years from the date of endorsement to ensure that it reflects the then-current situation with regards to groundwater monitoring and management. This GMMP may also be reviewed should any of the following occur:

- The addition or change of infrastructure within the project that has the potential to significantly change the predicted direct or indirect impacts related to groundwater, that was not approved as a part of the project and would require regulatory approval (e.g. the construction of an additional TSF or WRD, the addition of new dewatering or borefield infrastructure).
- Any change in operational practices on site that has the potential to significantly change the predicted direct or indirect impacts related to groundwater, and that was not approved as a part of the project and would require regulatory approval (e.g. an increase in abstraction rate, a change in the construction or operational methodologies associated with the TSF or WRD).
- A change in understanding, status, nature or scale of potential GDEs and/or beneficial users related to this GMMP (e.g. the addition of new third-party groundwater users, identification of additional plant species dependent on groundwater and/or a further understanding of the EWRs and EWPs (WRC, 2000) related to existing identified GDEs).

Any changes to this GMMP may require approval from EPA and may involve consultation with relevant stakeholders.

4 STAKEHOLDER CONSULTATION

Extensive consultation has been undertaken associated with the Section 38 Referral under Part IV of the EP Act and thereafter. Details of these consultations are provided in Section 3, Section 6.1.3, Appendix A4 and Appendix A5 of the EPA Section 38 Referral (OZ Minerals, 2021).

Through consultation specifically with the Traditional Owners the following areas were identified as areas of concern to Ngaanyatjarra People, these matters have been specifically considered in this GMMP.

- Potential impacts to community water supply at Jameson (Mantamaru) community 26 km north of the project area. During dedicated on-country consultations, relevant West Musgrave Traditional Owners raised the concern of impacts to the availability and quality of the community water supply at Jameson (Mantamaru), and of the difficulty in understanding the complexities of the groundwater modelling.
- It was noted through consultation with both the Ngaanyatjarra Shire, and with Traditional Owners, that while Linton Bore, which is located 15 km south-east of the Main Development Area, is not inherently significant, it is located on the edge of the Cavanaugh Range which is an important ethnographic area. Reduction in access to water at Linton Bore may be perceived as a reduction in the health and vitality of the land to which Traditional Owners feel custodianship and responsibility.
- Potential impacts to tree species resulting from water abstraction e.g. obligate water users. This is particularly apparent for a stand of desert oaks which form part of a significant dreaming trail known as the Marlu dreaming trail located immediately west and south of the Development Envelope. Further, impacts to other potential GDEs may be perceived negatively by the Traditional Owners due to broader cultural associations and custodianship of the land.
- The potential of exposure to mine chemicals either reagents, or through the production of deleterious waste generated from leachate of rock materials.

Consultation specific to this GMMP includes internal peer review with subject-matter experts (MBS Environmental, CDM Smith and AQ2) and meetings with the Government of Western Australia's DWER and EPA.

A review of the Draft GMMP was undertaken by the Ngaanyatjarra Council (environmental and hydrogeological consultant). All relevant feedback acquired during consultation has been considered in the development of this management plan.



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5 UPDATES TO THE EMP

This section is not applicable to the first version of the Groundwater Monitoring and Management Plan and will be updated in future revisions.

6 REFERENCES

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West Musgrave Copper and Nickel Project Groundwater Monitoring and Management Plan

APPENDICES



West Musgrave Copper and Nickel Project Groundwater Monitoring and Management Plan

Appendix A GDE Assessment Review



Memo

To	Justin Rowntree	Company	Oz Minerals
From	Duncan Storey / Shane Chalwell	Job No.	314
Date	20/03/2021	Doc No.	020a
Subject	Groundwater Dependant Ecosystem Assessment		

1. BACKGROUND

Oz Minerals (OM) are developing the West Musgrave copper nickel project, in the interior of Western Australia. Prefeasibility studies and environmental approvals have been undertaken and OM are now completing a Definitive Feasibility Study and the environmental management plans that are required to comply with approval conditions. The project area is characterised by shallow groundwater levels and "desert" vegetation; 38 vegetation communities were identified predominantly comprising *Acacia sp* with a *Triodia sp* understorey. In some areas *Melaleuca glomerata* and scattered *Corymbia opaca* also occur within the *Acacia* spp. communities; *M.glomerata* and *C.opaca* have been associated with groundwater dependent ecosystems (GDE) elsewhere. Groundwater modelling has shown that groundwater levels will be drawn-down over parts of the project area, by the combined effects of dewatering and water supply abstraction. One of the environmental conditions requires that terrestrial vegetation will not be affected by drawdown, outside of the <2m groundwater level drawdown zone. To quantify groundwater-vegetation risks, a preliminary desk-top assessment to identify potentially groundwater dependent ecosystems in the project area, was undertaken by CDM Smith (March 2020). This study identified that: 1. the spatial extent of vadophytic vegetation is much greater than potentially phreatophytic vegetation; 2. notwithstanding, potential groundwater use by vegetation occurs in 8 of 35 vegetation communities identified in the project area; and 3. if it does occur, groundwater use is likely to be facultative rather than obligate.

Oz Minerals have asked AQ2 to undertake a review of the assessment of at-risk GDEs completed by CDM Smith. The memo presents a brief summary and review of the previous work and provides recommendations for field measurements to reduce uncertainty and risk in the GDE assessment.

2. GDE ASSESSMENT UNDERTAKEN

2.1 Vegetation Survey

Western Botanical (2020) identified three associations as potential GDEs within the West Musgrave Project area based on landscape position, species assemblage and the presence of species known to access deep water. These communities were:

- Calcrete *Corymbia opaca* Woodland (CCoW), which occurs over 455 ha of deep sandy swales. Dominant tree and shrub species include *Corymbia opaca*, *Eucalyptus intertexta*, *Melaleuca glomerata*, *Acacia kempeana*, and *Acacia ligulata*.
- *Melaleuca glomerata* with *Acacia kempeana* Shrubland (MgAkS), which occupies 911 ha in the surveyed area and occurs as stands within the broader *Triodia* hummock grasslands.
- Low Mallee Woodland (LMW), which occurs across 4400 ha on calcrete platforms with deep sandy soil and mainly consists of *Eucalyptus gamophylla* and *Eucalyptus oxymitra* patches within a *Triodia basedowii* grassland.

There is also an additional 1765 ha of potential GDE where these associations form as mosaics with other vegetation units.

Analysis by CDM Smith added more communities to the list of potential GDEs based on the height of dominant tree and shrub species and the depth to groundwater. In particular, communities that contain *Corymbia opaca*, *Eucalyptus intertexta*, *Melaleuca glomerata*, *Eremophila duttonii*, *Acacia maitlandii*, *Acacia melleodora*, *Eucalyptus gamophylla* and/or *Hakea lorea* are potential GDEs as these species have been identified as possible groundwater users.

2.2 GDE Assessment

CDM Smith undertook a desk-top identification of potential GDEs in the project area (March 2020). The work adopted a 3-staged approach, following the framework presented in the Australian GDE Toolbox (Richardson et al 2011) and involves the increasing focus on areas of potential GDE.

The study combined:

- Vegetation mapping and potentially phreatophytic species (as identified in published literature).
- Depth to groundwater (with shallow depth to groundwater (<2 mbgl) increasing the likelihood of groundwater use).
- Remote sensing data to assess the persistent greenness of each vegetation community.
- Changes in groundwater salinity along flow-lines that may indicate evapotranspirative concentration of salts in groundwater.

The review identified 8 vegetation communities that may use groundwater, within the study area. One of these 8 was defined as a likely obligate phreatophyte while the remainder were defined as potential facultative phreatophytic systems. The 8 vegetation communities covered a relatively small portion of the overall project area (which comprises 35 vegetation communities in total).

The obligate GDE related to the presence of *Eremophila duttonii* shrubland.

Three of the potential facultative GDEs are associated with the presence of calcrete in the substrate with varying keystone vegetation species (including *Corymbia opaca*). Two of the potential GDEs relate to the presence of *Melaleuca glomerata* and the remaining two relate to the presence of various *Acacia sp.*.

2.3 Review and Comment

The desk-top assessment includes the following assumptions and / or limitations:

- The study focusses on the simple presence rather than abundance of potentially phreatophytic keystone species (which is appropriate from an ecological values perspective). The study assumes the presence of a potential phreatophytic species implies a potential GDE; no account is taken of species density. Species that are present at very low density (if they are keystone species) have the opportunity to develop extensive lateral roots and will have access to large volumes of soil water. In particular, it is noted that the *Corymbia opaca* woodland comprises only 2% tree cover which may allow extensive lateral tree roots. This means the desk top study is likely to be conservative (i.e., identified a larger area of GDE potential than may be the case).
- The determination of the potential for a species to use groundwater is based primarily on a detailed literature review as presented in Appendix A of the report (combined with project specific vegetation mapping). However, the basis of the listed conclusion by the studies in the appendix is not always clear nor is the application of any local context. This means the

desk top study is likely to be conservative (i.e., identified a larger area of GDE potential than may be the case).

- The desk top study notes the limitations of remote sensed data due to pixel size in the data set compared to the relative vegetation density. Over the observed data periods, all vegetation communities (both potentially GDE and non GDE) have relatively similar “greenness indices” (i.e., there is little differentiation). Also, the greenness index is generally higher in a wet period than a dry period. Overall, the greenness index assessment is not a strong diagnostic tool in this circumstance.
- The desk-top assessment does not consider potential causes of the increase in salinity through the project area, other than to note it is a potential indicator of evapotranspirative concentration (which is the case). The extent and scale of salinity increase is interesting though at odds with the extent that may be expected given the relatively small area of potential GDE and low-density vegetation within the potential GDE areas. This warrants further consideration.
- At desk-top level, the study could not consider the ecohydrological water balance and plant-available water. The study has identified areas of risk that require further investigation that will allow application of local context (such as vadose zone plant available water and vegetation density).

3. RECOMMENDATIONS

The following recommendations are made to add more confidence to important assumptions that have been used in the work and the assessment of probable GDEs:

- Key aspects of the conceptual ecohydrological model should be measured so that the water fluxes within the system can be quantified:
 - The actual density of trees that may use groundwater within each system should be quantified. This will involve measurements of stand basal area (SBA - trunk or stem (m^2) per unit area (ha)) in an appropriate quadrat sampling program.
 - The size of each stem should also be measured, and a size-class distribution (SCD) developed.
 - DBH / SCD / SBA should be recorded by species.
 - For each DBH measurement, sapwood should also be sampled through coring. This will allow a relationship between SBA and sapwood-area to be developed.
 - Pre-dawn and midday leaf water potential measurements should be collected from representative trees to gain an understanding of pre-dawn water status, hydraulic gradients that are driving transpiration, diurnal rehydration, and water stress. Based on the principle of nocturnal hydraulic equilibration between the root zone and soil matric pressure, pre-dawn leaf water potential can also provide an indication of plant water source.
 - Soil water, groundwater and plant xylem water samples should also be subject to isotopic analysis. The comparison of isotopic indicators will provide insight into the relative contribution of each water source to plant available water.
 - Hand-auguring within the potential GDE areas should be attempted to collect soil samples (although it is noted that the presence of hard-pans may limit auger penetration). Samples should be analysed for particle size distribution (including hydrometer analysis for the fines fraction) and moisture content; the latter should

be achievable if the samples are weighed and sealed in the field and then oven-dried in the laboratory.

- Data loggers should be installed in groundwater monitoring bores close to potential GDEs and set for relatively high frequency monitoring (e.g., 10-minute intervals) over a diurnal cycle. A diurnal rise and fall in groundwater level can often be discerned where transpiration from the water table is occurring.
- Develop a quantified conceptual model based on analysis of the above data. Key aspects of this should include:
 - Estimates of stand-level transpiration based on SBA or sapwood area measurements, and published transpiration estimates for the relevant species.
 - Estimate of vadose zone hydraulic properties using pedogenic transfer functions and the soil PSD data. Properties should include matric pressure / moisture content relationships, capillary rise, and unsaturated hydraulic conductivity; the latter will influence the ability for significant water migration to support the capillary fringe or shallow PAW.
 - Estimates of tree water source and water status using the LWP and isotopic data.
 - LWP and isotope data combined with groundwater level data should be used to estimate likely root zones / root depths for the potentially phreatophytic species. In this regard it should be noted that: root systems cannot tolerate permanent saturation and so the persistent groundwater level represents a lower limit to the root depth. Also, the lower the pre-dawn leaf water potential, the drier (and further from the capillary fringe) the root zone is likely to be. Conservatively, if pre-dawn LWP is less than -0.5 MPa, then groundwater connection is very unlikely.
 - A representative rainfall sequence (with respect to frequency and magnitude) should be developed (or adopted from surface water studies that have been completed as part of the project).
- A Hydrus-based numerical ecohydrological model should be developed to simulate the conceptual model as developed above. The model should include the groundwater table as a lower boundary condition and incorporate high levels of root-compensation (which is a common desert phreatophyte adaptation). The prime water input to the model will be the representative rainfall sequence. The modelled “soil” should cover the range as determined from the hand-auguring exercise. The model should be calibrated against all observed and inferred characteristics of the system including:
 - Depth to groundwater and inferred rates of groundwater recharge.
 - Soil moisture content.
 - Transpiration rates.
 - Modelled matric pressure can be compared with observed pre-dawn leaf water potential and used to calibrate both water availability and root depth.
- For unsaturated zone ecohydrological modelling, it is often the case that the combination of model parameters that simulate the observed outcome is unique i.e., each input parameter can only vary through a small range before the model is no longer consistent with field observations. Thus, the model provides a good verification tool for the conceptual model.
- The combination of field data, quantified conceptual model and numerical model should be used to confirm the likelihood and extent of groundwater use for each potential GDE type.

- The model should also be used to simulate the rate and extent of groundwater drawdown that is predicted from associated groundwater modelling. If groundwater use is important to the systems, then rates of transpiration will decline as less groundwater is available. The decline can be correlated to both loss in areal extent (i.e. reduction in SBA) and loss in key species if the model simulates that key matric pressure thresholds are exceeded i.e. if the model simulates prolonged periods with matric pressure below the point at which a tree may lose turgor or suffer embolism, then that species may be at risk.
- In parallel, a review of groundwater salinity and the major ions that compose the groundwater should be undertaken to provide more insight on the increase in groundwater salinity from north to south through the project area. This should include available information on soil, shallow geology and vegetation cover to determine causative factors.

We trust this review meets with your immediate requirements and provides an indication of the next steps to increase confidence and quantification in the understanding of the groundwater-vegetation interaction at West Musgrave. Should you require any further information, please do not hesitate to contact us.

Regards

Shane Chalwell

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Reviewed: DGS (01/06/21)

Appendix B Vegetation Health Monitoring Guidelines

B.1 Purpose

The trigger criteria and threshold criteria identified in the GMMP to manage potential impacts to environmental values, namely terrestrial groundwater dependent ecosystems (GDEs) are based on a number of assumptions and uncertainties. In particular, the GMMP relies on limited, to no impact to terrestrial GDEs outside of the 2 m water table drawdown contour. As such the GMMP has developed trigger criteria and threshold criteria aimed at ensuring that water table drawdown does not extend beyond the predicted modelled contours, and should trigger criteria and threshold criteria indicate an exceedance, a number of contingencies have been proposed to bring groundwater conditions within acceptable limits.

This vegetation health monitoring guideline provides a standardised framework for quantifying vegetation health, and changes to vegetation health over time, should groundwater threshold criteria identified in Table 8 of the GMMP be exceeded.

B.2 Baseline Survey

A baseline monitoring survey of potential terrestrial GDEs identified within the predicted 0.5 m water table drawdown contour will occur prior to commissioning of water affecting activities. This baseline will assist in measuring change that may be attributed to project activities. The baseline survey will occur using representative quadrats containing ten mature trees within each terrestrial GDE association and a vegetation health and conditional assessments will be completed, as detailed in Table 14. Should the baseline survey of potential terrestrial GDEs confirm that no GDEs are present, no further vegetation health assessments would occur.

B.3 Vegetation Health and Condition Assessment

B.3.1 Vegetation Health Monitoring Parameters and Methods

A set of monitoring parameters and methods has been selected to provide broad coverage of potential changes in vegetation health that may be expected at WMP (Table 14). The advent of new technology may result in changes to sampling methods and analyses employed.

Table 14: Vegetation Health Monitoring Parameters and Methods

No.	Monitoring Parameter	Method
Baseline Establishment		
1.	Water table monitoring	Construct water table monitoring bore, and gauge depth to water table using an electronic water level dip meter
2.	Condition and Health	Visual assessment of vegetation health (Table 15) Remote sensing assessment of condition and health (Section B.3.3)
3.	Water potentials: Leaf water potential	Collect leafy shoots at pre-dawn and midday from mid-canopy to be tested for water potential using a pressure chamber
4.	Stable isotopes of water	Collect twig, soil (at 0.5 m intervals) and groundwater samples and submit to a NATA-registered laboratory for analysis of stable isotopes of water in plant xylem, soil water and groundwater
5.	Photo point monitoring	Photos taken from fixed points
6.	Meteorological data	Data from weather stations installed near monitoring sites
Ongoing Assessment		
1.	Water table monitoring	Gauge depth to water table using an electronic water level dip meter
2.	Condition and Health	Visual assessment of vegetation health (Table 15) Remote sensing assessment of condition and health (Section B.3.3)
3.	Leaf water potential	Leafy shoots are collected pre-dawn and midday from mid-canopy to be tested for water potential using a pressure chamber
4.	Photo point monitoring	Photos taken from fixed points
5.	Meteorological data	Data from weather stations installed near monitoring sites

B.3.2 Vegetation Condition and Health

Vegetation condition and health of potential terrestrial GDEs is assessed using Souter et al (2010) condition rating (Table 15).

Table 15: Vegetation Health Assessment for Trees and Shrubs (adapted from Souter et al, 2010)

Score	Health Ranking	Health Rating/Description
Crown Extent and Density		
0	0%	None
2	1–10%	Minimal
3	11–25%	Sparce
4	26–75%	Medium
5	91–100%	Major
Epicormic Growth		
1	Absent	Effect is not visible
2	Scarce	Effect is present within the assessable crown but not readily visible
3	Common	Effect is clearly visible through the assessable crown
New Tip Growth Scores		
1	Absent	Effect is not visible
2	Scarce	Effect is present within the assessable crown but not readily visible
3	Common	Effect is clearly visible through the assessable crown
Reproduction Scores		
1	Absent	Effect is not visible
2	Scarce	Effect is present within the assessable crown but not readily visible
3	Common	Effect is clearly visible through the assessable crown
Leaf Die-off		
1	Absent	Effect is not visible
2	Scarce	Effect is present within the assessable crown but not readily visible
3	Common	Effect is clearly visible through the assessable crown
Presence of Mistletoe		
1	Absent	Effect is not visible
2	Scarce	Effect is present within the assessable crown but not readily visible
3	Common	Effect is clearly visible through the assessable crown
Bark Condition		
0	Intact	Intact bark
1	Minor	Minor cracks
2	Moderate	Moderate bark cracks
3	Extensive	Extensive bark cracks
4	Absent	Long-term dead tree

B.3.3 Multi-Spectral Imagery

Vegetation health can be measured using remotely-sensed data. There are a number of Indices that can be used, currently the most commonly applied is the Normalised Difference Vegetation Index (NDVI) but other indices may be used as they are developed to provide the most appropriate approach.

NDVI is a vegetation index derived from multispectral imagery to provide a quantitative measure of plant health/vigour. NDVI is a modulation ration between near infra-red (NIR) and red radiation as per the formula $NDVI = (NIR - \text{red}) / (NIR + \text{red})$. Values range from -1 (red dominant) to 1 (NIR dominant). Healthy green vegetation (chlorophyll content) exhibits low red and high NIR reflectance, resulting in positive NDVI values. The multispectral imagery used to derive NDVI measurements is generally captured to a spatial resolution of 0.5 m.

B.4 Statistical Analysis

Data will be handled in accordance with the data handling protocol developed by OZ Minerals for the project. The protocol will include the requirements as to data storage and protection, data extraction, quality control, analysis, interpretation, reporting and presentation.

Statistical analysis of data will be undertaken where data quantity and quality permits. Where data capture allows, analysis will include univariate or multivariate analysis, as deemed appropriate, to determine whether there are any statistical variations in monitoring data.

A statistically significant difference will be determined objectively using accepted statistical techniques with significance (P) set at $P < 0.05$.

Statistical analysis methods for vegetation health monitoring may include:

- Scatterplots for assessing relationships between parameters including identification of situations where statistical inference is not feasible
- Statistical tests such as parametric tests for difference between means (T test, ANOVA) and non-parametric test (Kruskal Wallas etc.)
- Least Square Means plots (with error bars) may also be used to help interpret p-value results with 95% confidence intervals of the difference between treatments also considered.

B.4.1 Vegetation Health Monitoring Program Review

This vegetation health and condition monitoring guideline will be reviewed and updated in-line with Section 2.3 of the GMMP.

B.5 References

Souter N.J., Cunningham S., Little S., Wallace T., McCarthy B. and Henderson M. (2010). *Evaluation of a visual assessment method for tree condition of eucalypt floodplain forests*. Ecological Management and Restoration. Volume 11, No. 3. December 2010.



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West Musgrave Copper and Nickel Project
EPA Section 38 Referral Supporting Document

Appendix K3. Greenhouse Gas Management Plan



West Musgrave Copper and Nickel Project

May 2021

Greenhouse Gas Management Plan



West Musgrave Copper and Nickel Project Greenhouse Gas Management Plan

VERSION CONTROL

Version	Authorisation	Position	Signature	Date
Final For Initial Approval	Justin Rowntree	Environment and Approvals Lead – West Musgrave		1 June 2021
	Michael Wood	General Manager – West Musgrave		1 June 2021
	Matt Reed	Acting Chief Commercial Officer – OZ Minerals		1 June 2021



West Musgrave Copper and Nickel Project Greenhouse Gas Management Plan

DISCLAIMER

This Management Plan and associated appendices for the West Musgrave Copper and Nickel Project (Document) has been prepared for submission to the Government of Western Australia's Environmental Protection Authority acting on behalf of the Minister for the Environment under the *Environmental Protection Act, 1986* (WA) and no one other than the Minister, or their delegate, should rely on the information contained in this Document to make, or refrain from making, any decision.

In preparing this Document, OZ Minerals Limited (OZ Minerals) has relied on information provided by specialist consultants, government agencies and other third parties. OZ Minerals has not fully verified the accuracy or completeness of that information, except where expressly acknowledged in this Document.

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NOTE ON CURRENCY

Where possible, information contained in this Document is up to date as at May 2021. This was not possible for all supporting appendices, and information based on those appendices, which were prepared by third parties (as discussed in the second paragraph in the Disclaimer above) prior to the Document being finalised.

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West Musgrave Copper and Nickel Project

Greenhouse Gas Management Plan

SUMMARY

A summary of the key Environmental Management Plan (EMP) information is presented in Table 1.

Table 1: Summary of Key EMP Information

Project Information	Description
Proposal Name	West Musgrave Copper and Nickel Project
Proponent Name	OZ Minerals
Ministerial Statement No/s and Condition/Clauses	The Proposal is currently being assessed by the Government of Western Australia's Environmental Protection Authority (EPA). The EPA has proposed that a Greenhouse Gas Management Plan (GHG MP) will be a condition of approval of the proposed project. A Ministerial Statement and associated conditions are yet to be issued.
Purpose of the EMP	<ul style="list-style-type: none">To support the assessment, approval and implementation of the Proposal under Part IV of the <i>Environmental Protection Act 1986 (WA)</i> (EP Act)The Proposal is being assessed by the EPA under Part IV of the EP Act, through Assessment of Referral Information (ARI)This GHG MP has been developed in accordance with the Instructions on how to prepare <i>Environmental Protection Act 1986 Part IV Environmental Management Plans</i> (EPA, 2020a) and Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2020b)This GHG MP has also been prepared to demonstrate the commitment of OZ Minerals' to a pathway to zero greenhouse gas emissions for the West Musgrave Project (WMP).
Key Environmental Factor	Greenhouse Gas
Objective	Reduce net greenhouse gas emissions to minimise the risk of environmental harm associated with climate change. Contribute to Western Australian GHG policy commitment to adapting to climate change and working with all sectors of the economy to achieve net zero greenhouse gas emissions by 2050.
Key Provisions of the EMP	<ul style="list-style-type: none">Continuous progression towards net zero emissions by 2050Development of Decarbonisation Roadmap to support a trajectory towards zero emissionsEstablish WMP baseline emissions in accordance with National Greenhouse and Energy Reporting (NGERs) and maintain emissions no greater than baselineImplement GHG monitoring and reporting programsAchieve emissions reduction trajectory as defined in the Decarbonisation RoadmapReview Decarbonisation Roadmap.
Proposed Construction Timing	Commencing 2022, progressing to 2024
EMP Required Pre-construction?	Yes, prior to issuing of Ministerial Statement
Proposed Operations Timing	26 years from date of commissioning

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1 CONTEXT, SCOPE AND RATIONALE

This Greenhouse Gas Management Plan (GHG MP) has been prepared by OZ Minerals to support the assessment, approval and implementation of the Proposal under Part IV of the *Environmental Protection Act, 1986 (WA)* (EP Act). GHG emissions are addressed under State legislation, primarily governed by the EP Act. In addition to State legislation, the following policy and guidance statements were considered in the development of this GHG MP:

- EPA Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2020b)
- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2020c)
- Greenhouse Gas Emissions Policy for Major Projects (Government of Western Australia, 2019a).

This GHG MP addresses the Notice Requiring Information for Assessment, received from the EPA on 14 April 2021 (the Notice). The Notice requires OZ Minerals to:

Provide a Greenhouse Gas Management Plan detailing credible estimates of scope 1, scope 2 and scope 3 Greenhouse Gas (GHG) emissions (annual and total) over the life of a proposal, a breakdown of GHG emissions by source inclusive of, but not limited to, stationary energy, fugitives, transport, and emissions associated with changes to land use, and projected emissions intensity (emissions per unit of production) for the proposal and benchmarking against other comparable projects. The Plan should demonstrate a commitment to achieving net zero emissions by 2050, or clearly articulate why this is not possible. The Plan should also outline how revisions of targets and strategies would be made publicly available. The Plan should be prepared in accordance with the Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2020).

The EPA Guidance for GHG emissions provides several items for consideration during the environmental impact assessment and management process, specifically:

- Application of the mitigation hierarchy to avoid, reduce and offset emissions
- The interim and long-term emissions reduction targets the proponent proposes to achieve
- Adoption of best practice design, technology and management appropriate to mitigate GHG emissions
- Whether proposed mitigation is plausible, timely, achievable and is all that is reasonable and practicable.

1.1 Proposal

1.1.1 Project Overview

The West Musgrave Copper and Nickel Project (WMP) is located in the West Musgrave Ranges of Western Australia. The WMP is located approximately 1,300 km north-east of Perth near to the border of South Australia and the Northern Territory. The WMP is within the Ngaanyatjarra Native Title determination, and Class A Reserve No. 17614 (for the Use and Benefit of Aboriginal Inhabitants). The nearest towns include the Indigenous Communities of Jameson (Mantamaru) 26 km north, Blackstone (Papulankutja) 50 km east, and Warburton (Milyirrtjarra) 110 km west of the project (Figure 1).

The project, with a current expected life of approximately 26 years, will consist of:

- Mining of copper and nickel ore from two open cut mine pits using conventional blast, load and haul methods
- Placement of mine waste into permanent waste rock dumps (WRDs) and dedicated tailings storage facility (TSF) adjacent to mine pit voids
- Milling and processing of ore using floatation to produce two separate copper and nickel concentrates
- On-site power supply using a combination of renewable power infrastructure (photovoltaic solar panels, wind turbines and battery storage) supported by backup thermal power generation
- Development of a process/potable water supply borefield that may include a combination of overland and/or underground pipelines for use during construction and operations
- Miscellaneous infrastructure, including stormwater management infrastructure (bunds and drains), internal roads and service tracks, a dedicated site access road, accommodation village (approximately 450 beds during operations and 1,200 during construction), airstrip, wastewater treatment, landfill and other supporting infrastructure including offices, warehouses and workshops.
- Concentrate will be transported to Esperance via existing roads and rail networks.

A summary of the key project characteristics is presented in Table 2.

Table 2: Key Project Characteristics

Elements	Location	Proposed Extent Authorised
Physical Element		
Mine and associated infrastructure	Figure 2	Clearing of up to 3,830 ha of native vegetation within a Development Envelope of 20,852 ha
Operational Element		
Mining voids	Figure 2	Below water table mining Nebo pit void to be backfilled above water table post-closure Babel pit void to be a permanent and episodic pit lake post-closure
Mining waste (waste rock)	Figure 2	Placement of waste rock into permanent WRDs
Ore processing waste (tailings)	Figure 2	Disposal of tailings into a TSF and/or Nebo pit void
Power supply	Figure 2	Up to 60 MW (instantaneous load requirement) of fossil fuel electricity generation Up to 100 MW of photovoltaic solar electricity generation Up to 100 MW of wind electricity generation
Water supply	Figure 2	Abstraction of up to 7.5 GL/a of groundwater from the Borefield and through mine pit dewatering



Figure 1: Site Location

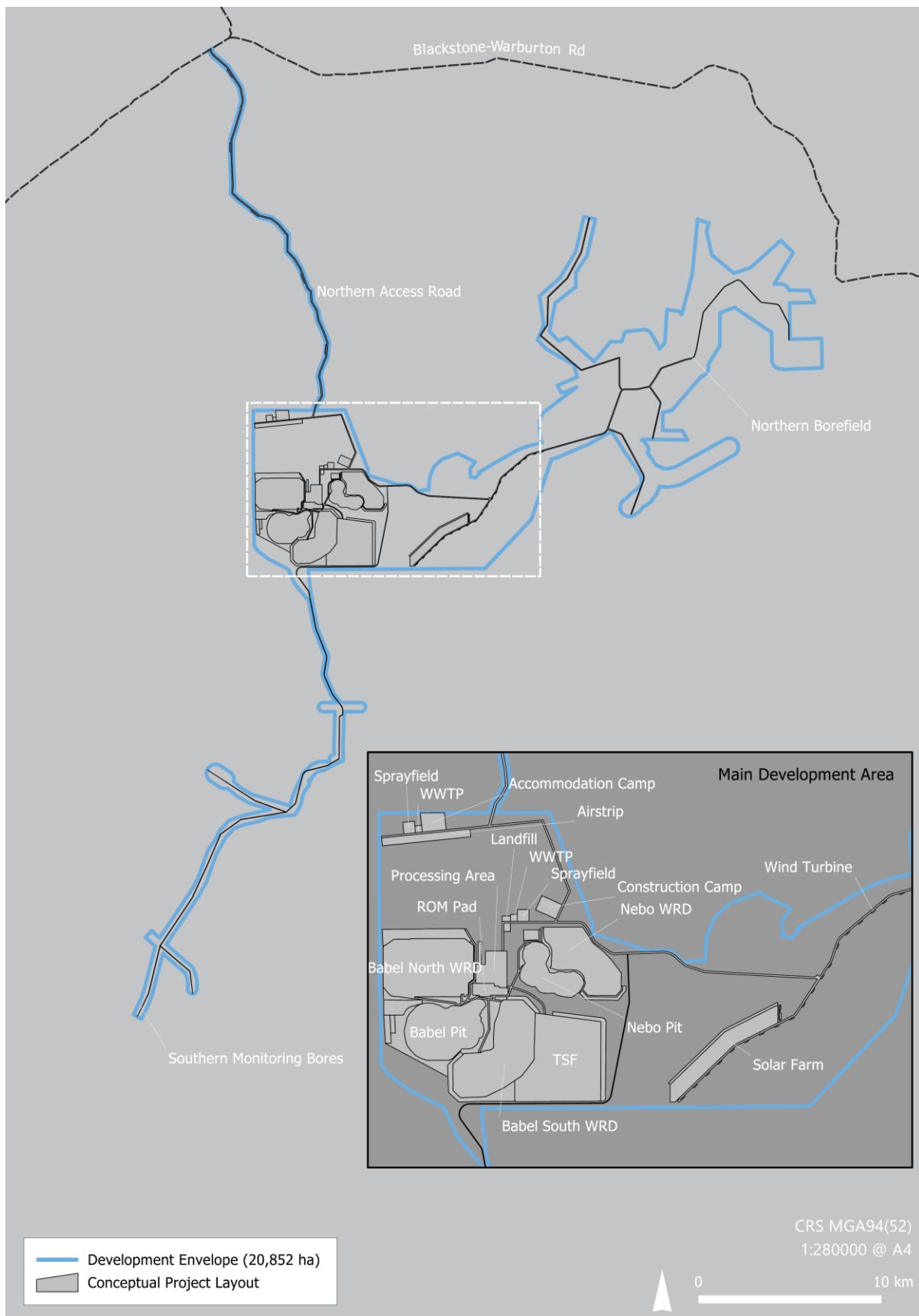


Figure 2: Location of Key Physical and Operational Elements

1.2 Key Environmental Factor

This GHG MP specifically relates to the Greenhouse Gas Emissions factor guidelines within the EPA Air environmental factor. The EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020c) lists the following as their objective for greenhouse gas emissions:

To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change

The objective recognises the fundamental link between GHG emissions and other Environmental Factors through effects on climate. For example, climate change has already caused a significant drying of the State's south-west, which in-turn places significant additional pressures on water resources, flora and fauna, marine environmental quality, and social surroundings.

1.2.1 Proposal Activities that May Affect the Key Environmental Factor

1.2.1.1 Scope 1 and Scope 2 Emissions

The most significant sources of GHG emissions expected to be emitted by the project include:

- Combustion product emissions associated with the use of diesel electricity generation
- Combustion product emissions associated with use of diesel-powered mining and earth moving vehicles.

Estimates of GHG emissions from the project have been prepared using methods and emissions factors from the *National Greenhouse and Energy Reporting [NGER] (Measurement) Determination, 2008* (Cth) for four operational scenarios. For each scenario, the diesel combusted for the mining fleet and LPG combusted over the life of the mine, remain the same at 997,139 kL (223,381 kL transport and 773,758 kL non-transport) and 214 kL, respectively. The key difference between each scenario is the fuel combustion for power generation:

- Scenario 1: 100 percent diesel/0 percent renewable (i.e., a typical 'business as usual' case)
- Scenario 2: 20 percent diesel/80 percent renewable
- Scenario 3: 40 percent diesel/60 percent renewable
- Scenario 4: 100 percent pipeline natural gas.

Scenario 2 represents the current proposed project target, and current base case, against which other scenarios were compared. However, OZ Minerals recognises that some uncertainty exists relating to the availability and consistency of renewable energy sources such as wind and sun, and as such greenhouse gas emissions have been considered for a range between Scenario 3 and Scenario 2. A summary of these projected emissions is presented in Table 3 and the lifetime emissions profile for Scenario 2 is shown in Figure 5.

The total predicted scope 1 and scope 2 emissions generation over the life of the mine is 4,060,221 t CO₂-e with an emission intensity of 0.01560 t CO₂-e/tonne ore mined for Scenario 2, and 5,415,555 t CO₂-e and 0.02091 t CO₂-e/tonne ore mined for Scenario 3, respectively (Figure 3). Even under Scenario 3, this emissions intensity represents a significant improvement over business-as-usual emissions.

A breakdown of Scenario 2; scope 1 and scope 2 emissions by source over the life-of-mine is presented in Figure 4.

Table 3: Projected Scope 1 and Scope 2 Greenhouse Gas Emissions under Scenario 2 and Scenario 3

Scenario	Greenhouse Gas Emissions by Scope (average t CO ₂ -e/annum)		Life-of-Mine Emissions (t CO ₂ -e)
	Scope 1	Scope 2 ¹	
Scenario 3 (60% renewable penetration)	77,670 – 115,570	100,400	5,415,555
Scenario 2 (80% renewable penetration)	77,670 – 115,570	50,200	4,060,221

¹ Assumes that electricity is generated and purchased via an ‘over-the-fence’ contractual arrangement. Contractual arrangements for electricity supply are yet to be finalised.

