MAGNETITE
MINES

Razorback Iron Ore Project

Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans

3 October 2025

Applicant: Razorback Iron Pty Ltd

Exploration Licences 6353, 6126, 6127, 6788 and 6878

PREPARED BY

eco logical AUSTRALIA
A TETRA TECH COMPANY

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Prepared by	**Louise Swann, Sarah Holt, Michael Short, Charlotte de Wolff, Richard Lewis, Omema Khurram**
Reviewed by	**Louise Swann**
Approved by	**Jasmine Richards**
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Acknowledgement of Country

Magnetite Mines acknowledges the Ngadjuri Peoples as the Traditional Owners of the lands on which the Razorback and Iron Peak deposits are located.

We recognise the strength of Culture and connection to Country continues to this day

We pay our respects to the older people who came before us. To those who prepared the ground for us to walk on - together.

We will strive to continue their legacy.

Magnetite Mines also acknowledges the First Peoples of the River Murray and Mallee and other Aboriginal groups that are connected to the Razorback Project.

We pay respect to your Elders, past, present and emerging.

Contributors

Magnetite Mines would like to acknowledge and thank the following companies and individuals that have joined the Razorback team since 2020 and assisted in the development of this Mining Lease Proposal, associated studies and supporting engagement programs:

PRINCIPAL PROJECT PARTNER

eco logical AUSTRALIA A TETRA TECH COMPANY

TECHNICAL PROJECT PARTNERS

AMC consultants

GHD

HATCH

IMPACT ASSESSMENT PARTNERS

CDM Smith

rps A TETRA TECH COMPANY

BDO

LINKING FUTURES

LATERAL Environmental

TETRA TECH COFFEY

katestone www.katestone.global

CIRQA

Resonate

SPECIALIST PARTNERS

MinterEllison.

LUVO environmental

Alexander Symonds Surveying Consultants

EMM creating opportunities

sonus.

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GOYDER South Australia's Heartland

CONVERGEN

VILLAGE GATE BRAND & EVENT AGENCY

Huw Morgan

Disclaimer

This Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans has been prepared for submission to the South Australian Minister for Energy and Mining (Anastasios (Tom) Koutsantonis) and the Minister for Climate, Environment and Water (Dr Susan Close) under the *Mining Act 1971* (SA) as well as the Federal Minister for the Environment and Water under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). No one other than these South Australian and Federal Minister(s) should rely on the information contained within this Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans to make, or refrain from making, any decision.

In preparing the Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans, Magnetite Mines Ltd has relied on information provided by specialist consultants, government agencies and other third parties. Magnetite Mines Ltd has not fully verified the accuracy or completeness of that information, except where expressly acknowledged in the Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans.

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Version	Description	Prepared By	Reviewed By	Date created
V1	Razorback Mining Lease Proposal	Eco Logical Australia	Allan Kane	11 March 2025
V2	Razorback Mining Lease Proposal – Validity assessment update	Eco Logical Australia	Allan Kane	3 October 2025

Declaration of Accuracy

The following declaration of accuracy is made in accordance with Regulation 84 of the *Mining Regulations 2020 (SA)*.

Name	Tim Dobson
Position	Director
Company / Agent	Razorback Iron Pty Ltd
Signature	
Date	10 October 2025
Summary of steps undertaken to review the compliance report to ensure its accuracy	I, Tim Dobson, holding the position of Director, have taken the following steps to review the information in this Mining Lease Proposal Application to ensure its accuracy: • implemented an audit process against the Razorback Project Mining Lease Application Terms of Reference to ensure the minimum requirements have been addressed. • undertaken an internal process for review, endorsement or sign off by senior management of Magnetite Mines Ltd and • internal peer review by a suitably qualified and experienced company employee.

Executive summary

Preface

Applicant

Razorback Iron Pty Ltd, a subsidiary of Magnetite Mines Ltd (MGT, the Company), is seeking to develop an extensive magnetite iron ore resource in northeastern South Australia (SA). The Company has established expertise in exploration and magnetite resource development, with a focus on mining projects that supply high-grade iron feedstock for cleaner steelmaking processes. This emphasis aligns with current industry trends toward direct reduced iron (DRI) technology and the goal of lowering overall carbon emissions in steel production.

The principal objective for the Razorback Iron Ore Project's (the Project) is to produce a reliable supply of high-grade iron ore concentrate to meet domestic and global steel industry demand. The Company has undertaken geological evaluations, stakeholder engagement activities, and environmental assessments to ensure that the development of the Project meets stringent technical, social, and regulatory standards

For the purposes of this Mining Lease Proposal (MLP), reference to MGT is assumed to include Razorback Iron.

The Razorback Iron Ore Project

The Project is located approximately 240 kilometres (km) northeast of Adelaide, approximately 75 km east of Peterborough, and approximately 37 km south of Yunta (refer Figure S1).

MGT submits this MLP and Miscellaneous Purposes Licence (MPL) Management Plans (collectively referred to as the MLP) to support applications for a Mining Lease (ML) and four MPLs for the purposes of constructing and operating the key project elements as show in Table S1 and Figure S1.

Table S1: Key Project Elements

Proposed Tenement	Key Project Elements
ML	
Razorback ML	Mining, processing, tailings storage facility (TSF), and ancillary infrastructure
MPL	
Transmission Line (TL) MPL	Electricity infrastructure to support mine operations
Haul road (HR) MPL	Haul road infrastructure to support mine haulage operations and location of a water pipeline
Rail siding (RS) MPL	Rail spur and materials handling operation with haul road to support mine haulage and export operations
Laydown area MPL	Temporary laydown area to support mine construction

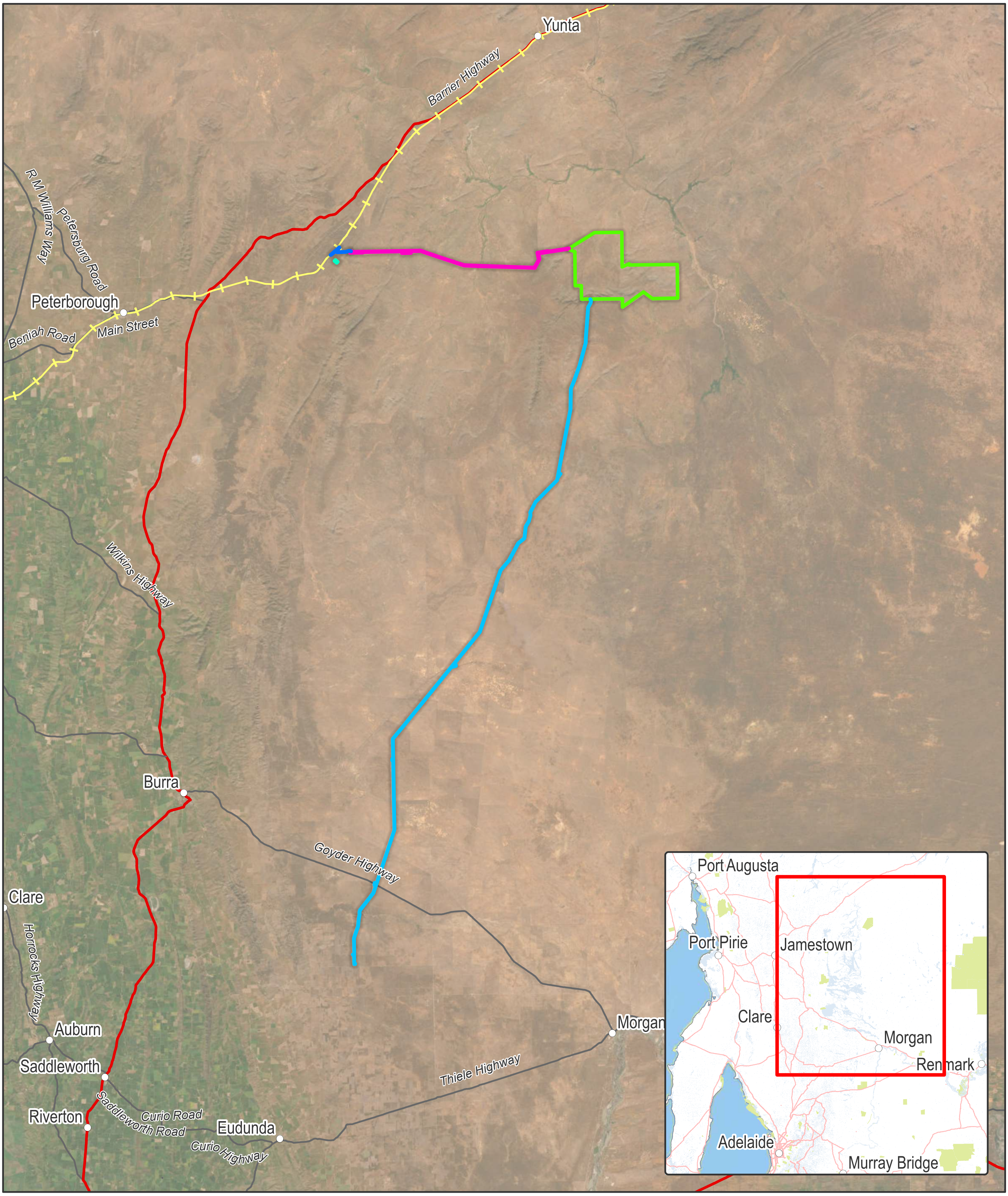


Figure S1: Key Project Elements

Project rationale and market context

The steel industry's growing requirement for higher-grade iron products, particularly magnetite concentrates, is driven by efforts to reduce the carbon footprint of steel manufacturing. Magnetite ore generally requires beneficiation but yields a superior final product with high iron content and low impurities. The concentrate is intended for export, leveraging existing regional infrastructure, including rail corridors and potential power connections.

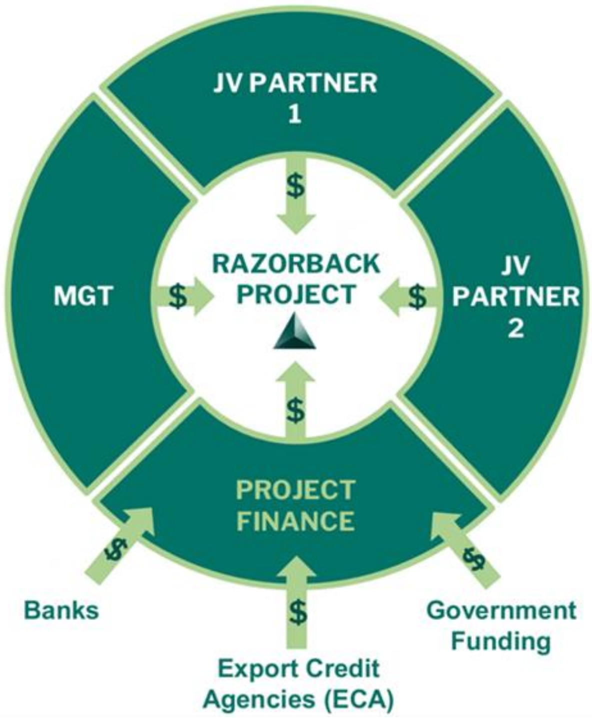
The Project targets magnetite-bearing strata in the Braemar Iron Formation, a siltstone-dominated unit that has been demonstrated to host substantial magnetite deposits. Advanced exploration and resource delineation programs conducted over multiple years have confirmed the continuity and economic viability of this mineralisation. The Project envisions an annual production of approximately five million tonnes (Mt) of iron concentrate, subject to market conditions and the refining of feasibility work.

For further details on market context, please refer to Chapters 1 and 9.

Funding model

The capital cost of construction of the Project is estimated at $2 billion. It is proposed that the Project will be developed as a Joint Venture (JV) between motivated investors and offtake partners, and negotiations with potential partners are advancing. MGT will be the operator of the site and will retain majority ownership (i.e., 51%) with an expectation of 2-3 other strategic partners becoming equity owners of the remaining balance. Execution funding mechanisms may include Export Credit Agencies in Australia and Japan, as well as potential Federal Government support for provision of multi-user facilities.

MGT's current financial commitments are limited to SA exploration activities, with aggregate tenement expenditure through to expiry of $2 million which is well within the financial capacity of the company.



For further details on financing, please refer to Chapter 10.

Access to land

MGT sought to lower land access risk and impact through its provisional assessment and siting of linear infrastructure corridors. The Company aimed to prioritise placement of infrastructure, and the TL in particular, within properties where the owner viewed the proposed development as compatible with the current and future use of their respective properties, and who expressed an interest in negotiating a mutually acceptable outcome with MGT. Land access negotiations are well advanced for most privately owned titled properties.

MGT remains committed to ensuring landowners are adequately compensated for the use of and, where relevant, the loss of productivity or value in their land, while effecting the continued security, productive operation and general care of their land through suitable management commitments.

For further details on tenure and land access, please refer to Chapter 1.

Project Description

Life of mine

The Razorback Project is centered on the mining of Razorback and Iron Peak deposits with a target production of 5 Mt per annum of high-grade iron concentrate (dry equivalent) for the international steel market. The initial mine life (as presented in this MLP) is 38 years; however, there is sufficient resource to extend the mine life to 56 years (which would require further approvals).

Site operations overview

An overview of the Project's proposed general operations is shown in Figure S2. Mining and processing are co-located within the Project area and enabled by a series of non-process infrastructure/facilities and provision of major utilities (power, water).

Iron ore concentrates will be transported via a 53.6 km long dedicated site access and haulage road to the Hillgrange rail siding (RS) for loading onto freight trains and transport via railway line to port for export to end markets.

The scope of the Project has been defined following detailed geological, geotechnical, mining, metallurgical processing, waste management and infrastructure assessments, test work programs and feasibility studies. MGT has leveraged the extensive experiences of global resource development experts Hatch, GHD and AMC Mining Consultants in the assessment of and planning for this Project.

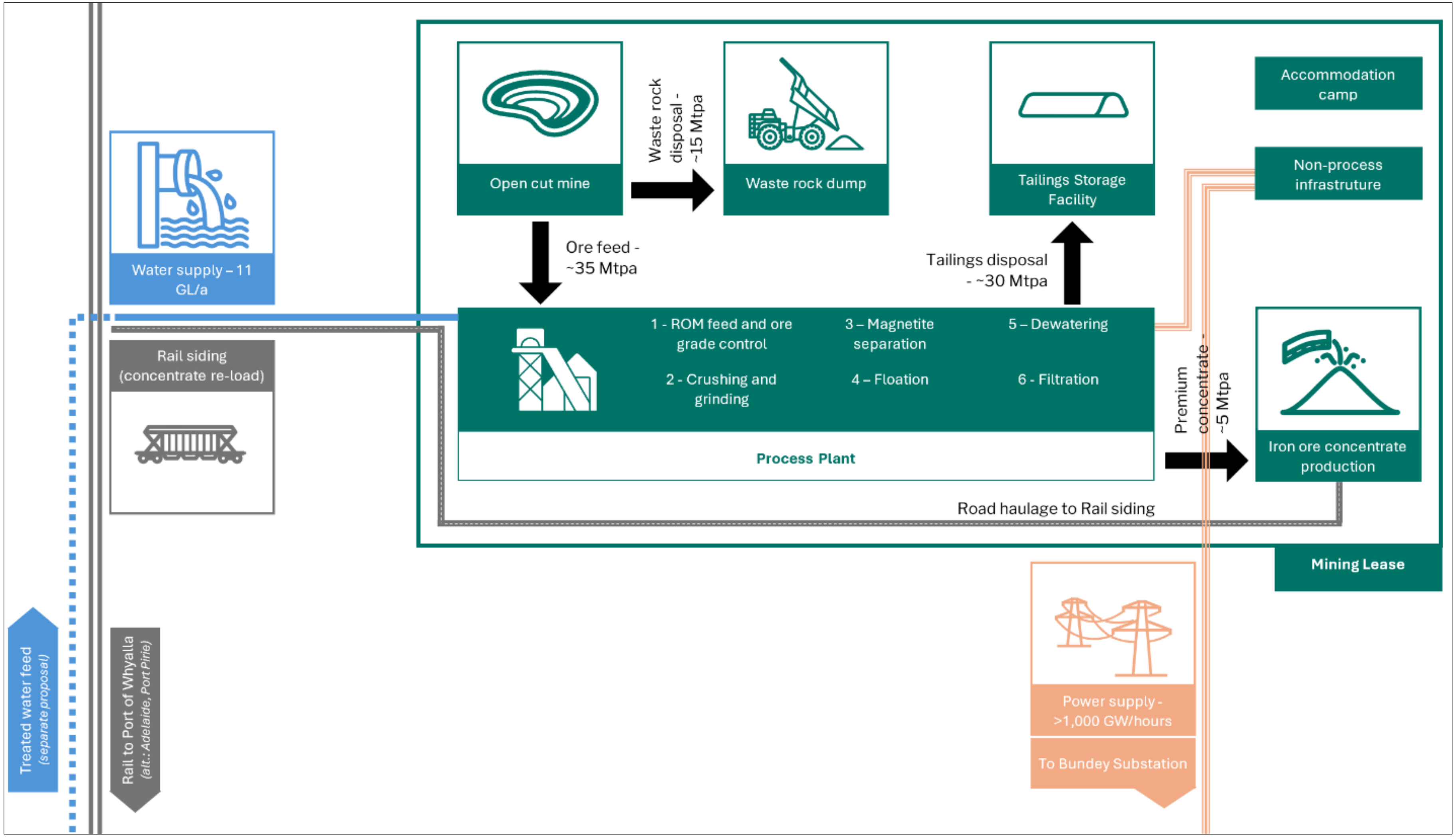


Figure S2: Schematic of proposed operations, Razorback project

Mining methodology

The deposits will be mined as open cut pits, with ore extracted through conventional drill and blast and truck and shovel methods, providing an average annual process plant ore feed rate of 35 Mtpa, varying as a function of ore body grade variability and stripping ratios.

A progressive mining and pit development sequence will commence at Iron Peak for the initial mining period (Mining Years 1–12), given its higher in-situ iron ore and mass recovery grades that provide early project value. The final Iron Peak pit void will be 2,500 m long (east-west), 600 m wide and 320 m deep. Mining will move to the Razorback pit (Mining Years 12–38 on current design), with potential for mining up to Year 56 (with appropriate tailings storage increases within the current footprint and additional approvals). While the 56-year mining model will result in a final Razorback pit void that is 8,000 m long (east-west), 900 m wide and up to 310 m deep, it is expected that the 38-year life of mine (LOM) pit void extent will be a subset of this. This MLP seeks consent to mine within the full Razorback deposit extent (up to the 38-year LOM) so it may optimise mine production based on future product and market dynamics.

Waste rock, which includes overburden and low-grade ore that falls below the magnetite cut-off minimum grade, will be placed primarily within permanent waste rock dumps (WRDs) adjacent to the pits, and also used in construction, geotechnical and rehabilitation applications.

Ore will be processed using established (conventional) technologies and processes inclusive of:

- two stages of crushing
- two stages of grinding and magnetic separation
- reverse flotation
- final fine grinding and cleaner magnetic separation scavenger circuit, with tailings and ore concentrate as the primary outputs.

Tailings will be disposed to a single Central Thickened Discharge (CTD) TSF, which will be sufficient for the life of mine. Coarse sand tailings material will be used to construct perimeter and internal TSF embankments, with fines material and surplus coarse material deposited within the TSF impoundment area. The final TSF will be 5,000 m long (north-south), and 5,800 m wide (east-west) with a final embankment height of approximately 60 m.

Closure

At closure, it is proposed that all redundant infrastructure will be decommissioned, demolished and removed from site. Selected infrastructure may, however, be retained where it supports the post-mining land uses (for example roads, culverts, water bores and sheds) subject to formal agreement with the relevant landowner. Most disturbance areas and new post-mining landforms will be rehabilitated to native vegetation systems consistent with the pre-mining land use (ecological and low-intensity pastoral / rangeland grazing uses) and to provide improved long-term visual amenity outcomes. The mined pits will be left as voids, forming pit lakes over time.

A visualisation of the site at closure is shown in Figure S3.

For further details on the project description and proposed mining operations, please refer to Chapter 4.

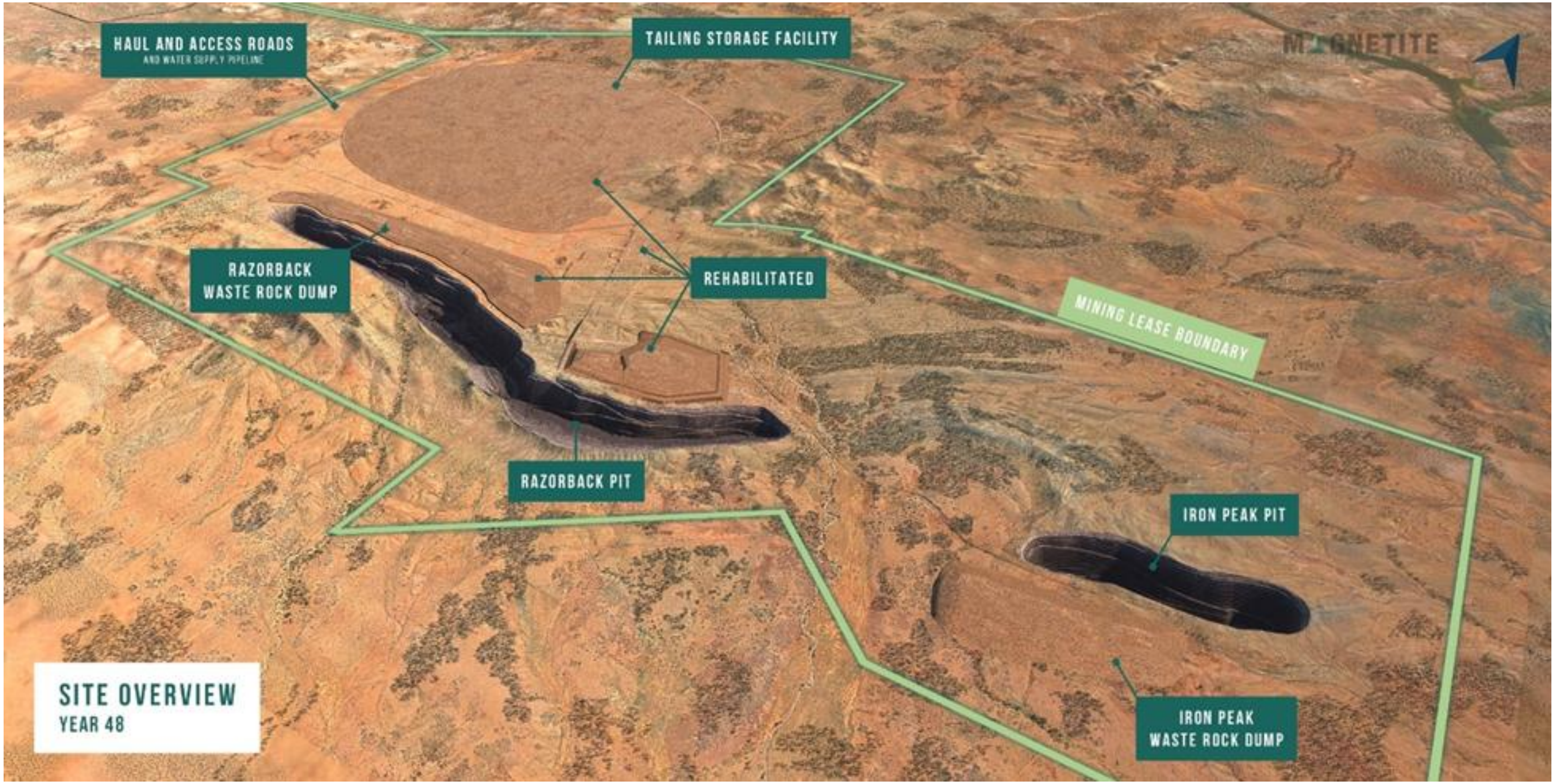


Figure S3: Post-closure render

Supporting Infrastructure

Water supply

A water supply of approximately 11 Gigalitres/annum (GL/a) is required to service the Project during operational phase. The use of seawater with a coastal desalination plant is the preferred sustainable and scalable water supply option.

The provision of process water to the boundary of the Hillgrange MPL is outside the scope of this MLP; however, the continuation of the water supply pipeline from Hillgrange to the process plant (within the RS MPL, Haul Road MPL and into the ML) is within the scope of this MLP. This MLP demonstrates the Project can be effectively and efficiently mined through the provision of process water for the Project that is subject to an alternate approvals process.

Haul road

Site access will be via the unsealed, two-way 53.6 km haul road. Once constructed, this haul road will provide access to support construction of the main site and, subsequently, ongoing vehicle access during mining and closure operations. This ongoing use of the haul road includes use for concentrate (product) haulage between site and the RS at Hillgrange. The existing public road network (Rucioch and Crocker Roads) will form the connection from the RS to the Barrier Highway. Minor safety upgrades will be completed along this corridor and at the intersection of Rucioch Road with the Barrier Highway and are subject to a separate approvals process.

Rail siding

Development of a sub-parallel rail spur siding at the existing Hillgrange RS is part of the proposed logistics network for transporting iron ore concentrate from the Project to the Port of Whyalla. The existing siding is situated approximately 55 km from the Project's process plant and acts as a rail passing loop between the Yunta (westward) and Peterborough (eastward) rail sidings on the Broken Hill – Crystal Brook section of the national freight network. A 130 m long goods loop/maintenance siding is also located at the siding.

The scope of MGT's RS includes the development of rail and supporting infrastructure, including:

- a new rail spur, approximately 2.0 km in length that extends from the existing goods loop/maintenance siding
- a parallel hardstand area along the full alignment of the new rail spur, to support the unloading, management and train loading of concentrate products
- a workshop and administration/facilities area at the northern end of the rail spur
- an access road between the RS and Crocker Road and connection to the HR.

Hillgrange laydown area

The Hillgrange Laydown Area is located on a parcel of land adjoining Hillgrange Road and is proximate to both the RS and the western access point of the HR. The maximum extent of the area is approximately 10 hectares (ha) and has been proposed as a flexible use area for temporary applications during the construction phase.

It is intended that a temporary accommodation camp will be installed at the site as the first Project activity, with use of the camp maintained as overflow capacity during peak construction workforce periods.

Power supply

The Project's main processing facilities demand a reliable power source. The Project includes the construction of a new 126 km high voltage TL between a new substation constructed within the ML and Bundey Substation, to provide a connection to the SA section of the National Electricity Market.

Accommodation camp

MGT will develop an accommodation camp to house workers across the construction, operations and closure phases. The camp will include dining, recreational, and medical facilities, aiming to reduce pressure on surrounding towns' resources.

For further details on proposed supporting infrastructure, please refer to Section 4.8.

Regulatory Overview

The Project will require two primary statutory approvals and numerous secondary approvals under both State and Commonwealth legislation. The MLP is structured to meet both State and Federal requirements.

Mining Act 1971 (SA)

MGT seeks a ML under the *Mining Act 1971 (SA)* as the initial regulatory gateway. After securing leases, the Company must develop a Program for Environment Protection and Rehabilitation (PEPR) that details operational control measures, monitoring frameworks, and closure strategies. Both the ML and associated MPLs and the PEPR must be approved before construction or operations can commence.

This document has been submitted in accordance with the Project Terms of Reference (TOR) under the Mining Act and Guideline MG2a. For more information on Mining Act regulatory framework and other State based legislation, please refer to Chapter 2.

Environment Protection and Biodiversity Conservation Act 1999 (Cth)

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) is the primary Commonwealth legislation established to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. The Project was referred for as it overlays a Threatened Ecological Community (TEC) (the Mallee Bird Community (MBC) of the Murray Darling Depression Bioregion (MDDB)) which is recognised under the EPBC Act. MGT referred the Project to Department of Climate Change, Energy, the Environment and Water (DCCEEW) and received notification that the proposed action is a controlled action and will require assessment and approval under the EPBC Act before it can commence.