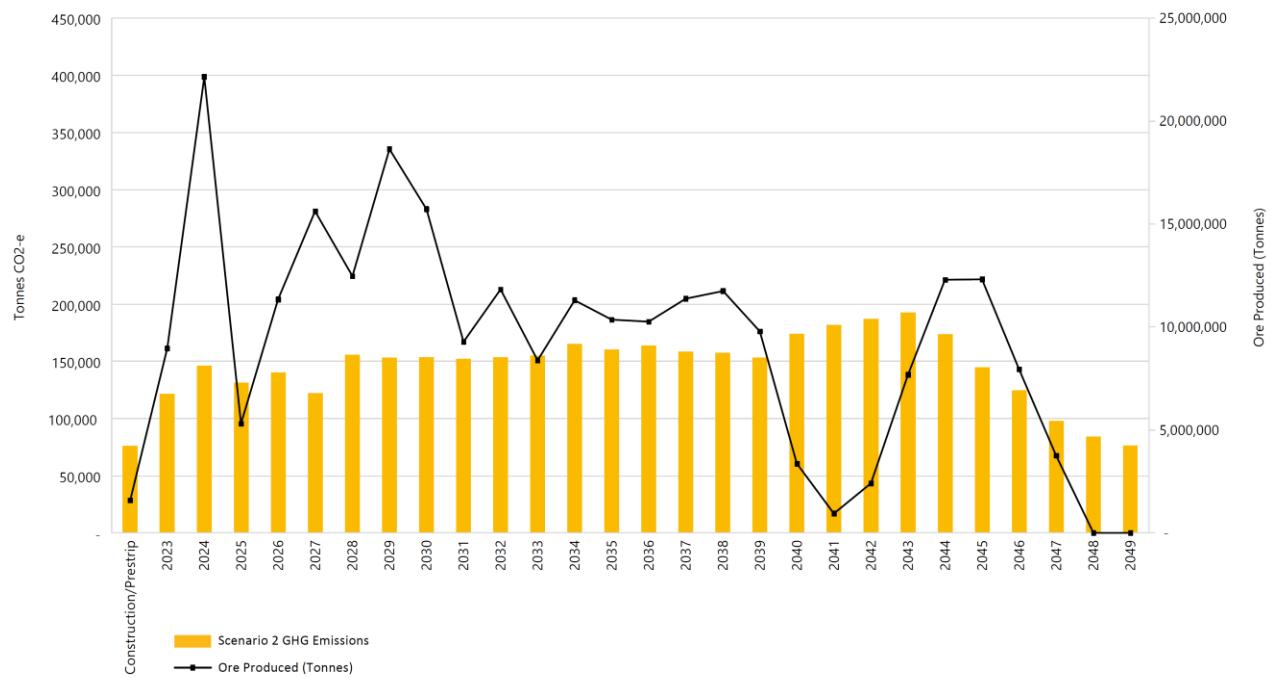


Figure 3: Projected Annual Life-of-Mine Scope 1 and Scope 2 Emissions Profile

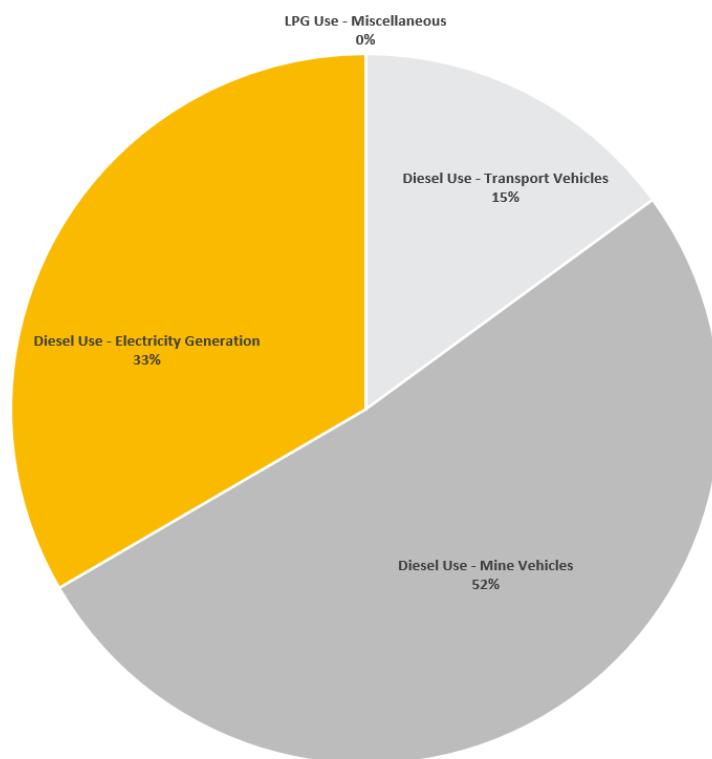


Figure 4: Breakdown of Life-of-Mine Scenario 2 Scope 1 and Scope 2 Emissions by Source

1.2.1.2 Scope 3 Emissions

Initial estimates of scope 3 emissions for the life of the project have also been estimated, however are subject to significant uncertainty given the current phase of the supporting engineering studies. Scope 3 emissions estimated to date including emissions associated with:

- Fuel and energy use
- Upstream transportation and distribution
- Processing of sold products
- Downstream transportation and distribution
- Use of sold products
- End of life of sold products
- Waste generation during concentrate production.

Scope 3 emissions not currently included in the assessment include:

- Purchased goods and services (reagents, spares etc.)
- Some capital goods (specifically the mined rock haulage fleet)
- Employee commuting-related emissions.

The total predicted scope 3 emissions generation over the life of the mine is 7,722,260 t CO₂-e with an emission intensity of 0.03016 t CO₂-e/tonne ore mined for Scenario 2 (Figure 5), and 7,413,607 t CO₂-e and 0.02895 t CO₂-e/tonne ore mined for Scenario 3, respectively (Table 4).

Table 4: Projected Scope 3 Greenhouse Gas Emissions under Scenario 2 and Scenario 3

Scenario	Scope 3 Greenhouse Gas Emissions (average t CO ₂ -e/annum)	Life-of-Mine Emissions (t CO ₂ -e)
Scenario 3 (60% renewable penetration)	21,800 – 380,000	7,413,607
Scenario 2 (80% renewable penetration)	21,800 – 395,000	7,722,260

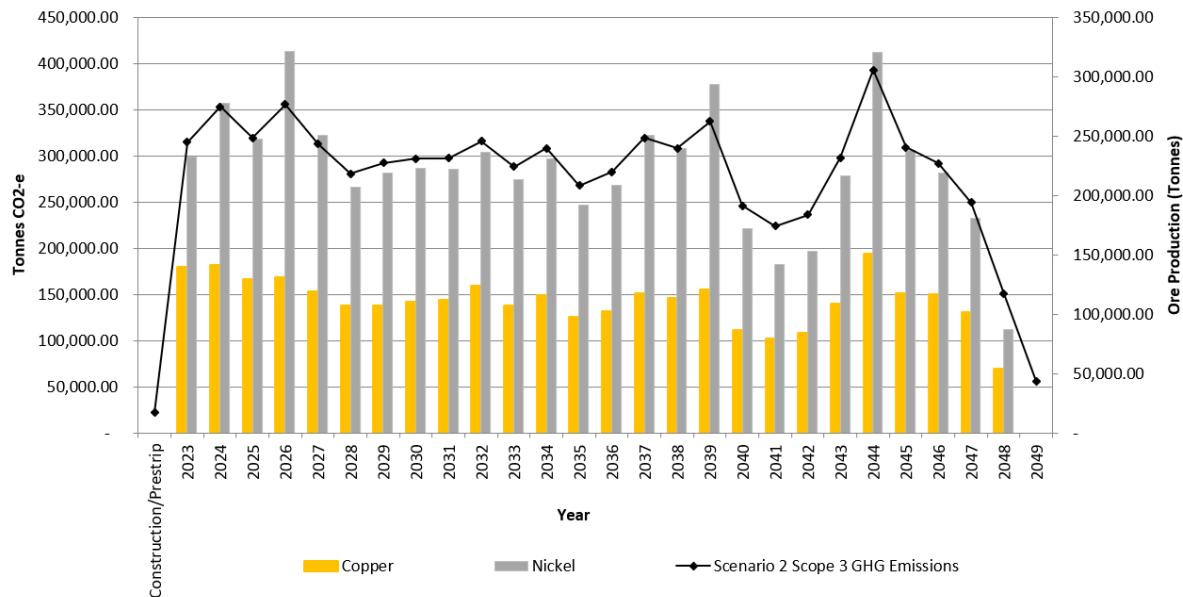


Figure 5: Projected Annual Life-of-Mine Scope 3 Emissions Profile

1.2.1.3 Land Use Change

No local studies into the potential carbon stocks of the environment in the West Musgrave region have been undertaken. An extensive study was undertaken by the Government of Western Australia's Department of Agriculture and Food in 2010 (Alchin, Tierney and Chilcott, 2010) into the potential for carbon offset enterprises within the Pilbara and Kimberley. This report quantified the carbon stocks on a range of vegetation associations within the Kimberley and Pilbara region, including within the Cheela Plains pastoral lease. Although this lease is a significant distance from the project, the area is subject to similar rainfall and has extensive spinifex grasslands (identified as the Capricorn land system) common around the project area.

The average carbon stocks measured for the Cheela Plains are summarised in Table 5.

Table 5: Land Use Change-related Greenhouse Gas Emissions Estimate

Carbon Pool	Carbon Mass (t C per ha)	Greenhouse Gas Emission (t CO ₂ -e per ha)
Soil	45.29	166.21
Woody vegetation	27.23	99.93
Herbaceous vegetation	14.37	52.74
Coarse woody debris	71.41	262.07
Total	158.30	580.95

Assuming a maximum area of native vegetation clearance associated with the project of 3,830 ha, the total land use-related change in carbon stocks would be up to 2,225,040 t CO₂-e, noting that the topsoil, incorporating coarse woody debris, would be stockpiled during operations and subsequently used in rehabilitation activities across the project area upon closure, and thus the carbon stock will not be removed from the environment.

1.2.2 Site Specific Environmental Values

The project is situated in remote Western Australia within the Shire of Ngaanyatjarraku. The nearest towns/settlements that have the potential for air quality related impacts from the project are Jameson (Mantamaru, approximate population of 160 people), Blackstone (Papulankutja, approximate population of 153 people) and Warburton (approximate population of 580 people) located approximately 26 km north, 50 km east and 110 km west of the project respectively.

As there are few anthropogenic influences in the area, the existing contributors to GHG emissions include power generation for remote settlements, vehicle use by community members and users of the Great Central Road and bushfires.

1.3 Condition Requirements

A Ministerial Statement and associated conditions are yet to be issued.

1.4 Rationale and Approach

This GHG MP outlines how GHG emissions for the project will be monitored and managed to minimise the Company's contributions to global GHG emissions. This recognises the Company's significant focus during project design to minimise overall emissions through use of renewable energy technologies. It is recognised however that with fast changing technology, additional opportunities to minimise GHG emissions may become available over the life of the project.

1.4.1 Survey and Study Findings

A GHG benchmarking exercise was undertaken to compare the project's scope 1 and scope 2 emissions with other comparable Australian base-metal projects. In Western Australia, this included operating copper and nickel projects that produce concentrates for sale locally or for export. These projects included the Nova, Jaguar and Tropicana Projects (Independence Group) and the DeGrussa Project (Sandfire Resources). Emissions from OZ Minerals' Prominent Hill Mine in South Australia were also included.

A comparison of emissions intensity against other similar operating projects is presented in Table 6.

Table 6: Scope 1 and Scope 2 Greenhouse Gas Intensity of Selected Australian Base-Metals Projects

Operation	Emissions Intensity (t CO ₂ -e / t Ore Mined)
Prominent Hill (OZ Minerals) ¹	0.02863
Tropicana (Independence Group) ²	0.02665
Jaguar (Independence Group) ²	0.07710
Nova (Independence Group) ²	0.10399
De Grussa (Sandfire Resources) ³	0.05840
West Musgrave Project (OZ Minerals) – Scenario 2	0.01560
West Musgrave Project (OZ Minerals) – Scenario 3	0.02091

¹ Internal data

² Independence Group NL, 2017

³ Sandfire Resources, 2020

At the peak, the WMP emissions levels would represent approximately 0.2% of Western Australia's total GHG emissions, and 0.03% of Australia's total annual GHG emissions.

1.4.2 Key Assumptions and Uncertainties

This GHG Management Plan has been developed using all relevant and available information at the time of preparation. As the understanding of GHG management improves over time, this GHG Management Plan may require updating.

The key assumptions and uncertainties associated with this current GHG MP are described in Table 7.

Table 7: Key Assumptions and Uncertainties Associated with WMP GHG Management

ID	Assumption/ Uncertainty	Description
A1	Data accuracy	Whilst there is uncertainty around the exact volumes of diesel required, and the amount of renewable electricity that may be generated year-to-year, it is assumed that the GHG emissions estimates presented in this GHG MP reasonably reflect the likely GHG footprint of the project. These numbers have been prepared by a suitably qualified third party using standard NGERs methodologies.
U1	WA and Commonwealth GHG Policy	The Western Australian EPA released a draft GHG Factor Guideline in December 2019. The guideline was finalised in April 2020 (EPA, 2020b). Further, the State introduced the Western Australian Climate Policy (Government of Western Australia, 2020) in November 2020, detailing plans to achieve the aspiration of having net zero emissions by 2050. This policy provides that, in mining, the State initiate projects which target lowering overall energy costs and reducing the carbon footprint from mining and mineral processing, through adoption of alternative energy sources and energy-efficient processes. State and Commonwealth Government policies continue to evolve, which introduces uncertainties. Some of these include:

ID	Assumption/ Uncertainty	Description
		<ul style="list-style-type: none"> The introduction of the intensity-based Benchmark Baseline process for the estimation of baseline emissions under the Safeguard Mechanism The State's contribution to Commonwealth targets The specific inclusions, exclusions and scope of State and Commonwealth emissions reduction targets to 2050 and any interim targets State and Commonwealth policy on low emissions technologies, such as the Commonwealth Technology Investment Roadmap
U2	Carbon price	<p>At the current time, there is no uniformly applied carbon price for carbon emissions in Australia, nor a uniform (Australia-wide) policy for the application of carbon credits, beyond the provisions of the Safeguard Mechanism (see Section 2.2.2). The previous carbon pricing scheme was repealed in 2014 following a change of Government. OZ Minerals maintains an internal carbon price, used to inform energy-related decision making.</p>
U3	Carbon emissions	<p>The project is proposing to generate on-site renewable electricity via installed wind turbines and solar photovoltaic systems, to be backed up by diesel-powered electric generators. Modelling has demonstrated that circa 70–80% renewables penetration can be achieved for the site, , however climatic variables (wind speed and duration, and solar irradiation) mean that this value is likely to vary over time, and thus the carbon emissions are expected to vary year-to-year.</p> <p>The Decarbonisation Roadmap seeks, amongst other things, to minimise or eliminate this variation, however until the details of this are finalised, carbon emissions from WMP remain subject to some uncertainty.</p>
U4	Alternative Fuels	<p>At the present time there exists uncertainty about the efficiency, life-cycle emissions and timing associated with the availability of renewable solutions for the replacement of diesel for the mining fleet, representing around 52% of the total scope 1 and scope 2 emissions for the project. The cost-effective availability of alternative fuels is likely to be the single largest impediment to achieving net zero emissions by 2050.</p>

1.4.3 Management Approach

The management approaches discussed in this document are based and developed around the mitigation hierarchy of avoid, minimise, rehabilitate and off-set to ensure impacts to the environment have been avoided or reduced to as low as reasonably practicable, and to identify and assess opportunities for improvement, and progress their implementation.

Management actions detailed in this GHG MP have been specifically designed to ensure the project meets the EPA's objective for Greenhouse Gases (see Section 1.2). As such, the management actions focus on the minimisation of GHG emissions from sources within the project's Development Envelope i.e., scope 1 and scope 2 emissions.

Until such time as the project is implemented, and contracts have been let for the supply and transport of materials into and from the project, and for the sale of concentrates, OZ Minerals has limited ability to influence indirect (scope 3) emissions associated with the project. As such, commitments to the



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minimisation of scope 3 emissions are not included in this GHG MP but, consistent with OZ Minerals' aspirations of systemically reducing scope 3 emissions across our value chain (e.g. current discussions with third party providers related to concentrate logistics management), may be incorporated in future revisions.

1.4.4 Rationale for Choice of Management Targets

The provisions included in this GHG MP are management-based as they relate to specific management actions.



2 INTERNAL AND REGULATORY FRAMEWORK

2.1 OZ Minerals' Approach to Climate Change

OZ Minerals accepts the international scientific consensus of the Intergovernmental Panel on Climate Change (IPCC), recognise the 2015 Paris Agreement and support its commitment to limit global average temperature rise to below 2 degrees Celsius and pursue 1.5 degrees Celsius. To this end, the project would be managed in accordance with the OZ Minerals Climate Change Statement, described in the following section. This climate challenge statement has been integral to the thinking when designing the WMP.

2.1.1 Climate Change Statement

OZ Minerals is committed to building our business sustainably — operating ethically, safely, minimising our environmental footprint, ensuring we are well-governed and are socially responsible. We deliver our aspirations by focusing on value creation for our stakeholders and we report how we have created value under the elements of Safety, Environment, Community, Health and Wellbeing (www.ozminerals.com/media/reports/annual).

A key focus of our commitment to sustainability relates to the threat of climate change. OZ Minerals recognises that climate change is a shared global challenge that requires business, government and society to work together. We are committed to playing our part in reducing greenhouse gas emissions and preparing for the physical impacts of climate change and the transition to a net-zero emissions by 2050.

OZ Minerals recognises there is a need for large reductions in global greenhouse gas emissions to reduce the scale of climate change and avoid the most severe impacts. This, coupled with the world's increasing requirement for secure, affordable energy, creates significant challenges which are best met by companies, governments and society working together.

The OZ Minerals Annual and Sustainability Report (OZ Minerals, 2020) details our Strategic Aspirations and Acceleration Priorities, which help the Company to focus on high impact activities. With respect to greenhouse gas emissions, the following Strategic Aspiration has been developed:

We will emit zero scope 1 emissions and strive to systematically reduce scope 2 and scope 3 emissions across our value chain.

To facilitate this, OZ Minerals' Acceleration Priorities related to greenhouse gas include:

- Reduce high-emissions energy use
- Investigate baseline scope 3 emissions.

2.1.2 Taskforce on Climate-Related Financial Disclosures

OZ Minerals is implementing our Action Plan for reporting our integrated climate change risks and climate-related financial disclosures in-line with the Task Force on Climate-related Financial Disclosures (TCFD) framework. The TCFD framework, together with our Action Plan, will provide a process to gain a better understanding of climate-related threats and opportunities, which can then be further integrated into our Company governance, strategy, risk management, standards and policies.

OZ Minerals' TCFD Action Plan has been aligned with our OZWay of working to support integration into our business. Integration through our strategy, governance framework, including risk and other process standards, policies and performance standards, ensures climate change risk management can be implemented and systematised across the Company and our devolved operating assets. As the Action Plan outlines, we aim to leverage and modify our Risk Management Specifications to comprehensively accommodate opportunities and threats arising from climate-related risk. Identifying risks, both opportunities and threats, for our business is key to delivering our strategy. We would continue to assure our responses to our identified climate risks are occurring and we would disclose progress in our Company's annual report and as part of our Stakeholder Value Creation Metrics..

2.1.3 Climate Change Risk Management

Climate change has been identified as a strategic risk (both opportunities and threats) by OZ Minerals since 2017. In 2020, a series of dedicated workshops with operational teams and senior management were conducted with OZ Minerals' Australian assets and projects to assess climate-related opportunities and threats in-line with OZ Minerals' Risk Management Specification. In 2021, this work will be undertaken across all OZ Minerals' global assets and projects.

The risk assessment workshops provided a platform to build understanding of climate-related risk in the context of the individual assets. Threat workshops utilised scenario analysis based on the Intergovernmental Panel on Climate Change's (IPCC's) Fifth Assessment Report (AR5) (IPCC, 2014), while opportunity workshops focused on identifying greenhouse gas reduction initiatives to support OZ Minerals' Strategic Aspirations.

Consistent with OZ Minerals' Risk Management Specification, climate-related risks are captured in asset and project risk registers. Controls and actions are captured against each risk, with regular review of progress. Risks are also reviewed regularly.

As part of a review of OZ Minerals' suite of Global Performance Standards in 2020, several Environment Performance Standards were updated to include considerations relating to assessment and management of climate-related threats and opportunities. Our Global Performance Standards enable us to effectively manage the material threats and opportunities that are common across OZ Minerals. The Performance Standards apply to our employees, directors, officers, contractors, consultants, and any other party when undertaking work for, or on behalf of, OZ Minerals.

Table 8 describes the OZ Minerals' general approach to climate change risk management.

Table 8: Climate Change Risk Management

Aspect	Description
Risk Trend Analysis	Increasing risk as community, investor and regulatory standards and expectations in relation to climate change continued to increase during 2020 and are expected to continue through 2021 and beyond
Threat	Climate change can cause disruption to mine production, logistics, and water supply as a result of extreme weather events. As regulatory agencies respond to climate change over the medium term, costs of inputs may rise and restrictions may be placed on how certain resources are provided, transported, and used. This may adversely impact the execution of the strategy and the ability of assets to operate efficiently
Opportunity	Climate change, combined with regulatory change, also has the potential to be a catalyst for growth in industries that require copper and could result in upward pressure on copper prices. Ability to proactively use lower-emission sources of energy, efficient production and distribution processes, new technologies, water and energy efficiency, and proactive participation in the carbon market can result in reduced operating costs, increased production capacity, an improved revenue and liquidity position. This can also increase reputational benefits and create value for our key stakeholders
Mitigation	OZ Minerals is committed to reducing the energy and water intensity of its operations, developing innovative practices in relation to chemical processing, and being more efficient in its transportation and processing activities. OZ Minerals' power strategy is focussed on the four key elements for all its operations: distribution, generation, procurement and demand management. Initiatives are underway across operations to reduce OZ Minerals' environmental footprint, including energy intensity, water use, waste management, and transport and logistics. We are focused on reducing carbon emissions, investing in low emissions technologies, managing climate-related threats and opportunities, and working collaboratively with others to contribute to identify improvements and transformational change. OZ Minerals has published a Climate Change Statement on its website which commits to playing its part in achieving net-zero carbon emissions by 2050

Specific threats and opportunities associated with GHG emissions identified by OZ Minerals' assets and projects that are considered relevant to the WMP are detailed in Table 9.

Table 9: Climate Change Risk Identification Relevant to the WMP

Risk	Description
Opportunities	<ul style="list-style-type: none"> • Examining options to increasingly electrify vehicle fleet over time, particularly diesel-powered haulage (scope 1) • Engaging with logistics partners to reduce transport emissions (scope 3) • Considering shifting demand peaks for energy-intensive plant and equipment to times of high renewable penetration (scope 2) • Implementing new and different processing techniques to reduce mill energy consumption (scope 1) • Considering greater renewable energy procurement (scope 2) • Evaluating onsite renewable energy options, particularly for site villages (scope 2) • Improving data collection processes and analytics to monitor and identify opportunities for improvement
Threats	<p>Extreme Heat</p> <ul style="list-style-type: none"> • Potential impacts: Employee safety (heat exposure), plant and equipment operation, power supply reliability, potential flight payload restrictions • Mitigating controls: Working in thermal conditions health and safety protocols, Trigger-Action Response Plans (TARPs) and design specifications and standards to include predicted temperature increases <p>Intense Rainfall Events</p> <ul style="list-style-type: none"> • Potential impacts: Reduced site access for supplies and shipment of product, direct impacts to infrastructure and operations, increased infrastructure maintenance requirements • Mitigating controls: Reviewing road design specifications and maintenance arrangements to consider future extreme rainfall predictions, review of site drainage infrastructure, review supply chain inventory management considering potential for disruptions, consideration of potential extreme rainfall events in TARPs

2.1.4 Emissions Reduction and Decarbonisation

2.1.4.1 Committed Emissions Avoidance and Reduction

OZ Minerals has made significant commitments to reduce GHG emissions associated with the WMP inline with our broader Strategic Aspirations and Acceleration Priorities (see Section 2.1.1). The implementation of these measures has resulted in emissions that are up to 136% less (equivalent to 5.42 Mt CO₂-e over the life-of-mine) than a standard 'business-as-usual' approach to electricity supply.

Committed measures to avoid and to reduce emissions for the WMP are summarised in Table 10.

Table 10: Mitigation Measures for Greenhouse Gas Environmental Factor

Mitigation Measures
Measures to Avoid
<ul style="list-style-type: none"> • The project is targeting 70–80% of its power supply from renewable sources that would offset significant GHG generation. To this end, the following actions have been undertaken to date: <ul style="list-style-type: none"> ◦ Collection of solar and wind data from 100 m tower on site, 24+ months of data ◦ Expression of Interested (EOI) process conducted to obtain proposals from invited parties, based on 60 MW load. EOI respondents are Australian and international, and include proposals for a wide range of technologies (renewable and non-renewable) to achieve low cost and high reliability — includes, wind, solar, battery, hydrogen, gas, diesel, trucked LNG • Implementation of an Energy Strategy, the focus area of which is to increase load flexibility and energy efficiency to align with variable renewable energy, focused on investigations covering three areas: <ul style="list-style-type: none"> ◦ Energy Reduction and Efficiency (energy demand reductions via innovative comminution and flotation solutions) ◦ Energy Management and Load Flexibility (active energy management via load scheduling matched to renewable energy generation forecasting) ◦ Fuel Substitution (substitution of fossil fuel energy with renewable energy and long-term energy storage) • The project would continue to pursue lower energy generation machinery such as vertical roller mills to minimise the overall project electricity requirements as part of ongoing value optimisation • The project would continue to investigate mechanisms to decarbonise the project, particularly the mobile fleet
Measures to Minimise
<ul style="list-style-type: none"> • Energy efficiency and GHG emissions would be considered as part of equipment selection and purchase • The project would integrate and disclose the vulnerability of the project to climate change risks as per the requirements for the TCFD • Appropriate emission control mechanisms would be selected to ensure that emissions comply with statutory requirements and acceptable standards • Develop a roadmap to net zero emissions by 2050 in-line with OZ Minerals' climate change statement and Western Australia's Greenhouse Gas Emissions Policy for Major Projects (Govt. of Western Australia, 2019)

2.1.4.2 Decarbonisation Roadmap

The WMP provides an excellent opportunity for OZ Minerals to showcase innovation in modern mining by demonstrating progress towards zero emissions mining for the WMP.

The WMP faces several decarbonisation challenges including heavy fleet. As part of the feasibility study-level of assessment for the copper-nickel mine, OZ Minerals is seeking support to develop four decarbonisation scenarios, in which the proposed mining operations at West Musgrave could achieve zero emissions. The business aims to understand the technology options, technical carbon abatement potential, associated capital and operating costs, interdependencies, as well as the threats and opportunities for each scenario. These scenarios will be developed into implementable Decarbonisation Roadmaps for the project.

The outputs of the decarbonisation study for the WMP will be used as inputs into the feasibility study-level of assessment to help OZ Minerals better understand what would be needed to develop and run the WMP as a net zero emissions mine and how this would create additional value for our five key stakeholder groups; communities, employees, shareholders, suppliers and governments.

The Decarbonisation Roadmap will be developed over three stages:

Stage 1: Scenario definitions and data collection.

The first stage will involve the following steps:

- Review and mapping of the value chain at WMP
- Calculate emissions baseline
- Define decarbonisation scenarios, which will include the lowest cost pathway and the fastest decarbonisation pathway
- Identify and prioritise decarbonisation technologies and the appropriate commercial and technical time for inclusion
- Identify options in consideration of most effective capital expenditure
- Assess scenario threats and opportunities.

Stage 2: Scenario modelling and marginal abatement cost curve development.

The second stage will involve the optimisation of the identified scenarios, following by the development of marginal abatement cost curves for each scenario.

Stage 3: Decarbonisation Roadmap and business case.

The final stage will be the development of business cases for each of the optimised scenarios (covering aspects such as capital and operational expenditure) over the project timeframe. Followed by the development of a roadmap for each scenario, which identifies points in time where OZ Minerals will be required to make key decisions about investment and technology selection.

To support the Decarbonisation Roadmap, OZ Minerals has partnered with research company State of Play and 13 other leading mining companies, plus numerous suppliers to the mining industry, to form the Electric Mine Consortium which aims to help reduce scope 1 and scope 2 carbon emissions.

2.1.4.3 Offsets

A requirement of the EPA Environmental Factor Guideline: Greenhouse Gas Emissions (EPA, 2020b) is to consider potential offsets for some or all of the project residual direct (scope 1) emissions as required to meet emissions reduction objectives. Previous sections of this GHG MP have detailed OZ Minerals' approach to decarbonisation above those mitigation measures already committed to. These will seek to reduce emissions to net zero by 2050.

Should OZ Minerals pursue offsets to mitigate some or all of its residual scope 1 emissions to meet its aspirations and/or commitments, this would most likely be through the purchase or generation of Australian Carbon Credit Units (ACCU) via the Climate Solutions Fund (CSF). An ACCU represents 1 t of CO₂-e abated or avoided.

Alternatively, or in addition to purchased ACCUs, the WMP may seek to generate ACCUs through emissions reduction or avoidance projects. To generate ACCUs, an individual or organisation must undertake an 'eligible emissions reduction' activity. These are defined in 'methodology determinations' which set out the rules for estimating emissions reductions from different activities. These methods ensure that emissions reductions are genuine (i.e. that they are both real and additional to business-as-usual operations). Methods potentially relevant to the WMP are:

- Industrial Electricity and Fuel Efficiency – which applies to an offset project that includes one or more of the following:
 - Modifying, removing or replacing existing energy consuming equipment
 - Installing energy consuming equipment as part of replacing, modifying or augmenting existing energy consuming equipment
 - Changing the way existing energy consuming equipment is controlled or operated
 - Changing the energy sources or mix of energy sources used by existing energy consuming equipment
 - Modifying, installing, removing or replacing equipment that affects the energy consumption of existing energy consuming equipment
 - Installing equipment that generates electricity at a location where existing energy consuming equipment consumes electricity obtained from an electricity grid and the electricity generated by the installed equipment will be used in substitution for the electricity obtained from an electricity grid.
- Industrial Equipment Upgrades – which applies to an offset project which includes one or more of the following:
 - Modifying, removing or replacing equipment
 - Installing additional equipment (e.g., waste heat recovery, pre-heating/cooling)
 - Changing the way existing equipment is controlled or operated (e.g., installing/upgrading control systems, sub-metering, refining control algorithms, or introducing additional feedback controls)
 - Changing the energy sources or mix of energy sources used.

There are other emissions reduction or avoidance projects that may be relevant to WMP (e.g., alternative waste treatment and landfill gas) however these are, in the WMP context, likely to deliver less significant outcomes.



2.2 Legislative Requirements

2.2.1 National Greenhouse and Energy Reporting Scheme

The National Greenhouse and Energy Reporting (NGER) scheme, established by the *National Greenhouse and Energy Reporting Act, 2007* (Cth) (NGER Act), is a single national framework for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER legislation. The objectives of the NGER scheme are to:

- Inform government policy
- Inform the Australian public
- Help meet Australia's international reporting obligations
- Assist Commonwealth, State and Territory government programs and activities, and
- Avoid duplication of similar reporting requirements in the states and territories.

The Clean Energy Regulator (CER) administers the NGER Act, its legislative instruments, and related policies and processes. This includes:

- Registering and deregistering corporations for reporting
- Receiving reports via the Emissions and Energy Reporting System (EERS)
- Monitoring and enforcing compliance
- Applying the audit framework
- Administering the National Greenhouse and Energy Register
- Administering the safeguard mechanism, and
- Publishing data.

Under the NGER Act, the WMP will be required to report scope 1 and scope 2 emissions data as it is projected to exceed the reporting threshold of 25,000 t of CO₂-e emitted per annum.

2.2.2 Emissions Safeguard Mechanism

The emissions safeguard mechanism was established as part of the Emissions Reduction Fund (ERF). The ERF provides an incentive for activities that count towards meeting Australia's international climate commitments. The emissions safeguard mechanism complements the emissions reduction elements of the ERF by compelling businesses to avoid increases in emissions beyond business-as-usual levels. It achieves this by placing a legislated obligation on Australia's largest greenhouse gas emitters to keep net emissions below their emissions limit (or baseline).

The safeguard mechanism operates under the framework of the NGER Act and applies to facilities with direct scope 1 emissions of more than 100,000 t CO₂-e per year. The Safeguard Mechanism came into effect on 1 July 2016.

Prior to the implementation of mitigation, the WMP may exceed the threshold for scope 1 emissions, in which case it would be required to:

- Calculate an emissions baseline based on either an independently audited forecast of production and either forecast emissions intensity provided by the responsible emitter or use of benchmark baseline based on benchmarked emissions intensities. This may be followed by a production-adjusted baseline after the commencement of operational activities at WMP
- Keep the facility's net emissions at or below its emissions baseline
- Report emissions in accordance with the NGER scheme.



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3 REDUCTION TARGETS

OZ Minerals has an overarching, company-wide objective of net zero scope 1 and scope 2 emissions by 2050 and Strategic Aspirations to emit zero scope 1 emissions and systematically reduce scope 2 and scope 3 emissions and supporting acceleration priorities to reduce high emissions energy use and baseline scope 3 emissions, to which the WMP has aligned itself. The decarbonisation study currently underway supports this and will, ultimately, provide a viable trajectory to meet this objective over the life of the project. This trajectory (or scenario trajectories, as developed) will be described in future revisions of this GHG MP.

4 MANAGEMENT ACTIONS AND MONITORING

To support OZ Minerals' objectives for GHG management at the WMP (outlined across the previous sections of this document), management actions have been developed as described in Table 11.

Table 11: Management Actions

ID	Management Action	Description
MA1	Continuously work towards achieving net zero emissions by 2050	In accordance with OZ Minerals' Climate Change Statement and Strategic Aspirations (see Section 2.1), the WMP aspires to net zero carbon emissions by the year 2050
MA2	Development of Decarbonisation Roadmap	Identification of mitigation opportunities and trajectories for the life of the WMP via the Decarbonisation Roadmap project, as described in Section 2.2
MA3	Establish WMP baseline emissions in accordance with NGERs and maintain emissions no greater than baseline	Using an appropriate methodology in accordance with the NGERs Safeguard Mechanism, the WMP will establish an emissions baseline that will form the basis for future reporting. Emissions from the WMP will be maintained at, or below, the developed baseline value, or offsets (ACCUs) will be purchased as necessary to offset emissions above the baseline
MA4	Implement GHG monitoring and reporting	Monitoring and reporting will be undertaken in accordance with the Commonwealth <i>National Greenhouse and Energy Reporting Act, 2007</i> (Cth)
MA5	Achieve emissions reduction trajectory as defined in the Decarbonisation Roadmap	WMP Management will ensure that appropriate resources are made available to implement the developed (and subsequently, the as-revised) Decarbonisation Roadmap to ensure progressive emissions reductions over the life of the project

The Objective-based EMP for GHG, based on the above Management Actions, is presented in Table 12.

Table 12: Objective-Based EMP for Greenhouse Gas Emissions

Objective-Based EMP	EPA Factor: Greenhouse Gas Emissions			
	Objective: To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change Key Impacts and Risks: Emission of GHG emissions and subsequent contribution to climate change			
Management Action	Management Target(s)	Monitoring	Timing/Frequency of actions	Reporting
MA1 Net zero emissions by 2050	Implementation of the committed emissions avoidance and reduction measures described in Section 2.1.4 of this GHG MP	Monitoring of the implementation progress of the committed measures via an audit of the WMP Obligations Register	Annually	<ul style="list-style-type: none"> Internally reported WMP Compliance Assessment Report (publicly available)
MA2 Development of Decarbonisation Roadmap	Finalisation of the WMP Decarbonisation Roadmap by end 2021	Decarbonisation Roadmap to be uploaded to Aconex (document management system)	End 2021	<ul style="list-style-type: none"> Internally reported WMP Compliance Assessment Report (publicly available)
MA3 Establish WMP baseline emissions in accordance with NGERs and maintain emissions no greater than baseline	Establish baseline emissions for the WMP prior to commencement of production	Baseline to be established using either: <ul style="list-style-type: none"> Calculated baselines—determined based on an independently audited forecast of production and either forecast emissions intensity provided by the responsible emitter or the default emissions intensity value. Benchmark baselines—based on benchmark emissions intensities (that is, the best, least emissions intensive standard for production) and an independently audited forecast of production. A landfill-benchmark baseline will be based on a benchmark capture efficiency rate for non-legacy emissions. Both calculated baselines and benchmark baselines are determined using forecasts of production and can be replaced with a production-adjusted baseline that reflects actual production from the facility following commencement of production.	Prior to commencement of production	<ul style="list-style-type: none"> Internally reported, included in WMP Obligations Register WMP Compliance Assessment Report (publicly available) Emissions baseline will be reported to the Clear Energy Regulator (CER), and subsequently published as a part of the Safeguard Mechanism data tables by the CER (publicly available)
	Maintain emissions below determined Safeguard Mechanism baseline over the life of the project	Monitoring in accordance with NGERs scheme methodology (<i>National Greenhouse and Energy Reporting (Measurement) Determination, 2008</i> (Cth))	Annually	<ul style="list-style-type: none"> WMP Compliance Assessment Report (publicly available) Annual OZ Minerals Sustainability Report Reporting in accordance with NGERs scheme requirements (<i>National Greenhouse and Energy Reporting Regulations, 2008</i> (Cth)) (publicly available)
MA4 Implement GHG monitoring and reporting	Monitor and report all scope 1 and scope 2 (if applicable) emissions	Monitoring in accordance with NGERs scheme methodology (<i>National Greenhouse and Energy Reporting (Measurement) Determination, 2008</i> (Cth))	Annually	<ul style="list-style-type: none"> WMP Compliance Assessment Report (publicly available) Annual OZ Minerals Sustainability Report Reporting in accordance with NGERs scheme requirements (<i>National Greenhouse and Energy Reporting Regulations, 2008</i> (Cth)) (publicly available)
MA5 Achieve emissions reduction trajectory as defined in the Decarbonisation Roadmap	Establish interim emissions reduction targets (trajectories) based on the outcomes of the Decarbonisation Roadmap and incorporate into MA1 targets	Update of GHG MP with revised MA1 targets following establishment of trajectories	Within six months of the internal agreement of emissions trajectories	<ul style="list-style-type: none"> Submission of revised GHG MP for Government of Western Australia's approval
	Implementation of the emissions reduction projects as required to achieve interim targets	Monitoring of overall emissions and quantification of realised emissions reductions in accordance with NGERs scheme methodology (<i>National Greenhouse and Energy Reporting (Measurement) Determination, 2008</i> (Cth))	Three-yearly	<ul style="list-style-type: none"> WMP Compliance Assessment Report (publicly available) Reporting in accordance with NGERs scheme requirements (<i>National Greenhouse and Energy Reporting Regulations, 2008</i> (Cth)) (publicly available)



5 ADAPTIVE MANAGEMENT

5.1 Greenhouse Gas Management

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of management actions, specifically, adaptive management in relation to this GHG MP includes:

- Defining the issue and objectives, and developing the GHG MP to address these (i.e., this document)
- Implementing the management actions described in this GHG MP (see Table 10 and Table 11)
- Monitoring and evaluating the applied management and mitigation against the outcomes and objectives (as per the monitoring program outlined in Table 12)
- Adjusting the management actions and monitoring (if required) to meet the outcome or objective, based on what is learnt from:
 - evaluation of emissions monitoring data
 - evaluation of the effectiveness of applied GHG mitigation measures
 - review of assumptions and uncertainties
 - review of risk assessment
 - external changes during the life of the project (e.g., technical advances or innovation, changes to Government policy).

5.2 Greenhouse Gas Management Plan

This GHG MP will nominally be reviewed at least every three years from the date of endorsement to ensure that it reflects the current situation with regards to WMP GHG management and monitoring. The GHG MP may also be reviewed should any of the following occur:

- A significant change in State or Commonwealth climate change policy (e.g., the introduction of revised emissions reduction targets and/or the introduction of a carbon price)
- The addition or change of infrastructure within WMP that has the potential to significantly change the emissions profile of the operation, and that was not forecast as a part of the Decarbonisation Roadmap
- Any change in operational practices on site that has the potential to significantly change the emissions profile of the operation and that was not forecast as a part of the Decarbonisation Roadmap



West Musgrave Copper and Nickel Project Greenhouse Gas Management Plan

- Material change is risk (threats and opportunities) associated with climate change identified by the West Musgrave Project.

Any changes to this GHG MP may require approval from Government of Western Australia and may involve consultation with relevant stakeholders.



6 STAKEHOLDER CONSULTATION

Extensive consultation was undertaken, associated with the EPA Section 38 Referral under Part IV of the EP Act and thereafter. This included discussion of all the EPA Environmental Factors, including Greenhouse Gases. Details of the consultation, stakeholders and outcomes are presented in Section 3 of the EPA Section 38 Referral (OZ Minerals, 2021).

Consultation specific to this GHG MP includes internal peer review with subject-matter experts (MBS Environmental and OZ Minerals Corporate) and meetings with the Government of Western Australia's Department of Water and Environmental Regulation (DWER) and EPA. A program of consultation on all Part IV-related Management Plans was undertaken with the Ngaanyatjarra Council and Traditional Owners, which indicated a low level of interest in greenhouse gas-related matters. All relevant feedback has been incorporated into this management plan.



West Musgrave Copper and Nickel Project Greenhouse Gas Management Plan

7 UPDATES TO THE EMP

This section is not applicable to the first version of the GHG MP but will be updated in future revisions.

8 REFERENCES

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West Musgrave Copper and Nickel Project
EPA Section 38 Referral Supporting Document

Appendix K4. Terrestrial Fauna Management Plan



West Musgrave Copper and Nickel Project

June 2021

Terrestrial Fauna Management Plan



West Musgrave Copper and Nickel Project Terrestrial Fauna Management Plan

VERSION CONTROL

Version	Authorisation	Position	Signature	Date
Final For Initial Approval	Justin Rowntree	Environment and Approvals Lead – West Musgrave		1 June 2021
	Michael Wood	General Manager – West Musgrave		1 June 2021
	Matt Reed	Acting Chief Commercial Officer – OZ Minerals		1 June 2021



West Musgrave Copper and Nickel Project Terrestrial Fauna Management Plan

DISCLAIMER

This Management Plan and associated appendices for the West Musgrave Copper and Nickel Project (Document) has been prepared for submission to the Government of Western Australia's Environmental Protection Authority acting on behalf of the Minister for the Environment under the *Environmental Protection Act, 1986* (WA) and no one other than the Minister, or their delegate, should rely on the information contained in this Document to make, or refrain from making, any decision.

In preparing this Document, OZ Minerals Limited (OZ Minerals) has relied on information provided by specialist consultants, government agencies and other third parties. OZ Minerals has not fully verified the accuracy or completeness of that information, except where expressly acknowledged in this Document.

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NOTE ON CURRENCY

Where possible, information contained in this Document is up to date as at May 2021. This was not possible for all supporting appendices, and information based on those appendices, which were prepared by third parties (as discussed in the second paragraph in the Disclaimer above) prior to the Document being finalised.

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West Musgrave Copper and Nickel Project

Terrestrial Fauna Management Plan

SUMMARY

A summary of the key Environmental Management Plan (EMP) information is presented in Table 1.

Table 1: Summary of Key EMP Information

Project Information	Description
Proposal Name	West Musgrave Copper and Nickel Project
Proponent Name	OZ Minerals
Ministerial Statement No/s and Condition/Clauses	The Proposal is currently being assessed by the Government of Western Australia's Environmental Protection Authority (EPA). The EPA has proposed that a Terrestrial Fauna Management Plan (TFMP) will be a condition of approval of the proposed project. A Ministerial Statement and associated conditions are yet to be issued.
Purpose of the EMP	To provide a management framework for terrestrial fauna and their habitats to avoid, minimise and mitigate potential adverse impacts associated with implementation of the West Musgrave Project.
Key Environmental Factor	Terrestrial Fauna
Objective	<i>To protect terrestrial fauna so that biological diversity and ecological integrity are maintained</i>
Key Provisions of the EMP	See Section 2
Proposed Construction Timing	Commencing 2022, progressing to 2024
EMP Required Pre-construction?	Yes, prior to issuing of Ministerial Statement
Proposed Operations Timing	26 years from date of commissioning

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1 CONTEXT, SCOPE AND RATIONALE

This Terrestrial Fauna Management Plan (TFMP) has been prepared by OZ Minerals to support the assessment, approval and implementation of the Proposal under Part IV of the *Environmental Protection Act, 1986* (WA) (EP Act). Terrestrial fauna is protected under Commonwealth and State legislation, primarily governed by three Acts:

- *Environment Protection and Biodiversity Conservation Act, 1999* (Cth)
- *Environmental Protection Act, 1986* (WA)
- *Biodiversity Conservation Act, 2016* (WA).

In addition to Commonwealth and State legislation, the following policy and guidance statements were considered in the development of this TFMP:

- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2020b)
- EPA Environmental Factor Guideline – Terrestrial Fauna (EPA, 2016a)
- EPA Technical Guidance – Terrestrial Fauna Surveys (EPA, 2016b)
- EPA Technical Guidance – Sampling methods for Terrestrial vertebrate fauna (EPA, 2016c)
- EPA Technical Guidance – Sampling of short-range endemic invertebrate fauna (EPA, 2016d)
- Interim guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (DBCA, 2017)
- Conservation advice *Liopholis kintorei* (Great Desert Skink) (TSSC, 2016)
- National recovery plan for the Great Desert Skink (*Liopholis kintorei*) (McAlpin, 2001).

This TFMP addresses the Notice Requiring Information for Assessment, received from the EPA on 14 April 2021 (the Notice). The Notice requires OZ Minerals to:

Provide a Terrestrial Fauna Management Plan detailing the application of the mitigation hierarchy concerning avoidance and minimisation of direct and indirect impacts to significant terrestrial fauna species, including but not limited to the scheduled species. The Plan should be prepared in accordance with the Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA, 2020a). The Plan should incorporate as an appendix the updated Short Range Endemic habitat connectivity assessment and review of the Night Parrot methodology, and detail how this information has informed management practices.

As defined by EPA (2016a and 2016b) terrestrial fauna may be significant for a range of reasons, including:

- Being identified as a threatened or priority species
- Species with restricted distribution
- Species that have declining populations or declining distributions
- Species at the extremes of their range
- Isolated outlying species populations
- Species which may be undescribed
- Degree of historical impact from threatening processes
- Providing an important function required to maintain the ecological integrity of a significant ecosystem.

Note that although the focus of this TFMP is on significant fauna as defined by the EPA, the overarching management approach and the specific management objectives, actions and targets (Section 2.1) are considered adequate to provide for the minimisation of impacts to all terrestrial fauna in order to ensure that the EPA Objective for Terrestrial Fauna (Section 1.2) is met. This includes potential impacts to those species of significance to the Ngaanyatjarra People, including the Australian Bustard (*Ardeotis australis*), goanna (all the *Varanus* genus) and macropods including Western Grey Kangaroo (*Macropus fuliginosus*), Euro (*Oosphranter robustus*) and Red Kangaroo (*Oosphranter rufus*).

1.1 Proposal

The West Musgrave Copper and Nickel Project (WMP) is located in the West Musgrave Ranges of Western Australia. The WMP is located approximately 1,300 km north-east of Perth near to the border of South Australia and the Northern Territory. The WMP is within the Ngaanyatjarra Native Title determination, and Class A Reserve No. 17614 (for the Use and Benefit of Aboriginal Inhabitants). The nearest towns include the Indigenous Communities of Jameson (Mantamaru) 26 km north, Blackstone (Papulankutja) 50 km east, and Warburton (Milyirrtjarra) 110 km west of the project (Figure 1).

The project, with a current expected life of approximately 26 years, will consist of:

- Mining of copper and nickel ore from two open cut mine pits using conventional blast, load and haul methods
- Placement of mine waste into permanent waste rock dumps (WRDs) and dedicated tailings storage facility (TSF) adjacent to mine pit voids
- Milling and processing of ore using floatation to produce two separate copper and nickel concentrates

- On-site power supply using a combination of renewable power infrastructure (photovoltaic solar panels, wind turbines and battery storage) supported by backup thermal power generation
- Development of a process/potable water supply borefield that may include a combination of overland and/or underground pipelines for use during construction and operations
- Miscellaneous infrastructure, including stormwater management infrastructure (bunds and drains), internal roads and service tracks, a dedicated site access road, accommodation village (approximately 450 beds during operations and 1,200 during construction), airstrip, wastewater treatment, landfill and other supporting infrastructure including offices, warehouses and workshops
- Concentrate will be transported to Esperance via existing roads and rail networks.

A summary of the key project characteristics is presented in Table 2.

Table 2: Key Project Characteristics

Elements	Location	Proposed Extent Authorised
Physical Element		
Mine and associated infrastructure	Figure 2	Clearing of up to 3,830 ha of native vegetation within a Development Envelope of 20,852 ha
Operational Element		
Mining voids	Figure 2	Below water table mining Nebo pit void to be backfilled above water table post-closure Babel pit void to be a permanent and episodic pit lake post-closure
Mining waste (waste rock)	Figure 2	Placement of waste rock into permanent WRDs
Ore processing waste (tailings)	Figure 2	Disposal of tailings into a TSF and/or Nebo pit void
Power supply	Figure 2	Up to 60 MW (instantaneous load requirement) of fossil fuel electricity generation Up to 100 MW of photovoltaic solar electricity generation Up to 100 MW of wind electricity generation
Water supply	Figure 2	Abstraction of up to 7.5 GL/a of groundwater from the Borefield and through mine pit dewatering



Figure 1: Site Location

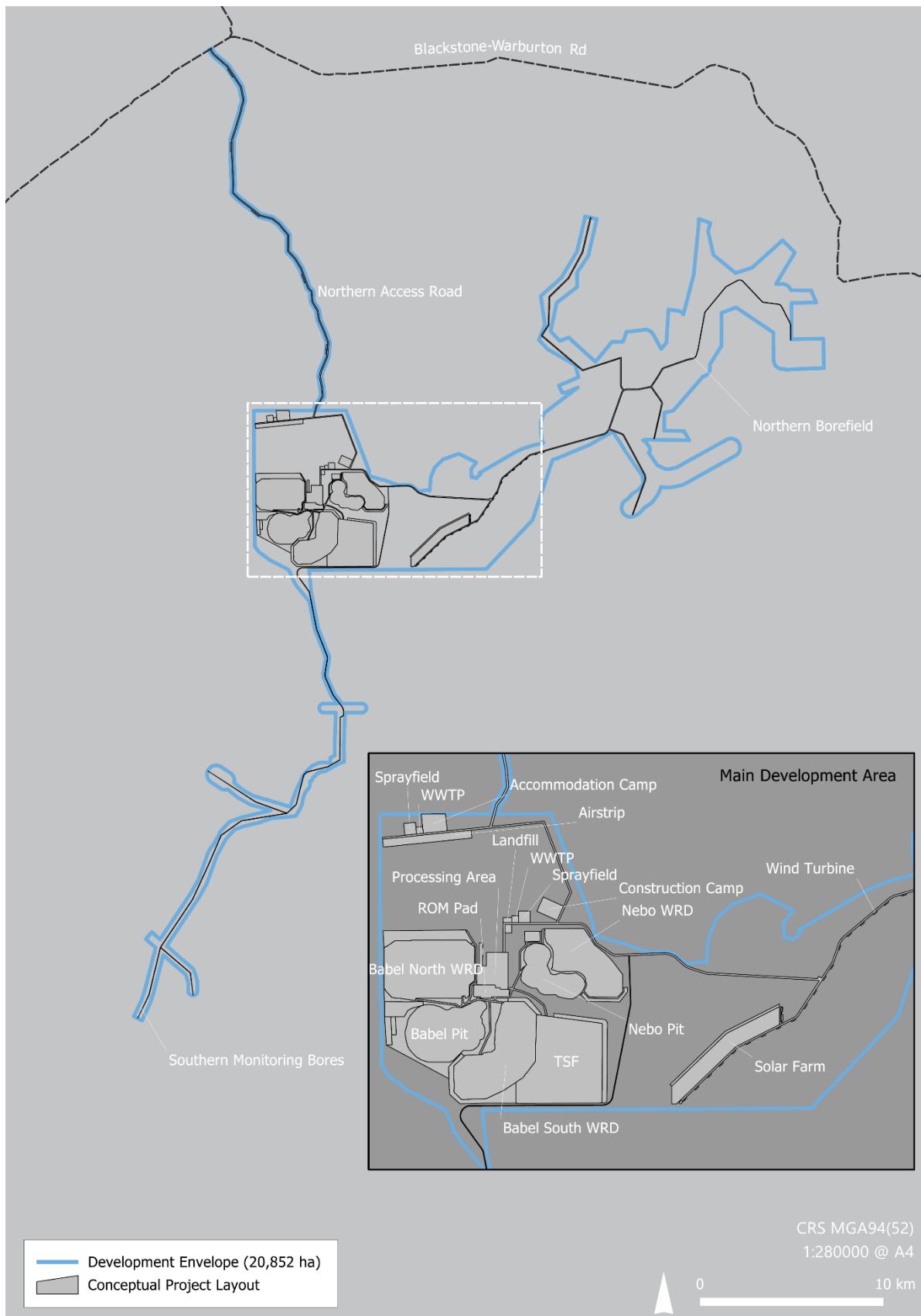


Figure 2: Location of Key Physical and Operational Elements

1.2 Key Environmental Factor

This TFMP specifically relates to the Terrestrial Fauna factor guidelines. The EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020b) lists the following as their objective for Terrestrial Fauna:

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

1.2.1 Proposal Activities that May Affect the Key Environmental Factor

In compliance with the Notice provided by the EPA, this management plan applies only to the management of significant terrestrial fauna species, including but not limited to the scheduled species, to the extent that the interaction of the project may negatively impact these terrestrial fauna such that the EPA objective may not be achieved. To this end the following credible events have been identified with the potential to result in negative impacts to significant terrestrial fauna species, including but not limited to scheduled species, specifically:

- Decrease in poorly represented fauna habitat as a result of project-related land clearing
- Significant decrease in richness and abundance of fauna, including of significant fauna, as a result of interactions with project-related vehicles and machinery or entrapment
- Increase richness and abundance of predator species resulting from project-related attractants (water and food sources) result in high levels of predation of native fauna
- Decrease in the richness and abundance of poorly represented fauna habitat and significant fauna species as a result of project-related altered fire regimes.

Other impact events identified in the EPA Section 38 Referral (OZ Minerals, 2021) were assessed as not having an impact on significant terrestrial fauna such that EPA's environmental objective for terrestrial fauna would not be met, and as such have not been considered further in this management plan.

1.2.1.1 Site Specific Environmental Values

The EPA Section 38 Referral (OZ Minerals, 2021) noted that one Threatened fauna species as defined in the *Environment Protection and Biodiversity Conservation Act, 1999* (Cth) (EPBC Act) and *Biodiversity Conservation Act, 2016* (WA) (BC Act) and three priority species designated by the Government of Western Australia's Department of Biodiversity, Conservation and Attractions (DBCA) were recorded within the survey area during project specific studies. These include:

- Great Desert Skink (*Liopholis kintorei*) – Vulnerable
- Brush-tailed Mulgara (*Dasyurus blythii*) – P4
- Southern Marsupial Mole (*Notoryctes typhlops*) – P4
- Striated Grasswren (*Amytornis striatus striatus*) – P4.

Further descriptions of these species, threatening processes and project-related impacts relevant to these species are provided in the following sections.

Consultation with the Ngaanyatjarra Council and Traditional Owners has identified several species of cultural significance that inhabit the WMP area. These species are described in Section 1.2.1.7, together with a summary of the potential impact significance.

1.2.1.2 Night Parrot (*Pezoporus occidentalis*)

A review of findings relating to the potential presence of the critically endangered Night Parrot (*Pezoporus occidentalis*) at WMP can be found in Appendix A. The review was undertaken by notable Night Parrot experts, Nigel Jackett and Nick Leseberg of Adaptive NRM, who have extensive experience identifying potential Night Parrot habitat and detecting Night Parrots using remotely deployed acoustic recording units (ARUs). The review concluded that methodological shortcomings employed in the initial WMP Night Parrot surveys (OZ Minerals, 2021; Appendix G3) presented limitations to detection of Night Parrots, and that conclusions pertaining to Night Parrot occupancy in the original study were not supported. The review recommended the following actions to increase certainty relating to potential Night Parrot occupancy at the WMP:

1. Conduct a desktop analysis of potential roosting and foraging sites using available products and hi-resolution satellite imagery, a process that the authors have used successfully to identify the presence of Night Parrot throughout Australia
2. Where the desktop analysis indicates potential roost habitat is extant, a comprehensive acoustic survey plan for these sites could be developed that would require a limited number of very brief acoustic surveys, and analysing the recordings from these surveys, with a recogniser known to be capable of detecting a higher percentage of Night Parrot calls.

In May 2021, following the review described above, Nigel Jackett, Nick Leseberg and Steve Murphy of Adaptive NRM, undertook the first of the above listed recommendations. This Night Parrot Habitat Analysis can be found in Appendix A, the study concluded:

Night Parrot roosting habitat is unlikely to occur within the Development Envelope, reducing uncertainties in previous assessment.... Therefore, additional acoustic surveys (or re-analysis of sound data collected by Donato Environmental Services (2019)) are unlikely to detect the presence of roosting Night Parrots within the Development Envelope. Acoustic surveys within potential foraging habitat are unlikely to detect Night Parrots, due to the small and fragmented extent of potentially suitable habitat available, and the relatively large distance Night Parrots would need to travel to access potential foraging habitat within the Development Envelope.

This analysis provides a strong conclusion of the low likelihood of Night Parrot occurrence at the WMP and surrounds. Based on these combined studies and findings relating to the likely absence of Night Parrot, no specific consideration has been made for the specific management of Night Parrots at the project beyond the general management measures detailed in this plan.

1.2.1.3 Great Desert Skink (*Liopholis kintorei*)

The Great Desert Skink is a large burrowing lizard restricted to sandy habitats in the western desert region of Central Australia (Plate 1). Listed as Vulnerable under both the EPBC Act and the BC Act, the Great Desert Skink has a scattered distribution across its range, and is known to have disappeared from former habitats, particularly in the Gibson Desert, Great Victoria Desert and Great Sandy Desert Regions.

The Great Desert Skink is endemic to Australian arid areas within the western desert region and occurs across a broad area covering the south-western and western areas of the Northern Territory, the north-western extent of South Australia, and a central expanse of inland Western Australia.

Known population extents include seven main populations (McAlpin, 2001 and DoEE, 2020), with the greatest concentration of historic records occurring in the Northern Territory (ALA, 2020). Table 3 and Figure 3 provide known locations of Great Desert Skink (McAlpin, 2001 and TSSC, 2016).

A recent discovery of Great Desert Skink as part of the Lake Well Potash Project confirmed a range extension for the species of 480 km west of the WMP in similar sandplain spinifex habitats (Western Wildlife, 2019).

A summary of Great Desert Skink status, threats and potential impacts is provided in Table 4.

Table 3: Known Populations of the Great Desert Skink

Location of Known Population	State/Territory	Tenure	Estimated Population	Habitat	Distance from Project
Patjarr (Karilywara) and proposed Gibson Desert Indigenous Protected Area (IPA)	WA	Ngaanyatjarra Council	<2,500	Gravelly undulating plain with scattered <i>Acacia pruinocarpa</i> or <i>A. aneura</i> over <i>Triodia basedowii</i> and low shrubs	200 km
Kiwwirrkurra community and surrounds including vicinity of Lake Mackay	WA	Ngaanyatjarra Council	<500	Sandplain with spinifex and scattered shrubs (<i>Acacia spp.</i> , <i>Eucalyptus spp.</i> , <i>Hakea spp.</i> , <i>Grevillea spp.</i>)	350 km
Karlamilyi National Park	WA	DBCA	Unknown	Unknown	630 km
Lake Wells Potash Project	WA	Lake Wells Potash Project	<50	Sandplain spinifex	480 km
Tanami Desert including Rabbit Flat-Sangster's Bore, The Granites, and near Kintore	NT	Various Aboriginal Lands Trusts	<2,250	Sandplain with spinifex and scattered shrubs and occasional trees (<i>Acacia spp.</i> , <i>Eucalyptus spp.</i> , <i>Hakea spp.</i> , <i>Grevillea spp.</i>)	700 km
Uluru-Kata Tjuta National Park (includes part of the Yulara borefields area)	NT	Uluru-Kata Tjuta Land Trust leased to Parks Australia	<500	Sandplain with spinifex (<i>Triodia basedowii</i> and <i>T. pungens</i>) and scattered shrubs and occasional trees (<i>Acacia spp.</i> , <i>Allocasuarina decaisneana</i> , <i>Hakea spp.</i> , <i>Grevillea spp.</i>)	325 km
Yulara lease lands and surrounding Land Trust lands (includes part of the borefields area)		Ayers Rock Resort Corporation and Katiti Land Trust	<350	Sandplain with mulga and minyura over woollybutt grass (<i>Eragrostis eriopoda</i>) and spinifex	325 km
Anangu-Pitjantjatjara Lands	SA	Anangu-Pitjantjatjara Council	<50		

Table 4: Great Desert Skink – Summary of Status, Threats and Potential Impacts

Legal conservation status	Listed as Vulnerable under the EPBC Act and the BC Act
Status at WMP and region	<p>Studies undertaken to support the West Musgrave Project (WMP) included both site-specific (within and near to the Development Envelope) and regional (within 200 km of the West Musgrave Development Envelope).</p> <p>The regional study (within 200 km of the Development Envelope) identified 80 warrens representing 10 to 12 new sub-populations (Figure 3 and Figure 5).</p> <p>The site-specific study, covering 46,262.3 ha, identified four groups of warrens throughout the study area.</p> <p>All Great Desert Skink signs both regionally and locally were found in similar deep sand spinifex areas.</p> <p>Following the site-specific surveys, the project Development Envelope was amended to exclude deep sand spinifex habitat that contained three of the four identified groups of Great Desert Skink burrows. As such, 82% of deep sand spinifex has been excluded from the Development Envelope, with the remaining deep sand spinifex being isolated to the northern borefield area. The project proposes to clear up to 0.1% of the deep sand spinifex habitat for the purpose of low impact borefield infrastructure (e.g. buried pipe, service track and pumping infrastructure).</p>
Threats	<p>Moore et al. (2015) reported that Great Desert Skink is adversely affected by fire and predation (including by dingoes, foxes and cats). The recovery plan (McAlpin, 2001) for the Great Desert Skink indicated the following potential threats:</p> <ul style="list-style-type: none"> • Cessation of traditional land management practices, and particularly the creation of new fire regimes • Predation by foxes and feral cats • Rabbits destroying and occupying burrow systems.
Potential impacts as a result of the WMP	<ul style="list-style-type: none"> • Direct loss of individuals during vegetation clearing for the borefield pipeline and associated borefield infrastructure (service tracks and pumping infrastructure) • Direct loss of individuals as a result of vehicle strikes either during construction, or while using service tracks to access other areas of the borefield • Direct loss of individuals post-wildfires due to predation by foxes, dogs and cats • Direct loss of individuals due to predation by feral animals, including foxes, dogs and cats as a result of the creation of new tracks and cleared areas.



GREAT DESERT SKINK
(*Liopholis kintorei*)



BURROW

SCAT LATRINE



HABITAT
Spinifex Sandplain



Images courtesy of Western Wildlife

Plate 1: Great Desert Skink (*Liopholis kintorei*)

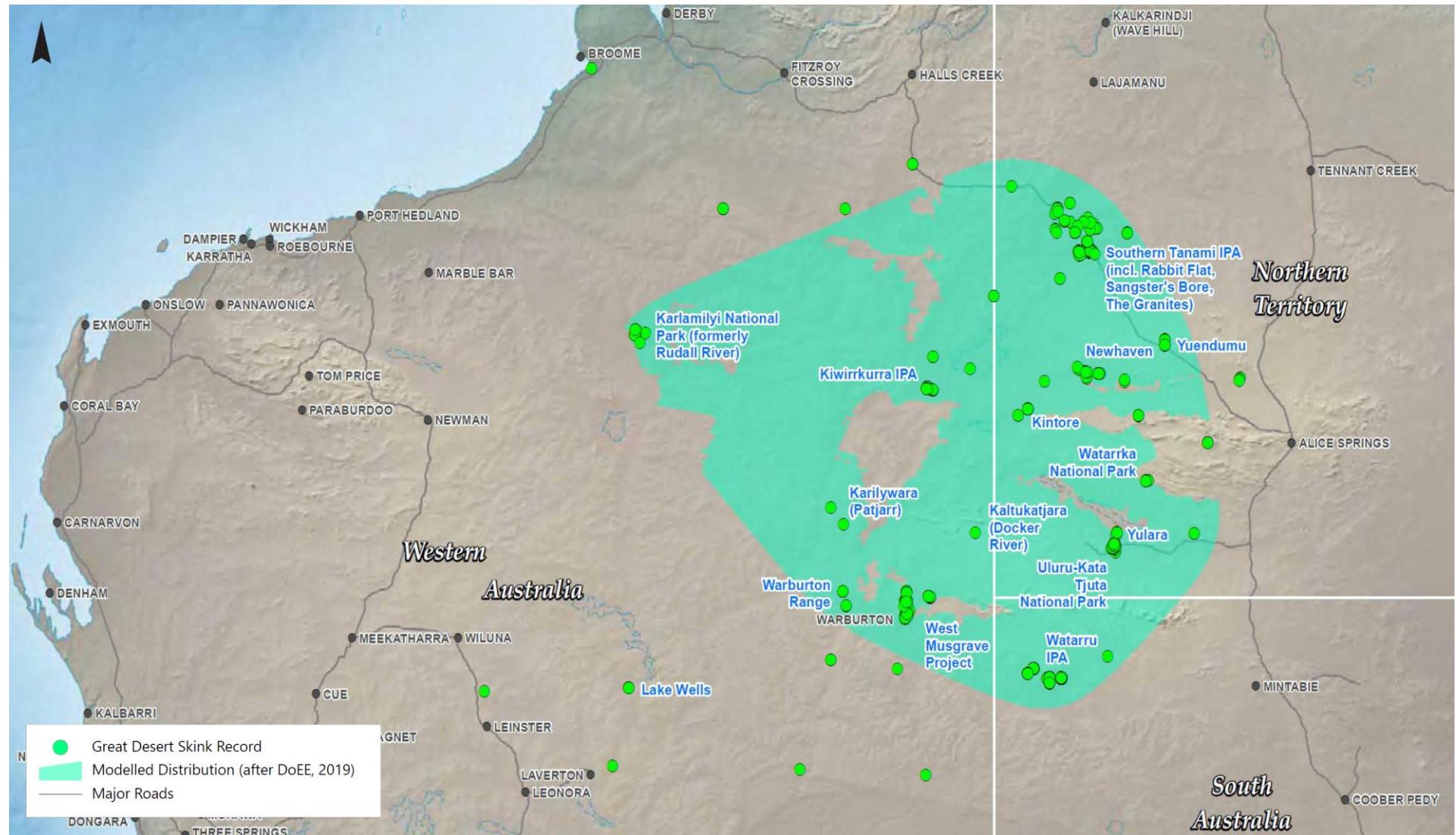


Figure 3: Known Populations of the Great Desert Skink in a Regional Context

1.2.1.4 Southern Marsupial Mole (*Notoryctes typhlops*)

The Southern Marsupial Mole is widespread across the deserts of central Australia, occurring where its sand dune habitat is present (Woinarski et al., 2014). Although there are no robust estimates of population size, given the inherent challenges of sampling for this species, there is no evidence of ongoing population decline and it is listed as of ‘Least Concern’ in the Action Plan for Australian Mammals 2012 (Woinarski et al., 2014).

The Southern Marsupial Mole spends most of its time underground, where it ‘swims’ through the sand. Its underground lifestyle means that it may be less vulnerable to predation by feral cats and foxes (Woinarski et al., 2014). A summary of Southern Marsupial Mole status, threats and potential impacts is provided in Table 5.

Table 5: Southern Marsupial Mole – Summary of Status, Threats and Potential Impacts

Legal conservation status	Listed as Priority 4 by DBCA
Status at WMP and region	<p>Evidence of its presence was found opportunistically in dune cuttings in the Northern Borefield where numerous back-filled tunnels were observed. Signs of this species was also identified in a mole trench dug in the proposed Main Development Area.</p> <p>Several records were identified in an extensive area of sand dunes and spinifex sandplain immediately south-west of the proposed Development Envelope. This habitat, near to, but outside of the Development Envelope is extensive and totals over 20,000 ha.</p> <p>The Southern Marsupial Mole is considered likely to occur throughout the Development Envelope and region where sand dunes are present.</p>
Threats	<p>Project-related vegetation clearing and excavation activities are likely to be the most significant threats to this small fossorial marsupial. Its underground lifestyle means that it may be less vulnerable to predation by feral cats and foxes (Woinarski et al., 2014).</p>
Potential impacts as a result of the WMP	<ul style="list-style-type: none"> • Direct loss of individuals during project-related vegetation clearing in dunes and adjacent swales • Direct loss of individuals during project-related earthworks in sand dunes and adjacent swales.

1.2.1.5 Brush-tailed Mulgara (*Dasyurus blythi*)

Brush-tailed Mulgara is widely distributed across arid Australia, and though its population has declined in the past, it is currently thought to be stable or only slowly declining (Woinarski et al., 2014). It is thought that its ability to use a variety of food resources, tolerate severe declines in bodyweight, enter torpor and dig deep burrows has buffered the species from the impacts of feral predators and a variable climate and resource availability (Masters and Dickman, 2012). It is therefore listed as of 'Least Concern' in the Action Plan for Australian Mammals 2012 (Woinarski et al., 2014).

The Brush-tailed Mulgara occurs mostly on Spinifex grasslands, sheltering during the day in burrows which have been constructed on the flats between sand dunes. A summary of Brush-tailed Mulgara status, threats and potential impacts is provided in Table 6.

Table 6: Brush-tailed Mulgara – Summary of Status, Threats and Potential Impacts

Legal conservation status	Listed as Priority 4 by DBCA
Status at WMP and region	Tracks, burrows and diggings of this species were recorded extensively across the fauna survey area, records were obtained with remote cameras within Spinifex Sandplain on the Western Access Road and Southern Monitoring Bore area, with a single individual trapped in each survey period along the Western Access Road. The primary locations where these species were identified were the Western Access Road and Southern Borefield area. These locations have subsequently been excluded from the Development Envelope.
Threats	Cattle grazing, altered fire regimes and predation by cats and foxes are said to have contributed to the population decline of this species (Van Dyck and Strahan, 2008).
Potential impacts as a result of the WMP	<ul style="list-style-type: none"> • Direct loss of individuals during project-related vegetation clearing • Direct loss of individuals from predation by foxes, dogs and cats following wildfires as a result of project-related altered fire regimes • Increased feral animal predation (foxes, dogs and cats) along project-related service tracks and in newly created cleared areas.

1.2.1.6 Striated Grasswren (*Amytornis striatus striatus*)

The Striated Grasswren's preferred habitat is spinifex meadows with or without low shrubs (*Thryptomene* sp.) or Acacia sp. on sandy or loamy substrate. *Amytornis s. striatus* known distribution is the sandy deserts (i.e. Great Victoria, Gibson and Great Sandy) in central and eastern Western Australia (Johnstone and Storr, 2004). A summary of Striated Grasswren status, threats and potential impacts is provided in Table 7.

Table 7: Striated Grasswren – Summary of Status, Threats and Potential Impacts

Legal conservation status	Listed as Priority 4 by DBCA
Status at WMP and region	<p>The Striated Grasswren was recorded on the Western Access Road, Northern Borefield, Southern Borefield Area and Main Development Area in a range of habitats. It is likely to occur in suitable habitats throughout the region but may be absent from areas that have been subject to extensive fires.</p> <p>Many of the areas where this species was extensively recorded, such as the Western Access Road and Southern Borefield, have subsequently been excluded from the Development Envelope.</p>
Threats	<p>The two most significant threats to this species are predation, particularly of eggs and chicks by foxes, feral cats, wild dogs and raptors, and extensive wildfires that burn mature spinifex.</p>
Potential impacts as a result of the WMP	<ul style="list-style-type: none"> • Direct loss of individuals during project-related vegetation clearing • Direct loss of individuals, nesting sites or eggs from wildfires as a result of project-related altered fire regimes • Direct loss of individuals from predation by foxes, dogs and cats following wildfires as a result of project-related altered fire regimes • Increased feral animal predation (foxes, dogs and cats) along project-related service tracks and in newly cleared areas.

1.2.1.7 Culturally Significant Terrestrial Fauna

Through consultation with Ngaanyatjarra People, several fauna species of cultural importance were identified, these included totem species representative of story lines or dreamtime stories or those used as food resources. These animals included bardi grubs (witchetty grub) which are generally associated with *Acacia kempeana*, Australian Bustard (*Ardeotis australis*), goanna (all the *Varanus* genus), Emus (*Dromaius novaehollandiae*) and macropods including the Western Grey Kangaroo (*Macropus fuliginosus*), Euro (*Oosphranter robustus*) and Red Kangaroo (*Oosphranter rufus*).

A summary of the potential impacts to these species is presented in Table 8. No significant adverse impacts to these species are predicted. Although not specifically described any further in this TFMP, the management targets and actions described in Table 14 are also considered suitable for the minimisation of impacts to species of cultural heritage significance.

Table 8: Potential Impacts to Terrestrial Fauna Species of Cultural Significance

Species	Description	Potential Impacts
Bardi Grubs and <i>Acacia kempeana</i>	<p>Bardi grubs are commonly found in the roots of <i>Acacia kempeana</i> which commonly occur within the fauna survey area and region.</p> <p><i>Acacia kempeana</i> is a spreading shrub or tree of between 1 and 6 m in height. The species is common throughout inland Australia and has no conservation status.</p>	<p>The project is unlikely to impact these species on either a local or regional scale, and as such is unlikely to result in any change of access or abundance of bardi grubs to Ngaanyatjarra People.</p>
Goanna (<i>Varanus</i> species)	<p>Seven goanna species comprising 67 individuals were identified in the fauna survey area. Of these, the majority were represented by the sand goanna, <i>Varanus gouldii</i> (45 records). This species represented one of the most numerous reptile species identified in the fauna survey area. <i>Varanus</i> species are particularly widespread in inland arid Australia and have no conservation status. <i>Varanus</i> species are found in a wide variety of habitats including open woodland and sand plains which are particularly prevalent in the region.</p>	<p>While there may be a very localised decline in the abundance of this species near to the Main Development Area, the large range of habitats occupied by this species and the abundance of available regional habitat makes it unlikely that the project would have an impact on the abundance or ability of Ngaanyatjarra People to access this species.</p>
Australian Bustard (<i>Ardeotis australis</i>)	<p>The Australian Bustard is a large ground dwelling bird up to 1.2 m tall, which is common in grasslands and open woodlands throughout mainland Australia. This species remains relatively common and widespread across most of northern Australia; however, its range appears to have contracted in the south-east of Australia over the past century.</p> <p>While the Australian Bustard has no Commonwealth or WA State conservation listing, the assessment of IUCN in 2016 noted a declining population trajectory. The total population is thought to exceed 10,000 and be no greater than 100,000 individuals. Forty-nine records of the Australian Bustard were made during field surveys from throughout the fauna survey area in a range of habitat types.</p>	<p>Given the range of habitats this species occupies and the abundance of available regional habitat, it is considered unlikely that the project would have an impact on this species. Targeted hunting of this species is likely to present a greater pressure to this species than the project activities.</p>

Species	Description	Potential Impacts
Macropods, including Western Grey Kangaroo (<i>Macropus fuliginosus</i>), Euro (<i>Oosphranter robustus</i>) and Red Kangaroo (<i>Oosphranter rufus</i>)	<p>Macropods are a relatively rare visitor to the project area. Ngaanyatjarrra People have anecdotally noted that macropods are more plentiful in the area during sustained wet periods, and during dry periods are more prevalent in specific areas such as nearby to some of the larger rocky ranges such as Jameson Range.</p> <p>Six records of Grey Kangaroo were identified from a single camera trap in the southern most extent of the fauna survey area. No other macropod species were identified in the fauna survey area. Macropods are uncommon in the area likely due to the limited number of water points and hunting pressure.</p>	<p>Implementation of the project is considered unlikely to change the already uncommon occurrence of macropods in the Development Envelope. If anything, the increasing number of water points may result in some increased incidence of macropods into the project area.</p>
Emus (<i>Dromaius novaehollandiae</i>)	<p>Emus are known to occupy most of mainland Australia and are known from a range of habitats including woodlands and open plains. Emus do not have any Commonwealth or WA state conservation listing.</p> <p>Two sightings of Emus and four indications of their presence were identified during field surveys of the West Musgrave area indicating that they are relatively uncommon to the project area. Similarly, to macropods, Emus are said to be more common during sustained periods of good conditions and are more commonly known from areas with available surface water.</p>	<p>The project is considered unlikely to change the already uncommon occurrence of Emus in the Development Envelope. If anything, the increasing number of water points may result in some increased incidence of Emus into the project area.</p>

1.3 Condition Requirements

A Ministerial Statement and associated conditions are yet to be issued.