It was determined the Project would be assessed via accredited assessment of this MLP. The Department for Energy and Mining (DEM) is assessing this MLP as an accredited assessment on behalf of the Commonwealth under Section 87 of the EPBC Act. This assessment provides for a single environmental assessment process conducted by the State, with DCCEEW providing comment on the MLP during the public commentary period and reviewing the Response to Submissions. At the completion of the assessment, DEM's Assessment Report will be provided to DCCEEW, assessing the likely impacts of the Project on MNES.

The Commonwealth Minister for the Environment and Water will then make an approval decision. On approval, a Decision Notice will be issued, including implementation conditions to be applied to the Project under Federal legislation.

This document has been submitted in accordance with the Project TOR including DCCEEW assessment requirements. For more information on EPBC Act regulatory framework please refer to Chapter 2. For assessment of matters under the EPBC Act, please refer to Chapter 8.

Secondary permitting

Upon completion of the EPBC Approval and the first stage of the Mining Act Approvals as above, there are a number of further legislative and secondary permitting requirements associated with the Project. These approvals will be sought in parallel with completion of the PEPR under the second state of the Mining Act approvals process.

For more information on the regulatory framework for the Project, please refer to Chapter 2.

Consultation and Engagement

Consultation philosophy

A philosophy of open, transparent, and iterative engagement underpins the Project through the development of the foresight sustainability initiative. This initiative commits MGT to be accessible, accountable and informative.

Throughout exploration and pre-feasibility phases, MGT has held public meetings, workshops, and targeted consultations with landholders, pastoral leaseholders, local government bodies, and Aboriginal community representatives. Agreements have been signed with Ngadjuri Nation Aboriginal Corporation (NNAC) and the District Council (DC) of Peterborough to enshrine respectful, and collaborative long-term relationships. This inclusive approach is reflected in the MLP, which details how feedback from various stakeholders has shaped operational design and mitigations.

For more information on the consultation process and details of consultation that has occurred up to the submission of this document, please refer to Chapter 5.

Environmental Impact Assessment

Baseline environmental conditions

A detailed environmental and social baseline has been collected for the Project since 2020, with earlier studies dating back to 2010. This work has informed an understanding of the key environmental values existing in the Project area and formed the basis for scoping of all potential impacts resulting from the Project.

A team of experienced and qualified experts were engaged to assess and evaluate the key aspects of the existing environment, including those shown in Table S2.

Table S2: Key environmental aspects assessed

Key environmental aspects assessed	
Topography and landscape	Vegetation and flora
Climate	Terrestrial and aquatic fauna
Topsoil and subsoil	Traffic
Geology and caves	Visual amenity
Geochemistry and geohazards	Air quality
Groundwater	Noise
Surface water	Heritage (Aboriginal, European and geological)

For a detailed description of the environmental and social baseline relevant to the Project, please refer to Chapter 3.

Impact Assessment Framework

MGT has completed a comprehensive assessment of the environmental and social impacts of the Project. The MLP employs a standardised framework, compliant with the Project specific TOR provided by DEM and DCCEEW, and DEM Guideline MG2a to identify, evaluate, and mitigate potential environmental impacts. Potential impact events were considered in relation to the areas in which they may occur, corresponding to the proposed tenement areas, being the Razorback ML, and two infrastructure areas (MPLs). Note that whilst four MPLs are applied for as per Table S1, the RS, the laydown area and the haul road have been considered for impacts as a single operational unit (referred to as the Haul Road) when being discussed in this MLP in particular, for impact assessment processes. Central to this approach is the "source-pathway-receptor" model, wherein each potential hazard (e.g., groundwater, dust, noise) is traced to its likely pathways and the specific receptors (communities, wildlife, water sources) it may affect. This framework enables transparent prioritisation of risks and aligns mitigation strategies with regulatory guidelines.

A team of experienced and qualified experts were engaged to undertake technical assessments to define the potential impacts on each key environmental aspect resulting from construction, operation and closure of the Project.

The risk of each identified impact was quantified pre mitigation including consideration of the effect of climate change, the certainty of the data used to quantify impacts, and whether the sensitivity to change in an assumption results in a change in the predicted potential impact event.

Mitigation measures have been proposed to reduce the likelihood and/or consequence of identified potential impacts, and an assessment of the confidence in these mitigation measures was completed. A second risk assessment was completed for all potential impacts post mitigation. The mitigation measures proposed demonstrate the risks can be mitigated effectively.

MGT has committed to a range of proposed environmental outcomes and has proposed detailed methods and timing of measuring progress against these outcomes.

For a detailed description of the impact assessment process and proposed environmental outcomes, please refer to Chapter 7.

Social Impact and Community Well-Being

Local communities

Communities near the Project's footprint are sparsely populated. Impact assessment and engagement have identified community concerns regarding dust, noise, road safety, and employment opportunities. The Company's socio-economic studies anticipate workforce migration into the region, which aligns to stakeholder aspirations for the Project, which could place demands on local infrastructure. In response, the MLP details collaboration with councils to address housing, healthcare, and community service needs.

Cultural heritage protection

Significant attention has been paid to Aboriginal heritage through lengthy engagement with traditional owners, in particular the Ngadjuri, and expansive cultural heritage surveys. This has assisted the Company in understanding the cultural values of the Project area. The MLP refers to ongoing discussions with native title groups and commitments to abide by any cultural heritage protocols or agreements. Archaeological surveys (for residual areas) and a "chance find" procedure for unrecorded sites are integral to safeguarding local Indigenous cultural values.

Employment and training

Extensive construction and operations jobs are expected, along with indirect employment in supporting sectors (e.g., hospitality, transport, engineering services). The Company has expressed interest in partnerships with local secondary, tertiary and vocation educational providers to develop a skilled workforce from the region. Training opportunities, apprenticeships, and local hiring targets form part of the Project's social responsibility framework.

For further information on social impact, please refer to Chapter 5 and Section 7.13.

Benefits And Economic Contributions

Regional development and diversification

By generating new employment opportunities, the Project is expected to diversify local economies traditionally dependent on agriculture and pastoral activities. Ancillary businesses—ranging from heavy vehicle maintenance to catering—may also arise or expand. This economic diversification may contribute towards the stabilisation of population levels in nearby rural areas.

State and Federal contributions

The payment of royalties to the State, in addition to company taxes and payroll taxes, will provide contributions to government revenue. These funds may be reinvested in local infrastructure, community development programs, or broader State and Federal initiatives.

State and Federal revenues from the Project are predicted to total approximately $2 billion over the 30-year forecast period. Revenue distribution through State and Federal taxation and royalty streams will continue until end of operations.

State Government directed revenue is estimated to be $37 million in the first year of operation and $55 million annually thereafter, for a total of $1.6 billion over 30 years (comprising of $1.5 billion in royalties, $26 million in Lease payments and $108 million in payroll tax).

Federal Government directed revenue is estimated to be $12 million in the first year of operation and $16 million annually thereafter for a total of $462 million over 30 years (comprising of $272 million excise duty and $190 million income tax).

For further information on potential benefits and economic contributions, please refer to Chapter 9.

Approvals Process and Next Steps

ML and PEPR

The MLP submission is the first formal step. Should the Minister for Mineral Resources and Energy grant the ML, the Company must submit a PEPR for approval before mining and ancillary activities can commence. The PEPR will detail how environmental outcomes, monitoring, and reporting obligations are to be achieved, including adaptive management strategies in response to unexpected circumstances.

Stakeholder participation

The Company proposes ongoing dialogue platforms, including community consultation programs, local council briefings, and a grievance redress system for promptly addressing disputes. Regular reporting to regulators and the public is anticipated, ensuring that stakeholders remain informed about the Project's operational status, environmental monitoring results, and any modifications to plans.

Regulators will invite written comments on the MLP (and other relevant documents). The Company is committed to addressing stakeholder feedback and adjusting management measures, if needed.

Conclusion

The Project, as outlined in the MLP, aims to develop a significant magnetite resource through responsible and systematically managed operations. The Company's planning encompasses robust environmental safeguards, progressive rehabilitation strategies, and sustained engagement with local, regional, and Indigenous stakeholders. The principal objective for the Project is to produce a high-grade iron concentrate for global steel markets, while also delivering economic benefits such as job creation, infrastructure improvement, and fiscal contributions to State and Federal governments.

Operating conditions common in semi-arid mines, including water sourcing, dust management, and protection of sensitive habitats, have been identified in the MLP, with a series of proposed measures demonstrating that risks can be mitigated effectively. Through diligent adherence to statutory requirements, transparent communication, and the integration of community perspectives, the Project seeks to achieve a balanced approach to mining development in SA, generating long-term value for both local communities and the broader region.

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Definitions and abbreviations

Abbreviation	Description
AADT	Average annual daily traffic
AAQ NEPM	*National Environment Protection Council (NEPC) National Environmental Protection (Air Quality) Measure 2021*
ABS	Australian Bureau of Statistics
ACHM	Australian Cultural Heritage Management Pty Ltd
ACM	Acid Consuming Material
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AET	Actual Evapotranspiration
AGD-AAR	Attorney-General's Department - Aboriginal Affairs and Reconciliation
AH Act	*Aboriginal Heritage Act 1988*
AHD	Australian Height Datum
Al_2O_3	Aluminium oxide
AMD	Acid mine drainage
AMSL	Above Mean Sea Level
ANC	Acid Neutralising Capacity
ANCOLD	Australian National Committee on Large Dams
ANFO	Ammonium nitrate / fuel oil
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
ARD	Acid Rock Drainage
ARI	Annual recurrence intervals
ARR	Australian Rainfall and Runoff
ARTC	Australian Rail Track Corporation
As	Arsenic
ASC	Australian Soil Classification
ASS	Acid Sulphate Soils
ASX	Australian Securities Exchange
AUD	Australian dollar
BAM	Biodiversity Assessment Method
BCA	Building Code of Australia
BCM	Bulk cubic metres
BDBSA	Biological Database of SA
BF-BOF	Blast furnaces and basic oxygen furnaces
bgl	Below ground level
BoM	Bureau of Meteorology

Abbreviation	Description
bq/g	Becquerel Per Gram
BSA	Batter slope angle
Bt	Billion tonnes
BTEX	Benzene, toluene, ethylbenzene, xylenes
ºC	Degrees Celsius
CaCl2	Calcium chloride
CALMET	Diagnostic Meteorological Model
CAPEX	Capital expenditure
CEMPs	Construction Environmental Management Plans
CEO	Chief Executive Officer
CER	Clean Energy Regulator
CFS	Country Fire Service
CHAZOPS	Control Hazard and Operability Study
CHIA	Cultural Heritage Impact Assessment
CHMP	Cultural Heritage Management Plan
CONCAWE	Conservation of Clean Air and Water in Europe
COR	Connection Options Report
COS	Coarse ore stockpile
CP	Conservation Park
Cth	Commonwealth
Cu	Copper
CRMs	Certified reference materials
CTD	Central Thickened Discharge
CV	Commercial Vehicle
DAWE	Department of Agriculture, Water and the Environment
DC	District Council
DCS	Distributed control system
DCCEEW	Department for Climate Change, Energy, the Environment and Water
DD	Diamond
DDH	Diamond drill hole
DEM	Department for Energy and Mining
DEW	Department for Environment and Water
DGV	Default Guideline Values
DIDO	Drive-in/drive-out
DIT	Department for Infrastructure and Transport
DO	Dissolved oxygen
DoE	Department of the Environment
DPC	Department of the Premier and Cabinet

Abbreviation	Description
DRI	Direct reduced iron
DRI-EAF	Direct reduced iron-electric arc furnace
DRP	Darling Riverine Plains
DRPF	Direct Reduction Pellet Feed
DTR	Davis Tube Mass Recovery
DEWHA	Department of the Environment, Water, Heritage and the Arts
E	Endangered
EAF	Electric arc furnaces
ECEC	Effective Cation Exchange Capacity
eDTR	equivalent DTR
EL	Exploration Licence
ELA	Eco Logical Australia
EMP	Environmental management plans
EP Act	*Environment Protection Act 1993*
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERD	Environment, Resources and Development
EPC / EPCM	Engineering, Procurement, Construction / Engineering, Procurement, Construction, Maintenance
ePEPR	exploration program for environment protection and rehabilitation
ESA	Economic Study Area
ESCPs	Erosion and Sediment Control Plans
ESD	Ecologically sustainable development
ESG	Environment, Social and Governance
Fe	Iron
FEL	Front end loader
FID	Final Investment Decision
FIF	Flood-induced failure
FIFO	Fly In / Fly Out
FLB	Flinders Lofty Block
FoS	Factor of Safety
FPIC	Free, prior and informed consent
FTE	Full-time equivalent
GDE	Groundwater Dependent Ecosystem
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIA	Groundwater Impact Assessment
GIS	Geographic information system
GISTM	Global Industry Standard on Tailings Management

Abbreviation	Description
GL	Gigalitre(s)
GMMP	Groundwater Management and Monitoring Plan
GRI	Global Reporting Initiative
GRP	Gross Regional Product
GSA	Geological Society of Australia
GST	Goods and Services Tax
GVL	Ground vibration
GWh	Gigawatt hours
ha	Hectares
HAZOPS	Hazard and Operability Study
HDD	Horizontal directional drilling
HML	Higher Mass Limits
HoA	Heads of Agreement
HP Act	*Heritage Places Act 1993*
HPGR	High pressure grinding roll
HR	Haul Road
HSE	Health, safety and environmental
HSU	Hydrostratigraphic units
HV	Heavy Vehicle
IAQM	Institute of Air Quality Management
IAP2	International Association for Public Participation
IBRA	Interim Biogeographic Regionalisation for Australia
ICOLD	International Commission on Large Dams
IEO	Index of Employment and Education
IGO	IGO Limited
IHE	Ironbark Heritage & Environment
ILUA	Indigenous Land Use Agreement
IMS	Incident Management System
IO	Input / output
IPSC	In-pit sizing and conveying
IRA	Inter-ramp angle
IRMA	Initiative for Responsible Mining Assurance
IRSD	Index of Relative Socio-economic Disadvantage
ISP	Integrated System Plan
JFE	JFE Shoji Australia Pty. Ltd
JORC	Joint Ore Reserves Committee
JV	Joint Venture
K	Hydraulic conductivity

Abbreviation	Description
KL/day	Kilolitres per day
Km	Kilometres
kV	Kilovolt
L	Litre
LC	Low Capacity
LFA	Landscape Function Analysis
LGA	Local Government Area
LIMS	Low intensity magnetic separator
LOM	Life Of Mine
LOR	Limit of reporting
L/s	Litres per second
LEM	Landform evolution modelling
LSA Act	*Landscape SA Act 2019*
LV	Light vehicle
mAHD	Metre Australian Height Datum
MBC	Mallee Bird Community
MDBP	Murray-Darling Basin Plan
MDD	Murray Darling Depression
MDDB	Murray Darling Depression Bioregion
M	Metres
m^2	Square metres
M bgl	Metres Below Ground Level
MCA	Multi-criteria analysis or Multi-criteria assessment
MCP	Mine Closure Plan
MDBA	Murray-Darling Basin Authority
MFS	Metropolitan Fire Service
MG2a	Preparation of a mining application for metallic and industrial minerals, Minerals Regulatory Guidelines
MGT	Magnetite Mines Limited
MIBC	Methyl Isobutyl Carbinol
Mining Act	*Mining Act 1971*
ML	Mining Lease
ML/day	Megalitres per day
ML/year	Megalitre per year
MLP	Mining Lease Proposal
MNES	Matters of National Environmental Significance
MoU	Memorandum of Understanding
MPa	Megapascals
MPA	Mercaptopropionic acid

Abbreviation	Description
MPL	Miscellaneous Purpose Licence
MR	Murraylands and Riverland
Mt	Million tonnes
Mtpa	Million Tonnes Per Annum
MVA	Megavolt ampere
MVG	Major Vegetation Groups
NAF	Non-Acid Forming
NAG	Net Acid Generation
NAPP	Net Acid Producing Potential
NEPC	National Environment Protection Council
NEM	National Electricity Market
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
NGER	National Greenhouse and Energy Reporting
NHVR	National Heavy Vehicle Regulator
NNAC	Ngadjuri Nation Aboriginal Corporation
NNTC	Ngadjuri Nation Native Title Corporation
NPI	Non-process infrastructure
NPW Act	*National Parks and Wildlife Act 1972*
NRM	Natural Resource Management
NSW	New South Wales
NT	Native Title
NT Act	*Native Title Act 1993*
NTU	Nephelometric turbidity units
NV Act	*Native vegetation Act 1991*
NVIS	National Vegetation Information System
NVMP	Native Vegetation Management Plan
NVF	Native Vegetation Fund
NY	Northern and Yorke
OC	Organochlorine
OCA	Outback Communities Authority
OPEX	Operational expense
OSOM	Over Size, Over Mass vehicle
OTL	Overhead Transmission Line
PAF	Potentially Acid Forming
PAR	Population at risk
P&D Code	Planning and Design Code
PBC	Prescribed Body Corporate
PDI Act	*Planning and Development Infrastructure Act 2016*

Abbreviation	Description
PEPR	Program for environment protection and rehabilitation
PET	Potential Evapotranspiration
PFS	Pre-feasibility study
PGA	Peak ground acceleration
PLL	Potential loss of life
PMF	Probable maximum flood
PMLUs	Post-mining land uses
PMST	Protected Matters Search Tool
ppm	Parts Per Million
Pualco Range CP	The Pualco Range Conservation Park
PSD	Particle size distribution
PSPL	Peak sound pressure level
R	Rare
RAM	Rangelands Assessment Method
RAP	Reconciliation Action Plan
RAV	Restricted Access Vehicle
RC	Reverse circulation
RCA	Radiation Consulting Australia
RFDS	Royal Flying Doctor Service
RFI	Request for further information
RISE	Regional Industry Structure and Employment
RIV	Riverina
RMP	Rehabilitation Management Plan
RO	Reverse osmosis
ROM	Run-of-mine
RPC Act	*Radiation Protection and Control Act 2021*
RS	Rail Siding
SA	South Australia / South Australian
SAAL	South Australian Arid Lands
SAAS	SA Ambulance Services
SAG	Semi-autogenous grinding
SANTS	South Australian Native Title Services
SARIG	South Australian Resource Information Gateway
SA Air EPP	*Environment Protection (Air Quality) Policy 2016* (SA)
SEB	Significant Environmental Benefit
SEDMPs	Soil erosion drainage management plans
SEIFA	Socio-economic Indexes for Areas
SEM	Scanning Electron Microscopy

Abbreviation	Description
SES	State Emergency Service
SDL	Sustainable Diversion Limits
SDS	Safety Data Sheets
SDF	Sunny day failure
SIA	Social Impact Assessment
SILO	Scientific Information for Land Owners
SiO_2	Silicon dioxide
SIS	Salt Interception Scheme
SME	Surface mobile equipment
SOs	Social objectives
S.O.P	Standard Operating Procedure
S-P-R	Source-Pathway-Receptor
SPSMB	Stockyard Plains Salinity Management Basin
SSTL	Site-specific trigger level
SWMP	Surface Water Management Plan
SY	Storativity and specific yield
t	Tonne
T	Transmissivity
TAPM	The Air Pollution Model
TCFD	Task Force on Climate-related Financial Disclosure
TEC	Threatened Ecological Community
TDS	Total Dissolved Solids
TL	Transmission Line
TMI	Total magnetic intensity
TML	Transportable moisture limit
TMR	Department of Transport and Main Roads
TOR	Terms of Reference
TRH	Total recoverable hydrocarbons
TSF	Tailings Storage Facility
TSP	Total Suspended Particulate
UCS	Uniaxial compressive strength
UNC	Uncertain
UN	United Nations
USD	United States dollar
V	Vulnerable
VA	Vegetation Association
VRM	Vertical roller mill
XRD	X-Ray Diffraction analysis

Abbreviation	Description
XRF	X-ray fluorescence
WDF	Waste derived fill
WoNS	Weeds of National Significance
WRD	Waste rock dump
WRP	Water Resource Plans
Wt%	Sulfur concentrations
WTS	Waste transfer station
WWTP	Wastewater Treatment Plant

Glossary

Term	Definition
Ancillary infrastructure	All infrastructure within the Site necessary for the construction and operation of the Project apart from mining and mineral processing infrastructure. Including but not limited to: • administration offices • car parking • internal access roads • laydown yards • on-site accommodation camp(s) • internal access roads • electrical infrastructure within the Site • sewerage treatment facilities • warehousing facilities • water treatment facilities • workshops for plant and equipment.
Conceptual Footprint	The extent of ground disturbance including earthworks associated with temporary and permanent infrastructure and facilities in the Site, and including a buffer area (variable width) to allow for temporary construction activities and minor layout changes. The buffer area is unlikely to be completely cleared, however all native vegetation clearing will be contained within the Conceptual Footprint. The Project has been assessed on the assumption that all land within the Conceptual Footprint will be cleared and hence presents a worst-case scenario, with actual impacts expected to be lesser.
Disturbance footprint	The extent of ground disturbance associated with the layout of the Project. This area is expected to be 100% cleared over the life of the mine.
Economic Study Area	The area of regional SA defined as likely or possible to be subject to economic impact (i.e., infrastructure development, employment, service provision and supply) from the Project. The ESA is inclusive of the Peterborough LGA (as the local economic assessment area) and is itself included within the South Australian and Australian economic assessment areas.
Project	The Razorback Iron Ore Project described in the approved Project Description (including haulage route, rail siding and transmission line but excluding water source and associated pipelines).
Project Area	The Site plus the area covered by ground disturbance associated with the haulage route, rail siding and the transmission line.
Proponent	Razorback Iron Pty Ltd, a wholly-owned subsidiary company of Magnetite Mines Ltd (MGT).
Site	The area covered by the proposed ML. The Site excludes all water pipeline infrastructure, the haulage route, rail siding and the transmission line to the extent that they outside of the proposed ML.
Study Area	The Project Area plus all land included in the fullest scope of the assessment. This will vary between technical studies.

Chapter 1

Introduction

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter introduces the Razorback Iron Ore Project's proposed activities and its location.

Information is provided on the location and nature of tenements being applied for as part of the Mining Lease Proposal (MLP) and Miscellaneous Purposes Licence Management Plans, which includes one Mining Lease (ML) and four Miscellaneous Purposes Licences (MPLs).

Descriptions of the land interests that may be affected by the proposed tenements are included, as is discussion regarding the Project's reasonable prospects to access land necessary for the mining activities.

Discussion on other approvals that may be required has been included to demonstrate parallel or future development consent processes.

1. Introduction

Razorback Iron Pty Ltd (Razorback Iron), a wholly-owned subsidiary of Magnetite Mines Limited (MGT), proposes to develop the Razorback Iron Ore Project (hereafter referred to as 'Razorback Project', 'the Project' or 'Project') located approximately 240 kilometres (km) northeast of Adelaide, approximately 75 km east of Peterborough and approximately 37 km south of Yunta (refer Figure 1-1).

Applicant nomenclature	Razorback Iron is the applicant relevant to this MLP and Miscellaneous Purposes Licence Management Plans. For the purposes of this document and all supporting documentation, the terms 'Magnetite Mines' and 'MGT' are hereafter used as a substitute for Razorback Iron.

The Project will include the Razorback and Iron Peak magnetite iron ore deposits. These predominantly siltstone deposits form part of the Braemar Iron Formation, a singular dipping tabular body with minimal structural complexity. The grades, thickness, dip and outcropping geometry of the Braemar Iron Formation are consistent over kilometres of strike. Ores from the Razorback and Iron Peak deposits are notably softer than other Australian and international magnetite resources. With average bond ball work indices of 8.6 kWh/t and 6.8 kWh/t for Razorback and Iron Peak respectively, this is between a half to a quarter of the significantly harder Pilbara and Mid-West magnetite ores.

With Probable Ore Reserves of 2 billion tonnes (Bt) and a Mineral Resource Estimate of 3.8 Bt (JORC, 2012) already established within the proposed ML area, the Project will produce five million tonnes per annum (Mtpa) of high-grade iron ore concentrates (67.5-68.5% Fe) including the targeted production of concentrates to Direct Reduced Iron (DRI)-grade specification necessary for "green iron" production. The Project, with sufficient classified Resources to support in excess of 90 years of production (subject to further technical studies) and a verified mine plan to support 56 years of operations, is scoped within this MLP and Miscellaneous Purposes Licence Management Plans to include an initial Project mining period of 38 years.

MGT has determined that the Razorback and Iron Peak deposits represent an economic resource of significant value to the State of South Australia (SA) and the global decarbonisation transition of the steel sector. The effective and efficient extraction, processing and export of iron ore from the Project is underpinned by MGT's rigorous feasibility programs, selection of low-risk, conventional mining and processing technologies and equipment, long (intergenerational) mine life, extremely low life-of-mine (LOM) strip ratio (0.35 tonnes (t) of waste per tonne of ore mined), proximate location to established supply and service chains, ready access to renewable energy and engagement of major Project partners. Through the Project's amenable geology, MGT can deliver high-grade iron ore feedstocks to materially reduce carbon emissions from steelmaking activities by up to 90% while driving an annual economic impact to the SA economy of over AU$1 billion annually (during operations phase) and contributing to the employment of 2,849 persons (450 directly) in the State.

MGT proposes to develop the Razorback and Iron Peak resources through open cut mining given the advantage provided by the outcropping orebodies and associated low stripping ratio. Extracted ore will be processed through multi-stage conventional crushing, grinding, magnetic separation and floatation processes to produce magnetite ore concentrates for supply to international markets. Mining and processing operations will include a tailings storage facility (TSF), waste rock dumps (WRDs), overburden and soil stockpiles. Key enabling infrastructure will include a high-voltage transmission line (TL) (external grid connection), mine haul and access road (site access and ore concentrate haulage), rail siding (RS) and rail network connection, mine accommodation camp and ancillary infrastructure.

Pursuant to the *Mining Act 1971* ('Mining Act'), a two-stage approval process applies to proposed mining operations in SA:

- Stage 1 – Holding a ML and any associated MPLs, if applicable.
- Stage 2 – Having operational approval through an approved program for environment protection and rehabilitation (PEPR).

This MLP and Miscellaneous Purposes Licence Plans (herein referred to as the MLP) supports the application for an ML and associated MPLs (Stage 1 approval) and has been prepared to satisfy the Mining Act, Mining Regulations 2020 ('Mining Regulations') and following key instruments:

- *Terms of Reference 006 – Mineral Mine Lease / Licence Applications* (DEM, 2020a) ('TOR006')
- *Minerals Regulatory Guideline MG2a – Preparation of a mining application for metallic and industrial minerals* (DEM 2020b) ('MG2a').

The requirements of TOR006 and where they have been addressed in this MLP, are tabulated in Chapter 12.