1.4 Rationale and Approach

This TFMP outlines how significant species will be managed, and where relevant monitored, to verify the effectiveness of the management measures and to ensure potential impacts associated with the proposed construction and operation of the WMP are minimised.

OZ Minerals' approach is to give significant focus during project design to avoid and minimise impacts by carefully designing the Development Envelope and siting infrastructure to avoid habitats known to support significant terrestrial fauna. It is recognised, however, that there are further mitigations available to reduce risks to those identified significant fauna species.

Although outside of the EPA's Notice for the scope of this TFMP, consideration has also been given in the development of the management approach to the potential project-related impacts on all terrestrial fauna species, including those of significance to the Ngaanyatjarra People, and the subsequent development of management and mitigation measures.

1.4.1 Survey and Study Findings

Since 2018 there have been multiple fauna surveys and assessments associated with characterising the fauna of the WMP project area, these include:

- Level 2 vertebrate fauna survey, including targeted survey of conservation significant fauna conducted by Western Wildlife (OZ Minerals, 2021; Appendix G1). Two levels of fauna survey were undertaken across the fauna survey area including a Level 2 fauna survey within the Main Development Area and proposed Western Access Road and a targeted survey for conservation significant species across the whole fauna survey area (including areas of proposed linear infrastructure). These surveys were undertaken as part of three survey events in three seasons. The fauna survey area covered a total area of 46,263.3 ha.
- Targeted Great Desert Skink survey conducted by Western Wildlife (OZ Minerals, 2021; Appendix G2). The surveys included targeted walking transects, of 767.7 km, within the immediate fauna survey area to identify signs of the Great Desert Skink, primarily burrows in association with a scat latrine (OZ Minerals, 2021; Appendix G2). Transects focused on habitats considered most likely to support the species, based on the literature, i.e. sandplains and dune swales. Other habitats, such as Calcrete – Spinifex Sandplain mosaic, were also surveyed, as these presented as superficially similar and it was unknown whether these had the potential to support the species.

- Avian fauna and microbat baseline characterisation conducted by Donato Environmental Services (OZ Minerals, 2021; Appendix G3). A detailed assessment of the aerial fauna (birds and bats) within the project area, concentrating on the proposed wind turbine electricity generator site and main infrastructure area. The study targeted the potential presence or absence of the Night Parrot (*Pezoporus occidentalis*). Specifically, this survey collected four months of audio recordings, using remotely deployed song meters and Anabats.
- A targeted Night Parrot habitat analysis (using a combination of vegetation survey results and remotely sensed imagery) was undertaken by leading Night Parrot experts over the entire Development Envelope (an area of 20,851.9 ha) and within a 10 km buffer distance around the entire Development Envelope (an area of 125,887.2 ha) (Appendix A and OZ Minerals, 2021; Appendix G3, Addendum 1). The habitat analysis concluded that Night Parrot roosting habitat is unlikely to occur within the Development Envelope, and that acoustic surveys within potential foraging habitat are also unlikely to detect Night Parrots, due to the small and fragmented extent of potentially suitable habitat available, and the relatively large distance Night Parrots would need to travel to access potential foraging habitat within the Development Envelope.
- Targeted and regional surveys for the McDonnell Ranges Black-Footed Rock-Wallaby and Great Desert Skink undertaken by the Ngaanyatjarra Council (OZ Minerals, 2021; Appendix G5). The Ngaanyatjarra Ranger Team, coordinated by the Ngaanyatjarra Council, undertook a regional study investigating the presence of both Great Desert Skink (*Liopholis kintorei*) and McDonnell Ranges Black-Footed Rock-Wallaby (*Petrogale lateralis*) within 200 km of the project's fauna survey area. The survey had two study aims, the first to confirm the presence of further populations of Great Desert Skink from a regional perspective, and the second to confirm the presence or absence of Black-Footed Rock-Wallaby, both inside the fauna survey area, and regionally.
- Short Range Endemic (SRE) survey conducted by Alacran (OZ Minerals, 2021; Appendix G6). A targeted survey consisting of three sampling events to identify SRE habitat, identify potential SRE species and determine if the fauna survey area supports a known SRE. A summary of the updated Short Range Endemic habitat connectivity assessment is provided here as Appendix B and also discussed in Section 7.6.3.8 of the EPA Section 38 Referral (OZ Minerals, 2021).
- An independent peer review of project-related impacts on EPBC-listed Threatened species and migratory species was undertaken by Jacobs. Jacobs concluded that the project would not have a significant impact on Matters of National Environmental Significance (MNES) based on the Australian Government's Department of the Environment's (DoE) Significant Impact Guidelines 1.1 (DoE, 2013).

A summary of survey effort as applicable to Terrestrial Fauna is summarised in Table 9. The results of these studies have contributed to a comprehensive understanding of the abundance and distribution of the vertebrate fauna, specifically significant fauna, in the project area and region. Study outcomes specific to the Great Desert Skink are summarised in Table 10.

Table 9: Local and Regional Terrestrial Fauna and Habitat Surveys of the WMP Region

Survey	Sampling Effort	Dates
Level 2 vertebrate fauna survey, including targeted survey of conservation significant fauna over 46,263.3 (OZ Minerals, 2021; Appendix G1)	<ul style="list-style-type: none"> • Identification of fauna habitats • 1,580 pitfall trap nights • 1,570 Elliot trap nights • 870 funnel trap nights • 314 cage trap nights • 39 hours of active bird surveys • 30 nights of 2 x Anabat Swift call detection • 795 km of walking transects looking for signs of conservation significant species • Deployment of 57 camera traps (of which 30 were left deployed for 3.5 months targeting conservation significant species habitat) • Mist netting • Spotlighing • Marsupial mole trenching 	20 June to 4 July 2018 17 to 31 October 2018 24 April to 6 May 2019
Targeted Great Desert Skink Survey (OZ Minerals, 2021; Appendix G2)	<ul style="list-style-type: none"> • 767.3 km of walking transects 	20 June to 4 July 2018 17 to 31 October 2018 24 April to 5 May 2019
Avian fauna and microbat baseline characterisation (OZ Minerals 2021; Appendix G3)	<ul style="list-style-type: none"> • 3,455 hours of acoustic recordings using 4 x SM2 and 4 x SM4; comprising 10,366 20-minute recording sessions • 308 hours of microbats recordings using 4 x SD2 Anabat™ 	Four-month deployment of SM Song Meters, and Anabats between 7 October 2018 and 24 January 2019
Targeted habitat analysis for potential Night Parrot habitat (OZ Minerals 2021; Appendix G3 Addendum 1)	Systematic grid searches of the Development Envelope (20,851.9 ha) and a 10 km buffer distance around the entire Development Envelope (an area of 125,887.2 ha) using a combination of vegetation and habitat survey data and remote sensing data to identify the potential presence of Night Parrot roosting, foraging and flyaway habitats	May 2021
Targeted survey and habitat assessment for the McDonnell ranges Black Footed Rock Wallaby and the Great Desert Skink (OZ Minerals, 2021; Appendix G5)	<ul style="list-style-type: none"> • Walking transects at six Great Desert Skink Regional Zones • Field inspections of six near mine and regional rocky-outcrops and rangelands • Deployment of six camera traps at near mine rocky outcrops 	Multiple field visits between 23 September 2019 and 22 November 2019

Survey	Sampling Effort	Dates
Short Range Endemic Survey (OZ Minerals, 2021; Appendix G6)	<ul style="list-style-type: none"> • 47 foraging sites • 22 dry pitfall trapping sites • 19 wet pitfall trapping sites 	20 June to 4 July 2018 17 to 31 October 2018 8 to 15 October 2019

Table 10: Survey Effort for the Great Desert Skink per Habitat Type

Habitat Type	Total Transects (km)
Sand dunes	47.5
Spinifex sandplains	166.3
Calcrete – Spinifex sandplain mosaic	137.1
Mallee sandplains	74.8
Calcrete – Mallee sandplain mosaic	25.7
Mulga sandplains	24.5
Calcrete plains	51.0
Mulga woodlands	72.3
Stony hills and plains	-
Chenopod shrublands	-
Claypans	0.4
Outside fauna survey area (primarily Spinifex Sandplain)	165.1
Total	767.3

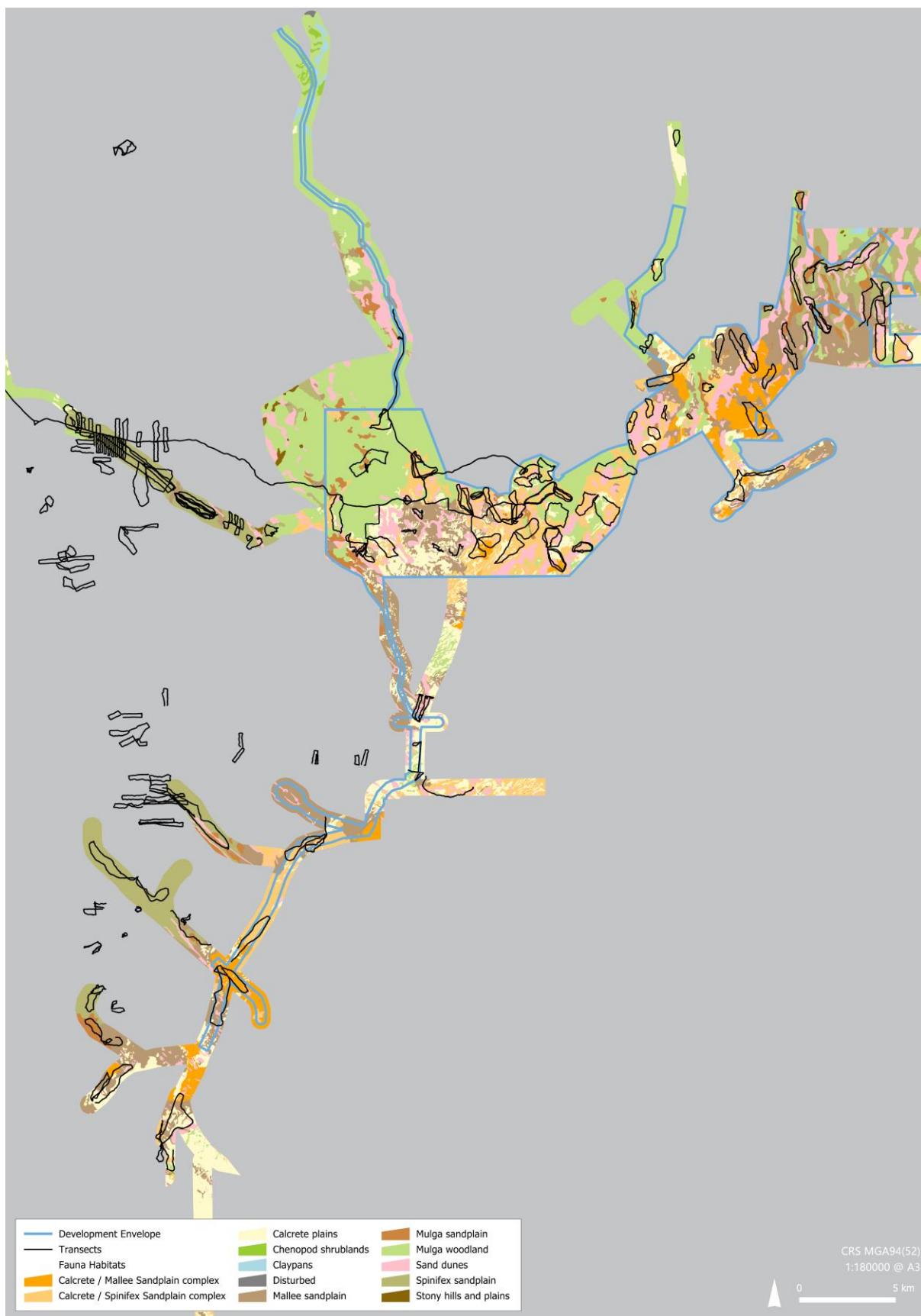


Figure 4: Great Desert Skink Survey Effort (Transects)

The targeted regional study undertaken by the Ngaanyatjarra Ranger Team identified 80 new warrens (groups of burrows), representing 10 to 12 previously undocumented clusters or sub-populations (e.g. populations separated by 10 km or more). Sixty-nine of these records were classified as active, having latrines with fresh scats (Figure 7). It is noted that the newly recorded burrows in the regional study were predominantly in relatively close proximity to vehicle access tracks (0.5 to 1 km) and do not represent an exhaustive inventory of the species area of occupancy throughout the landscape.

Within the project-specific fauna survey area (46,263.3 ha), a total of 106 Great Desert Skink burrows were recorded in four distinct areas or sub-populations (Figure 5 and Plate 1). Thirteen of these 106 records were located inside the Development Envelope, in the northern borefield area. For all sub-populations identified, it is considered likely that more burrows were present within deep sand spinifex, however as the purpose of the surveys was to investigate the extent of the population rather than document every burrow a full population estimates were not confirmed.

Based on interrogation of aerial imagery, Western Wildlife have indicated it is reasonable to assume that the area of occupancy of the species is far larger than just those locations where Great Desert Skink were identified. An indicative area of occupancy based on habitat mapping has been identified, as shown in Figure 9. Great Desert Skink burrows were found exclusively in Spinifex Sandplain, with a few burrows on the saddles of low dunes adjacent to these sandplain (Plate 1). Figure 6 shows the distribution of the burrows found within the fauna survey area. Burrows were often located in areas with patches of *Leptosema chambersii*, a widespread low shrub of the arid region. Great Desert Skink were not identified in any other habitat type within the project specific survey area, or in the Ngaanyatjarra Council Ranger study area.

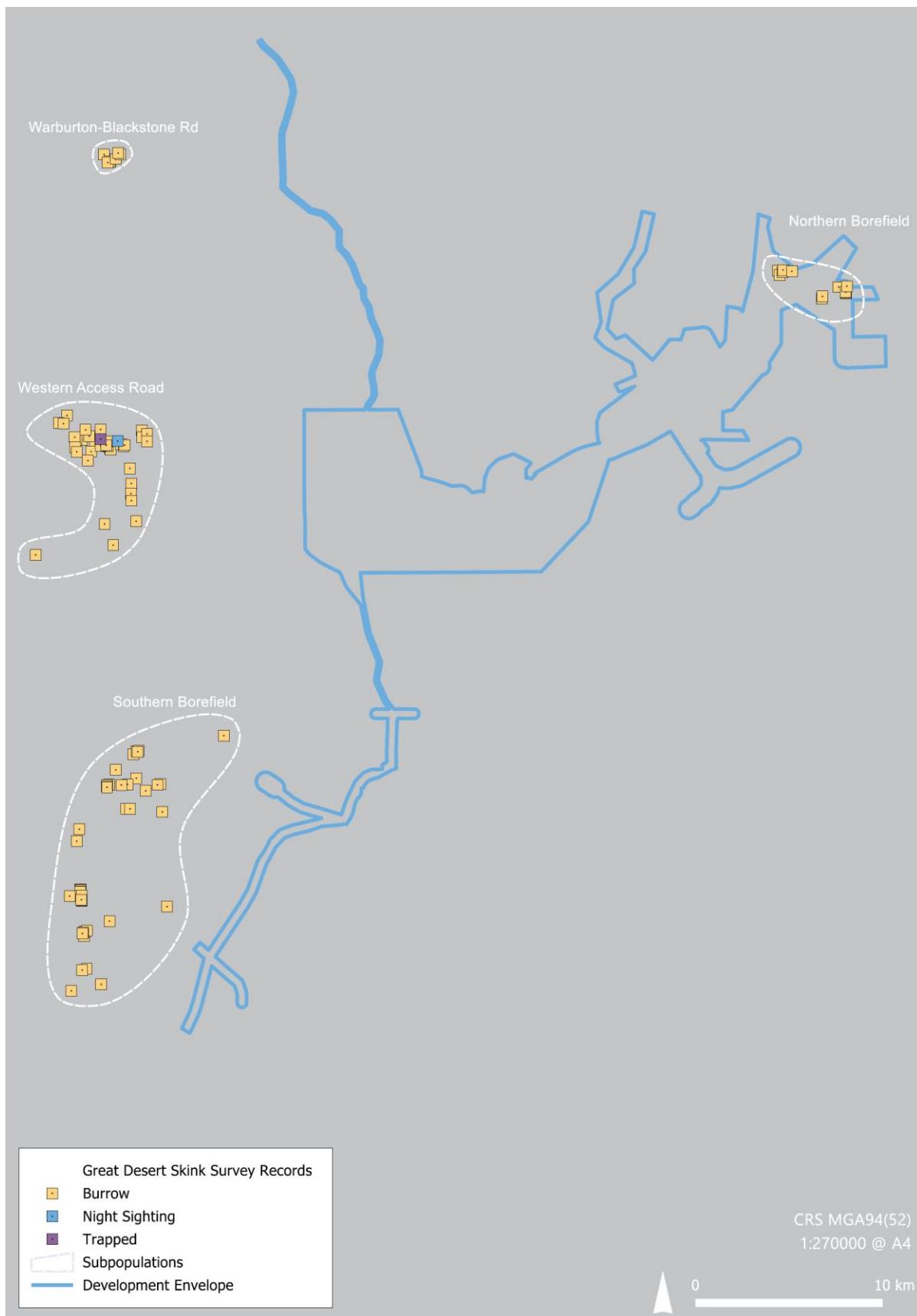


Figure 5: Great Desert Skink Survey Records Within the Survey Area

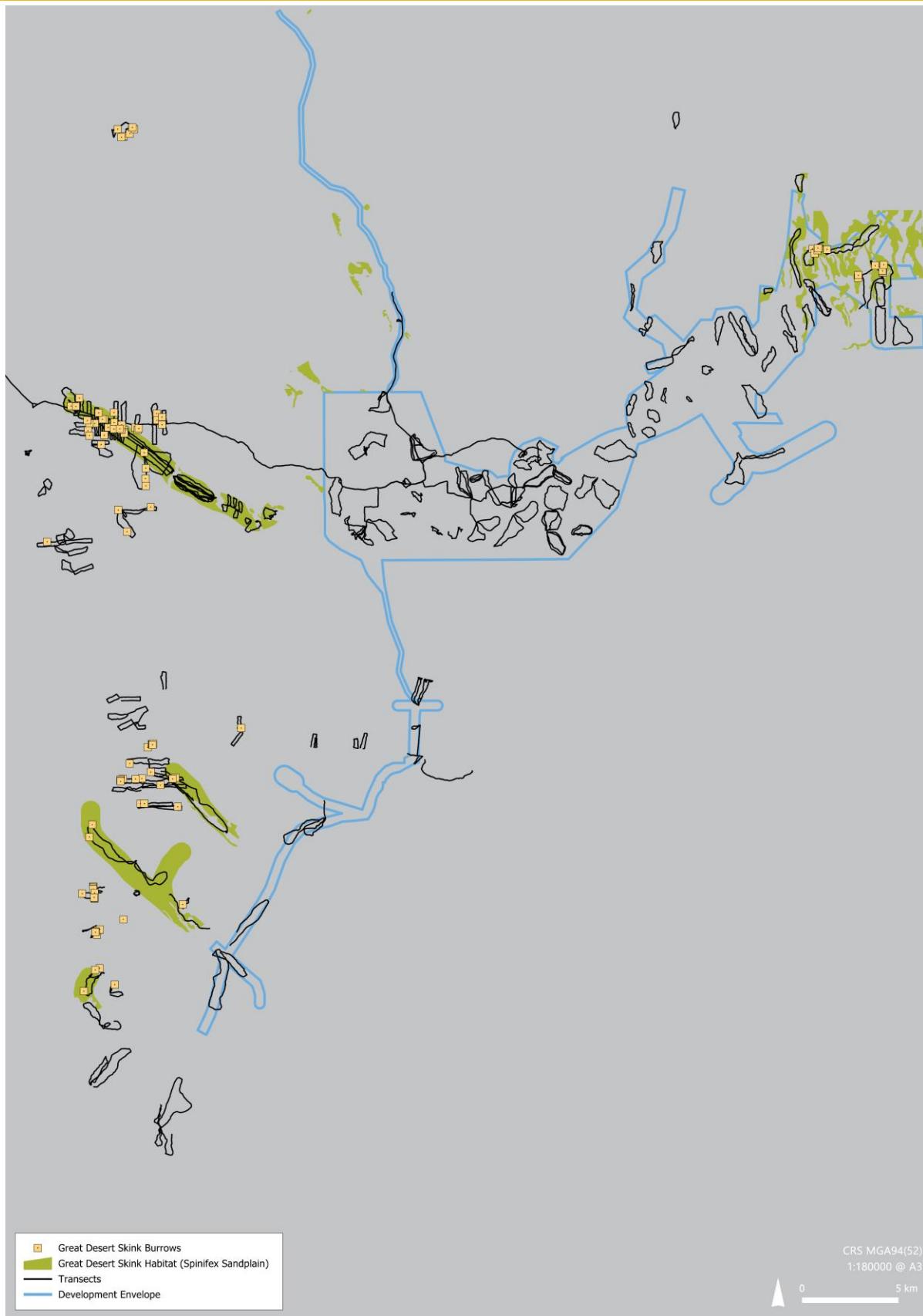


Figure 6: Observed Great Desert Skink Burrows in the Project Area

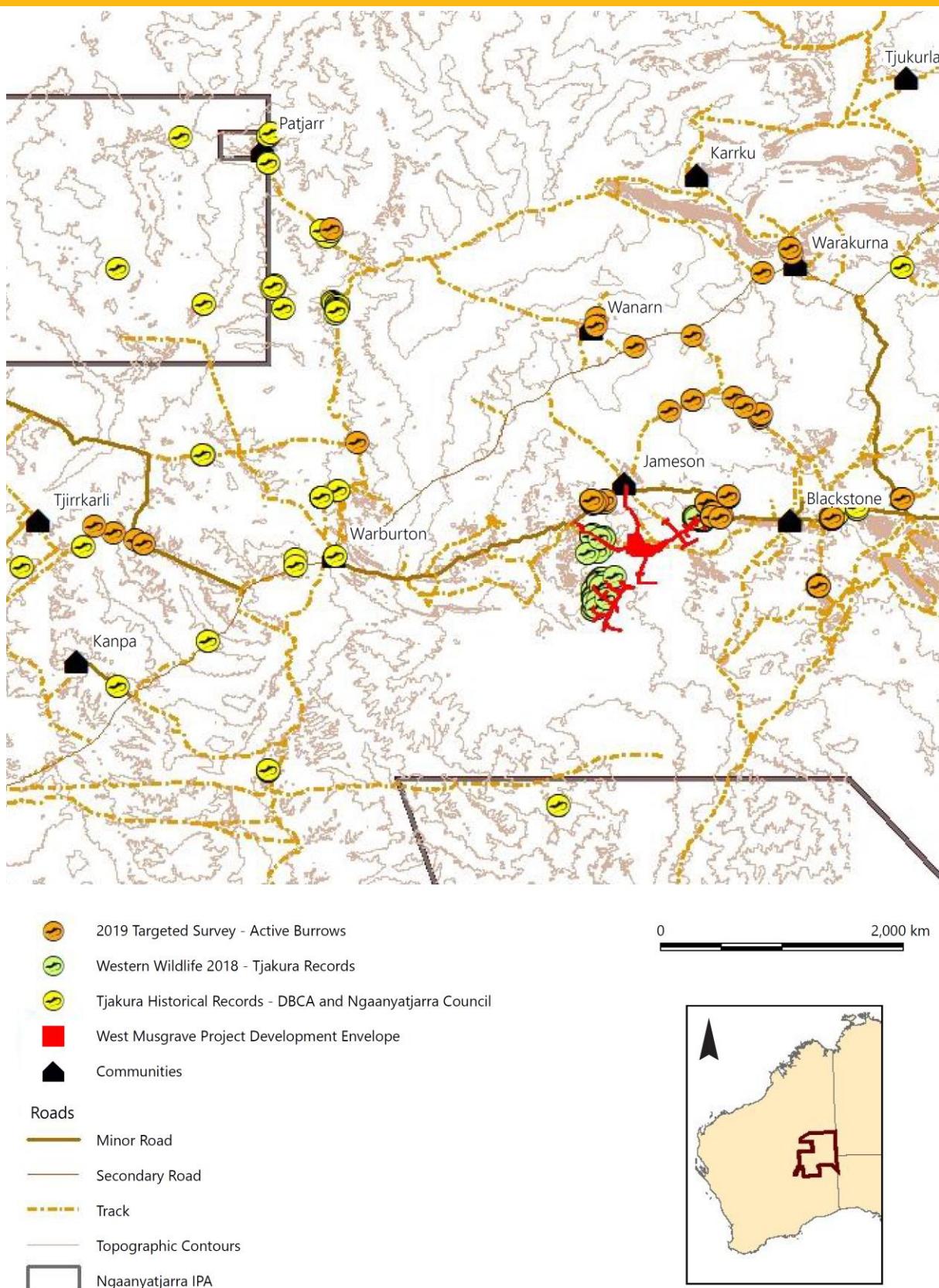


Figure 7: Regional Records for the Great Desert Skink Active Burrows



Figure 8: Great Desert Skink Habitat Within the Project Area



Figure 9: Assumed Area of GDS Occupancy in and Adjacent to the Development Envelope

1.4.2 Key Assumptions and Uncertainties

This TFMP has been developed using all relevant and available information at the time of preparation. As the understanding of terrestrial fauna management improves over time, this TFMP may require updating.

The key assumptions and uncertainties associated with this current TFMP are described in Table 11.

Table 11: Key Assumptions and Uncertainties Associated with Terrestrial Fauna Management

ID	Assumption/ Uncertainty	Description
A1	Survey effort	The fauna surveys undertaken to date accurately report the distribution and status of significant fauna and their preferred habitats in the project area. The competency and experience of the consultants carrying out Terrestrial Fauna surveys was sufficient to ensure qualified results.
A2	Species habitat	Based on the level of targeted survey effort for Great Desert Skink, the habitat preferences of this species are well known and limited to deep sand spinifex habitat, and occasionally on dune crests and swales adjacent to deep sand spinifex sandplains. No signs of Great Desert Skink have been found outside of these habitat types. Clearing of deep sand spinifex sandplain habitat in the Development Envelope is limited to an area of 6.7 ha within the Northern Borefield. This represents 0.1% of all Great Desert Skink habitat recorded and mapped in the project specific fauna survey area.
A3	Species distribution	Based on interrogation of aerial imagery, Western Wildlife have indicated it is reasonable to assume that the area of occupancy of the species is far larger than just those locations where Great Desert Skink were identified in the current survey.
A4	Threatening processes	Significant fauna are susceptible to a range of threatening processes, including predation / competition from introduced species and inappropriate fire regimes. Active management of these factors has the potential to result in a net positive outcome for fauna beyond current levels.
A5	Effectiveness of management actions	Protection of fauna habitat will result in the protection of significant fauna. The management actions proposed (Section 2) in this TFMP are appropriate and sufficient to protect significant fauna species from significant direct and indirect impacts.
A6	Protection of all native fauna	Measures to protect significant fauna habitat will also protect other native fauna species supported by that habitat. Measures to protect significant fauna will also protect all other native fauna, including those species of significance to Ngaanyatjarru People.
U1	Regional knowledge	It is considered likely that scheduled species including priority fauna populations found to date also occur more widely in the project region, outside of those areas associated with the Development Envelope. While interrogation of aerial imagery has identified significant areas of deep sand spinifex outside of the Development Envelope, the full extent of appropriate habitats and population areas outside of the Development Envelope for each listed fauna species is generally unknown.

1.4.3 Management Approach

While OZ Minerals has identified a number of avoidance, minimisation and mitigation measure that would be implemented to protect terrestrial fauna in the EPA Section 38 Referral (OZ Minerals, 2021) the management approach, and management actions detailed in this TFMP are specifically designed to ensure the project meets the EPA's objective for Terrestrial Fauna (Section 1.2) as it pertains to significant fauna, with a focus on the mitigation hierarchy; this includes avoidance and minimisation of direct impacts (Table 12) and the mitigation of indirect impacts (Table 13).

Table 12: Minimisation Measures for Direct Impacts to Significant Fauna

Mitigation
Measures to Avoid
<ul style="list-style-type: none"> A considerable effort has been made to reorient and reduce the size of Development Envelope to avoid impacts to environmental values. This has included a reduction of the Development Envelope from 25,200 ha to 20,852 ha (17% reduction), and of the disturbance footprint from 3,961 ha to 3,830 ha resulting in the exclusion of some areas known to support significant fauna (such as the formally proposed Western Access Road and parts of the Southern Monitoring Area where deep sand spinifex occur) Adjustment of the Development Envelope to exclude habitat known to support significant species (excluded 82% of Spinifex Sandplain habitat) Avoidance through informed design by minimising clearing to the smallest area possible and placing waste in-pit where practicable Avoidance or minimisation through informed design by avoiding clearing of habitat for conservation-significant species and, where practicable, micro-sighting infrastructure during construction to avoid significant habitats Siting of turbines outside of habitats known to support significant fauna species Consideration of the swept height of wind turbine blades above the vegetation canopy for wind farm design and development
Measures to Minimise
<ul style="list-style-type: none"> Development and implementation of a site-specific internal clearing/disturbance procedure and associated permit to prevent clearing outside approved boundaries, and to minimise disturbance to only that required The site induction program would provide information on protection of significant fauna habitats and ground disturbance authorisation procedures A pre-clearance survey would be undertaken in Spinifex Sandplain to ensure that proposed clearing is aligned away from signs of Great Desert Skink Various aspects of the conceptual and detailed design of the wind farm and individual turbines would take into account the following design features to reduce the risk of avian fauna and bat mortalities: <ul style="list-style-type: none"> Design of turbine towers with solid structure turbines, as opposed to lattice style structures to prevent birds, particularly raptors, using the turbines as perching and/or nesting locations, increasing the likelihood of rotor collision Size of turbines would be as large as practicable to allow the turbines to be more visible to avian fauna species and have lower blade rotational speeds than smaller turbines Turbines would be designed to create less edges where possible Provision of visibility enhancement devices

Mitigation
Measures to Rehabilitate
<ul style="list-style-type: none">• Progressive rehabilitation would be undertaken on disturbed areas as they become available• Monitoring of analogue and rehabilitated areas would be undertaken to ensure short, medium and long-term rehabilitation objectives are achieved• Ongoing development of monitoring methodology and rehabilitation techniques would occur during the life of the project. Further assessments over time would plot the development of rehabilitated areas against analogue sites and progression towards completion targets• Preparation and regular update of a Mine Closure Plan consistent with DMIRS and EPA Guidelines for Preparing Mine Closure Plans (DMIRS, 2020)

Table 13: Mitigation Measures for Indirect Impacts to Significant Fauna

Mitigation
Altered fire regimes
<ul style="list-style-type: none">• Fire breaks would be maintained around fixed plant areas• Fire management infrastructure would be maintained on site and in vehicles, along with competent persons for the management of bushfires• A Hot Works procedure would be put in place to ensure adequate controls are put in place for activities that have the potential to result in bushfire• Fire management protocols and land management would be consulted with the Ngaanyatjarra Council to ensure that aligned fire management outcomes are achieved

1.4.4 Rationale for Choice of Management Targets

The provisions included in this TFMP are objective-based as they relate to specific management actions.

2 EMP COMPONENTS

2.1 Management Objectives, Actions and Targets

Management objectives, actions and targets focused on achieving the EPA objective for Terrestrial Fauna (Section 1.2) as it relates to significant flora species are presented in Table 14. These focus the greatest management effort on project activities that have the highest likelihood of causing adverse impact on significant fauna species. The order of management objectives and the resultant management actions and targets is from highest to lowest management effort to achieve the EPA's objective.

Table 14: Objective-based EMP for Terrestrial Fauna

EPA Factor: Terrestrial Fauna Key Environmental Values: Significant fauna and associated habitat Key Impacts and Risks: <ul style="list-style-type: none"> • Decrease in poorly represented fauna habitat as a result of land clearing for the pipeline and service corridor alignment • Significant decrease in richness and abundance of fauna, including significant fauna, as a result of interactions with project-related vehicles and machinery or entrapment • Increase richness and abundance of predator species resulting from project-related attractants (water and food sources) result in higher levels of predation of native fauna • Decrease in the richness and abundance of poorly represented fauna habitat and significant fauna species as a result of project-related altered fire regimes 			
Management Action	Management Target(s)	Monitoring	Reporting
Management Objective: Minimise loss of significant fauna habitat and fragmentation as a result of project-related land clearing			
<ul style="list-style-type: none"> • Clearing in accordance with internal land clearing procedure • Minimise amount of active cleared land 	<ul style="list-style-type: none"> • Total project-related land disturbance is to be within the approved Development Envelope and not to exceed the approved area 	<ul style="list-style-type: none"> • Annual reconciliation of land disturbance-related survey data with the respective year's aerial imagery • Annual review of internal project-related land disturbance register relative to actual project-related land disturbance and LDPs 	<ul style="list-style-type: none"> • Internal project-related Land Disturbance Register and LDPs • Mining Rehabilitation Fund (MRF) annual reporting • Annual WMP Compliance Assessment Report
Management Objective: Minimise death or injury to significant fauna in the Development Envelope as a result of project-related land clearing			
<ul style="list-style-type: none"> • Undertake pre-disturbance surveys: <ul style="list-style-type: none"> ◦ in Spinifex Sandplain habitat to map all active Great Desert Skink burrows ◦ prior to proposed project-related land disturbance with adequate lead time (two months is recommended) to allow for design amendment to ensure avoidance of all active Great Desert Skink burrows ◦ to undertake designation/demarcation as 'fauna exclusion zones' prior to project-related land disturbance • Fauna spotter present during all project-related land disturbance in Spinifex Sandplain habitat 	<ul style="list-style-type: none"> • No death or injury to significant fauna attributable to project-related land disturbance activities • No loss of active Great Desert Skink burrows due to project-related land disturbance 	<ul style="list-style-type: none"> • Great Desert Skink burrow location and status data collected during pre-disturbance surveys • Fauna spotter to record observations of significant fauna and burrows during project-related land disturbance in Spinifex Sandplain habitat, including written records and photographs, where appropriate • Opportunistic identification of fauna mortalities 	<ul style="list-style-type: none"> • Pre-disturbance survey records including significant fauna observations and fauna mortality records • Fauna spotter recorded significant fauna observations including fauna mortality • GIS records of pre-disturbance survey records, fauna exclusion zones and locations of significant fauna recorded by fauna spotter • Annual WMP Compliance Assessment Report
Management Objective: Minimise death or injury to significant fauna as a result of interactions with project-related vehicles or machinery			
<ul style="list-style-type: none"> • Speed limits restricted to a maximum of 20 km/hr in close vicinity of Deep Sand Spinifex habitat, 60 km/hr in all other project areas, 80 km/hr on the main northern access road; with appropriate speed limit signage in place • Off-road driving not permitted outside of cleared areas • Personnel inductions include speed limit restrictions and non-compliance process 	<ul style="list-style-type: none"> • No death or injury to Great Desert Skink, Brush-tail Mulgara, Southern Marsupial Mole or Striated Grasswren as a result of vehicle strike attributable to the project 	<ul style="list-style-type: none"> • Six-monthly review of records of speed limit non-compliances within the 20 km/hr zones • Opportunistic identification of fauna mortalities 	<ul style="list-style-type: none"> • Annual WMP Compliance Assessment Report • Internal incident reporting and non-compliance reporting • Fauna mortality records • Induction records • Regulatory agency notification of incident for significant fauna

Management Action	Management Target(s)	Monitoring	Reporting
Management Objective: Minimise adverse impacts on significant fauna as a result of project-related pipeline construction			
<ul style="list-style-type: none"> Undertake pre-disturbance surveys: <ul style="list-style-type: none"> in Spinifex Sandplain habitat to map all active Great Desert Skink burrows Prior to project-related land disturbance with adequate lead time (two months is recommended) to allow for design amendment to ensure a minimum buffer distance of 50 m between active Great Desert Skink burrows and pipelines to undertake designation/demarcation as 'fauna exclusion zones' prior to project-related land disturbance Fauna spotter present during all project-related land disturbance in Spinifex Sandplain habitat Daily fauna removal from trenches during pipeline construction Fauna egress installed in open trenches during construction Pipelines in Spinifex Sandplain habitat to be buried or elevated ≥100 mm above the ground at least every 100 m 	<ul style="list-style-type: none"> No death or injury to significant fauna attributable to project pipeline construction No loss of active Great Desert Skink burrows due to land disturbance for project-related pipelines 	<ul style="list-style-type: none"> Great Desert Skink burrow location and status data collected during pre-disturbance surveys Fauna spotter to record observations of significant fauna and burrows during project-related land disturbance in Spinifex Sandplain habitat, including written records and photographs, where appropriate Daily trench inspections with records of fauna removal during pipeline trenching activities 	<ul style="list-style-type: none"> Pre-disturbance survey records including significant fauna observations Fauna spotter recorded significant fauna observations including fauna mortality GIS records of pre-disturbance survey records, fauna exclusion zones and locations of significant fauna recorded by fauna spotter Annual WMP Compliance Assessment Report
Management Objective: Minimise adverse impacts to significant fauna as a result of project-related increase in feral animal abundance			
<ul style="list-style-type: none"> Install fencing around domestic waste facilities minimise access to waste Construct and rehabilitate project borrow pits and all other constructed landforms to minimise permanent or long-term water holding Develop, implement and update a feral fauna species monitoring and control program within the Development Envelope for the operational phase in response to construction phase and ongoing monitoring results 	<ul style="list-style-type: none"> Minimise feral fauna species access to attractants (e.g. water sources and uncovered waste) Minimise feral fauna species access to ponded water in constructed landforms, including borrow pits Reduced observations of feral fauna species in project attractant areas (landfill, WWTP, water storage ponds, accommodation village) 	<ul style="list-style-type: none"> Quarterly feral animal monitoring and recording at attractant locations, including: <ul style="list-style-type: none"> presence/absence species status of fencing status of attractants (water storage, waste management) Post-rehabilitation earthwork inspections Post-rainfall inspections Workplace inspections (WWTP, landfill, water storages) Opportunistic fauna observations 	<ul style="list-style-type: none"> Internal incident reports Annual MRF reports Feral fauna species monitoring and control program records Annual WMP Compliance Assessment Report
Management Objective: Minimise adverse impacts to significant fauna as a result of project-related altered fire regime			
<ul style="list-style-type: none"> Develop and maintain a Fire Mitigation Plan and incorporate into the Asset Emergency Management Plan Install and maintain fire extinguishers and firefighting equipment in the project area and on site to relevant Australian Standards Install and maintain firefighting equipment in machinery and vehicles undertaking land disturbance activities Project emergency response personnel trained in fire and bushfire response Vehicles kept to access tracks or cleared areas Develop and implement a Hot Work Permit system Fire management practices developed in consultation with WA Department of Fire and Emergency Services (DFES) and the Ngaanyatjarru Council, including installation and maintenance of firebreaks if required Site induction to include information on prevention, management and response to fires 	<ul style="list-style-type: none"> No unplanned fires attributable to project-related activities Minimise the potential environmental damage from project-related extreme or out-of-control wildfires attributed to project-related activities 	<ul style="list-style-type: none"> Emergency response equipment inspections relative to relevant Australian Standards Annual fire response training exercise including wildlife response Annual review of fire break development for evidence of adequate installation and maintenance 	<ul style="list-style-type: none"> Internal incident reports Internal project-related Land Disturbance Register and LDPs Hot Work Permit register Induction and training records Annual WMP Compliance Assessment Report

2.2 Monitoring

Internal monitoring procedures and processes will be developed to support the delivery of the monitoring commitments described in Table 14 to ensure a consistent monitoring approach and methodology is applied over the life of the project. Where relevant and appropriate, the Ngaanyatjarra Council and relevant Ngaanyatjarra People would be consulted during the development of the monitoring procedures.