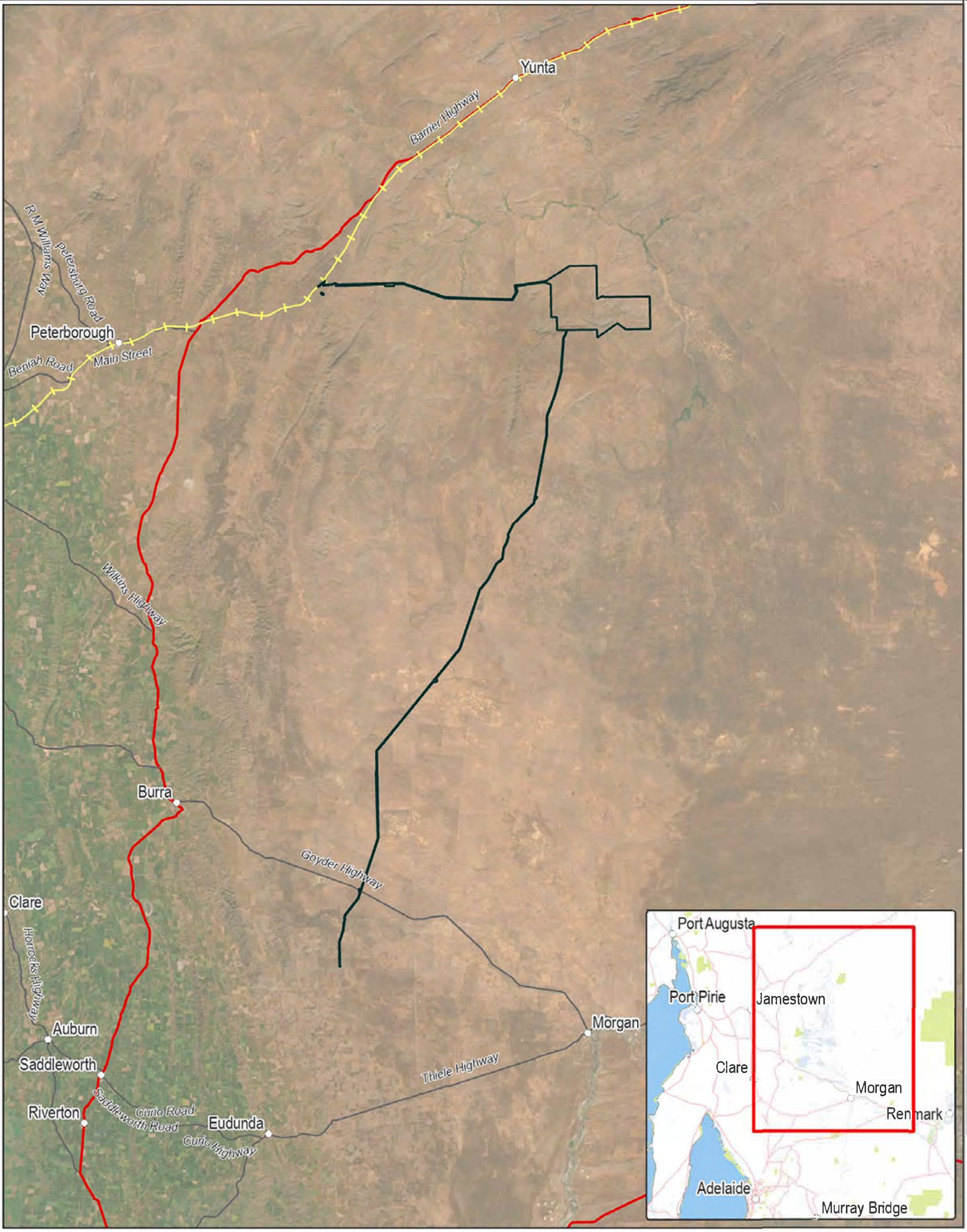

Figure 1-1: Project Area and locality

Project Area
Locality
Major highway
Main road
Operational railway

N

0 15 30
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

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Key project components – considerate of construction, operations and closure phases of the Project – are summarised in Table 1-1. Definition of key project terms / components are shown in Table 1-2 and Figure 1-2.

Table 1-1: Key project components

Key components	Summary
ML Area The area defined as the extent of the proposed ML	
Construction camps	Temporary construction camps are required to accommodate the construction workforce and early operations workforce, with an initial construction camp (up to 100 rooms) located at Hillgrange Road to support installation of the mine access / haul road (HR) road (refer Laydown Area MPL Area section of this table for further information), and a second construction camp of (up to 280 rooms, subject to final construction resource planning) within the ML area to support wider mine and infrastructure construction. The latter camp is likely to be positioned within the Project's planned disturbance footprint, such as within a proposed hardstand area or other area. Camps would include rooms, dining, laundry, amenities, recreational and temporary waste facilities.
Construction workforce	The construction workforce will be variable according to the construction schedule and type of works; workforce numbers estimated from capital spend rates assert an average demand of 1,000 full-time equivalent roles with up to 600 people on-site at any one time.
Permanent camp	A permanent mine accommodation camp will be constructed to house the mine operations workforce. The camp will have up to 400 rooms and include dining, laundry, amenities, recreational and waste management facilities. The permanent camp will accommodate personnel during the construction phase, the mining phase and the post-mining rehabilitation phase.
Operations workforce	The mine operations workforce will be variable over life of mine (LOM), comprising an average of 445 people, with up to 280 people on site at any one time. MGT estimates that approximately 30% may be sourced from local and regional communities. The operations workforce will also span part of the construction phase (operational readiness) and the post-mining rehabilitation and closure phase. It is proposed that the workforce will operate primarily on a fly-in / fly-out (FIFO) basis from Adelaide to Peterborough (using the existing Peterborough Aerodrome) with connecting buses to/from Site via the town of Peterborough. Some drive-in/drive-out (DIDO) may also be used for non-rostered attendance.
Rehabilitation resources	In locations earmarked for long-term ground disturbance, cleared vegetation (large timber and woody debris) and topsoils and subsoils (where present) will be removed and stockpiled for re-use in future site rehabilitation. Stockpiles will be established and catalogued based on their type and origin, ensuring re-use is consistent with the pre-mining environment and nominated post-mining land use.
Ore mining	Ore will be mined through conventional open-pit, drill-and-blast method. Mining will commence at the Iron Peak deposit (approximately Years 1 – 12) followed by mining at the Razorback deposit (Years 10 – 38 on current project design, with potential for mining up to Year 56 with appropriate tailings storage increases within the proposed ML (subject to further approvals)). Ore extraction rates are likely to be variable year-on-year, averaging approximately 35 million tonnes per annum (Mtpa). Total ore extraction would be approximately 1.2 Bt for the 38-year LOM base case, and approximately 1.9 Bt if ore extraction continued to Year 56 (subject to further approvals).
Project duration and life of mine	The proposed project duration is approximately 45 years, based on a 38-year LOM (active mining period) plus project construction (2.5 years) and rehabilitation / closure phases (approximately 10-12 years). It is noted that that the Project's active closure phase may be extended subject to final rehabilitation planning.
Waste rock dumps	Waste rock material (hard rock overburden excavated ore mining, and low-grade ore that falls below the ore processing minimum feed grade) will be placed at surface in WRDs and remain in place as post-mining landforms.

Key components	Summary
Ore processing	Ore processing will involve crushing, magnetic separation and wet flotation to produce the high-grade (65.5% Iron (Fe)) magnetite concentrate with non-target, non-magnetic reject materials (sand and fines) discharged as tailings. On average, the processing plant will treat approximately 32 Mtpa of direct ore feed material (with approximately 3 Mtpa of stockpile reclaim) to produce a nominal concentrate production target of 5 Mtpa (dry equivalent). A Run-of-Mine (ROM) pad adjacent the processing plant enables the temporary storage and blending of feedstocks.
Tailings storage	Tailings material will consist of both fine and coarse non-target, non-magnetic waste reject material generated through the crushing and processing of ore. Tailings material will be discharged to a single, LOM TSF. This TSF would be rehabilitated and remain as a post-mining landform. Coarse sand tailings materials will be used in the construction of the TSF embankments.
Power supply	Construction phase power requirements, including power to construction camps, will be met through portable diesel generators. A 20 megavolt ampere (MVA) substation will be constructed in the ML Area. This 20 MVA on-site substation would be fed by the 275 kilovolt (kV) overhead TL, which will be constructed within the TL MPL Area, connecting to the Project EnergyConnect substation at Bundey. The 20 MVA on-site substation will provide electricity to Project infrastructure within the ML via an intra-project power distribution network. Supplementary renewable electricity sources will also be considered for integration into the existing Project infrastructure developments (i.e., solar power generation). Total annual electricity demand of approximately 1,000 gigawatt hours (GWh) is forecast.
Water supply	Construction-phase water supply will be met primarily through local groundwater sources and off-site road-tanker supply, supplemented by harvested stormwater and reclaimed water, where practicable. Preliminary estimates indicate a construction phase water demand of ~500 ML/a across different water quality types. Access to and provision of a bulk process water supply (‘water supply system’) is outside the scope of this MLP. This water supply system, once scoped and commissioned, is planned to have a minimum supply capacity of approximately 30 megalitres per day (ML/day) required to provide the 10-11 GL/annum demand for the 5 Mtpa concentrate production target. Note: a water supply pipeline from Hillgrange rail siding to the Process Plant area is including within the scope of this MLP, and will be located parallel to the haul and access road within the proposed Haul Road (HR) MPL and ML.
Exploration	Exploration- and development-related activities have been proposed within this MLP – both for further definition of current Resources/Reserves and for the assessment of new resources. These may include resource definition drilling, surface exploration, geotechnical and hydrogeological drilling, costeans and bulk sampling, and related supporting activities. Note: Where appropriate, exploration activities may be undertaken pursuant to authorisations through overlapping exploration licences (ELs) and exploration PEPRs (‘ePEPR’).

Key components	Summary
Transmission Line (TL) MPL Area The area defined as the extent of the proposed TL corridor	
TL	A 275 kV overhead TL will be constructed, connecting to the Project Energy Connect 330 kV substation at Bundey (located 15 km northeast of Robertstown) and feeding power to the 20 MVA on-site substation sited within the ML. The TL corridor will be approximately 125 km in length (of which 116 km is within the MPL) with a nominal 50 m wide combined power and maintenance easement. Other temporary areas may also be required for supporting activities (e.g. mobile construction camps [refer below], construction worksites, laydown yards, stringing pads and temporary access roads), and have been proposed at five locations.
Construction workforce	The TL construction workforce will be variable according to the construction schedule and type of works, averaging 80 people and peaking at approximately 100 people deployed at any one time. The workforce demand may also reflect whether the adopted construction methodology employs one or more crews.
Construction camps	One or more mobile, relocatable accommodation camps may be used to house the TL construction workforce. The camps will include essential supporting facilities (i.e., dining facilities, ablutions and waste holding facilities). The camp would be relocated periodically in keeping with the linear construction program.
Haul Road (HR) MPL Area The area defined as the extent of the proposed primary mine access / HR road corridor and RS	
Site Access and HR	A new haul and site access road will be required, connecting the ML to Crocker Road (for access to the Barrier Highway via Rucioch Road). The road will provide general vehicle access to and from site and form part of the ore concentrate haulage corridor between the mine and proposed RS at Hillgrange. The haul and site access road will interact with existing local roads (Crocker Road and Sawers Road) and is proposed to receive movement priority given the higher traffic volumes associated with mine-related vehicle movements. Intersections with Crocker and Sawers Roads will be subject to upgrades and safety improvements. The site access and HR corridor will also host a section of the future bulk water supply pipeline (relevant section included within the scope of this MLP). Note: the use of Crocker Road and Rucioch Road (including the level crossing with the Crystal Brook–Broken Hill rail line and intersection with the Barrier Highway) will require upgrades that are outside of the scope of this MLP – please refer to Section 1.8 for further information.
RS	A new purpose-built RS will be constructed at Hillgrange, comprising an approximately 2 km, 50 m-wide hardstand and rail spur alongside and connecting to the existing Crystal Brook–Broken Hill rail line. The RS will include a laydown area, workshop, office and ablutions, and road connecting to the main HR and Crocker Road. The RS will be used throughout the LOM to transfer ore concentrate from truck to train for onward transport to a suitable export facility. It is proposed that initial export will be via the Port of Whyalla (approximately 315 km west) which is capable of handling the proposed production volumes in its current configuration.
Water supply	Construction-phase and operations-phase water supply for the HR will be met primarily through local groundwater sources and, potentially, limited off-site road-tanker supply supplemented by harvested stormwater and reclaimed water, where practicable. Potable water supply for offices and ablutions during operations will be met through off-site road-tanker supply.
Power supply	Power supply during construction and operations phases will be met through diesel-powered generators. Supplementary renewable electricity sources may also be considered for integration into the existing RS infrastructure developments (i.e., solar power generation).

Key components	Summary
Laydown Area MPL	
The area south of the RS MPL used for laydown of construction materials during construction phase.	
Construction laydown	A Project staging and construction laydown area is required to enable early-phase construction activities. The laydown area, consisting of general hardstand and intra-site access, is located on Hillgrange Road proximate to the intersection of Crocker Road and the proposed HR. The laydown area will be used for the temporary storage, handling and marshalling of construction equipment, materials and supplies, and may include the installation of temporary shelters, where required.
Construction camp	A temporary construction camp is required to accommodate part of the construction workforce. An initial construction camp (up to 100 rooms) will be co-located with the laydown area at Hillgrange Road to support installation of the mine access / HR road and development of other accommodation camps within the ML area. Once these other camps are established, the camp at Hillgrange will provide overflow for the remainder of the construction phase. The camp will include rooms, dining, laundry, amenities, recreational and temporary waste facilities. Once construction phase activities have been completed, the construction camp will be decommissioned and removed.

Table 1-2: Key Project areas

Project Area	Definition
Site	The area within the proposed ML.
Disturbance footprint	The area of land on which the Project will be located. The disturbance footprint is likely to be 100% cleared during the life of the Project.
Conceptual Footprint	The disturbance footprint plus an additional buffer to allow for minor layout changes and construction footprint. The buffer size is variable and includes: • no buffer on TL disturbance footprint where it lies outside of the Site • no buffer on laydown area • 50 m buffer on HR (except in areas where tenement boundaries are closer than 50 m to the disturbance footprint) • minimum of 50 m buffer on all infrastructure within the Site, with some additional areas of buffer to avoid acute angles.
Project Area	The sum of the five proposed tenement areas.

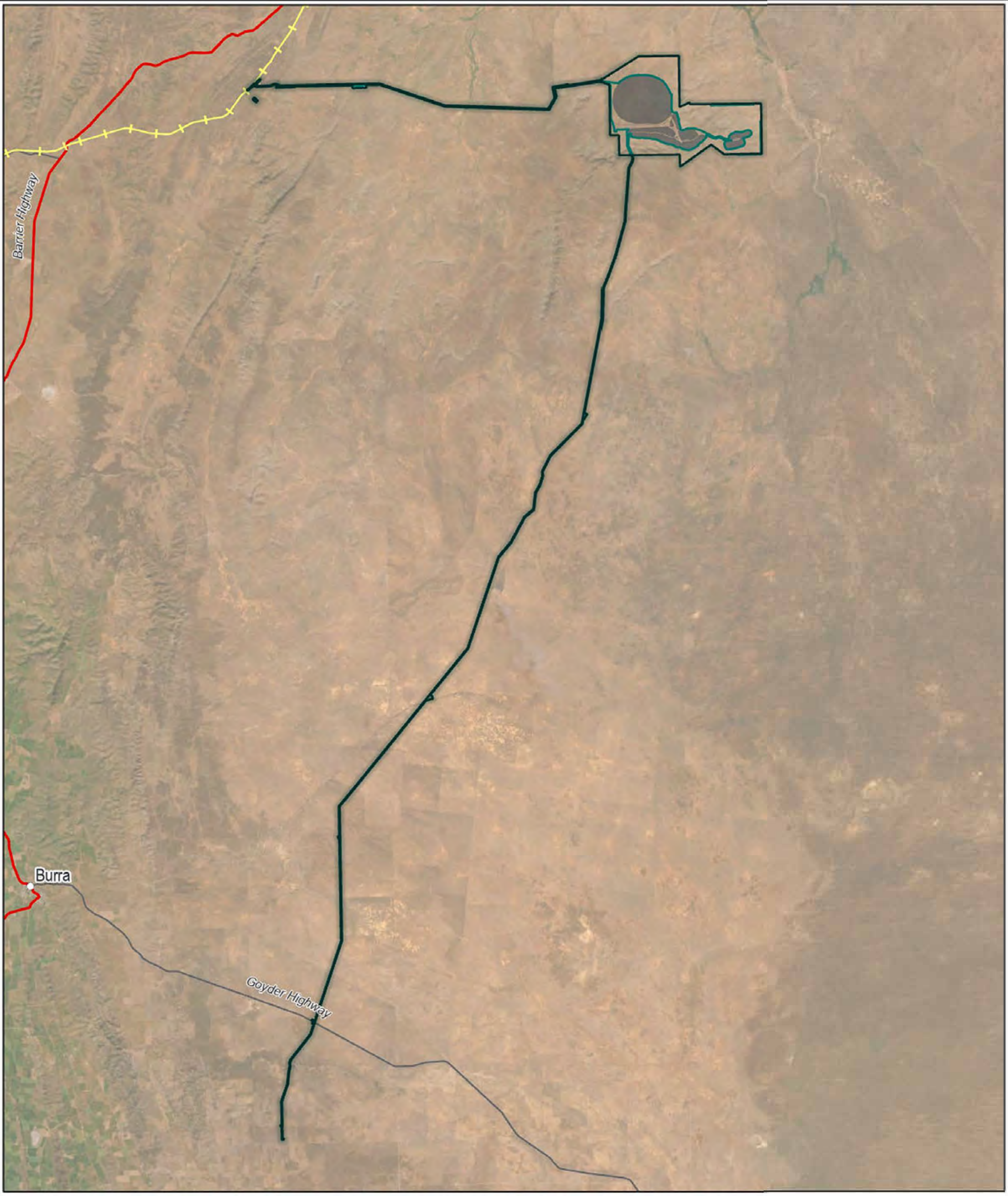

Figure 1-2: Project components

	Project Area		Locality
	Conceptual footprint		Major highway
	Disturbance footprint		Main road
			Operational railway

0 10 20
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

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1.1. Project proponent

Key details regarding the Project application and the Proponent are included in Table 1-3.

Table 1-3: Project and Proponent details

Proposed Project	
Project Name	Razorback Iron Ore Project
Exploration Licence Number(s)	ML: 6353, 6126, 6127, 6878 MPLs: 6126, 6127, 6788, 6878
Mineral Type(s)	Iron Ore – Magnetite
Minerals to be Authorised	Iron Ore – Magnetite, Hematite; Precious metals, gold and extractives such as sand, gravel, stone, shell, shale or clay
Primary Minerals Sought	Iron Ore - Magnetite, Hematite
Other Mineral(s) Sought	Precious metals, gold and extractives such as sand, gravel, stone, shell, shale or clay
Location	The proposed ML for the Razorback Iron Ore Project is located approximately 240 km northeast of Adelaide, approximately 75 km east of Peterborough and approximately 37 km south Yunta. The associated proposed MPLs include: • a 38 km haul and access road corridor in a generally east-west direction from the ML boundary to Crocker Road, Nackera • a RS adjacent the existing Hillgrange Siding, and a HR corridor between the RS and Crocker Road, Nackera • a construction laydown area on Hillgrange Road, Nackera • a 116 km TL corridor in a generally north-south direction from the ML boundary to the Bundey Substation, Bundey.
District Councils / Authorities	District Council (DC) of Peterborough Regional Council (RC)of Goyder Outback Communities Authority (OCA)
Proponent	
Proponent Name	Razorback Iron Pty Ltd
Australian Business Number (ABN)	27 140 686 362
Australian Company Number (ACN)	140 686 362
Registered Address	Suite 3.03, Level 3 30 Currie Street, Adelaide SA 5000
Proponent Contact	Allan Kane Director - Sustainability Suite 3.03, 30 Currie St, Adelaide SA 5000 +61 8 8427 0516 info@magnetitemines.com www.magnetitemines.com Yes – Consent granted to receive electronic correspondence

1.2. Proposed new tenements

Five new tenements are proposed by Razorback Iron (as the proponent) through this MLP, consisting of a single ML and four MPLs. The proposed tenements are listed in Table 1-4 and shown in Figure 1-3.

Note that whilst four MPLs are applied for as per Table 1-4, for ease of discussion the MPLs for the RS, the laydown area and the HR will be combined into a single operational unit (the HR) when being discussed in this MLP and, in particular, for impact assessment processes.

Table 1-4: Tenement details

Tenement	ML	TL MPL	HR MPL	RS MPL (incl. western extent of HR)	Laydown area MPL
Operational unit	ML	TL	HR	HR	HR
Purpose	Mining and Mineral Processing	Mine operations supporting infrastructure: electricity TL.	Mine operations supporting infrastructure: Site Access and HR, RS and part of the future bulk water supply pipeline (water supply infrastructure outside of ML / MPLs subject to separate approvals).		Mine operations supporting infrastructure: construction laydown and accommodation camp
Location and Underlying Tenure	Unincorporated Area. CL6194/510 'Manunda' Pastoral Station (Station No. 1101; Crown Ref: PE002217). CL6191/512 'Ti Tree Well' Pastoral Station (Station No. 1216; Crown ref: PE002228). CL 6180/809 (Crown Ref: OP006682A)	Unincorporated Area and RC of Goyder. Refer Table 1-8 for list of underlying land titles	Unincorporated Area and DC of Peterborough. Refer Table 1-8 for list of underlying land titles	DC of Peterborough. Refer Table 1-8 for list of underlying land titles	DC of Peterborough. Refer Table 1-8 for list of underlying land titles
Mineral Claim or MPL Application Number	N/A	N/A	N/A	N/A	N/A
Tenement Total Area (ha)	12,474	667	472	34	12

It should be noted that the proposed new tenements have been refined during the planning and impact assessment processes. As a result, some tenement and Project footprint representations within technical studies and other reports presented in Appendices A, B and C may be slightly different to the final proposed extent. These refinements primarily consist of:

- relocation of the camp from the northeastern corner of the site to the southwestern corner resulting in a reduction in overall clearing required and improvement in safety considerations
- change in alignment of Iron Peak HR resulting in a reduced impact on a listed Threatened Ecological Community (TEC) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- minor reconfiguration of the TSF embankment profile.

The very small to negligible differences in Project extent and layout do not change the outcome of specialist studies; therefore, any minor differences between Project representations in the body of this MLP versus that in the Appendices can be disregarded.

1.2.1. Consideration of other licence types

MGT has considered whether other licences may be required pursuant to the Mining Act.

The construction of the HR and RS corridors will involve the movement of soils, gravels, rocks and other similar materials within the respective MPLs. MGT has considered whether additional, overlapping licences are required to deal with the use of extractive materials to construct infrastructure within these corridors. MGT's view is that an overlapping licence for the extraction and use of extractive minerals is not required. The proposed activities do not involve removing the extractive minerals from the MPL areas and the extractive materials will solely be used for the construction of the HR (including construction / laydown areas, and the RS and associated access road.

To the extent that DEM considers that the use of the extractive minerals to construct the HR and RS requires MGT to hold a suitable permit, MGT proposes that the terms and conditions of the respective MPLs make provisions for this. In accordance with Section 56K of the Mining Act, MGT proposes that DEM make provision for the management and use of the extractive minerals produced to allow for the construction and maintenance of the HR and RS. In addition, the extractive minerals are to be exempted from the payment of royalties by the Company in accordance with Section 56K(b) of the Mining Act.

Consent of the underlying owners of land is not required under Section 56T (1) of the Mining Act as the extractive minerals will be produced during the course of carrying out authorised operations under the MPL.

MGT confirms that the use of extractive minerals within the tenements in connection with the construction and maintenance of the HR and RS:

a) will not adversely affect the ability of the tenement holder to ensure that the land comprised in the tenement can be effectively and efficiently mined. The construction of the HR and RS are important components of MGT's infrastructure for the mine and ancillary operations. In addition, the HR corridor does not cross known areas of mineralisation and, if required, it would be relatively inexpensive to relocate the HR in the event of future mine expansion so would not be considered as potential sterilisation of resource
b) the appropriate environmental outcomes will be able to be achieved – for further information regarding environmental outcomes refer to Chapter 7 of this MLP.
c) will not adversely affect the ability of the tenement holder to comply with the other requirements of the Mining Act.

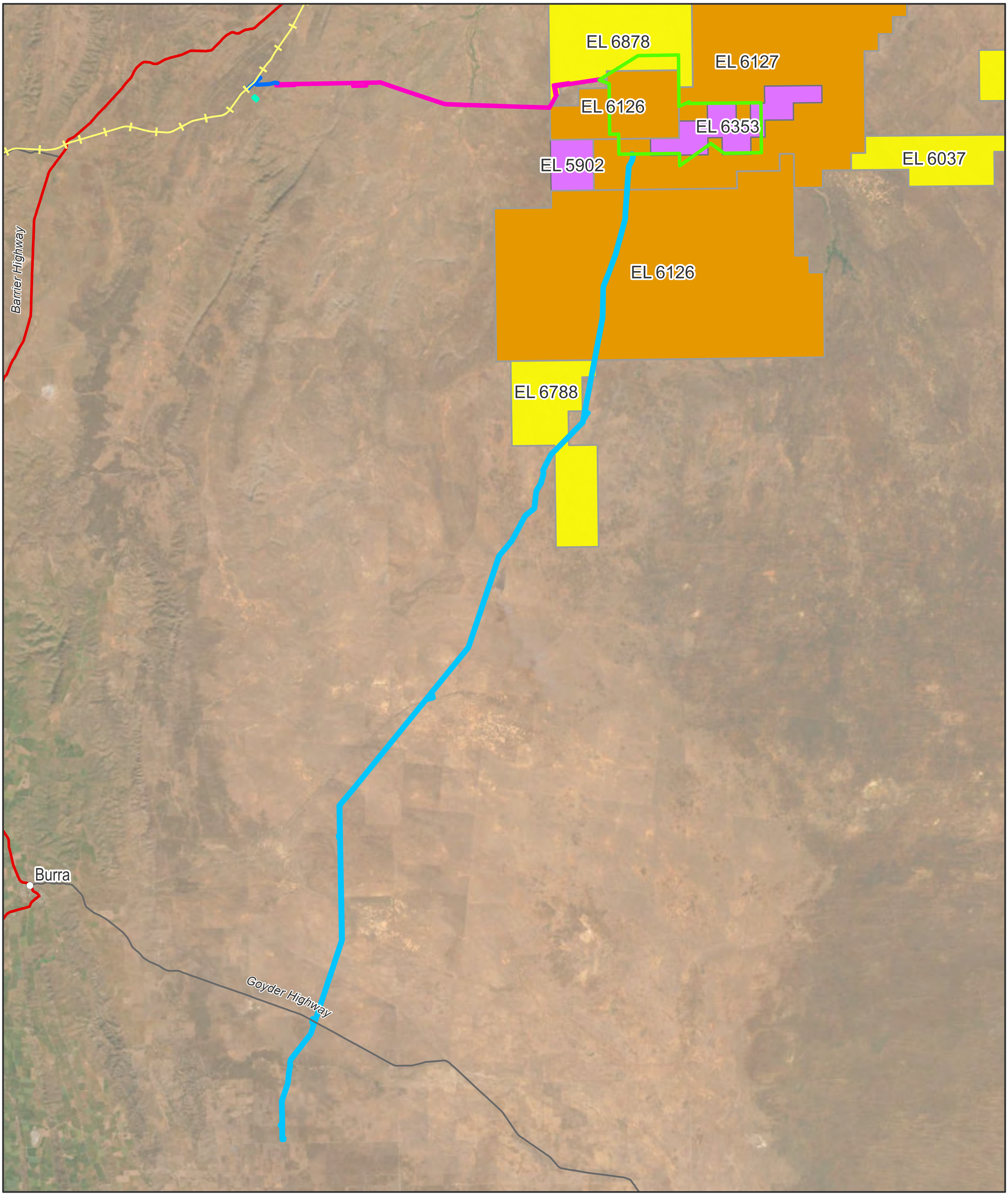

Figure 1-3: Proposed new tenements and existing exploration tenements

1.3. Exploration tenements

MGT maintains Exploration Licence (EL) tenements underlying the proposed ML as detailed in Table 1-5 and shown on Figure 1-3.

Table 1-5: Exploration tenement details subject to ML application

Tenement Number and Licensee	Approval Date	Expiry Date
6353 – Razorback Iron Pty Ltd	22 June 2019	21 June 2030
6126 – Ironback Pty Ltd	17 September 2017	16 September 2028
6127 – Ironback Pty Ltd	10 December 2017	9 December 2028
6878 – Magnetite Mines Ltd	30 November 2022	29 November 2029

Mining activities contemplated within this MLP are located within EL 6353 (Razorback Iron, as principal applicant) and EL 6126 (Ironback Pty Ltd). Ironback Pty Ltd, like Razorback Iron, is a wholly-owned entity of MGT. Both Ironback and MGT ELs are subject to the ML application and are supported by relevant tenement consent agreements (refer Section 1.7.3).