2.3 Reporting

2.3.1 Ngaanyatjarra Council and Ngaanyatjarra People

All reporting discussed in this section will be made specifically available to the Ngaanyatjarra People through the Ngaanyatjarra Council, including where necessary periodic face-to-face meetings to discuss the results and outcomes of monitoring.

Where necessary training and support of relevant members of the Ngaanyatjarra People will be supported by OZ Minerals to ensure an understanding of monitoring results and their relevance. Further, opportunities for the involvement of Ngaanyatjarra People in the monitoring activities will continue to be explored as the project is developed.

2.3.2 Annual Reporting

OZ Minerals will prepare Annual Environmental Reports (AERs) to be submitted to regulatory authorities. The format of these reports will be consistent with requirements stipulated by individual regulatory authorities.

A Compliance Assessment Report (CAR) will be submitted to the Compliance Branch at Government of Western Australia's Department of Water and Environmental Regulation (DWER) at an agreed date. The CAR will document compliance with conditions of approval including assessment of compliance with management plan requirements where management plans form part of approval conditions.

2.3.3 Incident Reporting

In recognition of the conservation status of the four species of significant fauna described in this FVMP, OZ Minerals will report deaths directly attributable to the project. Relevant regulatory authorities (EPA, DBCA and Department of Mines, Industry Regulation and Safety (DMIRS)) will be notified within seven days of the death being recorded.

2.3.4 Reporting to the Ngaanyatjarra Council

In addition to the regulatory reporting requirements outlined in Table 14, OZ Minerals would report key data from this TFMP to the Ngaanyatjarra Council, including:

- Fauna deaths attributable to the WMP, including mortalities of species considered significant to the Ngaanyatjarra people
- Feral animal monitoring outcomes.

These would be reported and/or presented in accordance with consultation and/or reporting schedules nominated within the Mining Agreement.

3 ADAPTIVE MANAGEMENT

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of management actions. Specifically, adaptive management in relation to this MP includes:

- Defining the issue and objectives, and developing the TFMP to address these (i.e. this document)
- Implementing the management actions described in this TFMP (Table 14)
- Monitoring and evaluating the applied management and mitigation against the outcomes and objectives, as per the monitoring program outlined in Table 14
- Adjusting the management actions and monitoring (if required) to meet the outcome or objective, based on what is learnt from:
 - evaluation of the effectiveness of applied mitigation measures
 - review of assumptions and uncertainties
 - re-evaluation of risk assessment
 - external changes during the life of the project (e.g. technical advances or innovation, changes to priority or threatened fauna listings).

It is recognised that there is a level of scientific uncertainty surrounding the Great Desert Skink, particularly in relation to abundance and distribution. This makes determination of residual impacts of implementing the project on local or regional scales difficult with any degree of certainty. Given the long life of the project, it is reasonable to expect that additional information will be gained on the species that may influence future management. For this reason, it is important that the management approach for the Great Desert Skink is adaptive.

3.1 Management Plan Review

Review processes for the TFMP will be based on formalised dates after project commencement and triggers such as:

- Monitoring results: If site-specific monitoring program results indicate that management targets are not being achieved.
- Changes in knowledge: If new information about a species' use of the Development Envelope or region is received which would better inform management approaches.
- Significant changes to project design: The relevance and effectiveness of existing management measures would be considered and amended as appropriate.



West Musgrave Copper and Nickel Project Terrestrial Fauna Management Plan

This management plan will also be reviewed and revised following any significant changes to the project from that described within the EPA Section 38 Referral (OZ Minerals, 2021). OZ Minerals will also review this plan within one year following implementation of the project, including a review of the management actions, monitoring methods and reporting requirements. Following any significant changes, the updated plan will be submitted to DWER for approval.

4 STAKEHOLDER CONSULTATION

Consultation has been undertaken as part of the Section 38 Referral under Part IV of the EP Act, and as part of ongoing discussions relating to a Mining Agreement with the Ngaanyatjarra People. Details of these consultations are provided in Section 3, Section 6.1.3, Appendix A4 and Appendix A5 of the EPA Section 38 Referral (OZ Minerals 2021).

Through consultation with Traditional Owners the following areas were identified as areas of concern to Ngaanyatjarra People relating to terrestrial fauna, these matters have been specifically considered in this TFMP:

- Potential impacts to food resources such as goanna, bush turkey (Australian Bustard), macropods and grubs or to species that are considered iconic in dreamtime stories or representative of dreaming trails. These iconic and totem species comprised the same suite of species as those listed as species that are regularly hunted.

Consultation specific to this TFMP includes internal peer review with subject-matter experts (MBS Environmental, Western Wildlife, Donato Environmental Services and Adaptive NRM) and meetings with the Government of Western Australia's DWER and EPA.

A review of a draft TFMP has been undertaken by the Ngaanyatjarra Council (environmental consultant). All relevant feedback has been considered in the development of this management plan.



West Musgrave Copper and Nickel Project Terrestrial Fauna Management Plan

5 UPDATES TO THE EMP

This section is not applicable to the first version of the Terrestrial Fauna Management Plan, and will be updated in future revisions.

6 REFERENCES

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West Musgrave Copper and Nickel Project Terrestrial Fauna Management Plan

APPENDICES



West Musgrave Copper and Nickel Project Terrestrial Fauna Management Plan

Appendix A. Night Parrot Peer Review and Habitat Analysis



West Musgrave Copper and Nickel Project

Night Parrot Peer Review and Habitat Analysis

NIGHT PARROT PEER REVIEW AND HABITAT ANALYSIS

As part of the Government of Western Australia's Environmental Protection Authority's (EPA) S40(2)(a) Notice Requiring Information for Assessment for the West Musgrave Copper and Nickel Project, the EPA requested a 'review of the Night Parrot methodology'.

The review, which can be found at ANRM 1, was undertaken by notable Night Parrot experts, Nigel Jackett and Nick Leseberg of Adaptive NRM, who have extensive experience identifying potential Night Parrot habitat and detecting Night Parrots using remotely deployed acoustic recording units (ARUs). The review concluded that methodological shortcomings employed in the initial WMP Night Parrot surveys presented limitations to detection of Night Parrots, and that conclusions pertaining to Night Parrot occupancy were not supported. The review recommended the following actions to increase certainty relating to potential Night Parrot occupancy at the WMP:

1. Conduct a desktop analysis of potential roosting and foraging sites using available products and hi-resolution satellite imagery, a process that the authors have used successfully to identify the presence of Night Parrot throughout Australia
2. Where the desktop analysis indicates potential roost habitat is extant, a comprehensive acoustic survey plan for these sites could be developed that would require a limited number of very brief acoustic surveys, and analysing the recordings from these surveys, with a recogniser known to be capable of detecting a higher percentage of Night Parrot calls.

In May 2021, following the review described above, Nigel Jackett, Nick Leseberg and Steve Murphy of Adaptive NRM, undertook the first of the above listed recommendations. This Night Parrot Habitat Analysis can be found at ANRM 2, and concluded:

Night Parrot roosting habitat is unlikely to occur within the Development Envelope, reducing uncertainties in previous assessments.... Therefore, additional acoustic surveys (or re-analysis of sound data collected by Donato Environmental Services (2019)) are unlikely to detect the presence of roosting Night Parrots within the Development Envelope. Acoustic surveys within potential foraging habitat are unlikely to detect Night Parrots, due to the small and fragmented extent of potentially suitable habitat available, and the relatively large distance Night Parrots would need to travel to access potential foraging habitat within the Development Envelope.

This analysis provides a strong conclusion of the low likelihood of Night Parrot occurrence at the WMP.

Details of the above listed Night Parrot habitat study and review are provided below.



West Musgrave Copper and Nickel Project Night Parrot Peer Review and Habitat Analysis

ANRM 1. Night Parrot Peer Review

OZ Minerals Ltd
West Musgrave Copper and Nickel Project

Peer Review of Night Parrot assessments

31 May 2021



Recommended citation: Jackett, N.A. and Leseberg, N.P. (2021). *OZ Minerals Ltd West Musgrave Copper and Nickel Project – Peer Review of Night Parrot assessments*. Report to OZ Minerals. Adaptive NRM, Malanda, QLD.

1. Introduction

In April 2021, MBS Environmental (on behalf of OZ Minerals Ltd) engaged Adaptive Natural Resource Management Pty Ltd (ANRM) to peer review reports relating to the assessment of the Night Parrot for the OZ Minerals Ltd West Musgrave Copper and Nickel Project (WMP). The predominant report assessing the Night Parrot, ‘*Avian and microbat baseline characterisation associated with the proposed wind turbine electricity generators*’ (Donato Environmental Services 2019), prepared by Donato Environmental Services (DES), examined the likelihood of the Night Parrot occurring within WMP area.

The specific scope of the Peer Review was to examine whether:

- Methods (habitat assessment and acoustic analysis) were reasonable;
- Locations of acoustic monitoring were reasonable;
- Survey effort was reasonable; and
- Conclusions were justifiable.

Additionally, it was requested that the Peer Review provide any advice or information relating to the flight heights of Night Parrots, for which there are no previously published data.

2. Peer Review

To assist the Peer Review, OZ Minerals Ltd provided core review documents and associated reference material relevant to the WMP. This material was reviewed by ANRM. ANRM also consulted David Donato of DES who conducted the acoustic analysis, to better understand the procedures used to analyse the recordings collected during the field survey. Under the main headings below we address each of the issues within the defined scope of the Peer Review.

Methods

Habitat assessment

All currently known Night Parrot populations occur at sites where there is a matrix of both suitable roosting and breeding habitat, and suitable foraging habitat. These habitats are typically structurally and floristically quite different (Murphy *et al.* 2017b). At sites where Night Parrots are known to occur, roosting habitat is provided by patches of relatively open, long unburnt, and structurally complex *Triodia*. Feeding habitat is characterised by relatively productive areas with a high diversity of perennial and annual grasses and herbs, typically found on run-on or floodplain areas (Murphy *et al.* 2017b).

Areas of open, long unburnt and structurally complex *Triodia* suitable for Night Parrot roosting habitat can be isolated and relatively small within the landscape. They are typically found in areas where natural fire breaks protect them from wildfires (Jackett *et al.* 2017; Murphy *et al.* 2017b). Palaeodrainage, open stony pavement, and rocky hills are likely to provide such protection.

DES (2019) stated (p. 4) “Roosting habitat for Night Parrot (*Pezoporus occidentalis*) is described as long unburnt *Triodia* [12], again a habitat of limited extent in the WMP [6]” citing Western Botanical (2019) who described and mapped the vegetation associations of the survey area. Yet, Western Botanical (2019) describes the ‘SAWS’ vegetation community as: “characterised by a composite hummock grassland (in a mature, long unburnt state)...The hummock grassland is dominated by the Spinifex species *Triodia basedowii* from 0.4 - 0.5 m and/or *Triodia schinzii* 0.5 - 0.8 m, with a PFC of 30 - 40%”. The SAWS vegetation community comprises – at minimum based on this vegetation community being a component of other vegetation communities – 5,723.7 ha (13.8%) of the vegetation mapped by Western Botanical (2019). Contrary to the assessment by DES, based on the available habitat mapping, the presence of mature, long unburnt hummock grassland is not of limited extent in the WMP.

Western Wildlife (2020) noted potential roosting or breeding habitat for Night Parrot did occur at some sites, where spinifex hummocks occurred on shallow sands surrounding calcrete outcroppings. It was suggested that increased water run-off promoted spinifex growth, giving the *Triodia* the size and structural complexity required by Night Parrots. The extent of potential roosting and breeding habitat was considered too patchy and small to map as part of their survey, so further details are unknown. Given the extent of this habitat, it would likely be a relatively simple exercise for it to be mapped using available products, or publicly accessible hi-resolution satellite imagery.

Based on the descriptions and representative images of the *Calcrete Plain Landform System* and *Hardpan Plain and Drainage Landform System* (Western Botanical 2019), it is considered likely that some suitable foraging habitat for Night Parrot exists within these systems, albeit only a small amount. The associations with vegetation structure and flora assemblages that are similar to known Night Parrot foraging habitat (Jackett *et al.* 2017; Murphy *et al.* 2017c) include:

- Calcrete Open Grassland;
- Calcrete Platform Hummock Grassland with *Acacia eremophila* var. Numerous-nerved variant (A.S. George 11924);
- *Maireana triptera* - *Atriplex vesicaria* Chenopod Shrubland;
- Claypan Playa;
- Claypan Grassland.

When attempting to establish whether likely foraging habitat occurred in the WMP, DES stated (p. 4) “[c]henopods usually in association with edges of watercourses or salt lakes [15], [are] not typically vegetation that is represented within the WMP area”. We concur that this vegetation is not well-represented within in WMP. However, Western Botanical (2019) described several vegetation associations, including the chenopod-dominated ‘*Maireana triptera* - *Atriplex vesicaria* Chenopod Shrubland’, which we believe DES should have acknowledged as being potential foraging habitat for the Night Parrot.

Further, on page 5, DES uses a lack of the following: gibber, water sources, bare ground, and sparse vegetation, as justification for foraging habitat not being present in the WMP. None of

these properties characterise Night Parrot foraging habitat. Rather, Night Parrot feeding habitat is more correctly characterised as the presence of relatively productive areas with a high diversity of perennial and annual grasses and herbs. These are typically found on run-on or floodplain areas (Murphy *et al.* 2017b).

Because DES did not use available mapping to correctly assess the presence of potentially suitable *Triodia*, did not identify the presence of some vegetation associations that reflect potential foraging habitat, and incorrectly concluded that some potential foraging habitat was not suitable based on erroneous interpretations of the available literature, we conclude that DES' assessment of the extent of suitable Night Parrot habitat within the Development Envelope was incorrect.

Acoustic analysis

DES used Kaleidoscope Pro (Kaleidoscope) software to conduct the acoustic analysis of field recordings from the WMP. Kaleidoscope provides a method of automated detection of vocalisations within bioacoustic recordings. It is widely used in acoustic analysis, including for Night Parrots (Biologic Environmental Survey 2020; Phoenix Environmental Sciences 2020). Kaleidoscope clusters similar signals (e.g. a particular call type of a bird) into groups, to be later classified or analysed. Once classified, new data can be analysed and matched to previously annotated clusters.

DES used Kaleidoscope cluster analysis to search for calls of the Night Parrot, as well as other arid bird species. The parameter settings used to run the Kaleidoscope cluster analyses targeting the Night Parrot are listed in Table 2 (pg. 13) of DES (2019). DES stated that the selected frequency ranges for the two cluster runs targeting the Night Parrot were 1600 – 2400 Hz, and 1600 – 2600 Hz.

DES (2019) attempted to assess the performance of the selected Kaleidoscope parameters through the insertion of Night Parrot reference calls into field recordings. The reference calls were sourced from the Night Parrot website: <https://nightparrot.com.au/index.php/resources/night-parrot-calls/> (D. Donato pers. comm.).

It is well-established in the acoustic analysis literature, that an accurate acoustic analysis requires: a detailed knowledge of the calls of the species of interest; access to a comprehensive library of the calls which have been recorded in the field on which to test the method of analysis; and, familiarity with the calling biology of the target species (Potamitis *et al.* 2014, Priyadasharni *et al.* 2018).

The cluster parameters employed by DES did not correspond with publicly available, peer-reviewed literature (Jackett *et al.* 2017, Leseberg *et al.* 2019), which give details of several Night Parrot call types with frequencies approaching 4000 Hz. *Didit* calls from the Great Sandy Desert, a frequent call type in that region (N. Jackett pers. obs.), are typically recorded between 2500 – 3100 Hz (Leseberg *et al.* 2019). DES did not cite either Jackett *et al.* (2017) or Leseberg *et al.* (2019), and we conclude DES was not familiar with either of these two references, otherwise cluster parameters incorporating the complete range of Night Parrot call frequencies would have been employed. DES was apparently familiar only with the nine publicly available calls at the time, which do not represent the Night Parrot's entire repertoire, nor the possible variation in the call types which are represented in that very small sample of calls. We conclude

that DES did not have a detailed knowledge of the calls of the species of interest. In fact, given that DES was apparently not familiar with the two primary references describing Night Parrot calls, and had access to a library of only nine Night Parrot calls, it is reasonable to conclude that DES had a very poor knowledge of Night Parrot calls.

It is recommended that before using a call recogniser to make conclusions about the presence or absence of a species, that recogniser is tested on field recordings with a known number of target vocalisations, so that performance can be assessed (Potamitis *et al.* 2014, Priyadarsharni *et al.* 2018). Publicly available reference calls, including those available for download on the Night Parrot website, are typically examples of unobstructed calls that are clearly audible and have been edited for listening purposes. The use of such calls when testing the performance of a recogniser is known to inflate performance, and the significant gap in performance between recognisers trained and tested on curated reference data, and those trained and tested on field data is well-established (Potamitis *et al.* 2014). This is particularly the case for Night Parrot calls. In field recordings, Night Parrot calls are often faint and obscured by insect noise, other bird calls, machinery noise, and/or wind noise. They also show much variation in frequency and structure. We acknowledge that the recogniser created by DES would have detected some Night Parrot calls, but for these reasons, the tests performed by DES which demonstrated good recogniser performance using the available reference calls inserted into field recordings cannot be used to predict the performance of the recogniser on field recordings containing Night Parrot calls.

In an attempt to recreate the performance of the cluster parameters used by DES on field recordings containing Night Parrot calls, we used Kaleidoscope 5.2.1 to test these same parameter settings on a batch of field recordings from the East Murchison and Great Sandy Desert known to contain 130 Night Parrot calls. The known Night Parrot call types within the test batch included *hollow whistle*, *three-note whistle*, *one-note trill*, and *didot*, and included variations of each. These call types are shared between Night Parrot populations (Leseberg *et al.* 2019) and are therefore considered call types likely to be detected during analyses in the WMP, if Night Parrots were in fact present. The number of true positive calls detected was compared against the known number of calls within the test batch. Both cluster runs described by DES were demonstrated of being capable of detecting 55.4 – 59.2 % of available Night Parrot calls within the test batch, with ‘Night Parrot frequency specific’ detecting the greatest proportion. All detections from ‘Night Parrot cluster run’ were detected during the ‘Night Parrot frequency specific’ cluster run, and as such, 59.2% of available calls were detected across both cluster runs. This assumes the analysis was conducted by an analyst experienced at identifying Night Parrot calls; it has been established DES had limited knowledge of Night Parrot calls, and was not experienced at identifying Night Parrot calls, so this is likely to be an overestimate. The results of the tests are shown in Table 1. By comparison, the Kaleidoscope cluster parameters developed by ANRM detected 117/130 (90.0%) of the calls in this test dataset.

Based on this assessment, we conclude that the analyst’s limited knowledge of Night Parrot calls, plus the relatively poor performance of the cluster parameter settings used to analyse this acoustic data were not satisfactory for detecting the range of Night Parrot call types that could have been present in this data.

Table 1. Testing of Kaleidoscope parameters used during the acoustic analysis in DES (2019)

Kaleidoscope results	Night Parrot cluster run (1600 – 2400 Hz)	Night Parrot frequency specific (1600 – 2600 Hz)
Kaleidoscope detections	315	408
Night Parrot detections (True positives)	72	77
Night Parrot calls available for detection	130	130
Proportion of available calls detected (%)	55.4	59.2

Locations of acoustic monitoring

A total of eight sites were selected for ARU deployment within the Development Envelope, four of which were deployed within the wind turbine footprint, and four located westward within 10 kms of the footprint (DES 2019). DES did not visit the WMP area to assess habitat in the field or deploy ARU units (D. Donato pers. comm.), the latter of which was conducted by OZ Minerals Ltd (J. Rowntree pers. comm.). ARUs were deployed at locations ‘deemed most relevant to be Night Parrot habitat’, after reviewing e.g. Murphy *et al.* (2017c) (D. Donato pers. comm.). As concluded earlier, the assessment of what constituted suitable and unsuitable Night Parrot habitat was unsatisfactory. It is not clear whether these sites represented all potentially suitable habitat within the Development Envelope, or a sample of potential habitat. Sites were not separated based on potential foraging or roosting attributes.

ANRM aligned the locations of the eight acoustic monitoring sites with vegetation associations mapped by Western Botanical (2019). ARUs were deployed in:

- CPHG – Calcrete Platform Hummock Grassland (n = 2);
- HPMW – Hard pan Mulga Woodland (n = 1);
- SAMU – Sandplain Mulga (n = 1);
- SAWS – Sandplains with Wattles other than Mulga (n = 3); and
- SDAGS – Sand Dune *Acacia* – *Grevillea* shrubland (n = 1).

ANRM acknowledge that some ARUs were deployed close to vegetation association boundaries, and therefore the vegetation at the site may have better reflected the adjacent association, as per observations by OZ Minerals (J. Rowntree pers. comm.). However, sampling within the ‘SAWS – Sandplains with Wattles other than Mulga’ was limited to ~3 sites, despite this association comprising mature, long-unburnt *Triodia* hummock grassland, and totalling 5,723.7 ha of mapped vegetation (Western Botanical 2019). As the sampling radius of an SM4 is ~200m (or ~3ha), and the sampling radius of an SM2 is ~100m or ~1ha) (see Survey Effort below), ANRM consider it unlikely this vegetation association was adequately sampled to draw conclusions on the presence (or absence) of Night Parrots roosting within the Development Envelope.

Additionally, deployments did not target the most likely foraging habitats for Night Parrots within the Development Envelope, as listed in the ‘Habitat Assessment’ section above. Consequently, the likelihood of detecting a Night Parrot away from potential roost or foraging habitat is considered very low.

Survey effort

Two approaches can be used to detect Night Parrots using acoustic surveys: short, methodical surveys can be employed to target potential roosting habitat, or longer duration surveys can be used to try and detect Night Parrots in the wider landscape.

Night Parrots are relatively easy to detect at potential roosting sites, as these sites are easy to identify, and they call very predictably within specific timeframes at these sites (Murphy *et al.* 2017a). This permits the presence or absence of Night Parrots at roost locations to be determined reliably by deploying ARUs systematically within an area of prospective roosting habitat so that the entire area is sampled, and only requires ARUs to be left in place for a relatively short survey period of around four still (non-windy) nights. Recorders should be set to record from sunset to sunrise, as per DBCA guidelines (DPaW 2017). If Night Parrots are not detected at a site within this period, it is very unlikely that the site is a roost site. There is very little benefit in targeting a roost area for more than a week, as the likelihood of birds moving into a new area to roost is considered remote (N. Leseberg unpubl. data).

Night Parrots can also be detected while moving throughout the landscape at night, including at prospective roosting and foraging sites. However, as they can range widely at night (Murphy *et al.* 2017b), a greater amount of search effort (i.e. number of nights and sampling locations) is required to determine if they are present within an area, and should ideally include wet periods when Night Parrots are known to be more vocal (Murphy *et al.* 2017a). Rainfall during the survey period was considered average overall. Slightly above average rainfall recorded at Giles in December 2018, but was average at Warburton during this same month (Western Wildlife 2020). While the parameters required to detect Night Parrots in these circumstances are not entirely clear, it is known that detections in these circumstances are likely to be very infrequent. This approach requires recorders to be left in place for extended periods (up to several months), while recording nightly between sunrise and sunset. If adopting this approach, ARU locations should target potential foraging sites, or roosting sites within a matrix of potential roosting and feeding habitat.

For this survey, ARUs recorded from 03:00 – 09:00, and 16:00 – 22:00 each day between 7 October 2018 and 24 January 2019. The ARUs recorded calls for 20 minutes every hour on the nominated hour. Estimations of sunset and sunrise times for the start and finish of the acoustic survey, as well as the number of hours recorded post-sunset and pre-sunrise are shown in Table 2.

The decision to not record between 22:00 and 03:00 each night, and to only record for 20 minutes every hour when recording was occurring, greatly reduced the probability of detecting a Night Parrot call. ANRM tested the sampling schedule used for this survey against field recordings from a Night Parrot population from an undisclosed Western Australian location. This dataset comprised 2,468 Night Parrot calls recorded at 51 unique ARU locations. The ARUs were not stationed at known Night Parrot roost sites but were spread out randomly through potential Night Parrot roosting and foraging habitat, with a similar objective to that of

the WMP assessment. The combined dataset included different seasons within the year. The times of each call were assessed against the ARU sampling schedule described in DES (2019) to determine what proportion of calls would have been *available* for detection (i.e. the ARU was recording at the time of call) using this schedule (Figure 1). We conclude that 88.1% of the calls were unavailable for detection from the complete dataset using the DES (2019) sampling schedule.

Table 2. Calculations of sunset and sunrise times at a centralised WMP location 26° 6' S, 127° 45' E.

Sunset/Sunrise	Start (7 October 2018)	Finish (24 January 2019)
Sunset	17:32	18:24
Sunrise	05:03	04:54
Estimated total recording post-sunset*	1 hour 20 minutes	1 hour
Estimated total recording pre-sunrise*	40 minutes	40 minutes
Proportion of night (sunset – sunrise) recorded (%)	17.4	15.9

*based on 20-min recordings commencing on the first hour post-sunset and finishing on the last hour pre-sunrise. Calculated using [Geodetic Calculators \(ga.gov.au\)](https://www.ga.gov.au/geodetic-calculators).

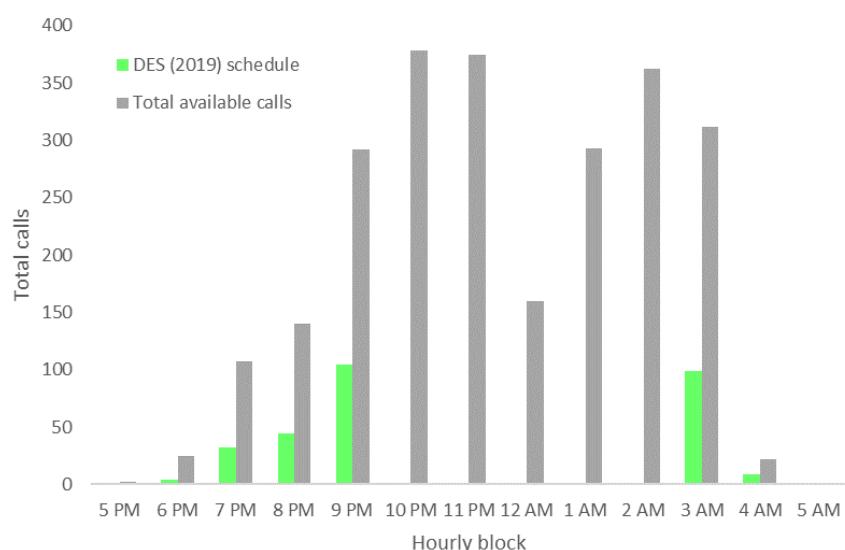


Figure 1. Number of calls available for detection using the DES (2019) sampling schedule at a site where ARUs were used to detect Night Parrots in a suitable habitat matrix.

ANRM also tested DES' sampling schedule against the smaller dataset (i.e. 4 x 12-hour recordings) described in Jackett *et al.* (2017) from a single ARU located in the vicinity of confirmed Night Parrot roost and nesting habitat. A total of 94 *hollow whistle* and *didit* calls were contained within this dataset, of which 98.9% were unavailable for detection using DES' sampling schedule (Figure 2).

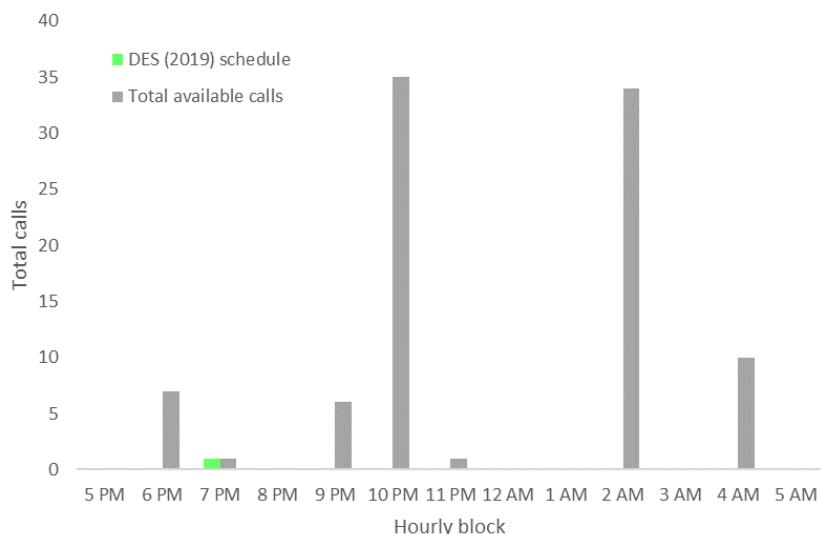


Figure 2. Number of calls available for detection using the DES (2019) sampling schedule at a Night Parrot location using a single ARU for four consecutive nights (Jackett *et al.* 2017).

These results suggest that the sampling schedule applied during this survey meant a high proportion of calls were likely unavailable for detection if Night Parrots were present within the WMP. It is important to note that when sampling in marginal habitat, as was potentially the case for this survey, the likelihood of there being a significant number of calls to detect is very small. It is more likely only a very small number of calls could be available for detection, probably fewer than 5-10. If this were the case, and Night Parrots were present in the WMP, the sampling schedule used by DES had an approximately 13% chance of recording those 5-10 calls, and as has been established previously, only a 59.2% chance of then extracting each of those calls from the dataset.

ANRM conclude that the combination of a) the analyst's limited knowledge of Night Parrot calls, b) the limitations of the Kaleidoscope parameter settings used, and c) the abbreviated sampling schedule employed resulted in a very low detection probability for any Night Parrot calls in the acoustic dataset.

We also note that both SM4 and SM2 units were used. There is a significant amount of literature (see e.g. Thomas *et al.* 2020, Yip *et al.* 2017, Stewart *et al.* 2020), supported by our own research (Leseberg *et al.* in review), which suggests the detection radius of an SM3 is around half that of an SM4 when used to detect Night Parrot calls, even when gain settings are matched as was done by DES during this survey (Donato Environmental Services 2019). SM3 has been shown to outperform SM2, so it follows that SM4 significantly outperforms SM2, and the detection radius of the SM2 will be around half that of an SM4. DES mistakenly concludes that using the equivalent gain settings on the ARUs means detection radius will be equivalent. This is not the case, as it does not account for the improved microphone sensitivity of the newer SM4 microphones.

Additionally, DES (2019) states that the effort expended at WMP was comparable to that implemented at Pullen Pullen. At Pullen Pullen, and when ANRM is conducting surveys for Night Parrots elsewhere, SM4s are set to record nightly, from sunset to sunrise, collecting

around 12 hours of data each night. This is significantly greater survey effort than occurred here.

We conclude that the survey effort used in this survey was insufficient to detect Night Parrots. Consequently, conclusions drawn about occupancy are not supported.

Conclusions and recommendations

DES (2019, p. 6) concluded that “Night Parrot (*Pezoporus occidentalis*) habitat probably doesn’t occur within the WMP” and that (p. 51) “the [acoustic survey and analysis] effort and technique (hardware and software) employed here is not deemed a limitation for the detection of Night Parrots”.

ANRM’s assessment is that neither conclusion is justified.

Based on the results of the vegetation assessments, there is the potential for both roosting and foraging habitat to exist within the Development Envelope. It is likely a desktop analysis of potential roosting and foraging sites could be conducted accurately using available products and hi-resolution satellite imagery.

ANRM recommends conducting a desktop assessment to determine the extent of Night Parrot habitat within the Development Envelope.

If the desktop analysis indicates potential roost habitat is extant, a comprehensive acoustic survey plan for these sites could be developed that would probably require a limited number of very brief acoustic surveys. Analysing the recordings from these surveys with a recogniser known to be capable of detecting a high percentage of Night Parrot calls would determine whether Night Parrots are present or absent within the Development Envelope with a high degree of certainty.

ANRM recommends that if suitable habitat is identified within the Development Envelope, a schedule of acoustic surveys targeting those sites is implemented, with the results analysed using a recogniser capable of detecting a high percentage of Night Parrot calls.

ANRM acknowledges that the DES (2019) sound dataset is available for reanalysis. However, ANRM consider there to be limited value in re-examining this dataset, due to the sampling schedule limitations identified during the peer review.

3. Night Parrot flight heights

DES (2019) described the flight behaviour and turbine risk collision of the Eastern Ground Parrot (*Pezoporus wallicus*) as a potential surrogate for the Night Parrot, for which data is lacking. With the exception that Night Parrots are known to cover large distances at night when travelling to foraging and drinking sites, the two species do share some behavioural attributes, so drawing similarities is valid. We concur with DES that although many Night Parrot movements are likely to be relatively close to the ground, Night Parrots should not be excluded from being a species with collision risk.

Night Parrots are most typically observed flying at levels less than 10 m above the ground (N. Leseberg & N. Jackett pers. obs.). Because most observations occur around roosting sites, where the birds are typically flying short distances, this is expected. However, two Night Parrots tagged at Pullen Pullen Reserve (Murphy *et al.* 2017c) were shown to travel considerable distances to reach foraging and drinking sites. On one occasion, a VHF tagged bird was actively tracked passing by the receiver operator at an estimated height of >40 m (Murphy unpubl. data). This included travelling over low range country, as well as over the canopy of woodland, to reach open, low-lying foraging areas. These long-distance commuting movements occur at much greater heights than movements within roosting or breeding habitats. Additionally, a Night Parrot has been observed via a thermal scope climbing in flight, to heights in excess of 30 m before disappearing from sight (N. Leseberg pers. obs.). Given these known and observed behaviours, it is likely that Night Parrots fly at heights which put them at risk of collision with turbine blades.

Despite being nocturnal, Night Parrots have been modelled as having relatively poor adaptations for nocturnal behaviour, with less visual acuity than Eastern Ground Parrot (Iwaniuk *et al.* 2020). Therefore, the potential for Night Parrots to be susceptible to collision is increased. As Night Parrots occur in very low densities in the areas they are known from, the mortality of one or more individuals is considered significant.

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West Musgrave Copper and Nickel Project Night Parrot Peer Review and Habitat Analysis

ANRM 2. Night Parrot Habitat Analysis

OZ Minerals Ltd
West Musgrave Copper and Nickel
Project:

Night Parrot
Desktop Habitat Analysis

26th May 2021



Summary

The West Musgrave Copper and Nickel Project (WMP) is located in the Musgrave Province of Western Australia and includes the Nebo-Babel nickel-copper and Succoth copper deposits. OZ Minerals is proposing to establish the WMP as a scaleable, low cost, long life, open pit mining operation.

OZ Minerals engaged Adaptive Natural Resource Management Pty Ltd to undertake a desktop analysis of potential Night Parrot habitat within the WMP Development Envelope (herein the Development Envelope). The aim of the desktop analysis was to determine if habitats suitable for the Night Parrot are extant within the Development Envelope.

The habitat analysis consisted of four steps:

- (1) identification of areas of open, long unburnt *Triodia* in the Development Envelope that could support long-term stable roost sites;
- (2) identification of productive patches that could represent suitable foraging habitat within the Development Envelope;
- (3) identification of habitats or landforms located between potential roost and foraging that could represent potential flyway habitat within the Development Envelope; and,
- (4) combining the results of steps (1), (2) and (3) to determine where within the Development Envelope Night Parrots are most likely to occur.

A total of 20,851.9 ha was assessed for potential roost habitat within the Development Envelope. No habitat deemed suitable for roosting for Night Parrots was identified from the available aerial or satellite imagery. Four vegetation associations totalling 70.9 ha (0.3 % of Development Envelope) were determined to comprise potential foraging habitat for the Night Parrot. No flyway habitat was considered to occur within the Development Envelope. A total of 125,887.2 ha was assessed for potential roost habitat outside of the Development Envelope within a 10 km buffer of potential foraging habitat. No potential roost habitat deemed suitable for Night Parrots was identified within the buffer area.

Although potential foraging habitat was identified within the Development Envelope, it was determined that Night Parrots are unlikely to have suitable roosting opportunities within 10 km of these potential foraging sites.

The results of the desktop habitat analysis indicate Night Parrot roosting habitat is unlikely to occur within the Development Envelope, reducing uncertainties in previous assessments (Donato Environmental Services 2019). Therefore, additional acoustic surveys (or re-analysis of sound data collected by Donato Environmental Services (2019)) are unlikely to detect the presence of roosting Night Parrots within the Development Envelope. Acoustic surveys within potential foraging habitat are unlikely to detect Night Parrots, due to the small and fragmented extent of potentially suitable habitat available, and the relatively large distance Night Parrots would need to travel to access potential foraging habitat within the Development Envelope.

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Recommended citation: Jackett, N.A., Leseberg, N.P. and Murphy, S.A. (2021). *OZ Minerals Ltd West Musgrave Copper and Nickel Project: Night Parrot Desktop Habitat Analysis*. Report to OZ Minerals Ltd. Adaptive NRM, Malanda, QLD.

1. Introduction

1.1. Project description

The West Musgrave Copper and Nickel Project (WMP) is located in the Musgrave Province of Western Australia and includes the Nebo-Babel nickel-copper and Succoth copper deposits. OZ Minerals is proposing to establish the WMP as a scaleable, low cost, long life, open pit mining operation.

In May 2021, OZ Minerals engaged Adaptive Natural Resource Management Pty Ltd (ANRM) to undertake a desktop analysis of potential Night Parrot habitat within the WMP Development Envelope (herein the Development Area) (Figure 1).

The aim of the desktop analysis was to determine if habitats suitable for the Night Parrot are extant within the Development Envelope. Three broad habitat types were assessed:

- (1) Potential roosting habitat;
- (2) Potential foraging habitat; and
- (3) Potential flyway habitat.

Accordingly, the analysis will seek to establish whether potential Night Parrot habitat occurs within the Development Envelope, and whether further targeted surveys, including an acoustic survey within prospective habitat is warranted.

The analysis is based on the results of research from western Queensland and is supported by preliminary research from Western Australia.

1.2. Night Parrot habitat

1.2.1. Roost habitat

Night Parrots in western Queensland, central and northern Western Australia, establish long-term stable roost sites in long unburnt *Triodia* (Jackett *et al.* 2017; Murphy *et al.* 2017a; Murphy *et al.* 2017c), and may occupy these sites for extended periods of up to several years (S. Murphy, N. Leseberg unpubl. data). These roost sites are also critical for breeding. These

sites typically support a pair or small group of Night Parrots, with individual roosts spread across an area up to several hectares (S. Murphy, N. Leseberg, unpubl. data).

All areas where long-term stable roost sites have been detected in both Queensland and Western Australia have been in open landscapes (Jackett *et al.* 2017; Murphy *et al.* 2017a). While there may be some scattered shrubs or isolated trees, these sites are practically treeless. The Night Parrot may have lower visual acuity than most other parrot species, and therefore, as a compromise to its nocturnal habits, may select such areas to improve predator detection and reduce collision risk when flying (Iwaniuk *et al.* 2020).

1.2.2. Foraging habitat

The nightly foraging activity of Night Parrots in western Queensland focuses on productive patches in an otherwise unproductive landscape (Murphy *et al.* 2017c), and preliminary research in Western Australia suggests similar behaviour (N. Jackett, N. Leseberg unpubl. data). These productive sites, characterised by their hydrology and the quick growth response of their vegetation after inundation, are detectable using a variety of methods, including remote-sensing techniques, hydrology data, vegetation mapping and aerial and satellite imagery. The proximity of such areas to suitable roosting habitat is likely to be an important factor determining the ability of a landscape to support Night Parrots.

1.2.3. Flyway habitat

Areas between roosting and foraging habitat that Night Parrots are likely to traverse are considered flyway habitat. In Western Australia, recent records indicative of flying Night Parrots have primarily occurred in drainage systems, and may indicate preferred flyway habitat when available (N. Jackett, N. Leseberg unpubl. data). In Queensland, two specimens collected as carcasses following probable collisions (and therefore potentially from flyway habitat) were found in areas of low mixed grassland, shrubs, herbs and chenopods with bare gibber (Boles *et al.* 1994; Cupitt and Cupitt 2008), with one of these observations occurring near a slight drainage depression (Cupitt and Cupitt 2008). Murphy *et al.* (2017c) demonstrated Night Parrots fly tens of kilometres when moving between distant resources (e.g. foraging areas, water sources), and are therefore likely to traverse a variety of habitat types in transit.

While there is no definitive evidence on flight heights for Night Parrots, observations suggest that birds do move at some height when travelling longer distances. A radio-tagged bird at Pullen Pullen was tracked flying over an observer at an estimated height of 40 m, and the same bird was known to fly over low range country and wooded areas, suggesting it probably flew at a height well above ground level (S. Murphy, pers. obs.). A bird has been observed in a thermal scope taking off from the ground and climbing to at least 30 m in height before it was lost from sight (N. Leseberg, pers. obs.).

127°40'0"E

127°50'0"E

128°00'0"E

25°50'0"S

26°00'0"S

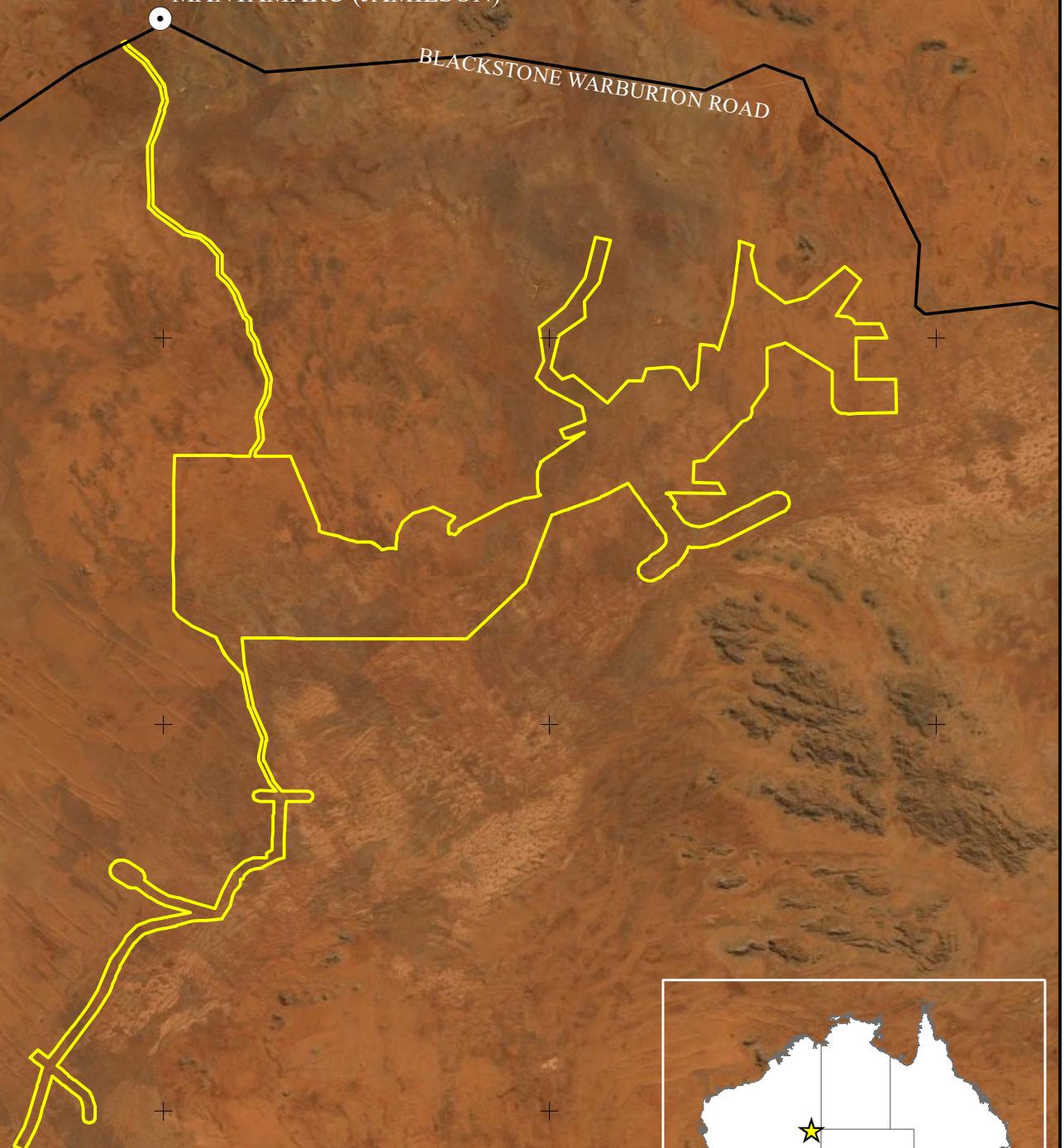
26°10'0"S

26°20'0"S

26°30'0"S

MANTAMARU (JAMIESON)

BLACKSTONE WARBURTON ROAD



0 2.5 5 10 km

1:300,000

N

Legend

WMP Development Envelope

Location of the Development Envelope

Figure 1.

2. Methods

2.1. Project team

This assessment was conducted by a team who have authored all papers concerning the ecology, biology and detection of Night Parrots since 2013:

Nigel Jackett

Nigel is PhD candidate at the University of Queensland and has been involved in threatened species conservation projects since 2007. In 2017, Nigel was part of a team that provided the first evidence of an extant population of Night Parrots in Western Australia since the early 20th century and has subsequently published descriptions of nesting habitat and calls for this species. Nigel works an acoustic specialist for Night Parrot surveys, and assists Indigenous ranger groups surveying for Night Parrot populations in the southern Kimberley and Great Sandy Desert. Nigel is a member of DBCA's Night Parrot Technical Advisory Panel.

Nick Leseberg

Nick has been researching Night Parrots since 2016 and is nearing completion of his PhD at the University of Queensland. Nick's research has focused on using historical reports to establish the current status and distribution of the Night Parrot, and also how to detect the species using acoustic recorders. Nick has written several papers describing the ecology and calls of the Night Parrot, and has assisted with the discovery of Night Parrots at several locations in both Queensland and Western Australia. Nick is a member of the Night Parrot Recovery Team.

Dr Steve Murphy

Steve is a rangeland ecologist with several decades of experience. He was the first researcher to be involved in the Night Parrot project following their rediscovery in western Queensland in 2013. Steve conducted the initial fieldwork that established acoustics as the primary detection method, and also lead the effort to capture and radio tag two Night Parrots. The data from that research has informed our understanding of the Night Parrot's resource requirements and habitat preferences. Steve is a member of the Night Parrot Recovery Team.

2.2. Desktop habitat analysis

The habitat analysis consisted of four steps:

- (1) identification of areas of open, long unburnt *Triodia* in the Development Envelope that could support long-term stable roost sites;
- (2) identification of productive patches that could represent suitable foraging habitat within the Development Envelope;
- (3) identification of habitats or landforms located between potential roost and foraging that could represent potential flyway habitat within the Development Envelope; and,
- (4) combining the results of steps (1), (2) and (3) to determine where within the Development Envelope Night Parrots are most likely to occur.

2.2.1. Potential roost habitat within the Development Envelope

All long-term stable roost sites detected in western Queensland and Western Australia have been found in relatively open areas of long unburnt *Triodia*. Although the total extent of *Triodia* at these sites does not appear critical, the size distribution of hummocks is important. The sites where Night Parrots occur all contain at least some patches of large, long unburnt *Triodia* hummocks, and are in open areas with few or no trees or shrubs. The tree and shrub density is typically fewer than 10–15 stems per hectare within roosting sites, and often lower than this (S. Murphy, N. Leseberg, unpubl. data).

We used available aerial and satellite imagery (ESRI World Imagery), in combination with previously mapped vegetation communities (Western Botanical 2019) to manually search the Development Envelope for potential roosting habitat using ArcGIS Desktop 10.7.1. (ESRI Inc., CA, USA). We applied a fishnet grid over the Development Envelope (Figure 2), to create 40 grid cells that were systematically searched for potential roosting habitat at a scale of 1:3000 m. Representative images of Night Parrot roost habitat as viewed with this scale are shown in Figure 3, and demonstrate the distinct structure of potential roost habitat is identifiable at such a scale.

127°40'0"E

127°50'0"E

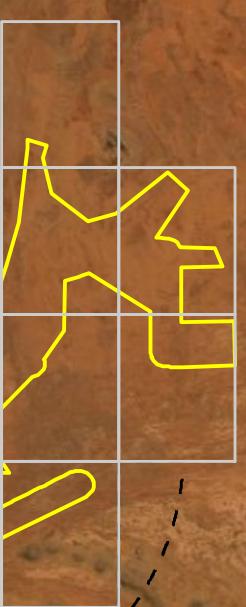
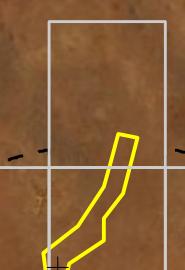
128°00'0"E

25°50'S

26°00'S

26°10'S

26°20'S



0
2.5
5
10
km



Search areas for potential roost habitat within the Development Envelope

Legend

- WMP roost search grid
- 10km buffer additional roost search
- WMP Development Envelope

Figure 2.

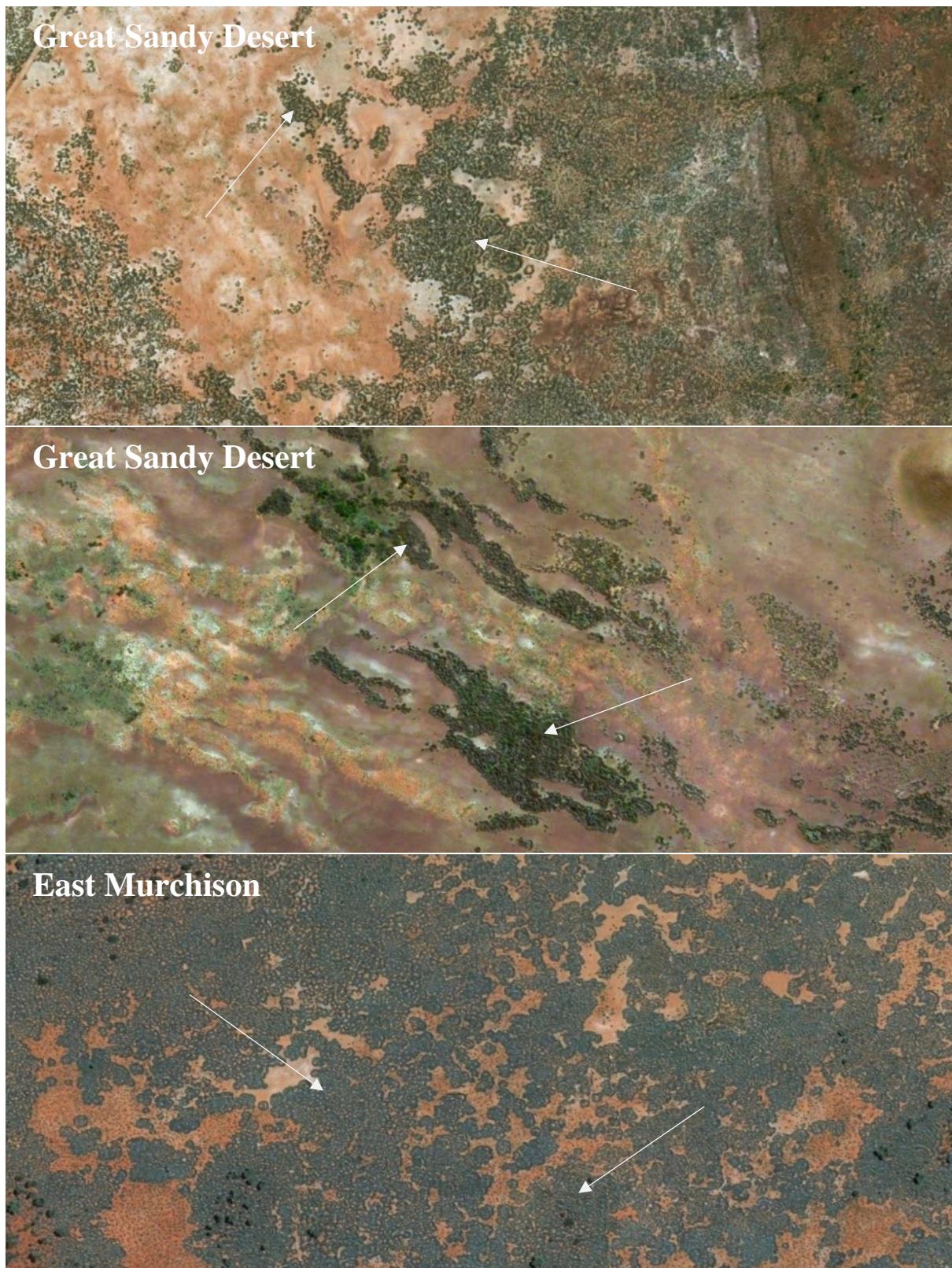


Figure 3. Examples of potential roost habitat at confirmed Night Parrot locations in Western Australia from satellite imagery at scale 1:3000. Note the complex *Triodia* formations (indicated by arrows), sparseness of trees, and surrounding bare ground.

2.2.2. Potential foraging habitat within the Development Envelope

Unpublished DNA analyses of faecal samples show that Night Parrots in western Queensland eat a relatively broad array of food plants including grasses (e.g. *Triodia longiceps*, *Uranthoecium truncatum*, *Brachyachne ciliaris*, *Astrebla lappacea*, *Dactyloctenium radulans*) and forbs (e.g. *Trianthema triquetra*) (S. Murphy, N. Leseberg, unpubl. data). Tracking studies show that Night Parrots visit floristically diverse run-on zones in the landscape, which can be large (e.g. floodplains) or small (e.g. gilgai formations) (Murphy *et al.* 2017c).

Available vegetation mapping (Western Botanical 2019) for the Development Envelope was examined to identify vegetation communities likely to comprise foraging habitat for the Night Parrot. Vegetation communities predominately containing an assemblage of grasses, forbs or chenopods, in relatively open landscapes, were selected from the dataset as potential foraging habitat. Identified foraging habitat was then overlayed on aerial or satellite imagery to obtain greater contextual information as to the likelihood of this habitat being available to Night Parrots.

2.2.3. Potential flyway habitat within the Development Envelope

Acoustic detections of Night Parrots in Western Australia indicate birds may prefer traveling along drainage lines when moving between resources. Hydrology and digital elevation model data layers for the WMP were analysed to determine potential flyway corridors within the Development Envelope.

2.2.4. Potential roost habitat within 10 km of potential foraging habitat

As Night Parrots are known to travel at least 9.4 km between roosting sites and foraging habitat (Murphy *et al.* 2017c), a 10 km buffer was created around all identified potential foraging habitat within the Development Envelope. The buffer area was searched using the same methods described above for identifying roost habitat within the Development Envelope.

3. Results

3.1. Potential roost habitat

A total of 20,851.9 ha was assessed for potential roost habitat. No habitat deemed suitable for roosting for Night Parrots was identified from the available aerial or satellite imagery.

Stands of *Triodia* were detected throughout much of the Development Envelope, but the complex structure associated with known Night Parrot roost habitat was not observed. The structure of these *Triodia* stands was typical of areas that are burnt relatively frequently, and therefore are relatively small in size and relatively open between hummocks. Additionally, the apparent (tree or shrub) stem density/ha in these *Triodia* stands was measured as being at least double of that observed at known Night Parrot roost locations (i.e. 10–15 stems/ha).

3.2. Potential foraging habitat

Four vegetation associations totalling 70.9 ha (0.3 % of Development Envelope) were determined to comprise potential foraging habitat for the Night Parrot (Table 1). Western Botanical (2019) provided the following descriptions of the four vegetation associations:

(1) AvS - *Maireana triptera* - *Atriplex vesicaria* Chenopod Shrubland: characterised by Low Shrubland of *Maireana triptera* 0.4m, PFC 10%, *Maireana* aff. *villosa* 0.4 m, PFC 10%, *Atriplex vesicaria* 0.5 m, PFC 5% and occasional *Eremophila clarkei* 1.2 m, PFC <1% with a grass component of occasional *Aristida contorta* 0.2 m, *Cenchrus ciliaris* (weed) 0.5m, PFC 1 to 2%. Landscape is level and has red silty sand forming a hard pan with a continuous lag gravel and stony mantle of ironstone (magnetite) to 5 cm diameter. A variable site with some bare areas with no vegetation, and other areas with occasional patches of Mulga in small groups which were not mapped separately. Associated species include *Enneapogon polypyllus* 0.2 m, patches of *Neurachne munroi* 0.3 m, *Maireana integra* and as yet unverified species: *Maireana* aff. *villosa* (WB39955)

(2) COG - Calcrete Open Grassland: characterised by an open grass plain associated with shallow sands over a calcrete plain, the upper stratum that is restricted to the edges

of the association is dominated by *Acacia kempeana* 1-4 m, *Acacia tetragonophylla* 3 m and *Acacia victoriae* subsp. *victoriae* to 3 m, with a PFC of 1-2%. The ground stratum grassland is dominated by *Enneapogon polyphyllus* 0.15 m, *Aristida contorta* 0.15m, *Sclerolaena patenticuspis* 0.15 m *Sclerolaena cornishiana* 0.15 m *Eremophea spinosa* 0.15 m and *Boerhavia repleta* 0.2 m with a PFC of 50 -65%. Other associated species recorded within this vegetation association include *Panicum decompositum*, *Solanum lasiophyllum*, *Dysphania melanocarpa*, *Malvastrum americanum* (weed), *Brassica tournefortii* (weed), *Euphorbia australis*, *Salsola australis*, *Cenchrus ciliaris* (weed) *Sida* sp. *excedentifolia* (J.L. Egan 1925), *Solanum centrale*, *Ptilotus obovatus*, and *Tribulus terrestris* (weed).

- (3) **CPN-G Claypan Grassland:** represents large, extensive low lying internally drained areas with medium to heavy heaving, cracking red sandy clay soil with numerous sink holes and would be subject to waterlogging and inundation following significant rainfall events. Vegetation is relatively uniform and consists of a perennial grassland of co-dominant *Aristida latifolia* 1.2 m tall, *Eragrostis xerophila* 0.3 m, *Eragrostis setifolia* 0.4 m, *Iseilema eremaea* 0.2 m with forbs dominated by *Rhynchosia minima* 0.4 m, PFC 50 - 65%, with occasional emergent *Eremophila longifolia* 2 m, *Acacia pteraneura* 2 - 4m, PFC < 1%. Occasional occurrences of *Cenchrus ciliaris* (weed) to 0.6 m were noted.
- (4) **CPP - Clay Pan Playa:** found within the Hardpan Mulga Woodlands and represents the lowest part of that landscape. They are small, very open hardpan areas which may have a gravelly lag gravel mantle. The vegetation within the Clay pan playa is dominated by annual grasses and herbs with very few to no perennial species present, due to being seasonally inundated for periods following rainfall. The fringing vegetation is characterised by a very scattered upper stratum of *Acacia tetragonophylla* 3 m, *Acacia pteraneura* 4 m, *Eremophila longifolia* 2 m and *Acacia victoriae* subsp. *victoriae* to 2.5 m, with a combined PFC 5 - 10% occurring in an annular ring on the margins of the clay pan. The central part of the claypans have a lower stratum characterised by a very open grassland dominated by *Eragrostis exigua* 0.4 m, *Diplachne fusca* subsp. *muelleri* 0.3 m, *Eragrostis pergracilis* 0.1 m, *Eragrostis dielsii* 0.05 m, *Trianthema triquetrum* 0.05 m and *Fimbristylis dichotoma* 0.15 m with a PFC 10- 15% (Plate 19, Plate 20).

Other associated species recorded within this vegetation association include *Tripogonella loliiformis*, *Dysphania melanocarpa*, *Salsola australis*, *Panicum decompositum*, *Atriplex elachophylla*, *Pluchea dentex*, *Aristida contorta*, *Dactyloctenium radulans*, *Enteropogon ramosus* and *Einadia nutans* subsp. *eremaea*. It is expected the species richness would be significantly higher in wetter seasons.

Table 1. Extent of potential foraging habitat within Development Envelope

Vegetation association	Extent within Development Envelope (ha)	Extent mapped by Western Botanical (2019) (ha)*	% of association within Development Envelope	% of Development Envelope
AvS	28.7	118.6	24.2	0.1
COG	11.4	699.2	3.6	0.1
CPN-G	5.8	143.9	4.0	0.0
CPP	11.4	23.5	48.6	0.1
Total	70.9	985.2	7.2	0.3

* Vegetation associations mapped by Western Botanical (2019) extended outside the current Development Envelope

3.3. Potential flyway habitat

The analysis determined there was no habitat deemed suitable for Night Parrots to roost in within the Development Envelope. As such, there is difficulty in determining if potential flyway habitat is present. The Development Envelope does not comprise any distinct drainage lines that are potentially the preferred flyway habitat for Night Parrots. Additionally, the Development Envelope is not topographically complex, with a general gradual decrease in elevation from over 528m asl in the northern extreme, to 436 m asl in the southern extreme. Within the central part of the Development Envelope, changes in topography are minor, with small rises of 10–15 m being typical.

The largest, continuous area of potential foraging habitat is located along a proposed road alignment in the extreme north-west of the Development Envelope (Figure 4). As such, if these habitats are utilised by Night Parrots, it is likely they are traveling to this site from outside of the Development Envelope.

3.4. Potential roost habitat within 10 km of identified foraging habitat

A 10 km buffer was created around all identified potential foraging habitat within the Development Envelope (Figure 4). Available aerial and satellite imagery for the buffer area was manually searched for potential roost habitat. Overall, the landscapes adjacent to the Development Envelope were deemed similar to that within the Development Envelope. However, to the east and north of the Development Envelope, more topographically complex areas (e.g. rocky hills) were identified.

A total of 125,887.2 ha was assessed for potential roost habitat outside of the Development Envelope within the 10 km buffer. No potential roost habitat deemed suitable for Night Parrots was identified within the buffer area.

127°40'0"E

127°50'0"E

128°00'0"E

25°50'0"S

26°00'0"S

26°10'0"S

26°20'0"S

4a

4b

4c

**Legend**

- [Green square] Potential foraging habitat
- [Yellow line] WMP Development Envelope

**Distribution of potential foraging
habitat - overview**

Figure 4.

**Adaptive
nrm**

127°39'0"E

127°40'0"E

127°41'0"E

25°53'0"S

25°54'0"S

25°55'0"S



0 0.25 0.5 1 km
N

Vegetation association AvS CPN-G WMP Development Envelope

Distribution of potential foraging habitat - WMP north

Figure 4a.



127°45'0"E

127°50'0"E

26°0'0"S

26°50'0"S

26°10'0"S

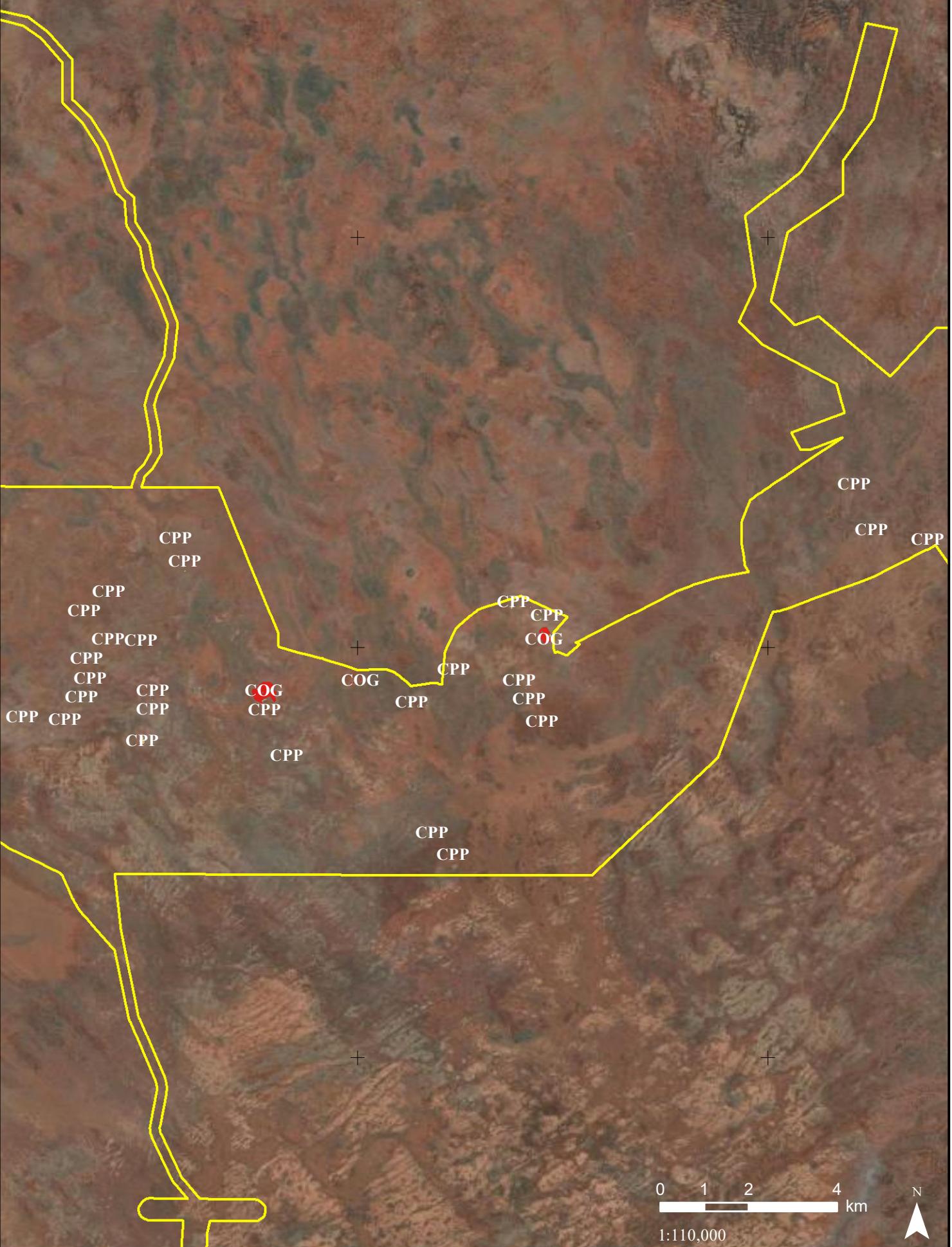


Figure 4b.

127°41'30"E

127°42'0"E

127°42'30"E

26°13'0"S

26°13'30"S

26°14'0"S

26°14'30"S

CPP
CPP

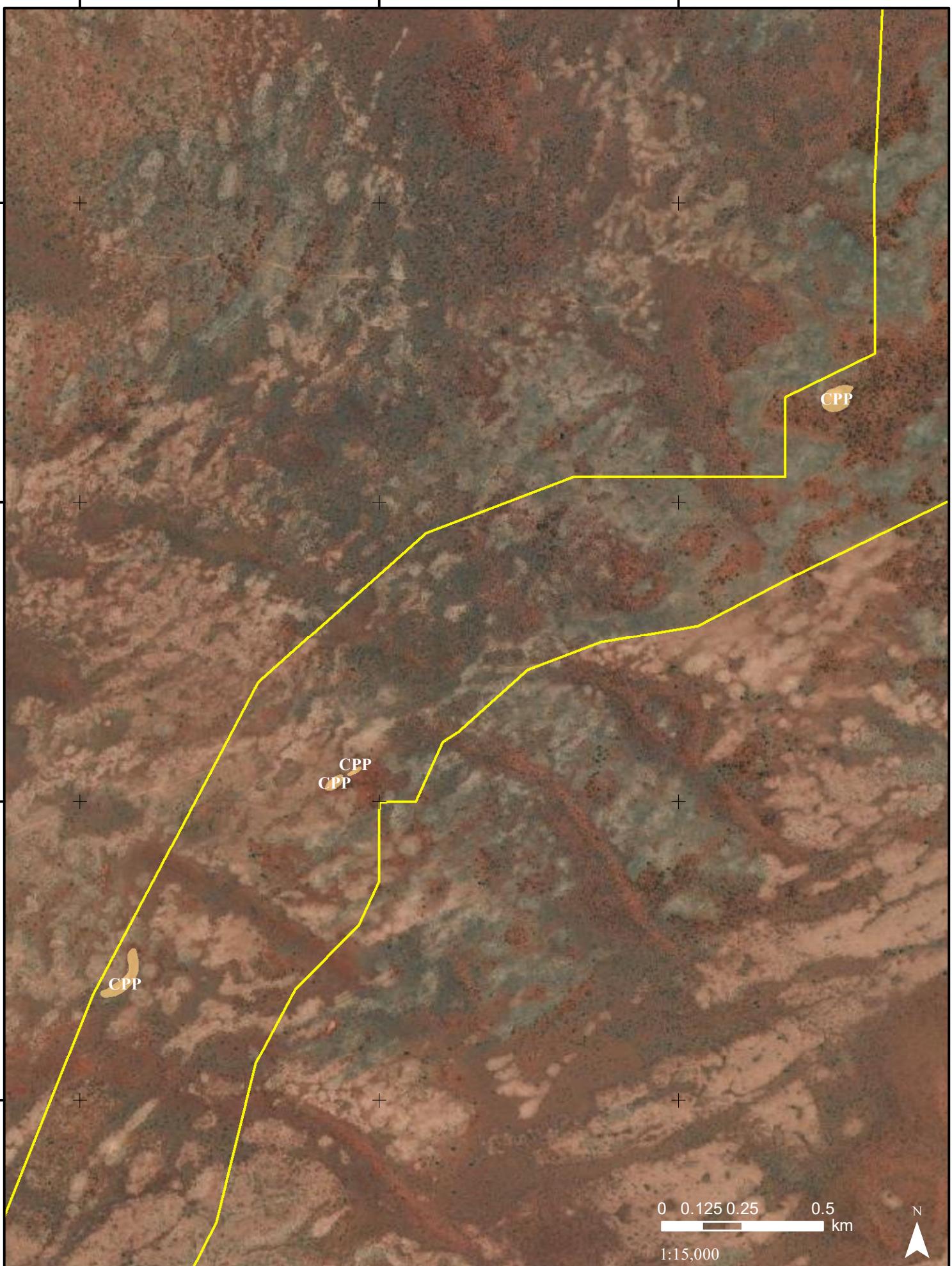
CPP

CPP

0 0.125 0.25 0.5 km

1:15,000

N

**Vegetation association**

CPP

WMP Development Envelope

**Distribution of potential foraging
habitat - WMP south**

Figure 4c.

**Adaptive
nrm**

4. Discussion

4.1. Roost habitat

The results of the habitat analysis suggest it is unlikely that Night Parrots roost within the Development Envelope. Additionally, it was also determined that Night Parrots are unlikely to roost within 10 km of identified potential foraging habitat.

Known Night Parrot roost habitat is typically surrounded by breakaways or mesas, bare earth, stony plains, or salt tolerant vegetation (Jackett *et al.* 2017; Murphy *et al.* 2017b; Murphy *et al.* 2017c). These features are all typically devoid of fuel to permit extensive fire events. The limited topography within the Development Envelope, as well as a lack of significant palaeodrainage systems, likely prevents the formation of complex *Triodia* stands suitable for Night Parrots to roost within, due to the susceptibility of the landscape to wildfire.

4.2. Foraging habitat

Four vegetation associations described by Western Botanical (2019) were considered potentially suitable foraging habitat for Night Parrots within the Development Envelope. These associations were considered to share structural and vegetation assemblage similarities with areas known to be visited by Night Parrots in Western Australia and Queensland (Jackett *et al.* 2017; Murphy *et al.* 2017c). However, these associations were limited in spatial extent within the Development Envelope, totalling 70.9 ha (0.3 % of the Development Envelope).

Additionally, smaller areas of mapped potential foraging habitat were often enclosed by more densely wooded vegetation associations. Night Parrots are typically thought to forage in relatively open (treeless) landscapes, and therefore it is unknown whether they would access such enclosed habitat if they were present within the landscape.

4.3. Flyway habitat

There were no distinct features within the Development Envelope that were considered as flyway corridors for transiting Night Parrots. As no potential roost habitat was identified within 10 km of the identified potential foraging habitat, it is unlikely there are regularly used flyways intersecting the Development Envelope.