It is noted that that selected MPLs overlay other MGT-owned ELs (directly and through subsidiaries):

- EL 6126 – HR MPL, TL MPL
- EL 6127 – TL MPL
- EL 6788 – TL MPL
- EL 6878 – HR MPL.

For information on ELs of other entities subject to MPL application, refer to Table 1-8 and Section 1.7.3.1.

1.4. Landowners

For the purposes of land access matters, all proposals and corresponding maps that include land parcel information have been based on amendments to the SA digital cadastre as proposed by MGT's licensed surveyor, Alexander Symonds. Errors between the existing cadastre and fence lines were noted, with some up to 400 m in scale, and are generally the result of an inaccurate cadastre which is common in pastoral areas where there is a limited control network and original surveys are the only source of boundary information.

The cadastral boundaries were updated by undertaking an extensive field survey to survey evidence of original boundaries including survey marks and evidence of old fencing. Field surveys were prioritised were proposed mineral tenement boundaries were in close proximity to cadastral boundaries. In other areas where the mineral tenements were a distance from cadastral boundaries, fence lines digitised from accurate orthorectified aerial imagery were used to spatially-improve the cadastre.

Alexander Symonds has re-submitted the spatially-improved cadastral boundaries to the Office of the Surveyor General to update the State's digital cadastre. These updates are likely to take some time to be processed and to filter through the GIS datasets. It is recommended that the spatially-improved cadastral boundaries be used for any assessment activities; relevant spatial files have been supplied to DEM in parallel to the MLP submission.

1.4.1. Native title

MGT acknowledges that the Razorback Project is located on the lands of First Nations groups and that their connections to their respective *Countries* and cultures continue to the current day. Further, the Company recognises the rights of First Nations groups through Commonwealth and SA native title statutes.

Information on native title claims and determinations relevant to the Project is provided in Table 1-6 and Figure 1-4.

Table 1-6: Native title areas, Razorback Project

Native title area and Claim / Determination status	Claim / Determination details	ML	HR MPL	RS MPL	Laydown Area MPL	TL MPL
Ngadjuri Nation #2 Conditional Determined (Consent), not registered	Tribunal file no.: SC2011/002 Federal Court file no: SAD84/2022 Date filed: 21 November 2011 Order date: 6 July 2023	All	All	All	All	Part
First Peoples of the River Murray and Mallee Region #2 Claim	Tribunal file no.: SC2019/001 Federal Court file no: SAD184/2019 Date filed: 20 August 2019	-	-	-	-	Part
Unclaimed area		-	-	-	-	Part

Discussion on the application of native title to the Project is provided in the following Sections.

1.4.1.1. Ngadjuri Nation #2 native title matters

The Ngadjuri Nation #2 native title claim was lodged in 2011 and conditionally resolved by Consent Determination in 2023. The final determination area spans approximately 15,300 km^2 and covers areas from Lyndoch, Nuriootpa and Kapunda in the south to Orroroo (part) and Yunta in the north, as well as the regional centres of Clare (part), Eudunda, Burra and Peterborough.

The entirety of the proposed ML, HR MPL, RS MPL and Laydown Area MPL are located with the Determination area, as is the northernmost 33 km of the TL MPL. Federal Court Determination Orders (State of SA v Vincent Branson and others, 2023) have established the status of native title within the determination area. Native Title has been extinguished in the majority of the Project Area within the Ngadjuri Nation #2 Determination area, generally as a result of the establishment of freehold titles or Crown perpetual leases. It is noted that the Orders state the previously judicially-decided point that validly reserved roads extinguished native title.

The application of Ngadjuri Nation #2 native title rights within the Project Area (by land parcel), as defined by the relevant Determination Orders, is displayed in Figure 1-5. Those land titles where native title is determined to exist are described in Table 1-7.

Table 1-7: Land titles subject to native title with the Ngadjuri Nation #2 determination area

Land title	Other recorded description/type	ML	HR MPL	RS MPL	Laydown Area MPL	TL MPL
CL 6191/512	Ti Tree Well Pastoral Lease	✓	-	-	-	-
CL 6194/510	Manunda Pastoral Lease	✓	-	-	-	-
CR 6221/462	Unalienated Crown land	-	-	-	-	✓

The Determination Orders established that the Ngadjuri Nation Aboriginal Corporation (ICN: 7713) is to be the Prescribed Body Corporate (PBC) for the purposes of Section 57(2) of the *Commonwealth Native Title Act 1993* (NT Act) and has duty to perform the functions mentioned in Section 57(3) of the NT Act after becoming the registered native title body corporate in relation to the Native Title Land.

1.4.1.2. First Peoples of the River Murray and Mallee Region #2 native title matters

The First Peoples of the River Murray and Mallee Region #2 claim was lodged in 2019 and covers an area of approximately 6,100 km^2. The claim area stretches from Robertstown and Balah in the north to Mypolonga in the south, and spans much of the plains to the west and north of the River Murray. The First Peoples of the River Murray and Mallee Region #2 claim is proposed for determination by consent in late 2025.

The southernmost 2.8 km of the TL MPL extends into the First Peoples of the River Murray and Mallee Region #2 claim area within the Bundey area. Tenure within the overlapping area is limited to three freehold properties only (property title references CT 6270/132, CT 5915/155, CT 6300/199) These freehold properties do not form part of the claim area, as the application explicitly excludes any land or waters that is or has been covered by a freehold estate. Given that portion of the MPL is limited to freehold land, native title has been extinguished; therefore, the Project activities within the First Peoples of the River Murray and Mallee Region #2 claim area will not be subject to native title. Regardless of this, heritage management and other Project participation opportunities remain valid.

1.4.1.3. Area subject to no active claim

An unclaimed area exists between the Ngadjuri Nation #2 Determination area and the First Peoples of the River Murray and Mallee Region #2 claim area. This area was included in the original 2011 Ngadjuri Nation #2 claim. Approximately 82 linear km of the TL is located within this unclaimed area.

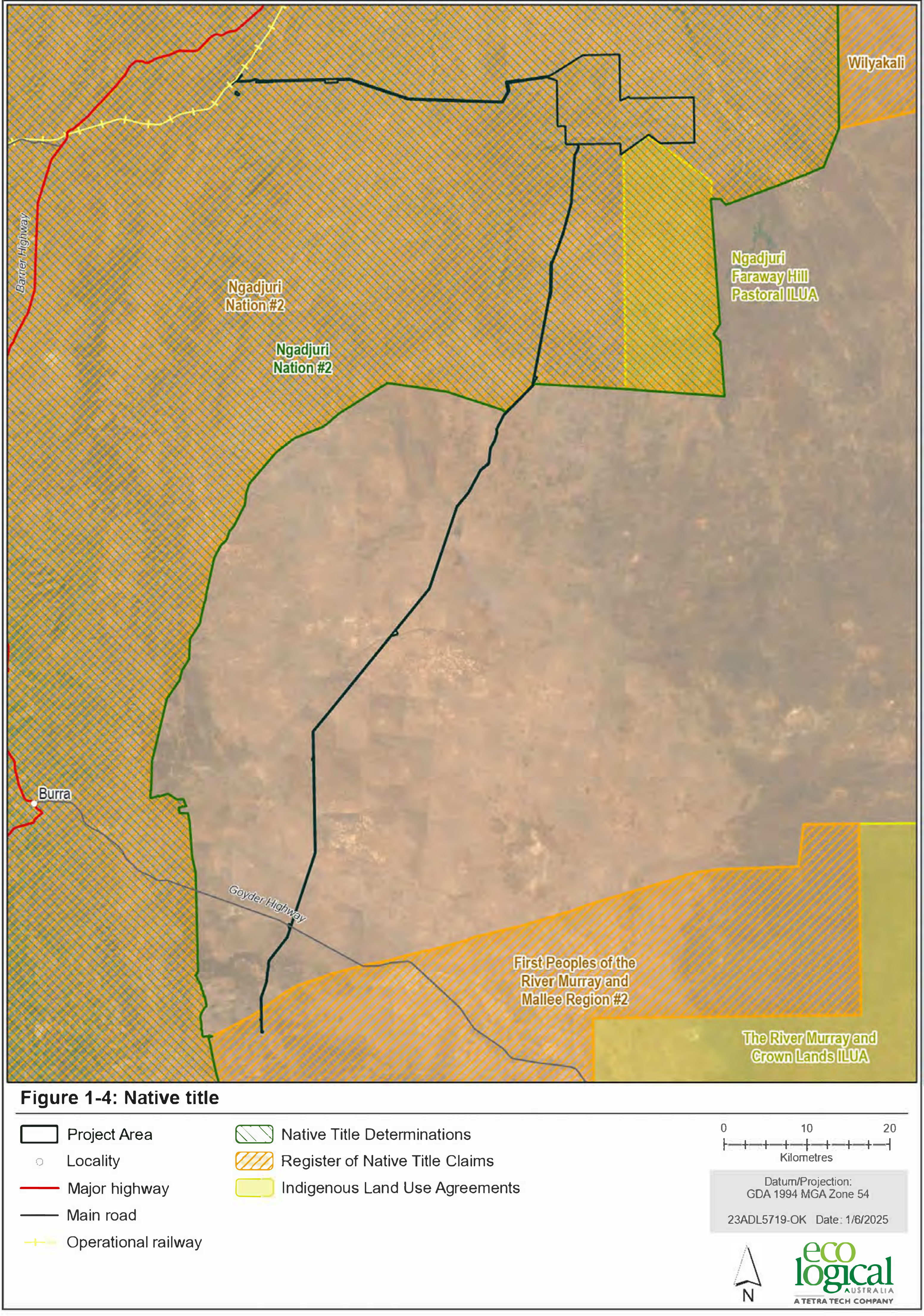

Figure 1-4: Native title

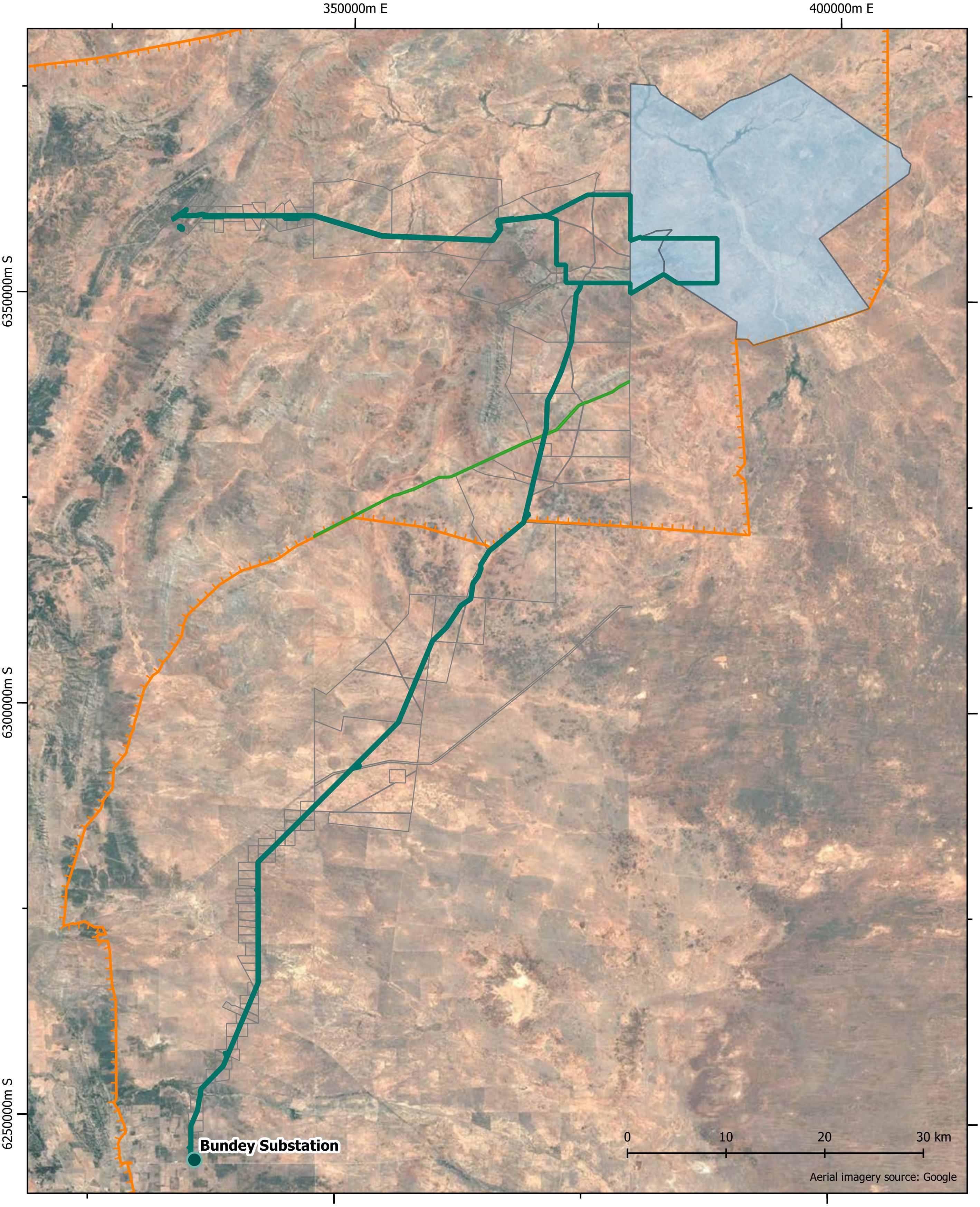

Figure 1-5: Status of Ngadjuri Nation #2 native title for Project Area by land parcel

Localities
Project Area
Tenure
Land parcels coincident with Project Area

Native Title areas
Ngadjuri Nation #2
Land parcels subject to Native Title
Land parcel - Pastoral Lease
Land parcel - Crown Reserve

GDA 1994 MGA Zone 54
1:400,000 @ A4
Author: A Kane
Date: 31/01/2025
Razorback MLP / Referral

MAGNETITE MINES

1.4.2. Land ownership and tenure

Land ownership and associated tenure information, other than native title (refer Section 1.4.1) and road reserves (refer Section 1.7.2), is provided in Table 1-8 below, and includes consideration of granted tenure under various statutory provisions, such as the Mining Act, *Energy Resources Act 2000*, and *Hydrogen and Renewable Energy Act 2023*.

Table 1-8: Land ownership details

Title ID	Type of Title	Landowner
ML		
CL 6194/510	Pastoral Lease	Mutooroo Pastoral Company
CL 6191/512	Pastoral Lease	Tigmas Pastoral Pty Ltd
CL 6180/809	Crown Perpetual Lease	Tigmas Pastoral Pty Ltd
EL 6353	EL (Mining Act)	Razorback Iron Pty Ltd
EL 6126	EL (Mining Act)	Ironback Pty Ltd
EL 6127	EL (Mining Act)	Ironback Pty Ltd
EL 6878	EL (Mining Act)	Magnetite Mines Ltd
MPL1: HR		
CL 6190/395	Crown Perpetual Lease	AJ & PA McBride Ltd
CT 5575/343	Freehold	Genevieve Findlay-Sawers
CL 6186/314	Crown Perpetual Lease	Joy Betty
CL 6195/721	Crown Perpetual Lease	Joy Betty
CL 6195/922	Crown Perpetual Lease	Joy Betty
CT 6195/720	Freehold	Joy Betty
CT 5574/36	Freehold	Joy Betty
CT 5959/876	Freehold	Shannon and Robert Murray
EL 6126	EL (Mining Act)	Ironback Pty Ltd
EL 6878	EL (Mining Act)	Magnetite Mines Ltd
EL 6971	EL (Mining Act)	Australian Ore Search No1 Pty Ltd
MPL2: RS		
CL 6165/814	Crown Perpetual Lease	Paul Andrew Forshaw
CT 6117/249	Freehold	Australian Rail Track Corporation
MPL3: Laydown area		
CL 6165/815	Crown Perpetual Lease	Paul Andrew Forshaw
MPL4: TL		
CL 6180/217	Crown Perpetual Lease	AJ & PA McBride Ltd
CL 6213/304	Crown Perpetual Lease	AJ & PA McBride Ltd
CL 6185/124	Crown Perpetual Lease	Faraway-Braemar Pastoral Co Pty Ltd
CL 6185/125	Crown Perpetual Lease	Faraway-Braemar Pastoral Co Pty Ltd
CL 6185/126	Crown Perpetual Lease	Faraway-Braemar Pastoral Co Pty Ltd
CL 6206/303	Crown Perpetual Lease	Gumhill Estate Pty Ltd

Title ID	Type of Title	Landowner
CR 6221/462	Crown Reserve	Minister for Environment and Water
CL 6199/829	Crown Perpetual Lease	Michael Philip McBride
CL 6213/202	Crown Perpetual Lease	Michael Philip McBride
CL 6185/898	Crown Perpetual Lease	Michael Philip McBride
CL 6185/899	Crown Perpetual Lease	Michael Philip McBride
CR 5764/652	Crown Reserve	Minister for Environment and Water
CL 6165/436	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6194/956	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6194/954	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6211/506	Crown Perpetual Lease	Belcunda Pastoral Co Pty Ltd
CL 6211/522	Crown Perpetual Lease	Belcunda Pastoral Co Pty Ltd
CL 6211/527	Crown Perpetual Lease	Belcunda Pastoral Co Pty Ltd
CL 6211/535	Crown Perpetual Lease	Belcunda Pastoral Co Pty Ltd
CL 6211/539	Crown Perpetual Lease	Belcunda Pastoral Co Pty Ltd
CL 6186/710	Crown Perpetual Lease	Graham Malcolm Kellock
CL 6186/711	Crown Perpetual Lease	Graham Malcolm Kellock
CL 6186/767	Crown Perpetual Lease	Graham Malcolm Kellock
CL 6194/944	Crown Perpetual Lease	David and Jane Hill
CL 6191/295	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6135/435	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6195/697	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL6195/930	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6194/948	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6194/951	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CL 6194/952	Crown Perpetual Lease	RB & JJ Riggs Pty Ltd
CT 5987/165	Freehold	Dandaraga Pty Ltd, and J Mosey, D Mosey and H Mosey
CT 5915/155	Freehold	Ian and Lorraine Mosey
CT 6300/199	Freehold	Mosey Family Farms
CT 6270/132	Freehold	Transmission Lessor Corporation
EL 6126	EL (Mining Act)	Ironback Pty Ltd
EL 6127	EL (Mining Act)	Ironback Pty Ltd
EL 6788	EL (Mining Act)	Magnetite Mines Ltd
EL 6206	EL (Mining Act)	Maosen Australia Pty Ltd
EL 6160	EL (Mining Act)	SA Exploration Pty Ltd
EL 7001	EL (Mining Act)	Valrico Pty Ltd
EL 6101	EL (Mining Act)	IGO Newsearch Pty Ltd
EL 6201	EL (Mining Act)	IGO Newsearch Pty Ltd

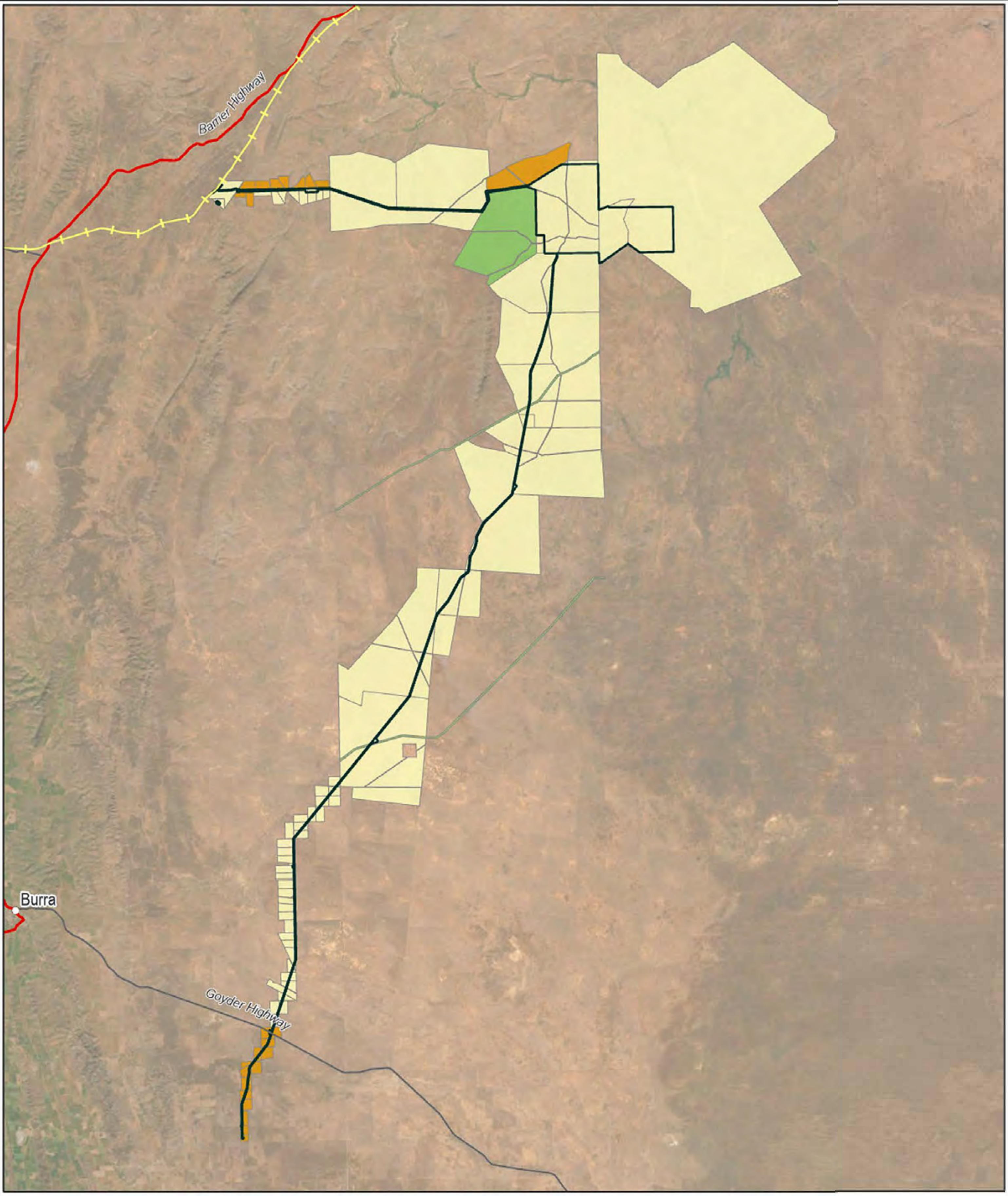

Figure 1-6: Land tenure

- Project Area
- Locality
- Major highway
- Main road
- Operational railway

Tenure

- Crown land - leased in accordance with terms and conditions
- Crown land - may include parks, government agency land and land registered on council community land registers
- Private land- freehold

0 10 20
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 1/6/2025

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1.5. Exempt land identification

Section 9 of the Mining Act identifies ‘exempt land’ being land that is, by default, protected from exploration and mining activities. Referencing Section 9 (1–5) of the Mining Act, and Section 5 of the Mining Regulations 2020, exempt land includes:

- land lawfully and genuinely used:
  - as a yard or garden
  - as a cultivated field, plantation, orchard or vineyard;
  - as an airfield, railway or tramway
  - as the grounds of a church, chapel, school, hospital or institution
- land that constitutes any parklands or recreation grounds under the control of a council
- land that is:
  - dedicated or reserved, under statute, for purpose of waterworks
  - vested in the Minister of Public Works for purpose of waterworks
  - comprised within an easement in favour of the Minister of Public Works
- land that constitutes a forest reserve under the *Forestry Act 1950*
- any separate parcel of land <2,000 square metres (m^2) within any city, town or township
- land situated within the ‘prescribed distance’ of a building or structure used as a place of residence[1] (except a building or structure of a class excluded by regulation from the ambit of this paragraph), with the relevant prescribed distances being:
  - 400 m in the case of advanced exploration activities
- land situated within 150 m of:
  - a building or structure, with a value ≥$2,500, used for industrial or commercial purposes
  - a spring, well, reservoir or dam.

Per Section 9AA of the Mining Act no mineral claim, lease or licence will authorise authorised operations on such land unless the benefit of the exemption is waived by the landowner (through negotiated agreement) or the Environment, Resources and Development Court (ERD Court).

MGT is in the process of negotiating access agreements with pastoral lease, Crown lease and freehold landowners for areas covered by the proposed tenements. These agreements will address waiver of exemption requirements as required under Section 9 of the Mining Act.

Exempt land relevant to the Project and this MLP is shown in Figure 1-7 and Table 1-9. Note that although Old Eurovale and Old Manunda buildings have been included in Figure 1-7 and Table 1-9 for completeness, they do not meet the definition of ‘place of residence’ (as defined above) and hence do not qualify as exempt land.

For the purposes of exempt land, MGT has defined railway as the linear corridor for each active rail line, and is generally 3 m either side of the rail centreline.

[1] Taken to mean a homestead that is used on a monthly basis by the landowners and/or the workers on a pastoral property, as per precedent set in ‘*Southern Titanium NL v Heidrich and others (2004) SAWC 1*’ and ‘*Stephen Brian Paddick and Stone Boutique Australia Pty Ltd v Seppo Sakari Karvonen for the Karvonen family Trust (2009) SAWC7*’.

Table 1-9: Exempt land

Map ID	Structure type	Owner	Title Ref	Easting	Northing	Approximate area of exemption (ha)	Waiver status	Summary of relevant conditions
1	Bores	RB & JJ Riggs Pty Ltd	CL 6194/956	347706.6895	6288459.753	1.49	In negotiation	-
2	Bores	Tigmas Pastoral Pty Ltd	CL 6191/512	379259.7724	6355901.811	7.06	In negotiation	-
3	Bores	Tigmas Pastoral Pty Ltd	CL 6191/512	379333.7594	6355869.895	7.06	In negotiation	-
4	Bores	Tigmas Pastoral Pty Ltd	CL 6191/512	381919.7002	6354200.788	7.06	In negotiation	-
5	Bores	Mutooroo Pastoral Company	CL 6194/510	382912.7624	6352712.805	6.43	In negotiation	-
6	Bores	S & R Murray	CT 5959/876	368072	6359918	1.04	In negotiation	-
7	Bores	Tigmas Pastoral Pty Ltd	CL 6180/809	377665.7344	6359834.844	7.06	In negotiation	-
8	Bores	Tigmas Pastoral Pty Ltd	CL 6180/809	373885	6358324	7.06	In negotiation	-
9	Bores	Tigmas Pastoral Pty Ltd	CL 6191/512	379941.7423	6354308.827	7.06	In negotiation	-
10	Bores	Tigmas Pastoral Pty Ltd	CL 6180/809	373776	6360983	7.06	In negotiation	-
11	Farm dam	Mutooroo Pastoral Company	CL 6194/510	385288.1165	6357279.304	11.69	In negotiation	-
12	Farm dam	Tigmas Pastoral Pty Ltd	CL 6180/809	374074.9519	6357703.288	10.11	In negotiation	-
13	Farm dam	Tigmas Pastoral Pty Ltd	CL 6180/809	374437.0803	6358156.847	13.43	In negotiation	-
14	Farm dam	Tigmas Pastoral Pty Ltd	CL 6180/809	374176.4233	6357686.499	12.20	In negotiation	-
15	Farm dam	Faraway-Braemar Pastoral Co Pty Ltd	CL 6185/126	371287.4301	6339801.185	1.67	In negotiation	-
16	Farm dam	Mutooroo Pastoral Company	CL 6194/510	382829.3642	6353808.69	9.67	In negotiation	-
17	Farm dam	Tigmas Pastoral Pty Ltd	CL 6180/809	373965.3287	6357717.384	13.64	In negotiation	-
18	Farm dam	Paul Forshaw	CL 6165/814	332619.9961	6359891.814	3.31	Finalised	Maintain equivalent water access
19	Farm dam	RB & JJ Riggs Pty Ltd	CL 6195/930	341101.1909	6263961.669	1.81	In negotiation	-
20	Farm dam	RB & JJ Riggs Pty Ltd	CL 6195/930	341051.72	6263921.095	1.67	In negotiation	-
21	Farm dam	Tigmas Pastoral Pty Ltd	CL 6180/809	376620.8214	6356186.523	12.26	In negotiation	-
22	Farm dam	RB & JJ Riggs Pty Ltd	CL 6194/951	341780.8847	6271136.609	2.44	In negotiation	-

Map ID	Structure type	Owner	Title Ref	Easting	Northing	Approximate area of exemption (ha)	Waiver status	Summary of relevant conditions
23	Farm dam	RB & JJ Riggs Pty Ltd	CL 6195/698	341901.4446	6271116.785	1.94	In negotiation	-
24	Farm dam	RB & JJ Riggs Pty Ltd	CL 6194/948	341780.5023	6271416.238	2.29	In negotiation	-
25	Farm dam	RB & JJ Riggs Pty Ltd	CL 6195/698	341925.6548	6269987.423	1.67	In negotiation	-
26	Farm dam	Michael Philip McBride	CL 6213/202	360997.8096	6310849.889	1.63	In negotiation	-
27	Ti Tree homestead	Tigmas Pastoral Pty Ltd	CL 6180/809	374914.83	6358118.08	50.25	In negotiation	-
28	Old Eurovale homestead	RB & JJ Riggs Pty Ltd	CL 6194/951	341796	6270833	N/A	Not applicable	Not applicable
29	Old Manunda homestead	Mutooroo Pastoral Company	CL 6194/510	385568.4969	6357646.535	N/A	Not applicable	Not applicable
30	Railway	Australian Rail Track Corporation	CT 6117/249	332420.4002	6359846.773	460.40	To be finalised as part of rail network connection process	-
31	Building/structure (shed and yards)	Tigmas Pastoral Pty Ltd	CL 6180/809	374492.00	6358312.80	12.36	In negotiation	-

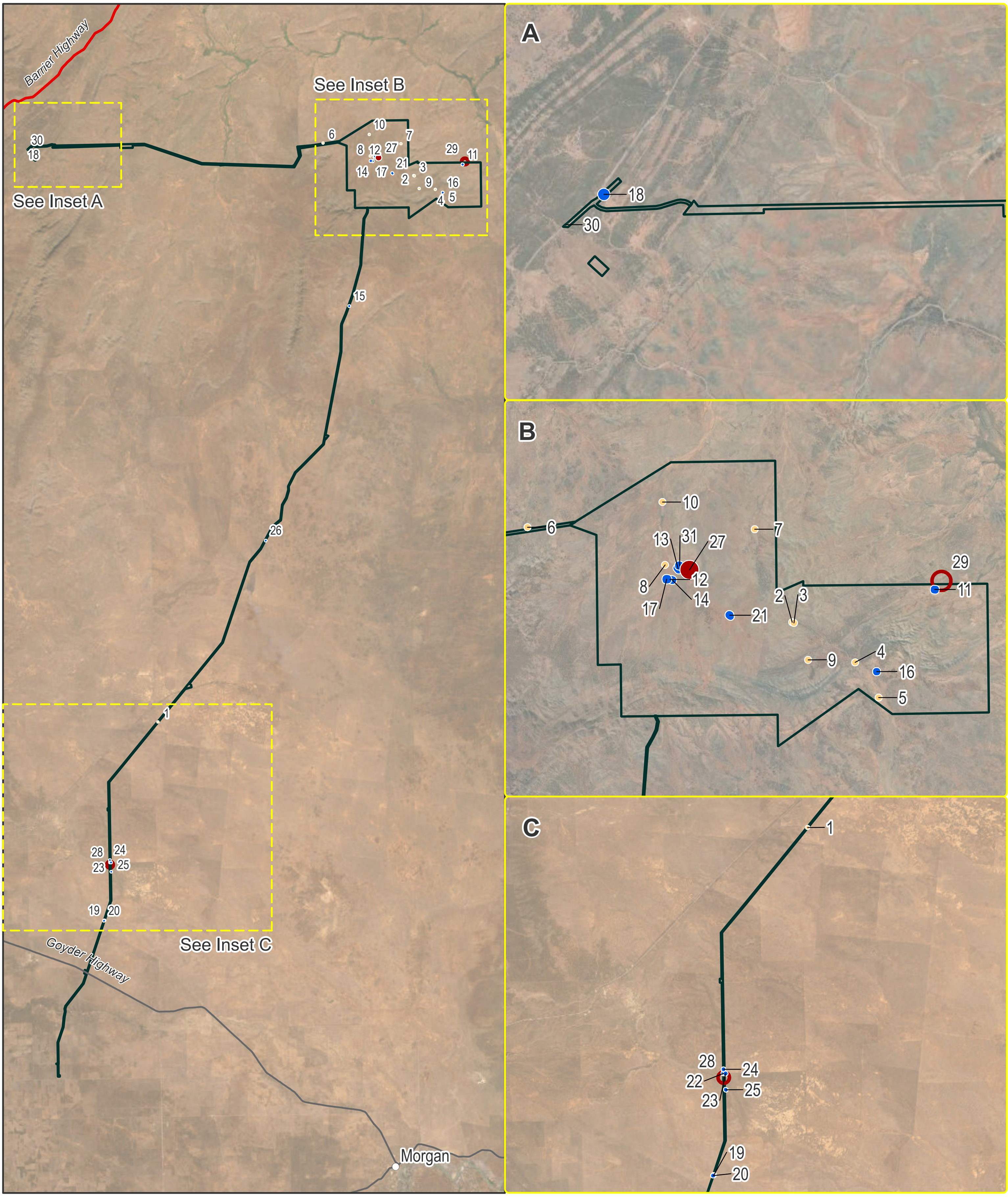

Figure 1-7 Exempt land

Project Area
Locality
Major highway
Main road

Exempt Land Feature
Bores
Farm dam / structure
Homestead / residences
Railway

Assessed for Exempt Land and deemed to not meet the relevant definitions of EL
Homestead / residences

0 10 20
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 10/10/2025

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Table 1-10: Exempt land datasets used

Infrastructure type	Dataset used
Railway	"Statewide Rail Network" from Department of Infrastructure and Transport (DIT), Statewide Rail Network - Dataset - data.sa.gov.au
Homestead / residences	"Geodata Topo 250K Series 3" from Australian Government's Bioregional Assessment Program, GEODATA TOPO 250K Series 3 - Dataset - data.gov.au
Farm dam	Digitised using ESRI's aerial imagery in ArcGIS Pro software "Waterbodies in SA" from Department for Environment and Water (DEW), Waterbodies in SA - Dataset - data.sa.gov.au.
Bores	"Groundwater Data" from WaterConnect, DEW, Groundwater Data Default (waterconnect.sa.gov.au)

1.6. Protected areas

1.6.1. Conservation areas

The Pualco Range Conservation Park (Pualco Range CP) is located adjacent to the western boundary of the proposed ML (refer Figure 1-8). It is 7,746 ha in size, located within Crown Land and was proclaimed under the *National Parks and Wildlife Act 1972* (NPW Act) in 2010 (Gazette, 2010). This conservation park was designated to protect and preserve local wildlife and the area's natural features. Specifically, Pualco Range CP supports high value habitat for *Pedionomus torquatus* (Plains Wanderer) (listed as Critically Endangered under EPBC Act, and Endangered under NPW Act), as well as other species of state importance including *Lophochroa leadbeateri* (Major Mitchell's Cockatoo), *Neophema chrysostoma* (Blue-winged Parrot) and *Falco peregrinus* (Peregrine Falcon) (DEWNR, 2011). As of 2024, no management plan has been developed (DEW, 2024).

There are numerous other conservation parks in northeast SA, none of which are close enough to the Project to be impacted (refer Figure 1-8).

1.6.2. National Parks

The closest National Parks are Wapma Thura-Southern Flinders National Park, and Mount Remarkable National Park, both of which are approximately 125 km from the Project.

1.6.2.1. Wapma Thura-Southern Flinders National Park

Wapma Thura-Southern Flinders National Park was proclaimed in 2010 to protect the area's wildlife and natural landscape Gazette, 2021a). The management plan for the park has not been yet developed (DEW, 2024).

1.6.2.2. Mount Remarkable National Park

Mount Remarkable National Park is known for its rugged ranges, quartzite ridges and gorges, dense vegetation and diverse habitats supporting several species of conservation significance (DEH, 2006). It was proclaimed in 2021 (Gazette, 2021b).

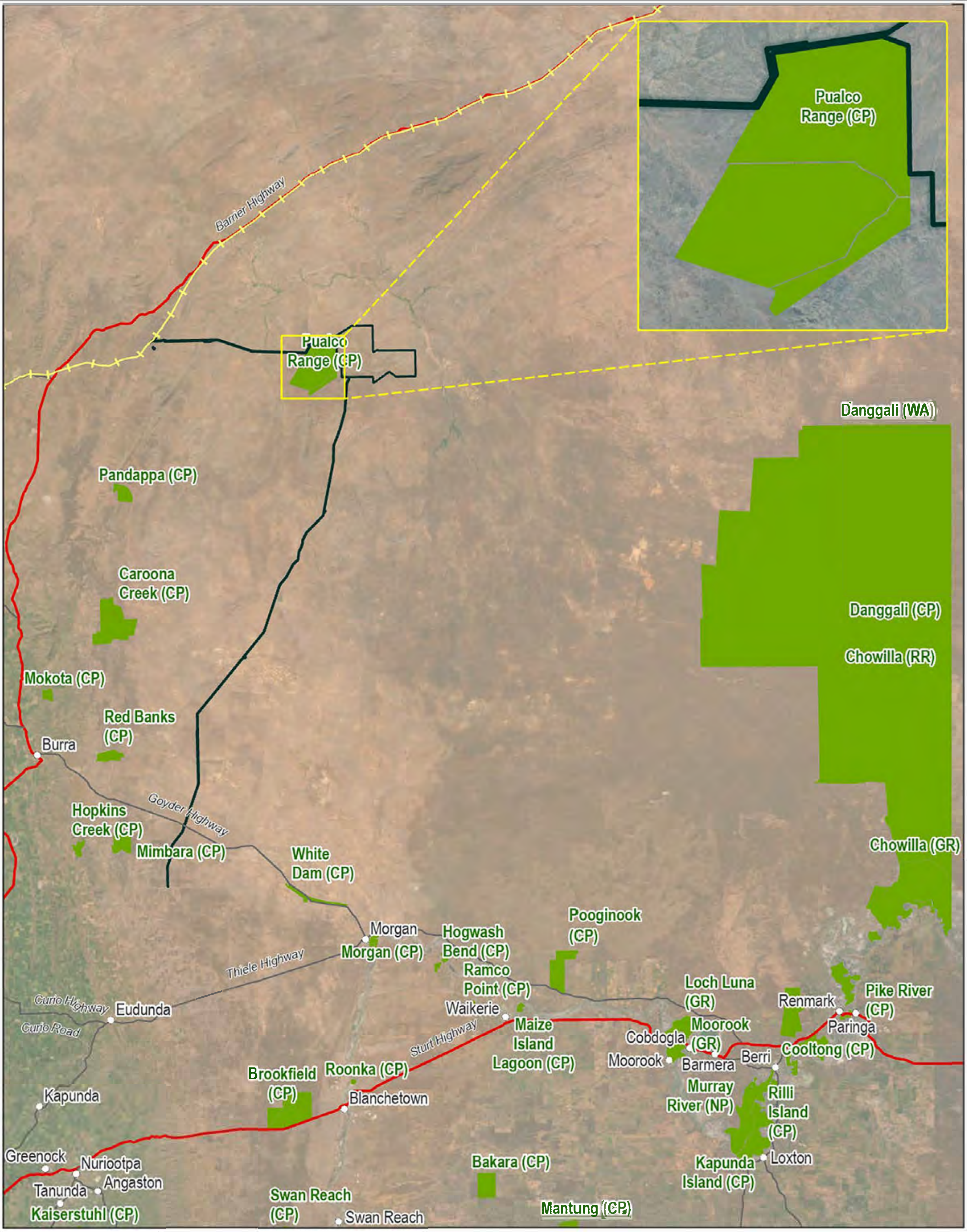


Figure 1-8: Proximity to protected areas

1.7. Reasonable prospect of access to land

Section 30(l)(e)(i) of the Regulations requires demonstration that there is a reasonable prospect that the land in respect of which an ML is sought could be effectively and efficiently mined.

For completeness, information relating to the reasonable prospect of access to land for proposed MLPs has been included.

1.7.1. Titled properties

1.7.1.1. Privately held titles and leases

Privately-held land titles over which the Project is proposed are identified in Section 1.4.2 and, specifically, in Table 1-8.

MGT sought to lower land access risk and impact through its provisional assessment and citing of linear infrastructure corridors. The Company aimed to prioritise placement of infrastructure, and the TL in particular, within properties where the owner viewed the proposed development as compatible with the current and future use of their respective properties, and who expressed an interest in negotiating a mutually-acceptable outcome with MGT.

Following confirmation of the proposed mine and infrastructure footprints, including consideration of all infrastructure corridor options, land access negotiations with 18 affected entities/persons were initiated. Each agreement has progressed through one of three principal negotiation and agreement plans, which may be either binding or optioned:

- selected purchase
- sub-lease agreement
- land access and compensation agreement.

The advanced status of Project agreement-making is summarised in Table 1-11.

Table 1-11: Status of land access negotiations by access stage, private landowners

Access stage	Stage description	Number of landowners at stage
7	Agreement finalised	1
6	Negotiation gate 2	4
4, 5	Agreement structure, Negotiation gate 1	10
3	Identification and assessment of management requirements	2
2	Project alignment (concept phase 2)	1
1	Project kick-off (concept phase 1)	0

The singular landowner at Stage 2 reflects a new stakeholder due to a recent land sale; MGT is working with the new landowner to expedite the land access negotiation process. Some landowners (generally those at Steps 4-6) have indicated their preference to await the submission of this MLP prior to finalising an agreement with MGT.

MGT announced the binding land access agreement for its Hillgrange rail infrastructure development in 2023 (MGT, 2023a).

MGT acknowledges that Ministerial consent may be required for its dealings with Crown perpetual leases and Pastoral leases, pursuant to the *Crown Lands Management Act 2009* (CLM Act) and *Pastoral Land Management and Conservation Act 1989* (PLMC Act), respectively.

In summary, MGT has assessed that there is a reasonable prospect of access to the relevant land, with land access negotiations well-advanced for most privately-owned titled properties. MGT remains committed to ensuring landowners are adequately compensated for the use of and, where relevant, the diminishment of value in their land, while effecting the continued security, productive operation and general care of their land through suitable management commitments. This approach will support MGT to finalise all necessary land access agreements prior to the grant of any mining production licences.

Specifically for those properties pertaining to the ML area (CL 6194/510, CL 6191/512, CL 6180/809), it is the intent of MGT to secure tenure through purchase and sub-leasing arrangements.

1.7.1.2. Crown Reserves

The Project is coincident with two Crown Reserves, both of which underlay small Sections of the TL MPL. Affected areas are identified in Table 1-12.

Table 1-12: Crown Reserves within Project Area

Land title	Suburb, LGA	Existing development within title area	Area impacted (ha)
CR 6221/462	Faraway Hill, Unincorporated Area	Not noted	1.3
CR 5764/652	Warnes, Unincorporated Area	Eastern Road	1.8

For clarity, it is noted that no access is sought to the Pualco Range CP (CR 6062/341) for Project activities.

Overstringing of the Crown Reserves with high voltage electrical conductors is proposed, as is some vehicular access during construction. Subject to tower spacing and overhead clearance requirements, one or more transmission towers may be erected within the Crown Reserves. Detailed design and engineering studies will be completed to determine if any physical development is proposed to occur within the Crown Reserves.

Consultation with DEW will address whether exclusive tenure is required to support any possible transmission tower construction with the Crown Reserves; however, MGT anticipates that non-exclusive tenure is satisfactory for Project access requirements.

MGT has assessed that there is a reasonable prospect of access to the relevant land, with early engagement with DEW's Crown Lands Section identifying the leasing, licensing or easement processes, or a combination of these, as being relevant land access approval pathways for the Project. MGT notes that an application for consent to undertake works or development on Crown land may also be required. Application processes for these access and development matters are well-established and are suitable for progression in concert with the assessment of this MLP.

1.7.1.3. Other interests in titled properties

MGT recognises the land development opportunities in part of the Project Area, principally the potential for new renewable energy generation projects in the areas immediately surrounding the Bundey Substation and coincident with the proposed TL MPL. Three land titles at the southern end of the TL MPL are subject to option rights held by third parties. MGT is actively negotiating with two individual rights holders to obtain a waiver of option rights and enable the completion of land access negotiations with the titled landowner.

MGT has assessed that there is a reasonable prospect of access to the relevant land, with each of the two rights holders providing support for MGT to establish its TL infrastructure while preserving their respective development opportunities. MGT's proposed development of transmission infrastructure is compatible with those development types proposed by the option rights holders, which includes other transmission infrastructure.

1.7.2. Road reserves

A series of formed and unformed road reserves exist across the Project Area. These road reserves are under the control and management of three road authorities:

- DIT
- DC of Peterborough
- RC of Goyder.

Section 4 of the Regulations requires that for any ML or MPL application over land consisting (partially or entirely) of a public road, street or highway must be accompanied by the written consent of the authority that has care, control or management of the road, street or highway. MGT has included all formed and unformed road reserves in its consideration of the obligations stipulated in Section 4 of the Regulations and included these in requests for consent to apply from each road authority. Descriptions of each formed and unformed road reserve that may be subject to the provisions of Regulation 4 are included in Table 1-13.

Table 1-13: Formed and unformed road reserves included in Regulation 4 consents

Tenement	Location description	DIT	DC Peterborough	RC Goyder
ML				
Unnamed road reserves (unformed) Out of Hundred	Located within land parcel H835400 S1400 (part)	✓	-	-
MPL1: HR				
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels D24519 Q2 and D24519 Q3 (part)	-	✓	-
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels F252298 A41 and F252298 A42 (part)	-	✓	-
Crocker Road Hundreds of Nackara and Hardy	Between land parcels H360400 S115, H220200 S205 H220200 S206 and H360400 S146 (part)	-	✓	-
Sawers Road Hundred of Hardy	Between land parcels H220200 S198 and H220200 SE201 (part)	-	✓	-
Old Boolrenunga Road (unformed) Spears Well Road (unformed) Other Unformed Road Hundred of Hardy	Between land parcels H220200 S192, H220200 S197 and H220200 S214 (part)	-	✓	-
Hern Road Hundred of Hardy	Between H220200 S187 and H220200 S189 (part)	-	✓	-
Quintrell Road Hundred of Hardy	Adjacent H220200 S186 (part)	-	✓	-
MPL2: RS				
Crocker Road Hundred of Nackara	Between land parcels H360400 S115, H220200 S205 H220200 S206 and H360400 S146 (part)	-	✓	-

Tenement	Location description	DIT	DC Peterborough	RC Goyder
MPL3: Laydown area				
Nil		-	-	-
MPL4: TL				
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels F253512 Q140 and F253512 Q141 (part)	✓	-	-
Unnamed road reserve (unformed) Out of Hundreds	Located within land parcel H835900 S1397 (part)	✓	-	-
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels F253584 Q159 and F253584 Q160 (part)	✓	-	-
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels F251612 Q4 and H835900 S1389 (part)	✓	-	-
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels H835900 S1391 and F253496 S377 (part)	✓	-	-
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels F253496 S376 and F253496 S377 (part)	✓	-	-
Unnamed road reserve (unformed) Out of Hundreds	Between land parcels H835800 S1375 and H835800 S398 (part)	✓	-	-
Unnamed road reserve (unformed) Out of Hundreds	Located with land parcel H835800 S398 (part)	✓	-	-
Goyder Highway Hundred of Bundey	Between land parcels H200400 S181 and H200400 S180 (part)	✓	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S100 and H835800 S1349 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S100 and H201200 S77 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S75 and H201200 S49 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S40 and H201200 S42 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S40 and H201200 S20 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S20 and H201200 S18 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S19 and H201200 S17 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S8 and H201200 S9 (all)	-	-	✓

Tenement	Location description	DIT	DC Peterborough	RC Goyder
Unnamed road reserve (unformed) Hundred of Rees	Between land parcels H201200 S155 and H201200 S156 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H201200 S155 and H200600 S157 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S157 and H200600 S155 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S160 and H200600 S155 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S160 and H200600 S145 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S199 and H200600 S145 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S144 and H200600 S145 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S143 and H200600 S145 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S160 and H200600 S167 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S167 and H200600 S172 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S172 and H200600 S127 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S128 and H200600 S127 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S119 and H200600 S127 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S119 and H200600 S120 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S103 and H200600 S120 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S103 and H200600 S102 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S90 and H200600 S205 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S89 and H200600 S91 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S89 and H200600 S74 (part)	-	-	✓

Tenement	Location description	DIT	DC Peterborough	RC Goyder
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S74 and H200600 S73 (all)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S74 and H200600 S72 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S63 and H200600 S74 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S63 and H200600 S48 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S47 and H200600 S187 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of King	Between land parcels H200600 S36 and H200600 S19 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Bundey	Between land parcels H200600 S6 and H200400 S181 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Bundey	Between land parcels H200400 S171 and H200400 S149 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Bundey	Between land parcels H200400 S148 and H200400 S138 (part)	-	-	✓
Unnamed road reserve (unformed) Hundred of Bundey	Between land parcels H200400 S137 and H200400 S136 (part)	-	-	✓
Bundey Church Road Hundred of Bundey	Between land parcels H200400 S104 and H200400 S69 (part)	-	-	✓

Consent to apply has been granted by each of the three road authorities, with DC Peterborough confirming their consent in December 2024 and DIT and RC Goyder notifying of the provision of their consent in March 2025.

MGT has assessed that there is a reasonable prospect of access to the relevant land, with consent to apply (via this MLP) received from each of the three road authorities indicating in-principal support for proposed Project infrastructure and enabling SA Government assessment and statutory public consultation.

A further agreement with each road authority is expected to support grant of the proposed MPLs over the road reserves, authorise development within or expanded use of the road reserve (as may be relevant), as well as establishing shared road management practices. These agreements will be formalised prior to the grant of the MPLs.

1.7.3. Other tenements

This Section identifies tenements affording tenured rights that are overlapped by the proposed Project Area.

1.7.3.1. Tenements held pursuant to Mining Act 1971

There are no granted mining leases, retention leases or mineral claims pursuant to the Mining Act within the Project Area as of the date of submission of this MLP.

There are five existing ELs pursuant to the Mining Act owned by MGT and its subsidiary companies within the Project Area as of the date of submission of this MLP. There are six existing ELs pursuant to the Mining Act owned by third parties within the Project Area as of the date of submission of this MLP. All 11 ELs are subject to the provisions of Section 80 of the Mining Act as the MGT tenement applications will result in overlapping tenure (i.e., no extinguishment of existing tenements will occur).

MGT has assessed that there is a reasonable prospect of access to the relevant land, with specific consideration given to the requirements of Section 80 of the Mining Act. A summary of the status of relevant agreements to resolve overlapping tenement matters is provided in Table 1-14.

Table 1-14: Status of Section 80 tenement consent agreements

Tenement	Tenement Owner	Relevant to	Status of agreement
MGT-owned			
EL 6353	Razorback Iron Pty Ltd	ML	Agreement executed with and for Razorback Iron
EL 6126	Ironback Pty Ltd	ML; HR MPL; TL MPL	Agreement executed with Razorback Iron
EL 6127	Ironback Pty Ltd	ML; TL MPL	Agreement executed with Razorback Iron
EL 6788	Magnetite Mines Ltd	TL MPL	Agreement executed with Razorback Iron
EL 6878	Magnetite Mines Ltd	ML, HR MPL	Agreement executed with Razorback Iron
Third party-owned			
EL 6206	Maosen Australia Pty Ltd	TL MPL	Agreement executed with Razorback Iron
EL 6160	SA Exploration Pty Ltd	TL MPL	Agreement executed with Razorback Iron
EL 7001	Valrico Pty Ltd	TL MPL	Agreement executed with Razorback Iron
EL 6101	IGO Newsearch Pty Ltd	TL MPL	Agreement executed with Razorback Iron
EL 6201	IGO Newsearch Pty Ltd	TL MPL	Agreement executed with Razorback Iron
EL 6971	Australian Ore Search No.1 Pty Ltd	HR MPL	Agreement executed with Razorback Iron

Agreements for all 11 ELs have been finalised, with all matters relating to Section 80 resolved for the ML, HR MPL and TL MPL. There are no overlapping tenement considerations pursuant to Section 80 relevant to the RS MPL and Laydown Area MPL.

SUMMARY OF STATUS

With all tenement consent agreements finalised for the ML, HR and TL, MGT asserts that there is a clear, reasonable prospect of access to land with regards to existing tenements under the Mining Act. MGT's approach has established Section 80 agreements on the basis of:

1. the ability of the existing tenement holder to continue to exercise all rights legally permissible under the existing tenement (no diminishment of intrinsic tenement value)
2. the ability to establish and develop a defined resource without unretractable encumbrance from the activities of the new tenement holder in the overlap area (no sterilisation of resources)

3. the development of clear, defined rights of both parties to ensure future effective tenement administration and compliance (including by DEM)
4. the inclusion of conditions that establish fair and reasonable strategies to cooperatively and collaboratively manage activities proposed by either party in the designated overlap area.

On a practical level, agreements form a co-existence framework that aims to maintain generally unrestricted access to the existing tenement for the existing tenement holder with practical controls implemented for activities within a defined overlap area. A management plan (or series of management plans) between the parties set out the proposed activities and any likely interaction with the activities of the other party. Agreements also propose to provide an infrastructure relocation condition; in the circumstance that the existing tenement holder proposes a mining operation, then the holder can request of MGT the removal of the TL in the affected area, thereby unencumbering the resource development potential.

Further, the presence of linear infrastructure, such as roads, pipe lines and transmission lines, are generally immaterial to exploration phase activities. MGT's development of such infrastructure in a region with limited existing grid connectivity potential has been welcomed by several EL owners who have indicated the potential future benefit of having the TL within their tenement.

1.7.3.2. Tenements held pursuant to Energy Resources Act 2000

There are no granted tenements pursuant to the *Energy Resources Act 2000* within the Project Area as of the date of submission of this MLP.

1.7.3.3. Tenements held pursuant to Hydrogen and Renewable Energy Act 2023

There are no granted tenements pursuant to the *Hydrogen and Renewable Energy Act 2023* within the Project Area as of the date of submission of this MLP.

1.7.4.* Native title *matters

1.7.4.1. Ngadjuri Nation #2

The application of native title through the Ngadjuri Nation #2 Determination Orders is discussed in Section 1.4.1.1. Native title exists across only three land titles within the Project Area, two of which are pastoral leases (Manunda, Ti Tree Well) and are coincident to a Section of the proposed ML. ML operations within those land titles where native title has been determined to exist include the Iron Peak pit and WRDs, part of the Razorback pit and central WRDs, and other incidental infrastructure.

The relationship between MGT and NNAC extends over a decade, when the two entities signed a Native Title Mining Agreement in August 2011 that enabled exploration activities, by providing a framework for collaborative heritage management. In December 2023, MGT and NNAC signed the Walking Together – One Team Partnering Agreement, as described in Section 5.4.2.2, that elevated the relationship to a partnership and enshrined a mutually-shared objective to realise the potential of the Razorback Project, achieve shared outcomes and respect and protect cultural matters.