4.4. Likelihood of Night Parrot occurrence within the Development Envelope

Although potential foraging habitat was identified within the Development Envelope, it was determined that Night Parrots are unlikely to have suitable roosting opportunities within 10 km of these potential foraging sites. While it is likely Night Parrots can travel greater than 10 km to reach foraging resources, we believe 10 km to be an appropriate limit for assessing the likelihood of Night Parrots accessing the potential foraging habitats within the Development Envelope.

4.5. Justification for additional Night Parrot acoustic surveys

The results of the desktop habitat analysis indicate Night Parrot roosting habitat is unlikely to occur within the Development Envelope, reducing uncertainties in previous assessments (Donato Environmental Services 2019). Therefore, additional acoustic surveys (or re-analysis of sound data collected by Donato Environmental Services (2019)) are unlikely to detect the presence of roosting Night Parrots within the Development Envelope.

Potential foraging habitat for Night Parrots was determined to occur within the Development Envelope, albeit relatively limited in extent. The additional assessment of potential roost habitat outside of the Development Envelope also indicated Night Parrots are unlikely to roost within 10 km of the potential foraging habitat. Therefore, additional acoustic surveys within potential foraging habitat are unlikely to detect Night Parrots, due to the small and fragmented extent of potentially suitable habitat available, and the relatively large distance Night Parrots would need to travel to access potential foraging habitat within the Development Envelope.

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West Musgrave Copper and Nickel Project Terrestrial Fauna Management Plan

Appendix B. Short Range Endemic Habitat Connectivity Assessment

MEMORANDUM

Attention:	Justin Rowntree	From:	Kristy Sell
Company:	OZ Minerals	Date:	31 May 2021
Subject:	Short Range Endemic (SRE) Habitat Assessment	Project:	West Musgrave Project

1. SRE HABITAT

Habitat mapping of the Study Area has been undertaken by Western Wildlife over a number of site visits between 2018 and 2020. The Study Area include the Development Envelope and adjacent areas and covered an area of 46,263 ha. This identified 11 different habitats based on observations made in the field, vegetation mapping and interpretation of aerial photography. Two of the eleven habitats are 'mosaics', where the Spinifex Sandplain or Mallee Sandplain occur in association with outcropping calcrete, at a scale too fine to be separately mapped. All habitats present in the fauna survey area are widely represented in the CR or GVD Bioregions (Western Wildlife, 2020).

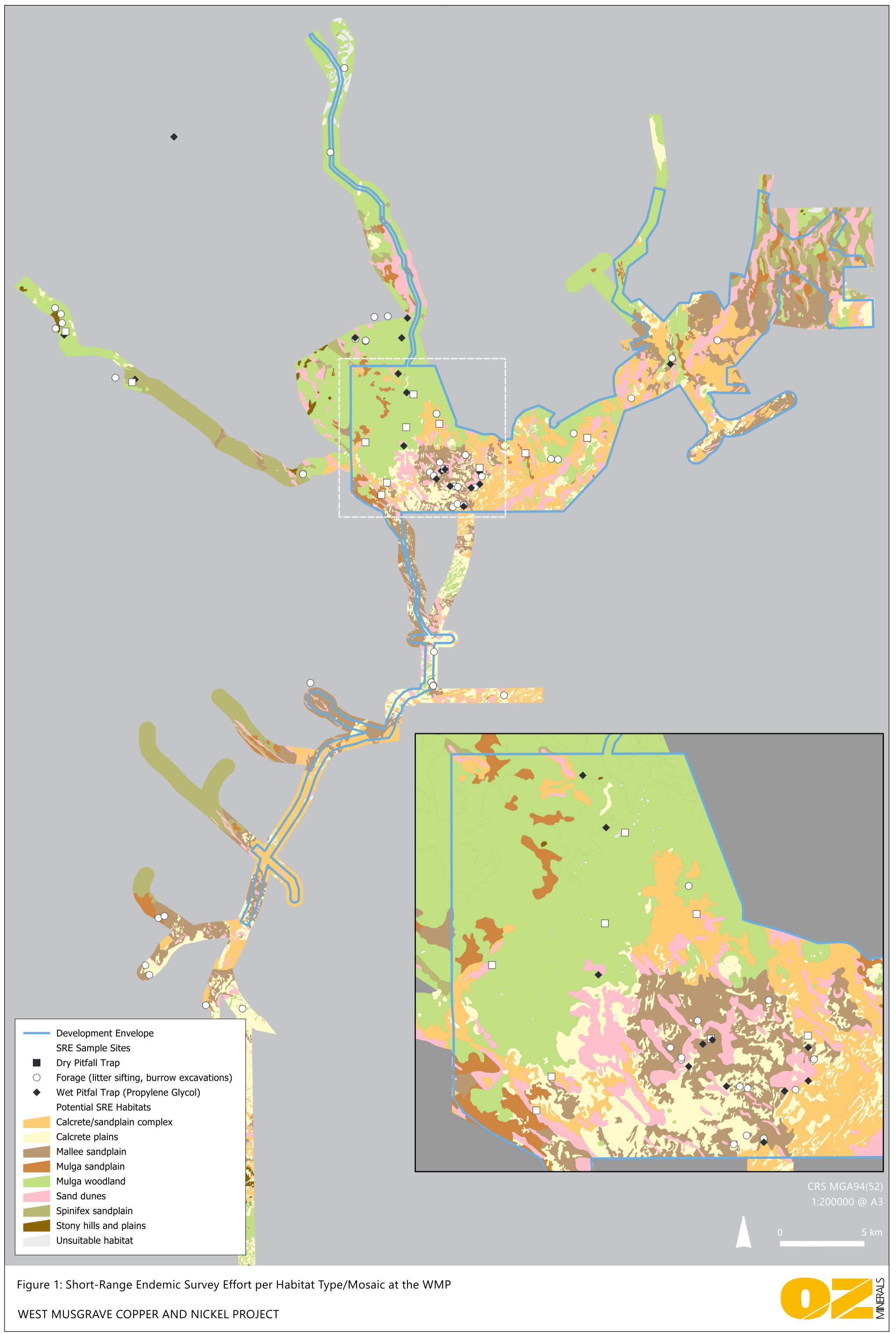
Short Range Endemic (SRE) fauna surveys were conducted by Alacran (Alacran, 2020). This included targeted surveys consisting of three sampling events to identify SRE habitat, identify potential SRE species and determine if the fauna survey area supports SRE fauna. Survey effort for SREs at the WMP is shown in Figure 1. SRE sample sites corresponded with nine of the 11 fauna habitats identified and constitute the most likely of those habitats to support SREs within the fauna survey area. Of the nine habitats surveyed, eight yielded invertebrates belonging to SRE groups. Of those eight, Mulga Woodland supported the greatest species richness of taxa from SRE groups (28) and represented the largest habitat by area within the survey area (12,856 ha or 28% of the total survey area).

According to Alacran, only one location within the fauna survey area that supported SRE groups of invertebrates represented unique habitat; a small granite boulder outcrop. This outcrop falls within the Stony Hills and Plains habitat and is likely to represent an extension of the nearby granite hills approximately 0.5 km south west of this sampling location. The eastern and central parts of the fauna survey area and the south eastern section of the Southern Monitoring Bores area cross a large spinifex sandplain habitat. This was the only geographical feature that could potentially represent a barrier to dispersal for species not suited to this habitat.

2. SRE ASSEMBLAGE

SRE surveys yielded a total of 3,209 invertebrate specimens from SRE groups, with a total of six orders, 15 families and 55 different taxa (Alacran, 2020). The poor state of knowledge about invertebrate fauna in and around the fauna survey area resulted in the majority of species being interpreted as new species after comparisons with West Australian Museum (WAM) reference specimens and publicly available DNA sequences failed to find species matches. Identification of species and morphospecies involved the use of both morphological and DNA sequence data, Cytochrome C Oxidase subunit I (COI).

Of the 55 different taxa, 50 were identified as being potential SREs owing to data deficiency (DD) regarding their known distribution or taxa belonging to unresolved species complexes with the remaining five species being widespread. All of these species were recorded from habitat types that were also observed outside of, but in close proximity to the fauna survey area, suggesting they may not be restricted to the fauna survey area.



3. IMPACT ASSESSMENT

The Project has potential to result in loss of SRE species and loss of SRE habitat.

The status of SRE invertebrate fauna recorded at the proposed project and surrounding area was based on categories developed by WAM in order to describe the status of taxa using current knowledge of distribution and biology of each species.

Of the 50 known potential SREs collected from the fauna survey area, 37 were recorded from both inside and outside of the Development Envelope and have thus not been considered further in this assessment. The impact assessment focuses on the remaining 13 potential SRE species.

Based on EPA Technical Guidance for Sampling of SREs (EPA, 2016), if vegetation units are restricted to the potential impact area, and are especially different from adjoining units, then there is potential for some SREs to be similarly confined (an example might be a granite outcrop in an otherwise sandy environment). In contrast, if similar vegetation units are contiguous and broadly distributed outside of the proposed impact area, then the likelihood of SREs being confined to the impact area is reduced.

Additionally, the EPA guidance states that a risk-based approach may be adopted for situations where surveys have been completed, but potential SREs are only recorded from within the Development Envelope. In this situation, a risk-based approach would be considered in cases where:

- A potential SRE taxon is represented by one or few specimens from only within proposed development areas
- Contextual data on the wider distribution and status of the taxon is unavailable from WAM or the Department of Biodiversity, Conservation and Attractions (DBCA).
- Additional targeted surveys appear unlikely to yield results in a reasonable timeframe.

For potentially restricted taxa that meet the above criteria, the use of habitat as a surrogate for inferring distributional boundaries can be considered. While there are limitations to the use of such surrogates, this provides the only practicable method of undertaking an informed assessment as to the likelihood of small-scale SRE distributional restrictions. Consideration can also be given to the known distribution patterns and ecology of other species belonging to the same genus, to inform assessment of potential restriction.

A vulnerability rating was undertaken and is provided in Table 1 for the remaining 13 potential SRE species to inform the assessment of the likelihood of SRE species being lost as a result of clearing from the proposed project. This vulnerability rating is based on the number of locations where specimens were collected and the prevalence near to, but outside the Development Envelope of the habitat types at these locations. The following describes the three classes of vulnerability assignment:

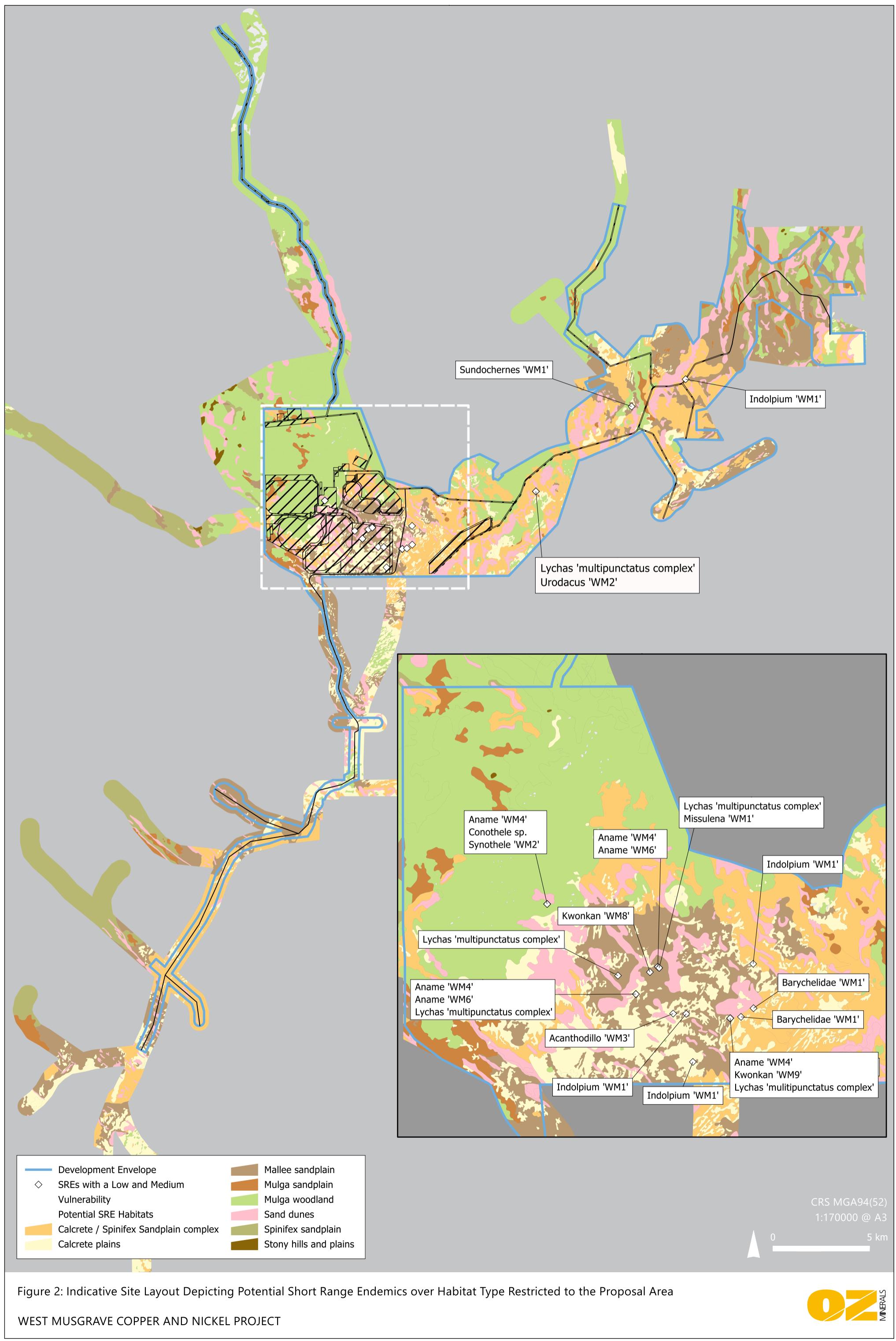
- Low Vulnerability: species collected from within a common habitat type at either multiple locations or a potential species surrogate has been observed at the proposed project.
- Medium Vulnerability: species collected from either a common habitat type or multiple locations (but not both).
- High Vulnerability: species which were collected in only one location in a rare habitat type.

No potential SRE species recorded as part of the proposed project assessment are considered to have a high vulnerability rating, whilst three have a medium vulnerability rating and ten a low vulnerability rating (Table 1).

The prevalence of habitat types available to potential SREs is depicted in Figure 2.

Table 1: Relative Vulnerability of the Proposal on Potential SREs

Order	Family	Species	No. of Collection Locations	Habitat	Species Surrogate	Vulnerability Assessment
Araneae	Actinopodidae	<i>Missulena 'WM1'</i>	1	Mallee Sandplain		Medium
	Barychelidae	<i>Synothele 'WM2'</i>	1	Mulga Woodland	<i>Synothele 'WM1'</i>	Low
		<i>Barychelidae 'WM1'</i>	2	Calcrete/Spinifex Complex		Low
	Halonoproctidae	<i>Conothele sp.</i>	1	Mulga Woodland		Medium
	Nemesiidae	<i>Aname 'WM4'</i>	4	Mulga Woodland Calcrete Plains Mallee Sandplain	<i>Aname 'MYG514'</i> <i>Aname 'WM1'</i> <i>Aname 'WM5'</i> <i>Aname 'WM7'</i>	Low
		<i>Aname 'WM6'</i>	2	Calcrete Plains Mallee Sandplain		
		<i>Kwonkan 'WM8'</i>	1	Mallee Sandplain	<i>Kwonkan 'WM3'</i>	Low
		<i>Kwonkan 'WM9'</i>	1	Mallee Sandplain		
		<i>Sundochernes 'WM1'</i>	1	Mallee Sandplain		Medium
	Olpidae	<i>Indolpium 'WM1'</i>	4	Calcrete/Spinifex Complex Mallee Sandplain	<i>Indolpium 'WM2'</i> <i>Indolpium 'WM3'</i>	Low
Scorpiones	Buthidae	<i>Lychas 'multipunctatus mosaic'</i>	5	Mallee Sandplain Calcrete/Spinifex Complex	<i>Lychas adonis'</i> <i>Lychas 'annulatuss mosaic'</i>	Low
	Urodacidae	<i>Urodacus 'WM2'</i>	1	Calcrete/Spinifex Complex	<i>Urodacus 'yaschenkoi'</i> complex <i>Urodacus holplurus</i>	Low
	Armadillidae	<i>Acanthodillo 'WM3'</i>	1	Mulga Woodland	<i>Acanthodillo 'WM1'</i> <i>Acanthodillo 'WM2'</i>	Low



Of the species which have a medium vulnerability rating:

- Two (*Missulena 'WM1'* and *Sundochernes 'WM1'*) occur within the Mallee Sandplain habitat. A single individual of each was found. *Missulena 'WM1'* was found in the Main Mining area. *Sundochernes 'WM1'* was found in the Northern Borefield area.
- One (*Conothele sp.*) occurs in the Mulga Woodland habitat within the Main Mining area. The *Conothele sp.* found was a juvenile species and therefore could not be compared with any species based on its morphology. Two attempts to amplify COI sequences from the specimen also failed. Due to it being the only representative of this genus and family from the fauna survey area, it was treated as an undiagnosable morphospecies rather than an ambiguous species by Alacran

Both of the habitats within which the three medium vulnerability rating potential SRE species were found are common within the Development Envelope, fauna survey area and the wider region. Project specific studies have mapped:

- 6,310.1 ha of the Mallee Sandplain fauna habitat in which *Missulena 'WM1'* and *Sundochernes 'WM1'* were found. Of this:
 - 3,445.7 ha (54.6%) is present within the Development Envelope.
 - 524.7 ha is expected to be impacted by the proposed project. This equates to 8.3% of the total mapped area.
- 12,856.1 ha of Mulga Woodland habitat in which *Conothele sp* was found. Of this:
 - 5,274.6 ha (41%) is present within the Development Envelope.
 - 1,264.8 ha is expected to be impacted by the proposed project. This equates to 9.8% of the total mapped area.

From Figure 2, it can be seen that Mallee Sandplain and Mulga Woodland habitats are extensive and well connected in the Main Mining Area and Northern Borefield area both within the Development Envelope and surrounds.

Based on only three species receiving a medium vulnerability rating, and each of these species occurring in habitats that are both common in the fauna survey area and region, and are continuous between the Development Envelope and beyond, these potential SREs are considered likely to be widely occurring, and as such unlikely to be materially impacted by the proposed project.

Yours sincerely
MBS Environmental



Kristy Sell
Managing Director

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West Musgrave Copper and Nickel Project
EPA Section 38 Referral Supporting Document

Appendix K5. Flora and Vegetation Management Plan



West Musgrave Copper and Nickel Project

June 2021

Flora and Vegetation Management Plan



West Musgrave Copper and Nickel Project Flora and Vegetation Management Plan

VERSION CONTROL

Version	Authorisation	Position	Signature	Date
Final For Initial Approval	Justin Rowntree	Environment and Approvals Lead – West Musgrave		1 June 2021
	Michael Wood	General Manager – West Musgrave		1 June 2021
	Matt Reed	Acting Chief Commercial Officer – OZ Minerals		1 June 2021



West Musgrave Copper and Nickel Project Flora and Vegetation Management Plan

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West Musgrave Copper and Nickel Project

Flora and Vegetation Management Plan

SUMMARY

A summary of the key Environmental Management Plan (EMP) information is presented in Table 1.

Table 1: Summary of Key EMP Information

Project Information	Description
Proposal Name	West Musgrave Copper and Nickel Project
Proponent Name	OZ Minerals
Ministerial Statement No/s and Condition/Clauses	The Proposal is currently being assessed by the Government of Western Australia's Environmental Protection Authority (EPA). The EPA has proposed that a Flora and Vegetation Management Plan (FVMP) will be a condition of approval of the proposed project. A Ministerial Statement and associated conditions are yet to be issued.
Purpose of the EMP	To provide a management framework for flora and vegetation, specifically to avoid, where possible, otherwise minimise direct and indirect impacts to priority and other significant flora resulting from the implementation of the West Musgrave Project.
Key Environmental Factor	Flora and Vegetation
Objective	<i>To protect flora and vegetation so that biological diversity and ecological integrity are maintained</i> , where ecological integrity is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements.
Key Provisions of the EMP	See Section 2
Proposed Construction Timing	Commencing 2022, progressing to 2024
EMP Required Pre-construction?	Yes, prior to issuing of Ministerial Statement
Proposed Operations Timing	26 years from date of commissioning

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West Musgrave Copper and Nickel Project

Flora and Vegetation Management Plan

1 CONTEXT, SCOPE AND RATIONALE

This Flora and Vegetation Management Plan (FVMP) has been prepared by OZ Minerals to support the assessment, approval and implementation of the Proposal under Part IV of the *Environmental Protection Act, 1986 (WA)* (EP Act). Flora and vegetation are protected under Commonwealth and State legislation, primarily governed by four Acts:

- *Environment Protection and Biodiversity Conservation Act, 1999 (Cth)*
- *Environmental Protection Act, 1986 (WA)*
- *Biodiversity Conservation Act, 2016 (WA)*
- *Biosecurity and Agriculture Management Act, 2007 (WA)*.

In addition to Commonwealth and State legislation, the following policy and guidance statements were considered in the development of this FVMP:

- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2020b)
- EPA Environmental Factor Guideline – Flora and Vegetation (EPA, 2016a)
- EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b).

This FVMP addresses the Notice Requiring Information for Assessment, received from the EPA on 14 April 2021 (the Notice). The Notice requires OZ Minerals to:

Provide a Flora and Vegetation Management Plan detailing application of the mitigation hierarchy including measures to avoid, where possible, otherwise minimise direct and indirect impacts to priority flora and vegetation species. The Plan should incorporate the February 2021 targeted flora and vegetation survey results for the Northern Borefield. The Plan should be prepared in accordance with the Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA, 2020a).

1.1 Proposal

1.1.1 Project Overview

The West Musgrave Copper and Nickel Project (WMP) is located in the West Musgrave Ranges of Western Australia. The WMP is located approximately 1,300 km north-east of Perth near to the border of South Australia and the Northern Territory. The WMP is within the Ngaanyatjarra Native Title determination, and Class A Reserve No. 17614 (for the Use and Benefit of Aboriginal Inhabitants). The nearest towns include the Indigenous Communities of Jameson (Mantamaru) 26 km north, Blackstone (Papulankutja) 50 km east, and Warburton (Milyirrtjarra) 110 km west of the project (Figure 1).

The project, with a current expected life of approximately 26 years, will consist of:

- Mining of copper and nickel ore from two open cut mine pits using conventional blast, load and haul methods
- Placement of mine waste into permanent waste rock dumps (WRDs) and dedicated tailings storage facility (TSF) adjacent to mine pit voids
- Milling and processing of ore using floatation to produce two separate copper and nickel concentrates
- On-site power supply using a combination of renewable power infrastructure (photovoltaic solar panels, wind turbines and battery storage) supported by backup thermal power generation
- Development of a process/potable water supply borefield that may include a combination of overland and/or underground pipelines for use during construction and operations
- Miscellaneous infrastructure, including stormwater management infrastructure (bunds and drains), internal roads and service tracks, a dedicated site access road, accommodation village (approximately 450 beds during operations and 1,200 during construction), airstrip, wastewater treatment, landfill and other supporting infrastructure including offices, warehouses and workshops.
- Concentrate will be transported to Esperance via existing roads and rail networks.

A summary of the key project characteristics is presented in Table 2.

Table 2: Key Project Characteristics

Elements	Location	Proposed Extent Authorised
Physical Element		
Mine and associated infrastructure	Figure 2	Clearing of up to 3,830 ha of native vegetation within a Development Envelope of 20,852 ha
Operational Element		
Mining voids	Figure 2	Below water table mining Nebo pit void to be backfilled above water table post-closure Babel pit void to be a permanent and episodic pit lake post-closure
Mining waste (waste rock)	Figure 2	Placement of waste rock into permanent WRDs
Ore processing waste (tailings)	Figure 2	Disposal tailings into a TSF and/or Nebo pit void
Power supply	Figure 2	Up to 60 MW (instantaneous load requirement) of fossil fuel electricity generation Up to 100 MW of photovoltaic solar electricity generation Up to 100 MW of wind electricity generation
Water supply	Figure 2	Abstraction of up to 7.5 GL/a of groundwater from the Borefield and through mine pit dewatering



Figure 1: Site Location

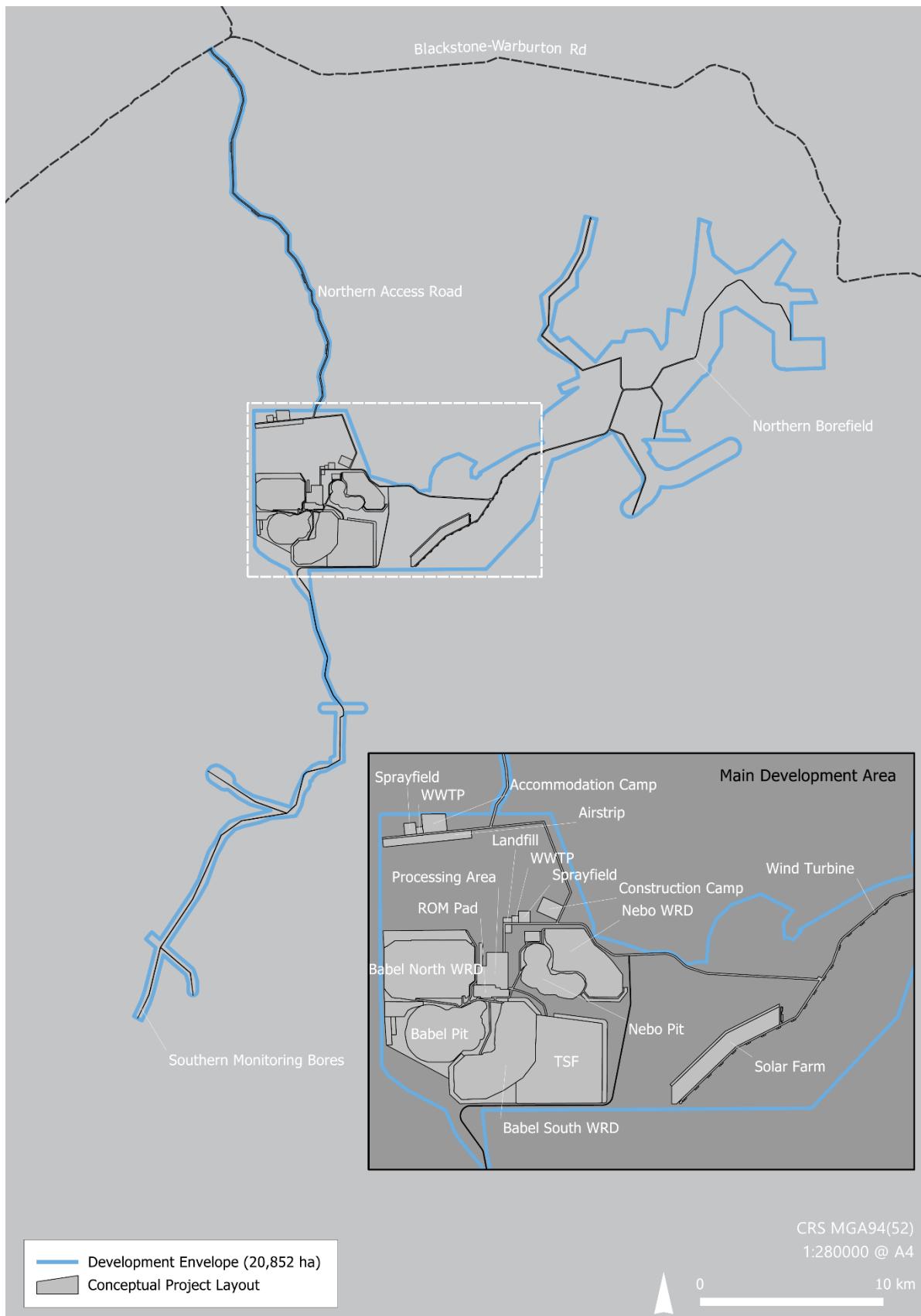


Figure 2: Location of Key Physical and Operational Elements

1.2 Key Environmental Factor

This FVMP specifically relates to the Land (Flora and Vegetation) factor guidelines. The EPA's Statement of Environmental Principles, Factors and Objectives (EPA, 2020b) lists the following as their objective for flora and vegetation:

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

The EPA Section 38 Referral (OZ Minerals, 2021) concluded that "*the Proposal was assessed (by OZ Minerals) as having no significant or irreversible impact on flora and vegetation-related environmental values and the EPA Objective for flora and vegetation 'To protect flora and vegetation so that biological diversity and ecological integrity are maintained' would be met should the Proposal be implemented*". This conclusion was based on:

- Significant survey effort having been undertaken over a 16-year period both inside and outside of the Development Envelope, over an area of 46,263 ha, by technical subject matter experts with a long history working at West Musgrave and within the bioregion. This survey effort contributed to a comprehensive characterisation of the botanical environment of the project area, and of the potentially sensitive flora and vegetation related environmental values.
- Vegetation associations, including terrestrial groundwater dependent ecosystems (GDEs), are considered to be widespread and well represented in the region (OZ Minerals, 2021; Appendix B1). No individual vegetation association identified would experience greater than 20.4% vegetation disturbance of the areas mapped during project flora and vegetation surveys.
- No TECs, or PECs were identified within the Development Envelope or a 100 km radius.
- No Threatened flora as listed under the *Environment Protection and Biodiversity Conservation Act, 1999* (Cth) or *Biodiversity Conservation Act, 2016* (WA) were recorded.
- Eight Department of Biodiversity, Conservation and Attractions (DBCA) priority taxa were recorded in the Development Envelope, of which four were recorded in the Main Development Area (consisting of one P1 and seven P3 species).
- Potential loss of priority flora is considered to present a low risk to the conservation status of these species as the species are known to occur outside the Development Envelope.
- Of the four identified species of taxonomic significance only one occurs within the disturbance footprint with a total take of 17.3% of the total populations recorded in the survey area, constituting of a relatively insignificant portion of the population recorded.
- Of the 17 range extensions identified within the Development Envelope, less than 12.8% of any given species recorded in the survey area fall within the disturbance footprint, constituting a relatively insignificant portion of the population recorded during surveys.

During the assessment of the EPA Section 38 Referral, the EPA noted that there remained uncertainty relating to the taxonomy of a potential novel species; *Eragrostis* sp. (G & S Cockerton WB37426), or whether this species was the priority 3 species *Eragrostis* sp. *Erect spikelets* (P.K. Latz 2122). Should this species have represented a new or novel species the proposed impacts of the Proposal could have been considered significant. Since the EPA Section 38 Referral (OZ Minerals, 2020), additional work has been undertaken to resolve this question (see Section 1.2.2 and OZ Minerals, 2021). Based on this new understanding the scope of this FVMP is therefore focussed primarily on the management of priority species, in particular on those specific impact events that have the potential to result in EPAs Environmental Objective for Flora and Vegetation from being met.

While the management measures proposed in this FVMP would contribute to the protection of priority species, it is considered that the same measures would also contribute to the protection of other flora species at West Musgrave. Further details relating to the monitoring and management of terrestrial GDEs is provided in the groundwater monitoring and management plan (OZ Minerals, 2021; Appendix K2).

1.2.1 Proposal Activities that May Affect the Key Environmental Factor

In compliance with the Notice provided by the EPA, this management plan applies to the management of priority flora species, to the extent that the interaction of the project may negatively impact this flora such that the EPA objective may not be achieved. To this end the following credible events have been identified with the potential to result in negative impacts to priority flora species, specifically:

- Loss of priority flora species resulting in a change in their conservation status due to project-related land clearing
- Loss of, or degradation of, vegetation condition due to project-related indirect impacts from:
 - Altered fire regimes
 - Increased abundance and or diversity of weeds.

Other impact events identified in the EPA Section 38 Referral (OZ Minerals, 2021) were assessed as not having an impact on priority or other species such that EPA's environmental objective for flora and vegetation would not be met, and as such have not been considered further in this management plan.

1.2.2 Site Specific Environmental Values

Eight DBCA priority flora species were recorded within the Development Envelope (Table 3 and Figure 3). An additional nine priority flora species were recorded within the study area, but outside of the Development Envelope. As these species have been avoided they are not discussed further in this FVMP.

In the time since submission of the EPA Section 38 Referral in December 2020 (OZ Minerals, 2020), a targeted flora survey was undertaken in March 2021 (referred to in the Notice as February 2021) to confirm whether one of the species identified as a potential species of taxonomic significance found in the Northern Borefield area (*Eragrostis* sp. (G & S Cockerton WB37426)) was actually the priority 3 species *Eragrostis* sp. *Erect spikelets* (P.K. Latz 2122). This targeted survey has subsequently confirmed that all specimens previously identified as *Eragrostis* sp. (G & S Cockerton WB37426) were actually *Eragrostis* sp. *Erect spikelets*. During this targeted survey further populations of *Eragrostis* sp. *Erect spikelets* (P.K. Latz 2122) were also identified. The results of the survey are reported as an Addendum to Appendix B1 Detailed Flora and Vegetation Survey of the updated EPA Section 38 Referral (OZ Minerals, 2021; Appendix B1 Addendum 2).