Under the leading principle of free, prior and informed consent (FPIC), MGT has sought to:

- engage with NNAC Board of Directors on a regular basis
- host two Project site tours for NNAC Directors and representatives
- host a visit to an operating magnetite mine to ensure clarity in understanding the scale and impact of mining and processing activities
- host three community engagement sessions, in conjunction with NNAC, to ensure community-level participation
- report annually to the Ngadjuri community on recent activities.

Further information on these activities is reported in Sections 5.4.1.2, 5.4.3, 5.4.5 and 5.6.1.1.

On the basis of this FPIC approach, MGT and NNAC, as the declared PBC, have commenced negotiation on an Indigenous Land Use Agreement (ILUA) to support the proposed development of the Project. A range of workshops has already been held, and others proposed as of the time of submission of this MLP, to progress ILUA negotiations. NNAC's access to independent advisory services has been supported by MGT.

MGT has assessed that there is a reasonable prospect of access to the relevant Ngadjuri land, with extensive engagement and heritage characterisation programs undertaken, and the ILUA negotiation process already advancing. It is anticipated that the ILUA will be finalised prior to the grant of any mining production tenements.

1.7.4.2. First Peoples of the River Murray and Mallee Region #2

The application of native title to the relevant Project land titles within the First Peoples of the River Murray and Mallee Region #2 claim area is discussed in Section 1.4.1.2. As all relevant tenure is freehold land and native title is likely to have been extinguished, it is anticipated that a native title agreement is not required.

1.7.4.3. Areas not subject to claim

As identified in Section 1.4.1.3, an area covering approximately 82 km of the TL MPL is not subject to any active native title claim.

MGT will give notice (a 'right to negotiate notice') to the relevant native title parties in accordance with Part 9B of the Mining Act and Part 5 of the *Native Title (SA) Act 1994*.

On the basis of the response to such notice, MGT will take the appropriate subsequent action, which may include application to the ERD Court for determination or negotiation with the native title parties to reach agreement.

1.7.5. General interests and restrictions in Project Area

Interests and restrictions in the Project Area are shown in Figure 1-9, and are described in the following Sections.

1.7.5.1. Public utility easements

RAIL

The proposed HR intersects with the existing Australian Rail Track Corporation (ARTC) Crystal Brook to Broken Hill rail line corridor at the location of Hillgrange Siding. The ARTC rail corridor is Commonwealth Land.

MGT has assessed that there is a reasonable prospect of access to the relevant land. ARTC has established a clear pathway for MGT to develop the RS adjacent the existing Hillgrange Siding, being:

- undertake a rail network connection process for the proposed connection onto the Hillgrange Siding goods loop (which will occur following front end engineering design works)
- negotiate a lease for ancillary land use on ARTC-controlled land (which will occur following a successful rail network connection process).

FORMED ROAD RESERVES

The Project Area intersects a number of formed road reserves used by the public:

- the proposed HR MPL and RS MPL both intersect Crocker Road, Nackara (DC Peterborough)
- the proposed HR MPL intersects Sawers Road, Hardy (DC Peterborough)
- the proposed TL MPL intersects:

- Lilydale Road, Faraway Hill and Warnes (DIT)
- Hogback Lane, Faraway Hill (DIT)
- Eastern Road, Warnes (DIT)
- Grassville Track, Burra Eastern Districts (RC Goyder)
- Goyder Highway, Bundey (RC Goyder, DIT)
- Bundey Church Road, Bundey (RC Goyder).

MGT has assessed that there is a reasonable prospect of access to the relevant land, with consent to apply (via this MLP) received from DIT, DC Peterborough and RC Goyder (refer Section 1.7.2 for information). Each consent provided contemplates a further agreement to authorise development within, or expanded use of, the road reserve (as may be relevant), as well as establishing shared road management practices.

POWER AND COMMUNICATIONS

A 19 kV overhead TL under the control and management of SA Power Networks is present within the TL MPL within the vicinity of Murkaby Station in the suburb of Warnes. No easement or other instrument is included as a notation on the land title.

The TL MPL terminates at the boundary of ElectraNet's Bundey Substation, Bundey.

A Telstra-operated communications tower (ref: 500750, 'Alice') is located approximately 180 m from the proposed TL MPL, within the vicinity of Kia Ora Station in the suburb of Warnes.

MGT has assessed that there is a reasonable prospect of access to the relevant land. The only access consideration regarding power and communications infrastructure is the existing 19 kV TL (no easement identified on the relevant title). The TL will require a crossing of the existing 19 kV line, which will be discussed with SA Power Networks and a plan proposed based on relevant technical standards.

WATER

No infrastructure associated with an SA Water distribution systems is located within the Project Area.

1.7.5.2. Defence land

The nearest Defence land to the Project Area is the Proof and Establishment Range near Port Wakefield, which is approximate 100 km west-southwest of the TL connection at Bundey Substation. The nearest Defence land to the ML is the Cultana Training Area, which is approximately 180 km to the west of the Project Area.

1.7.5.3. Other potential restrictions

The application area does not fall within the Adelaide Dolphin Sanctuary or the Adelaide International Bird Sanctuary, both of which are in excess of 100 km from the Project Area.

The application area does not fall within any marine park.

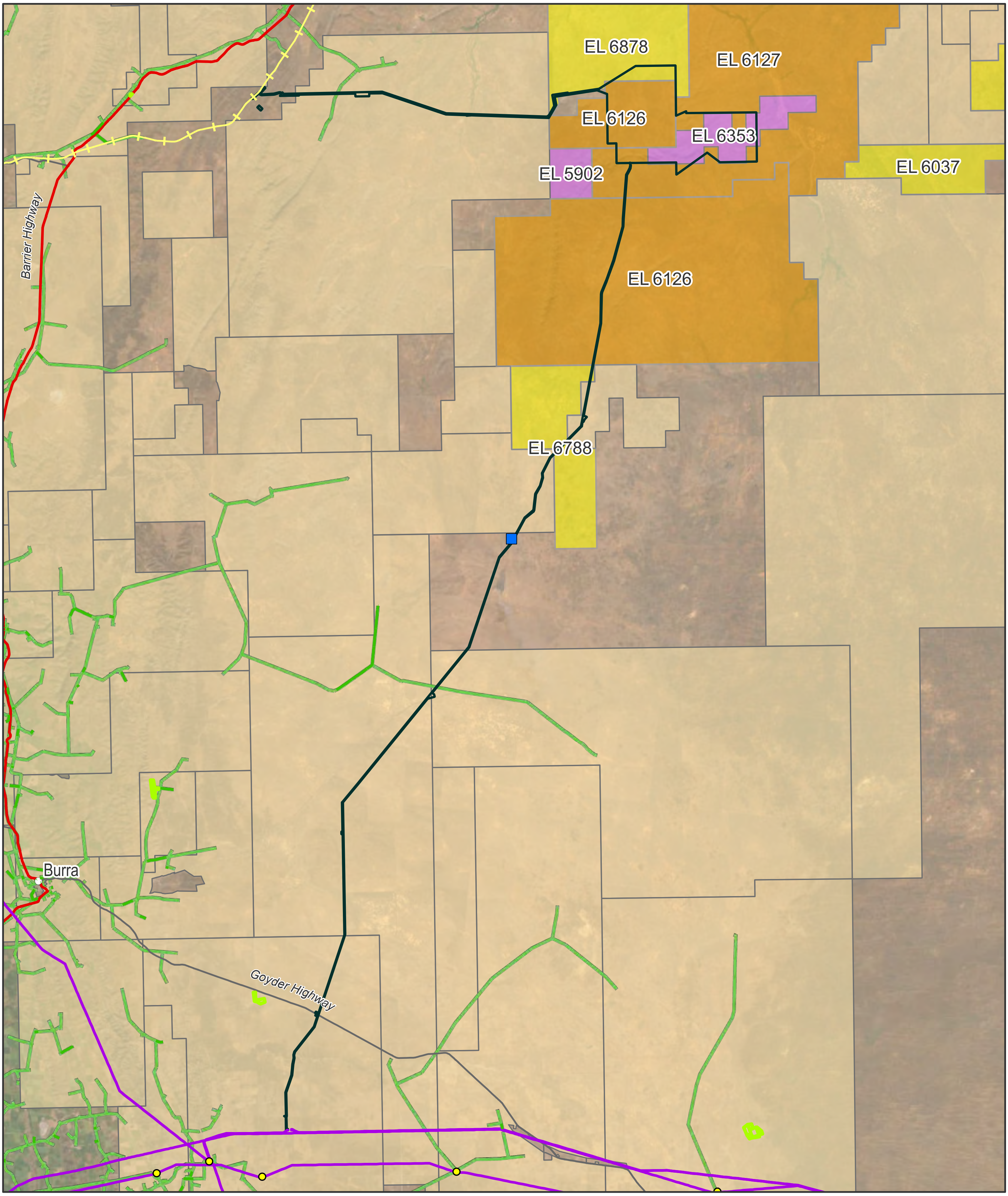
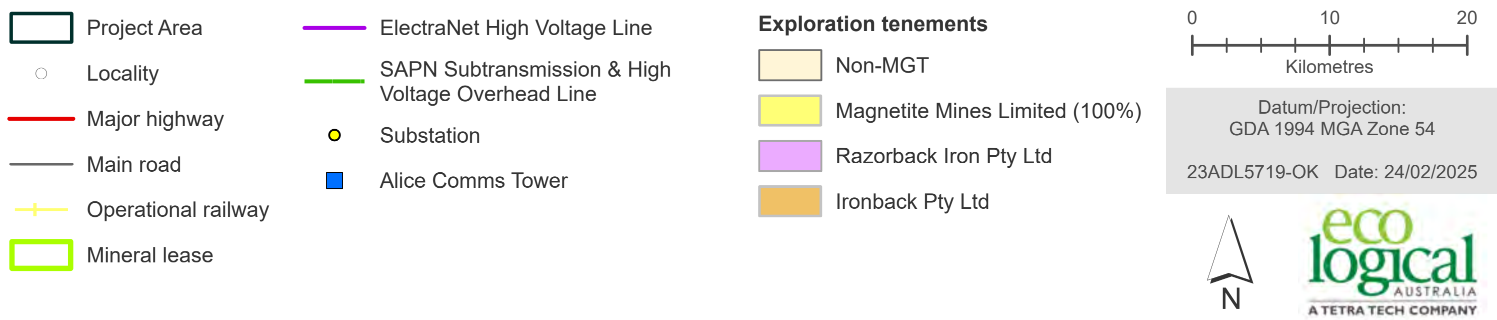


Figure 1-9: Interests and restrictions



1.7.6. Project process water supply

This Section is a summary of Appendix A6 and is provided to demonstrate and validate that the Project can be effectively and efficiently mined through the provision of process water that is subject to an alternative approvals process. MGT acknowledges that the assessment of effective and efficient mining includes consideration of the reasonable access to water to support the intended use.

A water supply of approximately 11 GL/a is required to service the Project. It is proposed that development of a coastal desalination plant, supporting infrastructure (including power supply), seawater intake and outfall, and a supply pipeline between the desalination plant and the proposed RS MPL at Hillgrange can provide the required water for the Project.

Note: the continuation of the process water supply pipeline from Hillgrange to the process plant is within the scope of this MLP and is located within proposed MPLs and MLs. A description of the proposed Project process water supply that is subject to approval under this MLP is provided in Section 4.8.6.2.

1.7.6.1. Process water supply option studies

MGT has investigated a range of potential process water supply options for the Project, with the objective to sustainably source 11 GL/a of potable-quality water that also has potential for future scalability. Between the period 2019 and 2023, MGT assessed supply opportunities from the following options:

- near-Site brackish-saline groundwater systems – predominantly the Paleoproterozoic Adelaide Geosyncline fractured rock aquifer
- regional saline groundwater systems, inclusive of Murray Basin aquifers – categorised as the Northern and Northwestern Murray Basin groundwater areas
- extraction from the Stockyard Plains Salinity Management Basin (SPSMB) – including (1) basin extraction only, (2) basin extraction supplemented with near-basin groundwater and (3) basin extraction supplemented with Northwestern Murray Basin groundwater
- offtake from existing water authorities
- offtake from the Northern Water Supply project
- seawater intake.

All options excluding offtake from existing water authorities or the Northern Water Supply project would require desalination and treatment prior to its use.

A summary of the conceptual supply model and relevant assessments completed for each process water supply option is provided in Appendix A6.

1.7.6.2. Selection of preferred process water supply

Each of the process water supply options described in Section 1.7.6.1 have been assessed to determine their feasibility, cost and development risk to establish the preferred supply option that supports the effective and efficient mining of the Project.

Outcomes of this assessment are presented in a relative performance assessment format in Appendix A6.

Table 1-15: Summary of relative assessment of factors of process water supply options

Factor	Near-Site groundwater	Regional groundwater – Northern Murray Basin	Regional groundwater – Northwestern Murray Basin	SPSMB	SPSM + SPSMB Groundwater	SPSMB + Northwestern Murray Basin	SA Water offtake	Northern Water Supply offtake	Seawater (coastal desalination)
Supply access (if 'No', no further assessment warranted)									
Potential for supply access	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Water resource potential									
Reliability of 11 GL/a supply	Low	Med	Med	Low	Med	Med	-	High	High
Confidence of resource	Low	Low	Low	Med	Med	Med	-	Low	High
Scalability	Low	Med	Med	None	Med	Med	-	High	High
Potential competing major project use	No	Yes	No	No	No	No	-	Yes	No
Design and engineering complexity									
Efficient water production efficiencies	Low	Med	Med	High	High	High	-	High	Med
Efficient water transfer/pumping	Med	High	High	Med	Med	Med	-	Low	Med
Novel and/or scaled technology risks	Low	Low	Low	Med	Low	Low	-	Low	Low
Costs and cost risks									
Preliminary resource assessment cost risks	High	High	High	Low	Med	Med	-	Low	Low
Capital cost	Med	Med	Med	Med	Med	Med	-	High	High
Operational cost	Med	Med	Med	Med	Med	Med	-	High	High
Regulatory and approvals									
Regulatory complexity	Low	Med	Med	High	High	Med	-	Low	Low
Approvals complexity	Low	High	High	Med	Med	High	-	Med	High
Environmental and access									
Established third-party users of resource	Yes	Yes	Yes	No	No	Yes	-	No	Yes
Presence of sensitive/protected communities, species and habitats	Med	High	High	High	High	High	-	Med	High
General land disturbance extent	Med	Med	Med	Med	Med	High	-	High	Med
Generation and discharge of brine	Yes	Yes	Yes	Yes	Yes	Yes	-	No	Yes
Land access complexity (including productivity impacts)	Low	Med	Med	Med	Med	Med	-	High	Med

Based on these results, MGT has determined that seawater (coastal desalination) is the most suitable supply option and represents an effective and efficient water supply option for the Project. The predominant factors contributing to this selection are discussed below.

Water resource potential	The seawater option has the highest water resource potential compared with other options. The scale of resource is vast, supply can be scaled, and reliability is high. Comparatively, SPSMB and groundwater options are compromised with regards to confidence in the presence of sufficient resource and scalability. The northern Murray Basin groundwater option may also be subject to future competing use.
Design and engineering complexity	While the seawater option has potential high water production efficiencies (i.e., singular water production process), the distance between production and usage is relatively large. Options using the SPSMB are assessed to have high production complexity given the need to operate multiple water production facilities (SPSMB extraction and groundwater options) or desalinate water at very high recovery rates (SPSMB option). Technology risks are generally low across most options.
Costs and cost risks	Seawater process water supply has a high capital and operational cost profile comparative to some other options (i.e., connection to existing water supply schemes); however, as most options require desalination, it is anticipated that cost differences are not material in most cases. Preliminary capital estimates (Class 4 and 5 based on the applicable AACE Cost Estimate Classification System) for seawater and SPSMB supply options support this assessment that cost profiles are relatively similar. All options that include the extraction of groundwater will have higher costs for preliminary resource assessment programs (i.e., investigations to confirm nature, extent and sustainable use levels of groundwater resources).
Regulatory and approvals	While overall regulatory complexity for the seawater process water supply option has been assessed as low, the approvals process will be expansive and extensive. Regulatory complexity has been assessed as higher for those options involved the SPSMB given the additional interfaces with the MDBA and the Joint Governments.
Environmental and access	Most options have a high probability of third-party use of the water resource (i.e., pastoral/farming applications) and for sensitive or listed species and communities. Brine discharge will need to be managed by MGT for all valid options except Northern Water Supply. Land disturbance profiles and land access complexity are relatively comparable across most options.

1.7.6.3. Detailed scoping of seawater desalination supply

With the selection of seawater (coastal desalination) as the preferred process water supply for the Project, MGT commissioned scoping and assessment programs to progress and inform the associated design, approvals and access processes.

INTAKE AND OUTFALL PARAMETERS AND MARINE CONSTRUCTION CONSIDERATIONS

Preliminary assessment of marine infrastructure requirements and approaches has been completed by GHD. The proposed 11 GL/a water supply requirement, or 30 Megalitres per day (ML/d), equates to:

- an intake of 79 ML/d (conservatively assuming 95% availability and 40% recovery rate of the desalination plant)
- outfall discharge of 49 ML/d.

Intake and outfall hydraulics have been assessed in Appendix A6 as a determinant in the identification of potential construction methodologies for the relevant marine infrastructure. Conduit diameters and intake and outfall lengths are key constraints when considering the potential construction methodologies. Horizontal directional drilling (HDD), micro-tunnelling and lay on bed methods have previously been used for the construction of desalination plant intake and outfalls in both Australia and internationally and are to be considered for this project. Drill and blast methods have not been considered at this time.

Intake and outfall parameters, along with construction methodologies, will be refined through engineering study programs. This information provides relevant context as to the feasibility of the preferred process water supply option and informs the identification and assessment of coastal desalination plant sites.

IDENTIFICATION OF COASTAL DESALINATION PLANT SITE OPTIONS

MGT commissioned GHD to complete a site assessment for the coastal desalination plant. Locations to be considered included those on the eastern side of the Spencer Gulf, generally between Wallaroo and Mambray Creek outlet.

Three priority desalination plant sites were identified by GHD, with each subject to a detailed assessment based on the following oceanographic and land features:

Oceanographic features:

- Seawater conditions – salinity, temperature, currents, tides
- Seabed conditions – water depth, benthic conditions/habitat, seafloor substrate
- Exclusion zones – Marine Parks
- Climate change - sea level rise, storm surge risk
- Commercial fishing and navigation

Land features:

- Land use and zoning, land availability
- Topography
- Native vegetation
- Soil and geology
- Proximity to power and road access

SELECTION OF PREFERRED DESALINATION PLANT SITE

A Multi-Criteria Assessment (MCA) was undertaken by GHD and MGT to evaluate the three potential desalination plant sites based on a range of critical criteria as summarised below:

- oceanographic and land features (as per above assessment)
- financial
- site acquisition and compatibility
- constructability and design
- environmental impacts and approvals
- power availability (in addition to proximity to power that was considered under ‘land features’).

It is noted that the financial assessment was completed based on the relative scale of infrastructure estimated to be required for each of the sites (i.e., length of supply pipeline to the mine, length of intake / outfall, length of access road or power connection). Further, the constructability assessment was completed based on the potential methods available for intake and outfall development and a relative comparison based on GHD’s experience on similar projects.

The MCA resulted in the identification of a preferred desalination plant site north of Port Pirie. MGT has elected to not formally disclose the location of the preferred site until such time that access discussions with the site owner have been finalised (refer to Section 1.7.6.4 for further discussion). It is noted for clarity that the proposed desalination plant is not subject to approval under this MLP, and a separate approvals process will apply (refer Section 1.7.6.5).

ASSESSMENT AND SELECTION OF PIPELINE ROUTE

MGT commissioned ELA (ELA, 2023c) to complete a preliminary constraints assessment on a broad pipeline corridor concept between Hillgrange and Port Pirie that analysed various environmental, social and administrative factors. The assessment identified material issues that are relevant regionally and would be representative of a range of pipeline pathing options. Those items assess as material include:

- ecology – potential for MNES
- coastal environment – impacts and approvals
- development approval risks due to multiple administrative authorities and stakeholders
- future works for field verification and micro-siting.

MGT's preliminary alignment for the process water supply pipeline between the preferred desalination plant site and the RS MPL at Hillgrange proposes to use the ARTC-controlled rail corridor for the majority of the required alignment. The ARTC rail corridor extends to within approximately 3 km of the preferred desalination plant site and can satisfy more than 95% of the pipeline's land access requirements.

A summary of outcomes from the constraints assessment and the pipeline route selection rationale is provided in Appendix A6.

The preliminary alignment in Figure 1-10 is displayed between Hillgrange and Port Pirie only, reflecting the decision to not disclose the chosen desalination plant location.

It is noted for clarity that:

- the proposed pipeline between the desalination plant and Hillgrange is not subject to approval under this MLP, and a separate approvals process will apply (refer Section 1.7.6.5)
- the continuation of the process water supply pipeline within the HR MPL is included within the scope of this MLP and is described in Section 4.8.6.2.

Figure 1-10: Preliminary pipeline alignment (not in MLP scope), Hillgrange to Port Pirie

Localities
Operational railway
Project Area

Pipeline alignments
Preliminary alignment
Optimisation option

GDA 1994 MGA Zone 54 | 1:600,000 @ A3
Author: A Kane | Date: 14/01/2025
Razorback MLP / Referral

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1.7.6.4. Land access for process water supply development

MGT has commenced discussions with ARTC regarding the proposal to construct the pipeline within the rail corridor. Correspondence received from ARTC confirms their in-principal support for the shared use of rail corridors for water supply to the Project, demonstrating their willingness to engage in further discussions and planning as a precursor to commercial negotiation and agreement.

ARTC has noted its understanding of the importance of reliable and sustainable water supply to large-scale mining operations, with their in-principal support intended to facilitate the water supply necessary for the Razorback Project as a significant regional economic development opportunity.

MGT and ARTC are finalising a MoU as part of the pipeline planning process, further demonstrating ARTC's supportive position.

The proposal to construct and operate a desalination plant has been discussed with the relevant private landowner. Following requests from the landowner, MGT has repositioned the proposed plant footprint within the property to reduce overall impacts. Commercial negotiations with the private landowner are continuing.

Access to other properties may be required; these negotiations will commence in concert with delineation of the final footprints and pipeline pathing.

MGT has also signed a Memorandum of Understanding (MoU) with the Port Pirie Regional Council (PPRC) that provides a framework for community participation in the planning of any proposed infrastructure developments within the council area (refer to Section 5.4.2.3 for further information). The MoU framework will drive continued collaboration between MGT and PPRC to ensure those Sections of the proposed process water supply infrastructure located within the PPRC area are responsibly delivered.

1.7.6.5. Proposed approvals pathway

STATE APPROVALS PROCESS

Information on the proposed development approvals pathway for the Project water supply is included in Section 1.8.1, with consideration given to processes prescribed in both the Mining Act and *Planning, Development and Infrastructure Act 2016* (PDI Act).

COMMONWEALTH APPROVALS PROCESS

Section 74A of the EPBC Act provides that the Minister responsible for the administration of that Act may refuse to accept a 'split referral'. In this context, a split referral is an action is which is part of a larger action that has not been referred or has been referred in a series of lesser referrals. It ensures all relevant impacts of an action are assessed and prevents a situation where impacts of each individual part of the action are deemed to not be significant, whereas consideration of the action in its entirety would have resulted in the action being found to have a significant impact on matters protected under the EPBC Act.

The Project (excluding the water source infrastructure outside the Project Area) was referred under the EPBC Act on 13 April 2024 [ref: EPBC 2024/09787]. A decision was received on 1 August 2024 that the referral for the Project was accepted under Section 24A which allows the Minister for the Environment and Water (Cth) to accept a referral that does not include all components of a larger action, noting the water supply pipeline and desalination plant linked to the action were not included in the referral.

A self-assessment considering potential impacts on MNES will be completed when sufficient information is available, and a referral of the process water supply infrastructure will be submitted if required.

1.7.6.6. Statement of the selection of the Project process water supply as supporting effective and efficient mining

This Section has sought to establish the necessary context of the intended Project process water supply to demonstrate that the Project has a valid, effective and efficient water supply model.

Assessment of the numerous water supply options has been reported, with a matrix of the relative advantages and disadvantages of each option documented across six assessment categories (Table 1-15). This assessment has led to the identification of the seawater (coastal desalination) option as the preferred process water supply for the Project. The rationale for this selection has been documented with its resource confidence, non-competing nature of the resource, scalability, efficiency of water production and lower comparative regulatory complexity of particular benefit.

The location of the preferred desalination plant site north of Port Pirie has been achieved through a MCA process, considerate of oceanographic, land, financial, constructability and other factors. The preliminary pipeline alignment has targeted the use of an existing transport (rail) corridor as an efficient means to reduce potential environmental and social impacts, with the corridor's landowner providing in-principal support for the development.

Approval pathways for the process water supply development have been assessed and a valid, effective approach has been defined under the PDI Act and EPBC Act.

MGT can confirm that capital and operating costs for the desalination plant, supporting infrastructure and the pipeline have been included in both the Project's current economic model and in the most recent Ore Reserve model – underscoring the viability and efficiency of the proposed process water supply solution and the ability to mine the Iron Peak and Razorback deposits effectively.

MGT has assessed that there is a reasonable prospect of access to and mining within the relevant land, with an effective and efficient process water supply identified for the Project and with supporting engineering, land access and approvals programs continuing or being commissioned.

1.8. Other approvals

The Project requires a selected range of additional development approvals in parallel to those approvals, permits; licences and other statutory processes required under the Mining Act and other Acts, as described in Chapter 2.

1.8.1. Project water supply infrastructure

A description of the proposed Project process water supply and demonstration of the validity of the proposed water supply infrastructure for the Project (contributing to the effective and efficient mining of Razorback and Iron Peak) is provided in Section 1.7.6, with further information detailed in Appendix A6.

This Section summarises the proposed development approval process for the Project water supply infrastructure, inclusive of the following development:

- desalination plant, with co-located pumping station
- marine intake and outfall infrastructure to / from desalination plant
- grid-connected power supply with site-based solar power generation
- desalination plant access road
- water supply pipeline from desalination plant to RS MPL (Hillgrange)
- potential additional pump stations and maintenance access locations (i.e., for line pigging).

1.8.1.1. Approvals pathway options

The Project process water supply infrastructure will be assessed under the EPBC Act (if required), as a stand-alone Project due to the acceptance of the current Project under Section 24A of the EPBC Act which allows the Minister for the Environment and Water (Cth) to accept a referral that does not include all components of a larger action. The self-assessment / referral process under the EPBC Act is not dependent on the State approvals pathway options discussed below.

MGT has identified three potential approvals pathways for the Project process water supply infrastructure:

- Option 1 – Approval of all water supply infrastructure under the PDI Act.
- Option 2 – Approval of all water supply infrastructure under the Mining Act.
- Option 3 – Combination approval under PDI Act and Mining Act.

The assumptions that have been applied to each of these options are recorded below.

OPTION 1 – APPROVAL UNDER THE PDI ACT

Option 1 relates to approval under the PDI Act of the both the desalination plant (and associated infrastructure) and the supply pipeline, up to the point of interface with the proposed RS MPL boundary at Hillgrange.

A detailed assessment of assessment pathways under the PDI Act are recorded in Appendix A6. Given the project scale and expected complexity in terms of constructability, land access, environmental and socio-economic impacts, the process water supply system would likely be classified as 'Impact Assessed Development' and supported by an Environmental Impact Statement (EIS) that the Minister for Planning (via the State Planning Committee) would use to determine whether to approve or refuse the development.

An impact assessed development declaration provides access to either the bilateral assessment process or interim 'accredited assessment' process (whichever prevails at the time) between the State and DCCEEW for consideration of impacts on matters of national environmental significance (MNES) under the EPBC Act; therefore, a single EIS can be used to assess impacts under the PDI Act and EPBC Act.