Table 3: Priority Flora Species Present in the Survey Area

Priority Species	Priority Status	Description and Habitat	Populations Recorded in Survey Area	Populations Recorded in Development Envelope	Representative Photograph
<i>Aenictophyton anomalum</i>	P1	<p><i>Aenictophyton anomalum</i> is a perennial herb growing to 0.2 m high with tufted stems ascending from long fine horizontal underground roots. The leaves are blue green in colour, folded and occur in two to five pairs of leaflets plus a single terminal leaflet. The leaflets are variable, from linear to obovate and are sometimes deciduous. Flowers are orange and in small terminal racemes.</p> <p><i>Aenictophyton anomalum</i> is always associated with the deep sands of the Sand Dune Acacia - Grevillea Shrubland (SDAGS) Vegetation Association.</p>	208	49	
<i>Amaranthus centralis</i>	P3	<p><i>Amaranthus centralis</i> is an erect annual herb growing to 0.6 m tall with angular, sometimes reddish, and sparsely hairy to glabrous stems (Western Australian Herbarium, 1998). It grows in red sand in ephemeral watercourses, sandy to clayey loam associated with riverbanks and edges of permanent pools in <i>Eucalyptus</i> lined channels, or <i>Acacia</i> Shrublands.</p> <p><i>Amaranthus centralis</i> was recorded throughout the survey area within the Hardpan Mulga Woodlands (HPMW) Vegetation Association.</p>	21	11	

Priority Species	Priority Status	Description and Habitat	Populations Recorded in Survey Area	Populations Recorded in Development Envelope	Representative Photograph
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	P3	<p><i>Aristida jerichoensis</i> var. <i>subspinulifera</i> is an upright perennial tussock grass 0.8 to 1.2 m in height. <i>Aristida jerichoensis</i> var. <i>subspinulifera</i> is similar in habit and features to the more widespread species <i>Aristida inaequiglumis</i> and <i>Aristida latifolia</i>. Separating these three species requires careful inspection of mature florets with a microscope.</p> <p><i>Aristida jerichoensis</i> var. <i>subspinulifera</i> was found within the Hardpan Mulga Woodland (HPMW) and Groved Mulga (GRMU) vegetation associations along the Northern Access Road corridor.</p>	4	2	
<i>Chrysocephalum apiculatum</i> subsp. <i>racemosum</i>	P3	<p><i>Chrysocephalum apiculatum</i> subsp. <i>racemosum</i> is a perennial shrub to 0.5 m high and 0.8 m wide with long silky hairs covering short glandular hairs on blue-green foliage, with clusters of bright yellow flower heads.</p> <p><i>Chrysocephalum apiculatum</i> subsp. <i>racemosum</i> has been seen scattered within the Sandplain and Sand Dune groups of Vegetation Associations along the Northern Access Road and Western Access Road alignments and Northern Borefield.</p>	9	1	

Priority Species	Priority Status	Description and Habitat	Populations Recorded in Survey Area	Populations Recorded in Development Envelope	Representative Photograph
<i>Eragrostis</i> sp. Erect spikelets (P.K. Latz 2122)	P3	<p><i>Eragrostis</i> sp. Erect spikelets (P.K. Latz 2122) is a perennial tussock grass growing to 0.4 m high.</p> <p><i>Eragrostis</i> sp. Erect spikelets (P.K. Latz 2122) was initially recorded along the Northern Access Road alignment, on the boundary of the <i>Acacia kempeana</i> Shrubland (AkS and HPMW) and growing in shallow sand over outcropping and sub cropping granodiorite.</p>	1,489	384	
<i>Eragrostis</i> sp. Limestone (P.K. Latz 5921)	P3	<p><i>Eragrostis</i> sp. Limestone (P.K. Latz 5921) is a perennial tussock grass to 0.3 m high and 0.4 m wide with short basal foliage forming a ring of live vegetation.</p> <p><i>Eragrostis</i> sp. Limestone (P.K. Latz 5921) is always associated with outcropping calcrete platforms and is found in small, isolated populations of up to a couple of dozen clumps with other grasses including <i>Triodia scariosa</i>, <i>Eragrostis eriopoda</i>, <i>Eriachne mucronata</i> typical form and <i>Aristida contorta</i>.</p>	183	117	

Priority Species	Priority Status	Description and Habitat	Populations Recorded in Survey Area	Populations Recorded in Development Envelope	Representative Photograph
<i>Goodenia asteriscus</i>	P3	<p><i>Goodenia asteriscus</i> is a herbaceous perennial, facultatively stoloniferous, rosette-forming herb growing from 8 to 22 cm tall, developing a woody taproot and thickened basal stem that retain the old pedicel bases.</p> <p><i>Goodenia asteriscus</i> has numerous records and is mostly been found growing on limestone plains with outcropping calcrete (Lang and Davies, 2017). During surveys it was found within the Calcrete Platform Hummock Grassland (CPHG) vegetation association, which is consistent with descriptions of vegetation and soil associations it has previously been collected within.</p>	299	94	
<i>Stackhousia clementii</i>	P3	<p><i>Stackhousia clementii</i> (P3) is a dense broom-like perennial herb, growing to 0.45 m high. The flowers are green/yellow/brown.</p> <p><i>Stackhousia clementii</i> has been recorded growing on skeletal soils and has been recorded in the region growing on shallow sands over calcrete (Western Australian Herbarium, 1998).</p>	226	32	

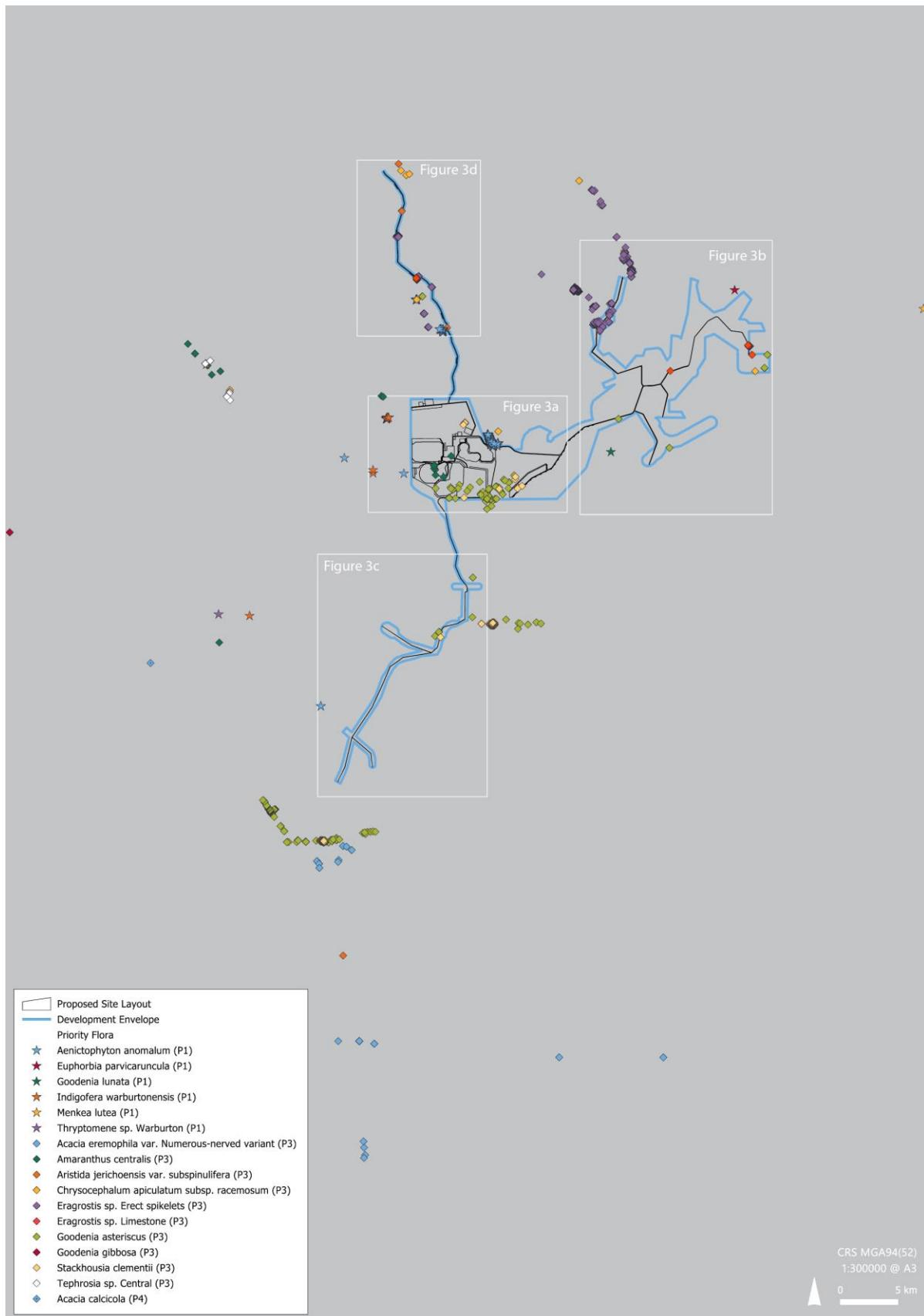


Figure 3: Priority Flora Species in the West Musgrave Project Area

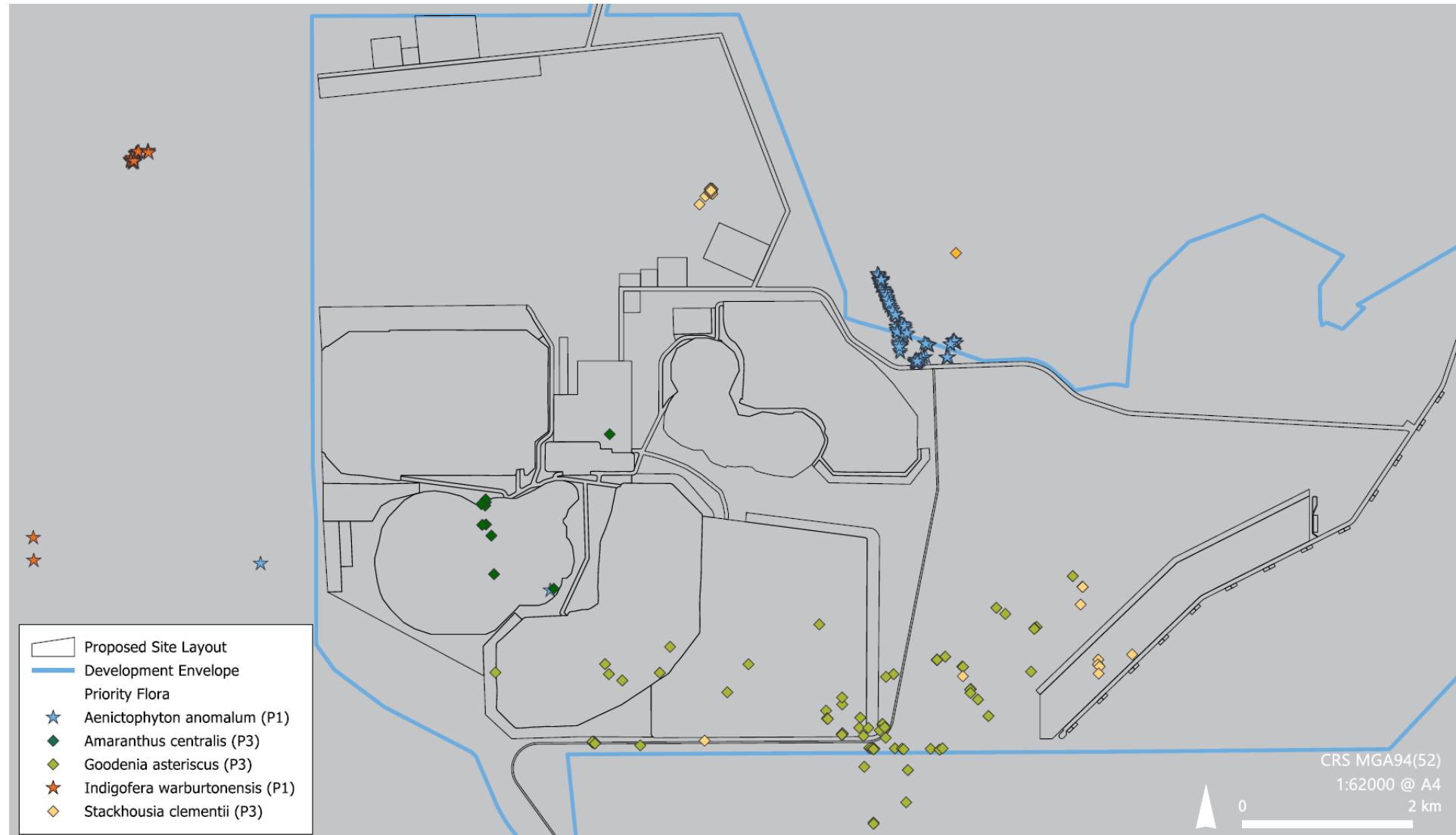


Figure 3a: Priority Flora Species in the West Musgrave Project Area

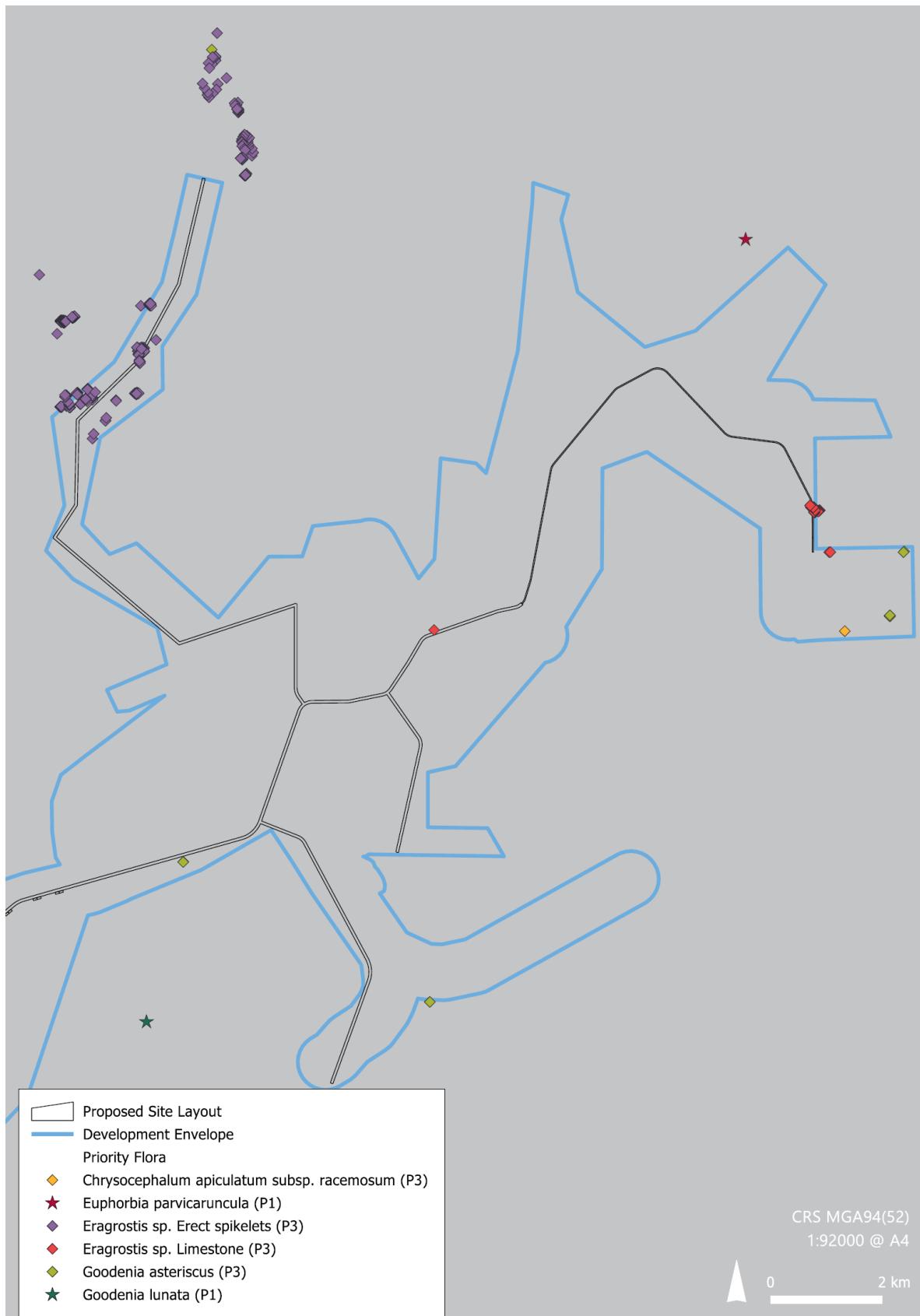


Figure 3b: Priority Flora Species in the West Musgrave Project Area

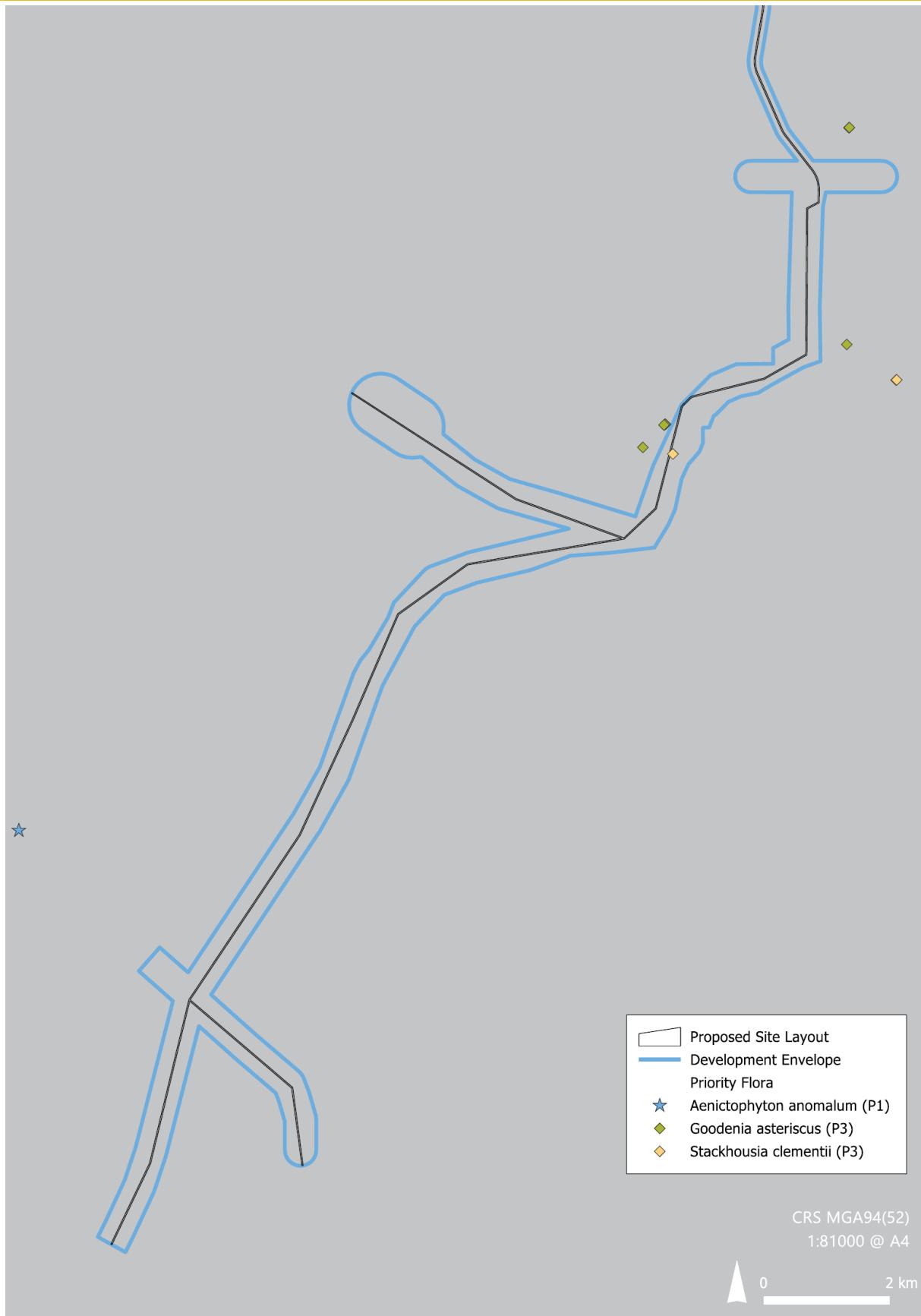


Figure 3c: Priority Flora Species in the West Musgrave Project Area

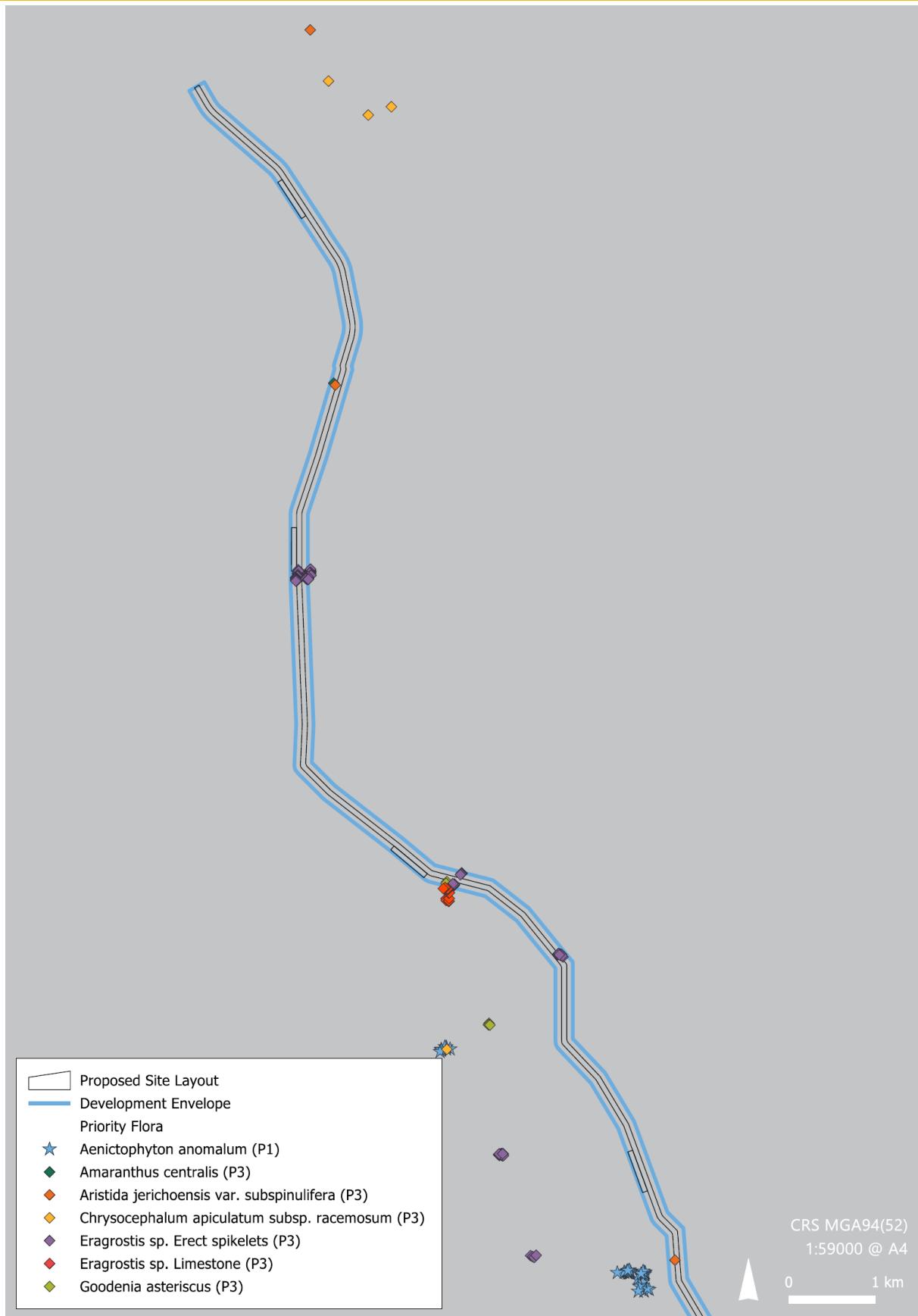


Figure 3d: Priority Flora Species in the West Musgrave Project Area

1.3 Condition Requirements

A Ministerial Statement and associated conditions are yet to be issued.

1.4 Rationale and Approach

This FVMP outlines how priority flora species will be managed, and where relevant monitored, to verify the effectiveness of the management measures and to ensure potential impacts associated with the proposed construction and operation of the project are minimised.

OZ Minerals' approach is to give significant focus during project design to avoid and minimise impacts by carefully designing the Development Envelope and siting infrastructure to avoid priority flora and vegetation species where possible.

1.4.1 Survey and Study Findings

1.4.1.1 Direct Impacts

Eight priority flora and vegetation species, as listed by DBCA, were recorded in the Development Envelope during surveys and are discussed in detail in Table 3.

The direct loss of priority flora species based on the indicative site footprint is presented in Table 4. These species are known to occur widely outside the Development Envelope, and all occur in other States or Territories, including within Aboriginal Lands where a greater level of protection is afforded (OZ Minerals, 2021). This broader occurrence demonstrates that the clearance of these populations presents negligible risk to the conservation status of these species. In addition, due to the under-studied nature of the project area, there is a high likelihood that these species occur more extensively than has been recorded to date.

Table 4: Indicative Disturbance of Priority Flora Species

Priority Species	Populations Within the Survey Area	Populations Within the Development Envelope	Other Known Populations	Proposed Populations to be Cleared	Percentage Loss of Populations (%)	Comments
<i>Aenictophyton anomalum</i> (P1) *	208	49	109	1	0.3	Recorded twice in WA (GVD and Murchison IBRA regions). Recorded more extensively in the south-west corner of NT and north-western SA. Also present as a disjunct population in northern NSW and southern Qld
<i>Amaranthus centralis</i> (P3)	21	11	103	10	8.1	Commonly occurs in southern NT, and in northern SA 10 Records of this species are from Central Ranges and Pilbara IBRA regions in WA
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i> (P3)	4	2	641	1	0.2	Represents a significant range extension within WA. Only a slight range extension south of known distribution in the NT
<i>Chrysocephalum apiculatum</i> subsp. <i>racemosum</i> (P3)	9	1	92	0	0.0	Widespread in the NT and populations also known in northern SA and western Qld Species is poorly known in WA with only 5 confirmed specimens held at the WA Herbarium
<i>Eragrostis</i> sp. Erect spikelets (P.K. Latz 2122) (P3)	1,489	384	147	63	3.9	Well known within central and southern parts of the NT and southern SA. Known from 6 other records in WA
<i>Eragrostis</i> sp. Limestone (P.K. Latz 5921) (P3) *	183	117	145	17	5.2	The majority of records are from the NT Known from 7 other records in WA
<i>Goodenia asteriscus</i> (P3)	299	94	25	31	9.6	Known from SA and 11 records within WA
<i>Stackhousia clementii</i> (P3)	226	32	220	5	1.1	Well represented and widely distributed in SA, NT and WA with some records in Qld

* Range extensions which are also Priority species

1.4.1.2 Indirect Impacts

Indirect impacts may occur to priority flora species as a result of interaction with indirect sources from the project. Table 5 outlines the credible indirect impacts events that may impact priority flora species and are considered further in this management plan.

Table 5: Potential Indirect Impacts to Priority Flora Species

Potential Impact	Description of Potential Indirect Impact
Project-related altered fire regimes	Traditional Owners actively use fire as a land management tool within the local area and region. Implementation of the project would require changes in traditional use of fire to ensure protection of people and project assets. While the increased occurrence of tracks, road networks, and cleared areas associated with the project provide natural fire breaks likely to reduce the intensity and extent of fires, further management measures would be required to minimise the likelihood of fire starting from project activities.
Project-related increase in the abundance and diversity of weeds	While eight existing weed species are known to occur within the survey area, six of these species are not considered to be significant, with the two remaining species considered to be highly invasive (OZ Minerals, 2021; Appendix B1). There is potential for project-related activities to introduce new species and increase abundance of weed across project areas.

1.4.2 Key Assumptions and Uncertainties

This FVMP has been developed using all relevant and available information at the time of preparation. As the understanding of flora and vegetation management improves over time, this FVMP may require updating.

The key assumptions and uncertainties associated with this current FVMP are described in Table 6.

Table 6: Key Assumptions and Uncertainties Associated with Flora and Vegetation Management

ID	Assumption / Uncertainty	Description
A1	Survey effort	<p>The flora surveys undertaken to date accurately report the distribution and status of flora in the project area</p> <p>Flora surveys were undertaken during 'good' seasons, and as such are considered likely to have captured the majority of flora species present</p> <p>The competency and experience of the consultants carrying out the flora surveys was sufficient to ensure qualified results.</p>
A2	Effectiveness of management actions	<p>The management actions required by this MP (Section 2) are appropriate and sufficient to protect priority flora species from significant project-related direct and indirect impacts, thereby not resulting in a potential adverse change in conservation status due to the project.</p>

ID	Assumption / Uncertainty	Description
U1	Regional knowledge	Few flora studies have been undertaken outside of the project area, and as such, the following uncertainty exists. It is considered likely that the priority flora species populations found to date also occur more widely in the region, outside of those areas associated with the Development Envelope.
U2	Knowledge sharing	The project area is located close to the borders of SA and the NT. Whilst WA survey records have been interrogated thoroughly as a component of the EPA Section 38 Referral (OZ Minerals, 2021) and this FVMP, the distribution of priority flora species may occur across borders into SA and the NT.

1.4.3 Management Approach

While OZ Minerals has identified a number of avoidance, minimisation and mitigation measure that would be implemented to protect flora and vegetation in the EPA Section 38 Referral (OZ Minerals, 2021) the management approach, and management actions detailed in this FVMP are specifically designed to ensure the project meets the EPA's objective for Flora and Vegetation (Section 1.2) as it pertains to priority flora, with a focus on the mitigation hierarchy; this includes avoidance and minimisation of direct impacts (Table 7) and the mitigation of indirect impacts (Table 8).

Table 7: Minimisation Measures for Direct Impacts to Priority Flora

Mitigation
Measures to Avoid
<ul style="list-style-type: none"> A considerable effort has been made to reorient and reduce the size of Development Envelope to avoid impacts to environmental values. This has included a reduction of the Development Envelope from 25,200 ha to 20,852 ha (17% reduction), and of the disturbance footprint from 3,961 ha to 3,830 ha resulting in the exclusion of some significant species Known locations of priority and significant flora species will be included in the site's GIS database to ensure locations are avoided where possible during future activities Project footprint will be designed to avoid priority and significant flora populations where possible Clear demarcation would be erected around Priority 1 species where possible, including <i>Aenictophyton anomalum</i>
Measures to Minimise
<ul style="list-style-type: none"> Land clearing would be kept to the minimum necessary for development of the proposed project, and avoid, where possible, Priority 1 species exclusion areas Develop and implement a site-specific internal clearing/disturbance procedure and associated permit to prevent clearing outside approved boundaries Where practicable, land clearing would be undertaken progressively with the amount of active disturbance minimised Existing disturbed areas would be used wherever possible to minimise total ground disturbance The site induction program would provide information on priority species, exclusion zones and ground disturbance authorisation procedures

Mitigation
Measures to Rehabilitate
<ul style="list-style-type: none"> • Progressive rehabilitation would be undertaken on disturbed areas as they become available • Topsoil and vegetation (including woody debris) would be re-spread over rehabilitated areas to act as a seed source and to protect the soil from erosion • Local provenance seed and propagated material would be used, if required, to rehabilitate disturbed areas

Table 8: Mitigation Measures for Indirect Impacts to Priority Flora

Mitigation
Altered fire regimes
<ul style="list-style-type: none"> • Firefighting equipment would be located on site and emergency personnel would be trained in fire response • Vehicles would not be permitted to leave access tracks or cleared areas • A Hot Work Permit system would be developed and implemented • All machinery and vehicles undertaking clearing activities would be fitted with firefighting equipment • Fire management practices would be made in consultation with the Department of Fire and Emergency Services (DFES) and the Ngaanyatjarra Council including installation and maintaining firebreaks if required, so that potential environmental damage from extreme and out of control wildfires is minimised, and infrastructure and the community are protected throughout the life of the project • The project site induction would include information on prevention and management of fires
Increased abundance and or diversity of weeds
<ul style="list-style-type: none"> • A vehicle hygiene procedure would be implemented for vehicles and equipment coming on to, or returning to, the site for earthmoving • Weed control would be implemented on areas to be disturbed for infrastructure • A weed control management plan would be developed to manage known weed infestations and prevent their spread

1.4.4 Rationale for Choice of Management Targets

The provisions included in this FVMP are objective-based as they relate to specific management actions.

2 EMP COMPONENTS

2.1 Management Objectives, Actions and Targets

Management objectives, actions and targets focused on achieving the EPA's objective for Flora and Vegetation (Section 1.2) as relevant to priority flora species are presented in Table 9. These focus the greatest management effort on project activities that have the highest likelihood of causing adverse impact on priority flora species. The order of management objectives and the resultant management actions and targets is from highest to lowest management effort to achieve the EPA's objective.

Table 9: Outcome and Objective-Based EMP for Flora and Vegetation

EPA Factor: Flora and Vegetation Key Environmental Values: Priority flora species Key Impacts and Risks: <ul style="list-style-type: none"> • Loss of priority flora species resulting in a change in their conservation status due to project-related land clearing • Loss of, or degradation of, vegetation condition due to project-related indirect impacts from: <ul style="list-style-type: none"> ◦ Altered fire regimes ◦ Increased abundance and or diversity of weeds 			
Management Action	Management Target(s)	Monitoring	Reporting
Management Objective: Minimise requirements for land clearing and associated loss of priority flora species Key Impacts and Risks: Project-related clearance of priority flora species, resulting in a change in their conservation status			
<ul style="list-style-type: none"> • Land disturbance kept to the minimum necessary for development of the project • Develop and implement a site-specific internal clearing/disturbance procedure and associated land disturbance permit (LDP) • Where practicable, land clearing undertaken progressively with the amount of active disturbance minimised • Existing disturbed areas used wherever possible to minimise total land disturbance 	<ul style="list-style-type: none"> • Total project-related land disturbance is to be within the approved Development Envelope and not to exceed the approved area • Disturbance of priority flora species populations avoided wherever practicable, and otherwise minimised 	<ul style="list-style-type: none"> • Annual review of land disturbance-related survey data, and comparison with project-related land disturbance on the respective year's aerial imagery, relative to the approved area of project-related land disturbance • Annual review of internal project-related land disturbance register relative to actual project-related land disturbance and LDPs 	<ul style="list-style-type: none"> • Internal project-related Land Disturbance Register and LDPs • Mining Rehabilitation Fund (MRF) annual reporting • Annual WMP Compliance Assessment Report • Details (locations and species) of additional priority flora species populations to be forwarded to the DBCA within 6 months of discovery
Management Objective: Minimise project-related indirect impacts to priority flora species Key Impacts and Risks: Loss of, or degradation of, vegetation condition due to project-related indirect impacts from altered fire regimes			
<ul style="list-style-type: none"> • Develop and maintain a Fire Mitigation Plan and incorporate into the Asset Emergency Management Plan • Install and maintain fire extinguishers and firefighting equipment in the project area and on site to relevant Australian Standards • Install and maintain firefighting equipment in machinery and vehicles undertaking land disturbance activities • Project emergency response personnel trained in fire and bushfire response • Vehicles kept to access tracks or cleared areas • Develop and implement a Hot Work Permit system • Fire management practices developed in consultation with WA Department of Fire and Emergency Services (DFES) and the Ngaanyatjarru Council, including installation and maintenance of firebreaks if required • Site induction to include information on prevention, management and response to fires 	<ul style="list-style-type: none"> • No unplanned fires attributable to project-related activities • To minimise the potential environmental damage from project-related extreme or out-of-control wildfires 	<ul style="list-style-type: none"> • Quarterly emergency response equipment inspections relative to relevant Australian Standards • Annual fire response training exercise including wildlife response • Annual review of fire break development for evidence of adequate installation and maintenance 	<ul style="list-style-type: none"> • Internal incident reports • Internal project-related Land Disturbance Register and LDPs • Hot Work Permit register • Induction and training records • Annual WMP Compliance Assessment Report
Management Objective: Minimise project-related indirect impacts to priority flora species Key Impacts and Risks: Loss of, or degradation of, vegetation condition due to project-related indirect impacts from increased abundance and or diversity of weeds			
<ul style="list-style-type: none"> • Vehicle hygiene procedure implemented for vehicles and equipment coming on to, or returning to, the site for earthmoving • Weed control implemented on all project-related areas of disturbance • Develop and implement a Weed Control Management Plan to manage known weed infestations and control spread 	<ul style="list-style-type: none"> • No vehicles or equipment brought to site without being cleaned of soil and vegetative matter • No new declared pest species under Section 22 of the <i>Biosecurity and Agriculture Management Act, 2007 (WA)</i> become established within project-related disturbed areas • No increases to weed species' diversity or abundance due to project-related activities 	<ul style="list-style-type: none"> • Quarterly review of vehicle and equipment hygiene inspection records • Annual review of site-wide weed inspection records in disturbance areas 	<ul style="list-style-type: none"> • Incident reports • Weed register • Workplace inspection reports • Annual WMP Compliance Assessment Report

2.2 Reporting

2.2.1 Ngaanyatjarra Council and Ngaanyatjarra People

All reporting discussed in this section will be made specifically available to the Ngaanyatjarra People through the Ngaanyatjarra Council, including where necessary periodic face-to-face meetings to discuss the results and outcomes of monitoring.

Where necessary training and support of relevant members of the Ngaanyatjarra People will be supported by OZ Minerals to ensure an understanding of monitoring results and their relevance. Further, opportunities for the involvement of Ngaanyatjarra People in the monitoring activities will continue to be explored as the project is developed.

2.2.2 Compliance Reporting

OZ Minerals will prepare Annual Environmental Reports (AERs) to be submitted to regulatory authorities. The format of these reports will be consistent with requirements stipulated by individual regulatory authorities.

A Compliance Assessment Report (CAR) will be submitted to the Compliance Branch at Government of Western Australia's Department of Water and Environmental Regulation (DWER) at an agreed date. The CAR will document compliance with conditions of approval including assessment of compliance with management plan requirements where management plans form part of approval conditions.

3 ADAPTIVE MANAGEMENT

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of management actions. Specifically, adaptive management in relation to this MP includes:

- Defining the issue and objectives, and developing the FVMP to address these (i.e., this document)
- Implementing the management actions described in this FVMP (Table 9)
- Monitoring and evaluating the applied management and mitigation against the outcomes and objectives, as per the monitoring program outlined in Table 9
- Adjusting the management actions and monitoring (if required) to meet the outcome or objective, based on what is learnt from:
 - evaluation of the effectiveness of applied mitigation measures
 - review of assumptions and uncertainties
 - re-evaluation of risk assessment
 - external changes during the life of the project (e.g., technical advances or innovation, changes to priority flora listings).

3.1 Management Plan Review

This FVMP will nominally be reviewed at least every three years from the date of endorsement to ensure that it reflects the current situation with regards to WMP flora management and monitoring. The MP may also be reviewed should any of the following occur:

- A change in conservation rating of any flora species known to occur in the project area (e.g., the addition of new species and/or an increase or decrease in the conservation rating of any species)
- The addition or change of infrastructure within WMP that has the potential to significantly change the predicted direct or indirect impacts on priority flora species, and that was not approved within the scope of the project
- Any change in operational practices on site that has the potential to significantly change the predicted direct or indirect impacts on priority flora species, and that was not approved within the scope of the project.

As this management plan is a requirement of a regulatory condition, OZ Minerals will seek formal approval from DWER to make any changes to this document after endorsement based on information gained through adaptive management and may involve consultation with relevant stakeholders.

4 STAKEHOLDER CONSULTATION

Consultation has been undertaken as part of the Section 38 Referral under Part IV of the EP Act, and as part of ongoing discussions relating to a Mining Agreement with the Ngaanyatjarra People. Details of these consultations are provided in Section 3, Section 6.1.3, Appendix A4 and Appendix A5 of the EPA Section 38 Referral (OZ Minerals 2021).

Through consultation with Traditional Owners the following areas were identified as areas of concern to Ngaanyatjarra People relating to flora and vegetation, these matters have been specifically considered in this FVMP or the Groundwater Monitoring and Management Plan (GMMP).

- Interest in general clearing activities, and where possible minimising the extent of vegetation that will require clearing to support the project activities
- Interest in what actions may be undertaken to control the introduction of weeds to the site
- Potential impacts to tree species resulting from water abstraction e.g. obligate water users. This is particularly apparent for a stand of desert oaks which form part of a significant dreaming trail known as the Marlu dreaming trail located immediately west and south of the Development Envelope. Further, impacts to other potential GDEs may be perceived negatively by the Traditional Owners due to broader cultural associations and custodianship of the land. This matter is addressed further within the GMMP.

Consultation specific to this FVMP includes internal peer review with subject-matter experts (MBS Environmental and Western Botanical) and meetings with the Government of Western Australia's DWER and EPA.

A review of a draft FVMP was undertaken by the Ngaanyatjarra Council's environmental consultant. The Ngaanyatjarra Council noted that this FVMP does not relate to any specific concerns raised by Ngaanyatjarra People, and that relevant flora and vegetation matters of greater interest to the Ngaanyatjarra People relate to potential GDEs which are managed within the GMMP.



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5 UPDATES TO THE EMP

This section is not applicable to the first version of the Flora and Vegetation Management Plan, and will be updated in future revisions.

6 REFERENCES

EPA. 2016a. *Environmental Factor Guideline: Flora and Vegetation*. Environmental Protection Authority. December 2016. Perth.

EPA. 2016b. *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*. Environmental Protection Authority. December 2016. Perth.

EPA. 2020a. *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*. Environmental Protection Authority. September 2020. Perth.

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Lang, P.J. and Davies, R.J.P. 2017. *Goodenia asteriscus (Goodeniaceae), a new arid zone species from north-western South Australia and eastern Western Australia*. Swainsona 31: 37–43.

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