OPTION 2 – APPROVAL UNDER THE MINING ACT

Option 2 relates to approval under the Mining Act of both the desalination plant (and associated infrastructure) and the supply pipeline, up to the point of interface with the proposed RS MPL boundary at Hillgrange.

The application process under the Mining Act requires the submission of an adequate MPL application that provides for an integrated impact assessment process and concurrent stakeholder consultation undertaken in accordance with TOR006. Alternatively, a scoping process pursuant to Part 10 of Mining Regulations may be commissioned by MGT or required by the relevant Minister.

A new or amended PEPR would also be required that incorporates the new development, including new or changed impacts and environmental outcomes.

It is noted that the SA Coastal Reserve (inclusive of the foreshore of Spencer Gulf) is prescribed as an area reserved from the Mining Act; therefore, tenure cannot be granted over the reserve. Sections of the reserved area can be lifted through proclamation by the Governor, returning that land as 'mineral land' under the Mining Act for receipt and assessment of a MPL application and potential grant of the tenement.

A MPL application process may provide access to either the bilateral assessment process or interim 'accredited assessment' process (whichever prevails at the time) between the State and Commonwealth DCCEEW for consideration of impacts on MNES under the EPBC Act; therefore, a single EIS can be used to assess impacts under the Mining Act and EPBC Act.

OPTION 3 – COMBINATION APPROVAL UNDER MINING ACT AND PDI ACT

Option 3 relates to a dual/combined approval under both the Mining Act and PDI Act, with two project scope scenarios (battery limits for each approval activity) contemplated:

- Option 3A:
  - water supply pipeline (and associated infrastructure) assessed and approved under the Mining Act (as MPL) up to the point of the desalination plant site / development envelope boundary (i.e., activities proposed under the Mining Act do not encroach into the SA Coastal Reserve)
  - the desalination plant facility, associated infrastructure and marine structures (seawater intake and brine outfall pipelines) assessed and approved under PDI Act.
- Option 3B:
  - water supply pipeline (and associated infrastructure) and desalination plant facility assessed and approved under the Mining Act (MPL) up to the boundary of the SA Coastal Reserve (i.e., activities proposed under the Mining Act do not encroach into the SA Coastal Reserve)
  - only the desalination plant marine structures (seawater intake and brine outfall pipelines only) assessed and approved under PDI Act.

For clarity, it is noted that the SA Coastal Reserve is not subject to any development or tenure application pursuant to the Mining Act under either Option 3A or 3B.

This approval option requires the preparation of two impact assessments to satisfy both Mining Act and PDI requirements, through an MPL application and relevant PDI assessment pathway, respectively. Complexity is further increased with the requirement to assess the entirety of the process water supply development for MNES. Options that would be considered include the possibility (and validity) of two assessment processes for each of the Mining Act and PDI Act approvals programs, whether a tripartite assessment option is possible, or if a standalone EIS is the preferred approach.

1.8.1.2. Proposed process water supply approvals program

As part of the assessment of the options identified in Section 1.8.1.1, MGT completed initial consultation with DEM and Planning and Land Use Services (part of the Department for Housing and Urban Development) regarding process water supply approvals. Based on these results, and with consideration to its Project delivery strategy, MGT has determined that its proposed approvals program for process water supply is under the PDI Act in its entirety (Option 1).

Factors considered in this assessment are listed in Appendix A6, with discussion included on the rationale for the selection of the preferred approvals pathway compared to other options (where relevant).

It is noted that the proposed approvals pathway is subject to review; as MGT continues to engage with regulators and stakeholders, and progresses preliminary baseline environmental studies, new or changed factors may impact the selection of the preferred approvals process. MGT will maintain active communication with relevant regulatory authorities through this interim process.

1.8.2. Barrier Highway intersection upgrade

Connection to the state highway network is required to provide effective and efficient access for the Project's construction and operations phases, supporting the provision of equipment and supplies to the ML as well as the transit of personnel.

The ML processing plant is located between 40-45 km from the Barrier Highway, with the proposed RS located approximately 10 km from the Barrier Highway. MGT identified that the use of existing roads would be the most effective, low-impact option to achieve a highway connection from the haul and access road. Therefore, the use of Rucioch and Crocker Roads (refer Section 1.8.3 for more detail) is proposed to form the required connection onto the Barrier Highway.

The existing intersection of the Barrier Highway and Rucioch Road is inadequate for the intended Project use, with MGT proposing an upgrade to provide separate left and right turn lanes on Barrier Highway, and Rucioch Road to be sealed on approach to the intersection. This proposal was included in the basis of assessment of the Project's traffic impact study (CIRQA 2024). A map indicating the location of the proposed intersection upgrade is provided in Figure 1-11.

While originally contemplated to be included within the scope of this MLP, MGT has elected to seek separate approval of the Barrier Highway intersection upgrade given:

- ownership and management of the relevant assets are not with MGT
- security of tenure is not required for this intended activity
- the remoteness of the intersection to other proposed production tenements
- alternative, collaborative approvals processes (with DIT and DC Peterborough) are deemed to be more favourable to all parties.

As such, a parallel approval program will be established for the Barrier Highway intersection upgrade following agreement-making with the relevant road authorities. It is possible that, subject to further discussions, MGT may not be the relevant applicant with the upgrades instead be administered by the relevant road authority or authorities.

Note: vegetation associations were mapped and assessed in the vicinity of the intersection, and are reported within this MLP for completeness and future Significant Environmental Benefit (SEB) assessment purposes.

1.8.3. Rucioch Road and Crocker Road upgrade

The road connection (identified in Section 1.8.2) between the HR and the Barrier Highway will require the widening of Crocker Road and Rucioch Road, with upgrades also proposed to:

- the ARTC rail line crossing
- the intersection of Rucioch Road, Crocker Road, Bullyaninnie Road and Smith Road.

A map indicating the locations of the proposed road, intersection and crossing upgrades is provided in Figure 1-11.

While originally contemplated to be included within the scope of this MLP, MGT has elected to seek separate approval of upgrades to Rucioch Road, Crocker Road and the relevant crossing / intersections given:

- ownership and management of the relevant assets are not with MGT
- security of tenure is not required for this intended activity
- alternative, collaborative approvals processes (with DIT and DC Peterborough) are deemed to be more favourable to all parties
- alignment with the preferred approval strategy for the Barrier Highway intersection development (with Rucioch Road).

As such, a parallel approval program will be established for the proposed upgrades following agreement-making with the relevant road authorities. It is possible that, subject to further discussions, MGT may not be the relevant applicant and instead be administered by the relevant road authority or authorities.

Note: vegetation associations were mapped and assessed in the vicinity of the intersection, and are reported within this MLP for completeness and future SEB assessment purposes.

1.8.4. Other potential approvals – pre-development phase

A range of unformed road reserves exist within the proposed Project Area (refer Section 1.7.2). The relevant road authorities are expected to assess the current and future use of these unformed road reserves, with consideration given to whether the reserves may be closed pursuant to the *Roads (Opening and Closing) Act 1991*.

Should such a determination be made, MGT will not be the applicant of any closures, and these processes will be administered by the relevant road authority.

1.8.5. Other potential approvals – construction and operations

MGT has proposed the adoption of the Peterborough Transit Hub model to support the movement of personnel from metropolitan and regional areas to the Site. This model, supported in-principle by DC Peterborough, aims to aggregate personnel in Peterborough (through air [charters to Peterborough Aerodrome], bus and/or private vehicle transport) for transfer to the Site via a dedicated coach service.

Further information on the Peterborough Transit Hub model is included in Section 4.11.1.2.

The potential benefits of the Peterborough Transit Hub include:

- minimising the use and opportunity costs of FIFO workforce structures
- maximises the accessibility to and potential participation (employment) in the Project by residents from Peterborough, the Mid North region and the Upper Spencer Gulf region
- improved population retention or attraction prospects within Peterborough
- opportunities for Peterborough businesses to serve a transiting workforce
- additional socioeconomic benefits accrued through potential increased local employment, service provision and population.

The proposed hub may require the provision of improved or additional facilities at the Peterborough Aerodrome, as well as car parking and coach transfer facilities at the Aerodrome or within the town itself. A collaborative strategic planning process has been proposed to DC Peterborough and Regional Development Australia – Yorke and Mid North to assess options and delivery modes that reflect community objectives. The strategic planning process would also include other private users of the Aerodrome along with potential Government representation.

Development approvals may be required, along with any relevant airside or landside authorisations, for the Peterborough Transit Hub model. A parallel approval program will be established for the proposed upgrades following the strategic planning process. It is possible that, subject to further discussions, MGT may not be the relevant applicant and instead be administered by an alternative proponent.

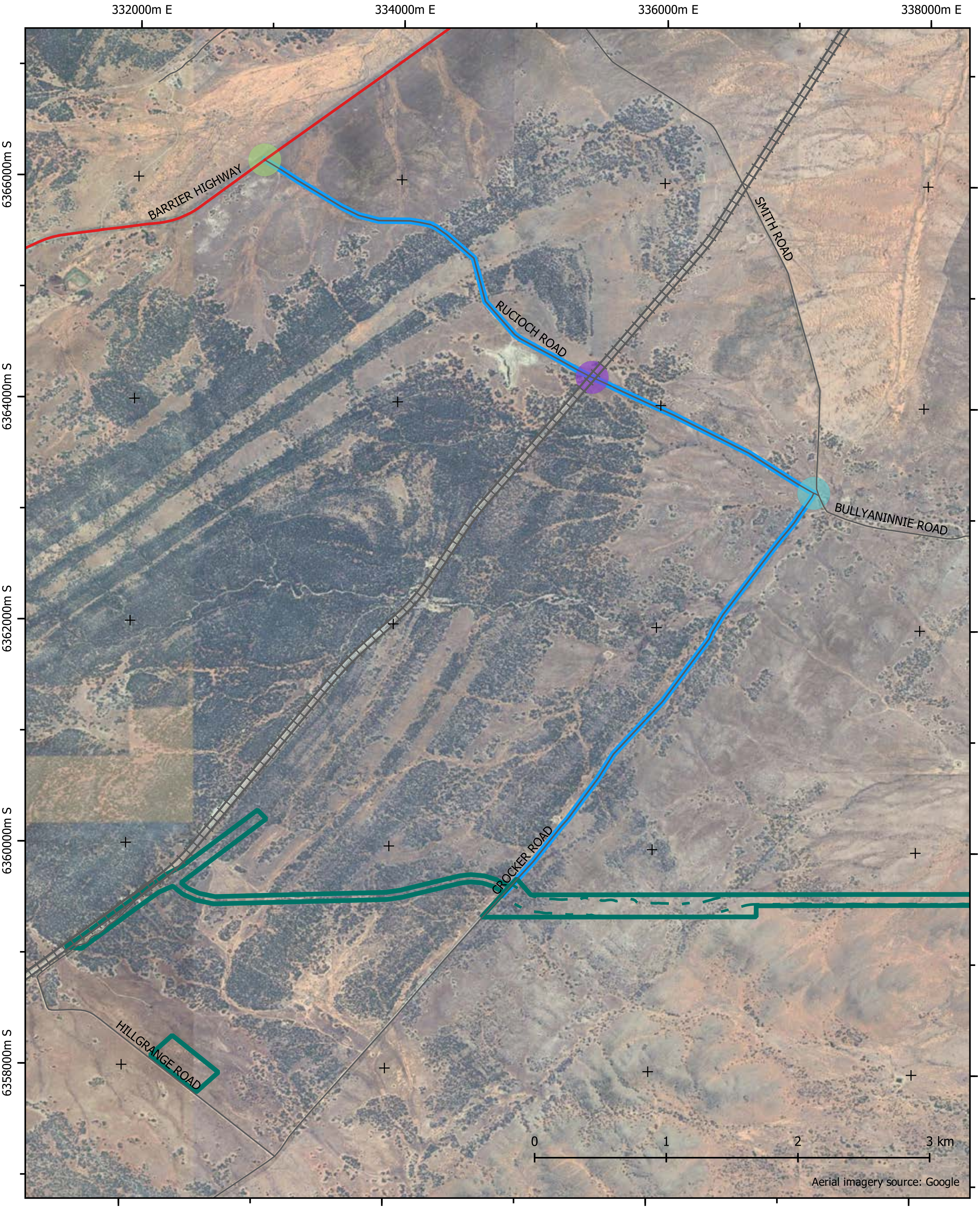

Figure 1-11: Location of activities subject to other approvals, road access

Project Area
Conceptual Footprint
Roads (classified)
Highway
Local
Operational railway

Locations of other approvals
Potential road surface upgrades
Barrier Highway-Ruchioch Road intersection
Rucioch Road rail crossing (ARTC)
Rucioch, Crocker, Smith and Bullyaninnie roads intersection

GDA 1994 MGA Zone 54
1:30,000 @ A4
Author: A Kane
Date: 31/01/2025
Razorback MLP / Referral

MAGNETITE MINES

Chapter 2

Regulatory framework

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter provides an overview of the primary SA and Commonwealth regulatory frameworks relevant to the Razorback Iron Ore Project, being:

- *Mining Act 1971 (SA)*
- *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*.

Information on the secondary State and Commonwealth regulatory frameworks applicable is also provided.

2. Regulatory framework

This Section sets out the regulatory framework which relates to the Project, including the interaction with State Mining Act, *Environment Protection Act 1993* (EP Act), *Native Vegetation Act 1991* (NV Act), *Aboriginal Heritage Act 1988* (AH Act), and Federal (e.g., EPBC Act, and NT Act legislation. These Acts, their corresponding regulations and associated statutory instruments, prescribe the primary and secondary approval processes to be met by the Project.

2.1. Mining Act

The Mining Act is the principal legislation for mining regulation in SA and is administered by the Department for Energy and Mining (DEM) on behalf of the Minister for Energy and Mining (SA). The Mining Act and the associated *Mining Regulations 2020* provide the regulatory framework for SA's mining industry.

Under the Mining Act, a two-stage approval process applies to proposed mining operations in SA:

- Stage 1 – Holding an ML, and any associated MPLs if applicable. The application for an ML must be accompanied by:
    - A proposal that complies with Section 36 of the Mining Act, regulations 46 and 47 of the Mining Regulations, and any determinations set out in the Terms of Reference (TOR) for the Project.
    - Information that complies with regulation 30 of the Mining Regulations and any determinations set out in the TOR for the Project.
    - A declaration of accuracy that complies with regulation 83 of the Mining Regulations.

  The application for MPLs must be accompanied by:
    - A proposal that complies with Section 49 of the Mining Act, regulations 46 and 47 of the Mining Regulations and any determinations set out in the TOR for the Project.
    - Information that complies with regulations 37 and 38 of the Mining Regulations and any determinations set out in the TOR for the Project.
    - A declaration of accuracy that complies with regulation 83 of the Mining Regulations.
- Stage 2 – Having operational approval through an approved PEPR. The PEPR is submitted to DEM once a ML and / or MPL is granted. Once the PEPR has been approved, mining and any associated approved activities can commence.

Figure 2-1 outlines the two-stage assessment process under the Mining Act.

2.1.1. Regulatory guidelines

This MLP has been prepared to meet the specific requirements set out in Terms of Reference 006 –Mineral Mine Lease / Licence Applications (DEM, 2020a) updated by DCCEEW and DEM to include minimum requirements to apply for a ML / MPL for the Project (referred hereafter as the TOR) and the Minerals Regulatory Guideline MG2a – Preparation of a mining application for metallic and industrial minerals (DEM 2020b) (referred hereafter as MG2a).

The content required in this MLP, as outlined in the TOR and MG2a, is as follows:

- basic information on the proposed mine
- declaration of accuracy requirement
- description of the existing environment
- description of proposed mining operations
- consultation
- management of environmental impacts
- reasonable prospect of access to land
- description of contributions to the economy
- reserves or resources (or both).

DEM will assess this MLP in collaboration with relevant government agencies and make a recommendation to the Minister. This decision will be based on the proposed level of impact and whether this impact is deemed acceptable, considering the economic and social benefits, and management via the proposed control measures.

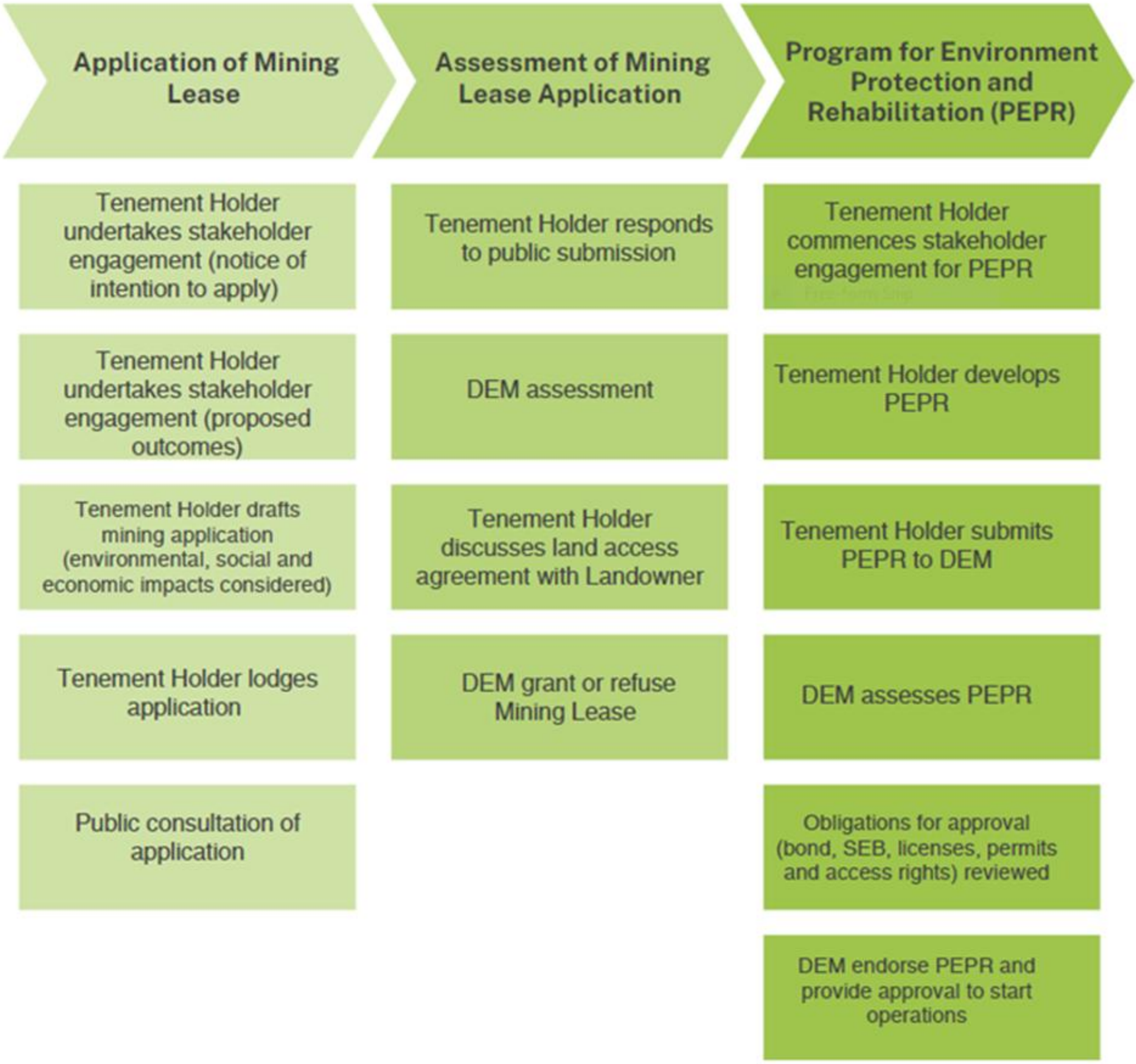

Figure 2-1: Mining Act assessment process (adapted from DEM, 2020)

2.2. EPBC Act

The EPBC Act is the Commonwealth Government's principal environmental legislation in place for the protection and management of Matters of National and Environmental Significance (MNES). The EPBC Act is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

A valid referral under the EPBC Act was accepted by DCCEEW on 13 April 2024 [ref: EPBC 2024/09787]. A request for further information (RFI) was received by MGT on 24 April 2024, and the response to the RFI was determined by DCCEEW as sufficient on 9 July 2024. A decision was received on 1 August 2024 that the referral for the Project was accepted under Section 74A which allows the Minister for the Environment and Water (Cth) to accept a referral that does not include all components of a larger action, noting the water supply pipeline and desalination plant linked to the action were not included in the referral. The decision was also made that the Project is a controlled action, and further assessment is required. Due to minor layout changes identified during Project development, the footprint of the final Project will be, in part, outside of the area referred to under the EPBC Act. A formal request for variation to change the assessed footprint was submitted to DCCEEW on 31 December 2024. However, as the changes reduce the Project footprint and do not result in increased impacts on MNES, it is anticipated the change will be accepted by the Minister for the Environment and Water (Cth) without requiring any changes.

The Project was determined as a controlled action as DCCEEW consider it likely that it will have a significant impact on EPBC-listed threatened species and communities (Sections 18 and 18A of the EPBC Act). Specifically, the relevant Matter (the controlling provision) is the Threatened Ecological Community (TEC) Mallee Bird Community of the Murray Darling Depression Bioregion (MBC of the MDDB) (Endangered) which is protected under Section 18A of the EPBC Act.

DCCEEW determined that DEM should use this MLP to complete an accredited assessment on behalf of the Commonwealth Government under Section 87 of the EPBC Act, as shown in Chapter 8. This assessment provides for a single environmental assessment process conducted by the State, with DCCEEW providing comment on the MLP during the public commentary period and reviewing the Response to Submissions. At the completion of the assessment, DEM's Assessment Report will be provided to DCCEEW, assessing the likely impacts of the Project on MNES.

The Minister for the Environment and Water (Cth) will then make an approval decision. On approval, a Decision Notice will be issued, including implementation conditions to be applied to the Project under Commonwealth legislation, including the potential requirement for provision of an environmental offset.

Construction and operation of the Project may not commence until the Minister for Environment and Water (Cth) has made an approval decision, independently of the state approval of the PEPR.

2.3. EP Act

The EP Act is administered by the SA Environment Protection Authority (EPA). The purpose of the EP Act is to protect the state's environment (land, air and water) and allow risk-based regulation of pollution, waste, noise and radiation. Under Section 25 of the EP Act, general environmental duty is established, requiring that an activity that pollutes, or might pollute the environment must not be undertaken unless all reasonable and practicable measures to minimise harm are implemented.

Where the proposed mining operation involves activities listed in Schedule 1 of the EP Act (e.g., mineral processing), an authorisation in the form of a works approval is required from the EPA and a licence must be obtained before these activities may commence. Section 35 also requires that a works approval is authorised in relation to construction or alteration of a building or structure to be used for a prescribed activity of environmental significance. Section 36 of the EP Act establishes the requirement for licensing, where a prescribed activity of environmental significance must not be undertaken without obtaining an environmental licence.

2.4. NV Act

The NV Act is a key piece of legislation for the management of native vegetation on both private and public land in SA. It promotes the conservation, management and regeneration of native vegetation and seeks to ensure personal and public safety. A Significant Environmental Benefit (SEB) must be provided for any vegetation clearance under the NV Act to offset the clearance and ensure an environmental gain over and above the impacts of the approved clearance (DEWNR, 2017). The SEB may be established in several ways including monetary contribution to the Native Vegetation Fund (NVF), management of native vegetation for conservation purposes, direct revegetation and/or on-ground works.

The approach to providing an SEB in relation to the proposed clearance for the Project is provided in Section 4.9.2.

2.5. AH Act

Any Aboriginal site, object or remains, whether previously recorded or not, is covered under the blanket protection of the AH Act. It ensures the protection of Aboriginal sites by making it an offence to damage or not report the finding of a heritage site. The AH Act provides the following definition of an Aboriginal site in Section 3:

> ***Aboriginal site*** *means an area of land –*
>
> > *(a) That is of significance according to Aboriginal tradition; or*
> >
> > *(b) That is of significance according to Aboriginal archaeology, anthropology or history,*
>
> *and includes an area or an area of a class declared by regulation to be an Aboriginal site but does not include an area or an area of a class excluded by regulation from the ambit of this definition*

The AH Act is relevant given the potential to encounter Aboriginal sites in the Project Area (refer Section 3.16.1)

2.6. NT Act

The NT Act adopts the common law definition of native title, defined as the rights and interests that are possessed under the traditional laws and customs of Aboriginal people in land and waters, and that are recognised by the common law. These rights may exist over Crown Land but do not exist over land held as freehold title. The NT Act recognises the existence of an Aboriginal land ownership tradition where connections to country have been maintained and where acts of government have not extinguished this connection.

2.7. Local Government

The Project Area is located within the DC of Peterborough, RC Goyder and the OCA (refer Figure 3-62). The zoning and relevant policies for the Project Area under each district are provided in this Section.

2.7.1. District Council of Peterborough

The DC of Peterborough Strategic Plan 2020 — 2022 (DC Peterborough, 2020) outlines the services the council plans to deliver to ensure the "community continues to enjoy a safe lifestyle, enhances the natural environment, and continues to facilitate a vibrant, sustainable local economy".

The Strategic Plan outlines several objectives for the region based on five key themes:

1. Economic sustainability.
2. Infrastructure.
3. Community wellbeing.
4. The environment.
5. Representative and accountable local government.

The Project would support the Council's economic sustainability objective 1.3 "*Facilitate new businesses development & employment opportunities"* by providing local employment and business opportunities.

2.7.2. Regional Council of Goyder

The Goyder Master Plan 2022 – 2037 (RC of Goyder, 2022) is a strategic document that outlines the visions and goals of the RC Goyder over the next 15 years. The Master Plan outlines pillars and objectives for the region, of which those relevant to the Project include:

- *Strengthening community. A well-resourced, active and connected community.*
- *Economic resilience. A strong economy that supports job growth, opportunities for community and business development for diverse community.*
- *The environment and heritage are valued and protected. A responsible and well-informed management of the natural and built environment and cultural heritage.*

Local employment and business opportunities supported by the Project would help to achieve the strengthening community and economic resilience objectives. The Project would implement environmental management measures to ensure the natural and built environment and cultural heritage is protected.

2.7.3. Outback Community Authority

The OCA Strategic Management Plan 2020-25 (OCA, 2020) outlines the vision for the region that *"an inspired and empowered community will ensure a more resilient Outback into the future"*. 'Grow our Economy' is one of three key objectives identified in the plan, with this aimed at facilitating opportunities and new investment in the Outback. The Project would provide opportunities for long-term investment for communities in Yunta and surrounding region.

2.7.4. Planning and Design Code

Effective from 31 July 2020 all outback and rural areas in SA were transitioned into and under the new state-wide planning system (PlanSA), which is underpinned by the Planning and Design Code (P&D Code).

The P&D Code includes spatial planning zones which determine the types of development that can occur in different areas. Each zone has specific 'desired outcomes' and 'performance outcomes' that respectively describe the intended result or purpose of development within a zone, and how the desired outcomes can be achieved. The Site, and the eastern section of the HR is located within the 'Remote Areas' zone, whilst the western part of the HR is within both the 'Remote Areas' and 'Rural' zones.

The stated Desired Outcome for the Remote Areas zone is:

> *A zone that includes a diverse range of uses including pasture growing, grazing, farming, agricultural processing and transportation, mining and petroleum, energy generation and storage, pipeline infrastructure, aerospace and defence related facilities, Aboriginal lands and related activities, tourist development, workers accommodation and settlements.*

The Project, inclusive of mining, workers' accommodation and water infrastructure (pipeline) within the proposed HR MPL and ML, sits well within the desired outcome for the zone.

The stated Desired Outcomes for the Rural zone are:

> *DO1: A zone supporting the economic prosperity of SA primarily through the production, processing, storage and distribution of primary produce, forestry and the generation of energy from renewable sources.*
>
> *DO2: A zone supporting diversification of existing businesses that promote value-adding such as industry, storage and warehousing activities, the sale and consumption of primary produce, tourist development and accommodation.*

As only part of the HR and the RS are within the rural zone, these land uses consistent with the desired outcomes.

There are no known plans for future changes in land use by other parties for the local area surrounding the proposed tenements. MGT is not aware of any future land use changes associated with the Project Area or immediate surrounding areas. MGT notes that renewable energy projects are proposed within or proximate to the TL but these are in accordance with the existing Desired Outcomes for the area.

The Project Area is outside the Woomera Prohibited Area.

2.8. Other legislation

Several other items of SA and Commonwealth legislation are also applicable to mining operations and have been considered for the Project through the assessment and management of impacts discussed in Sections 7 and 8. Awareness of and compliance with the requirements of other relevant legislation is important for a cohesive assessment and supports the development of the PEPR.

MGT will comply with all relevant State and Commonwealth legislation and regulations applicable to the Project.

Chapter 3

Description of the existing environment

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter provides a detailed characterisation of the existing environmental and social conditions of the area in which the Razorback Iron Ore Project is located. The descriptions provided here are sourced from multiple years of field-based studies and review of existing resources, and cover:

- topographic and climatic
- local and regional geology, including geochemical considerations
- terrestrial and aquatic ecology
- hydrological and hydrogeological conditions
- ambient noise and air quality conditions
- existing traffic loads
- community and social matters.

Protected heritage matters are also discussed.

Information on the potential predicted presence, or otherwise, of State and Commonwealth protected species and communities is also included within the Chapter.

3. Description of the existing environment

This Chapter provides an overview the existing environmental conditions within the Project Area and the regional setting relevant to development and operation of the proposed Project, with detailed supporting information provided in Appendix B. The information contained within this Chapter has been described sufficiently to provide a baseline for environmental and social impact assessment (SIA) (detailed in Chapter 7) undertaken in accordance with the requirements of the TOR.

The TOR sets out each element of the existing environment to be considered, with each being described only to the extent that they may need to be considered in assessing the potential impacts of the mine operations. Each of the elements listed in the TOR are considered relevant, and are discussed in this Chapter.

3.1. Topography and landscape

The Interim Biogeographical Regionalisation for Australia (IBRA) classifies landscapes across Australia into bioregions based upon common climate, geology, landform, and biodiversity information. These bioregions are then further refined into subregions.

According to the Interim Biogeographic Regionalisation for Australia (IBRA, Version 7), the Project Area is located within the two Bioregions;

- Flinders Lofty Block (FLB) and
- Murray Darling Depression (MDD).

Within these IBRA regions, three subregions are present across the Project Area. The subregions and associated project aspects are provided in Table 3-1 and illustrated in Figure 3-1.

Table 3-1: IBRA regions and subregions (IBRA, Version 7)

Project Aspect	IBRA region	IBRA subregion
Site	FLB and MDD (southern extent)	Olary Spur and Braemar
HR	FLB	Olary Spur
TL	MDD	Braemar and Murray Mallee (southern extent)

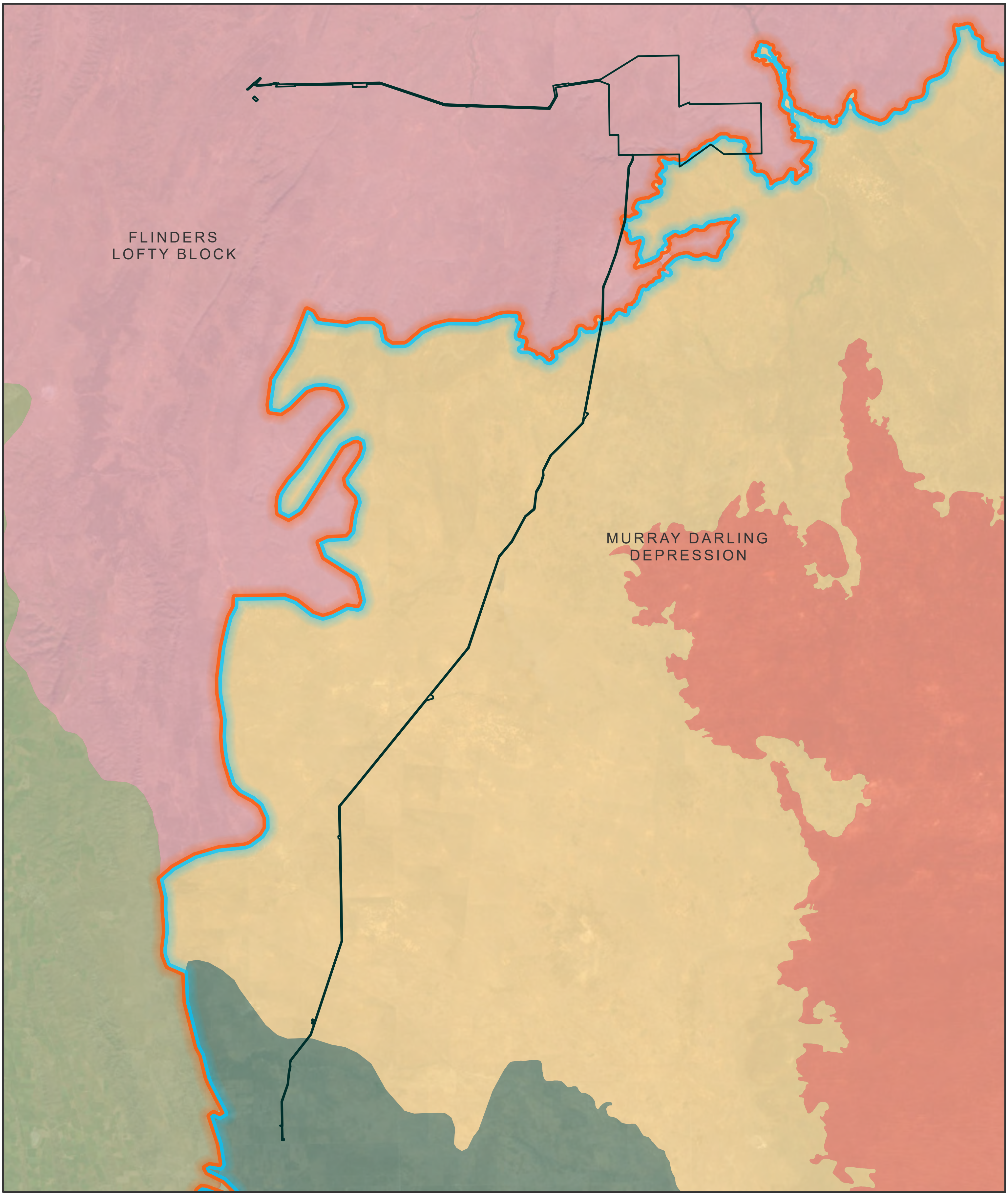

Figure 3-1: IBRA regions and sub-regions

Project Area

IBRA regions

- Flinders Lofty Block
- Murray Darling Depression

IBRA sub-regions

- Braemer
- Broughton
- Murray Mallee
- Olary Spur
- South Olary Plain

0 10 20

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 13/12/2024

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The topography of the Olary Spur subregion is dominated by the Mount Lofty and Olary Ranges which form highlands around the north-western margin of the sedimentary plains of the Murray Basin (Rogers, 1980). The northern region of the Murray Basin comprises a gently undulating plain rising gradually in elevation from approximately 45 m Australian Height Datum (AHD) near the River Murray, to about 170 m AHD where it abuts the Mount Lofty / Olary Ranges that sweep in an arc from west to north (Barnett, 2015). On the margins adjacent to the highlands, extensive flood outs and occasional low angle coalescing alluvial fans occur. Ephemeral creeks (such as Olary and Manunda Creeks) discharge onto the plains for 20 – 30 km before the flow infiltrates into the permeable sediments (Barnett, 2015).

Drainage lines have formed in the low-elevation areas at the base of the ridgelines and capture surface water runoff throughout the catchment, which is either recharged to groundwater through vertical infiltration in areas of outcropped fractured rock and/or discharged to the lower lying areas of the Murray Basin in the south-east. This process is discussed in further detail in Section 3.6 (Groundwater).

The Site is located within a series of hills that range between 500 m AHD to 200 m AHD. The western side of the site features higher elevations in contrast to the eastern side, which contains lower elevations to 250 m AHD (195-430 m above mean sea level (AMSL)) (refer Figure 3-2)).

The HR is to the west of the Site, comprising higher elevations in the west and central Sections characterised by hilly landscapes (owing to its proximity to the Olary Ranges), before decreasing in altitude to join the site topography described above (refer Figure 3-3, and to Figure 3-2 for corresponding cross-section location).

The TL will extend approximately 130 km south of the Site, increasing to a peak in height and then decreasing to join the site topography as described above (refer Figure 3-4, and to Figure 3-2 for corresponding cross-section location).

The slope and contours of the full Project Area and surrounding regional topography are shown in Figure 3-5.

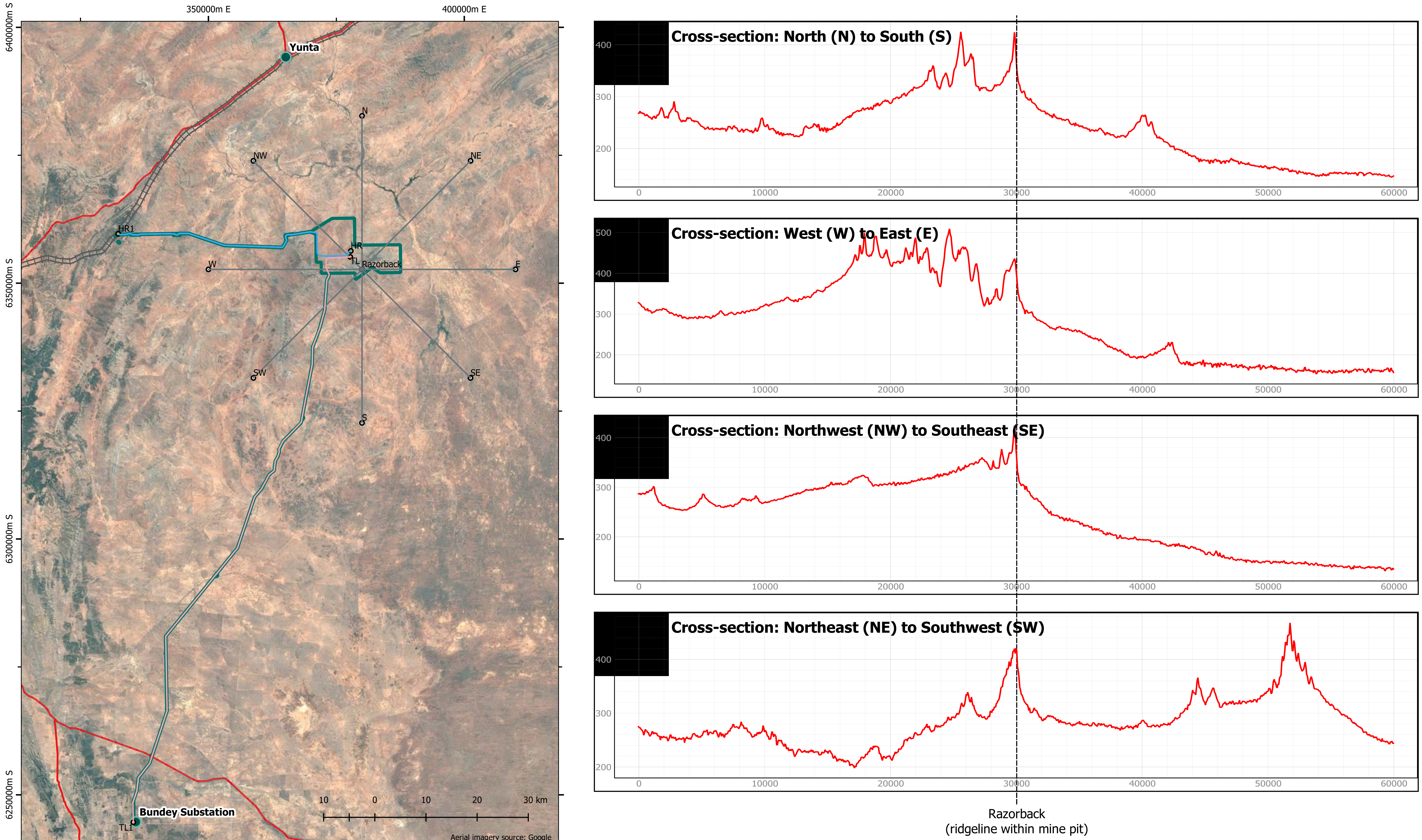


Figure 3-2: Regional topography cross-sections

Project Area
Localities
Existing railways
Existing roads
Main

Regional cross-sections
Cross-section location
Cross-section end points

Infrastructure cross-sections
HR cross-section location (Figure 3-3)
TL cross-section location (Figure 3-4)
Cross-section end points

Notes regarding all cross-sections:
- All elevations (y-axis) in m AHD
- Elevations interpolated from STRM arc-second (30m) model
- Distances (x-axis) also in GDA 1994 MGA Z54

GDA 1994 MGA Zone 54 | 1:700,000 @ A3
Author: A Kane | Date: 01/02/2025
Razorback MLP / Referral

MAGNETITE MINES

Figure 3-3: Representative topography cross-section of HR (east [HR] to west [HR1])

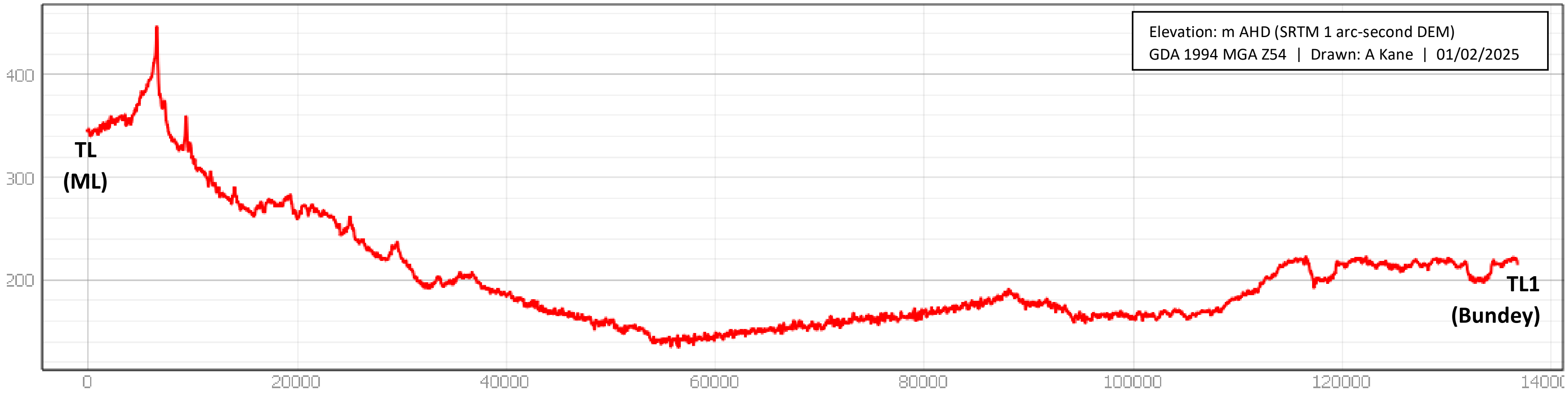


Figure 3-4: Representative topography cross-section of TL (north [TL] to south [TL1])

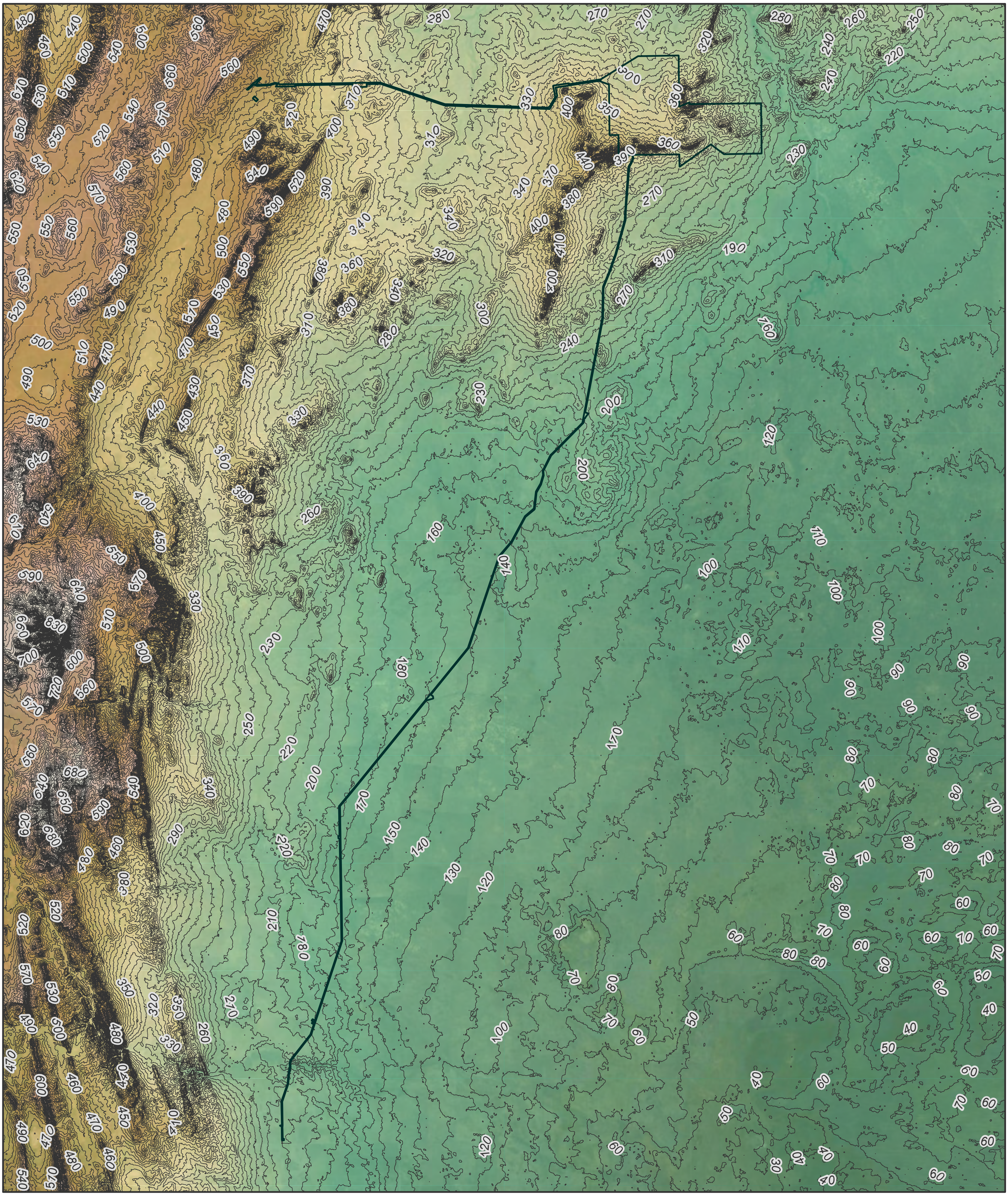


Figure 3-5: Regional topography

3.2. Climate

An overview of the regional and local climate is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B1 *Air Quality Baseline Assessment* (Lathwida, 2022) and Appendix C1 *Air Quality Impact Assessment* (Katestone, 2024).

3.2.1. Climate records

The Razorback Project is located in the semi-arid region in the far mid north of SA. The Project Area is in a region that spans across two different climate areas defined by Köppen climate classifications as warm desert and warm grassland (refer Figure 3-6) (BoM, 2023). The region generally experiences hot, dry summers and cool, relatively wet winters. Winter rain is often unreliable and erratic.

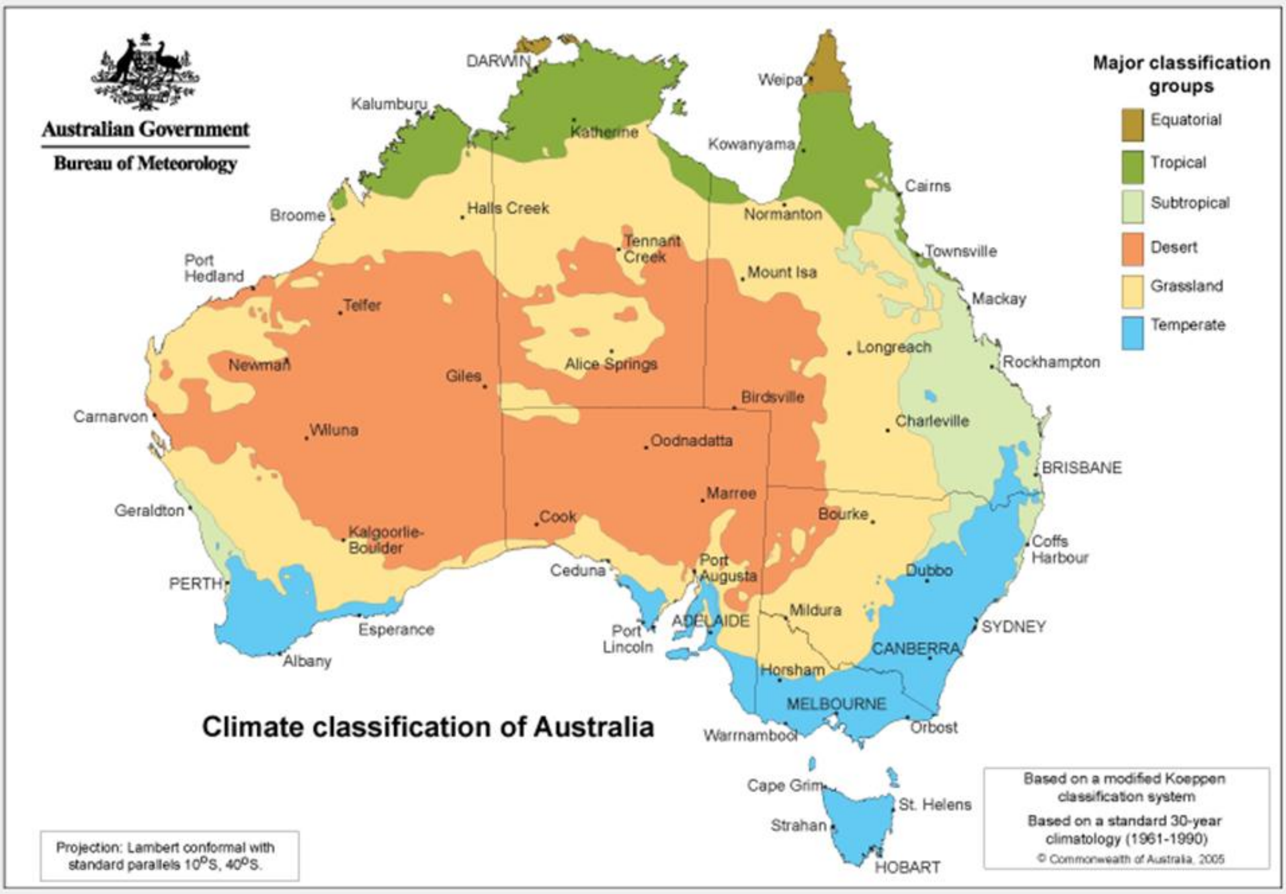


Figure 3-6: Köppen climate classification of Australia (major classes) (Source: Bureau of Meteorology, 2023)

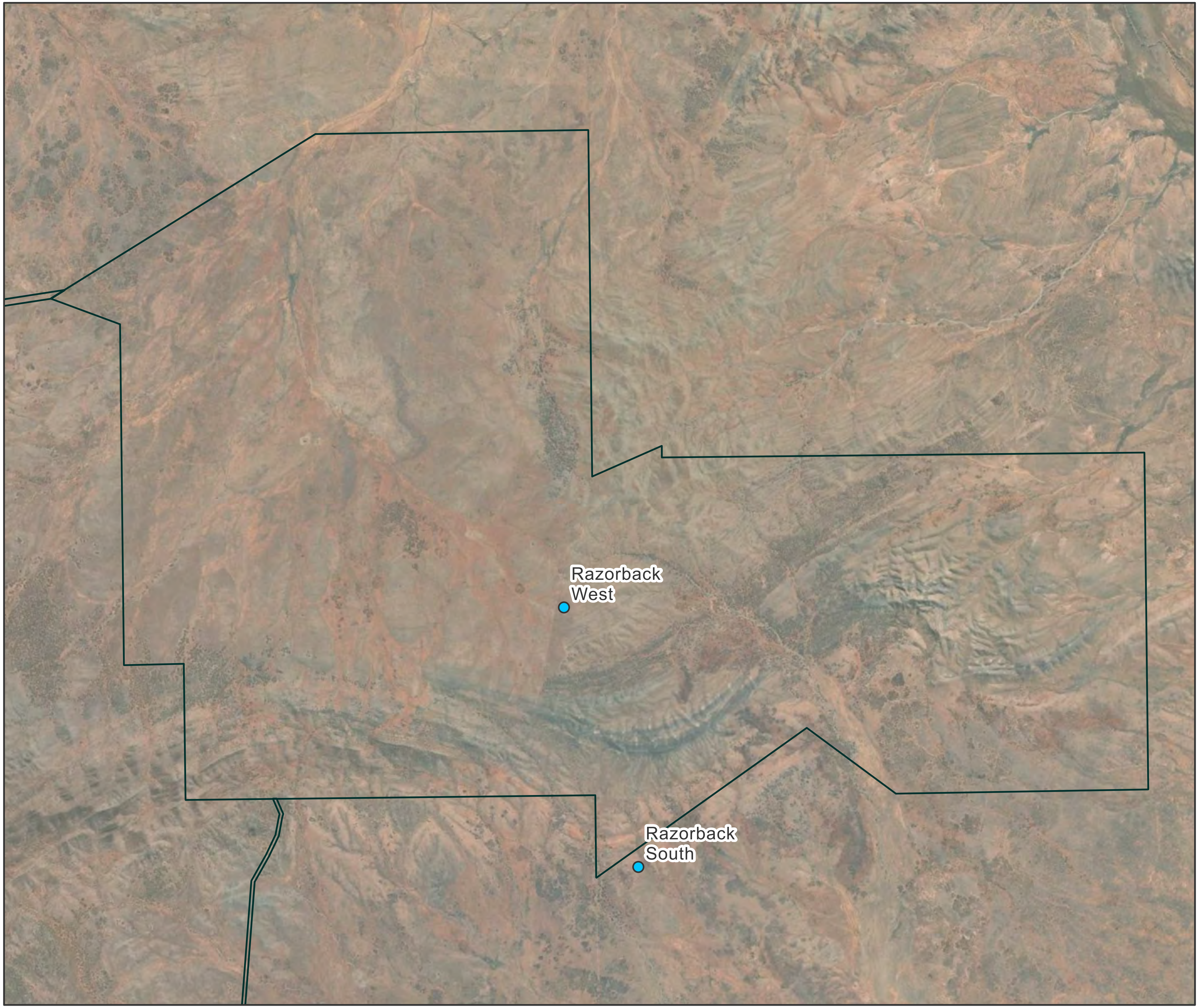
A defining feature of the Peterborough and Goyder LGAs, as well as the wider region, is Goyder's Line. Goyder's line is considered to define areas of productiveness of rural land and rural opportunities available in areas north and south of the line. The line runs east to west across SA and was drawn by Surveyor General George Goyder in 1865 to delineate land suitable for agriculture on a long-term sustainable basis and land only suitable for grazing (RC of Goyder, 2022). The line runs from Ceduna in the west, across to Spencer Gulf, north to Orroroo, then south and east across to the Victorian border at Pinnaroo. Climate change is reported to have the effect of moving the line southwards, requiring farms to adjust their farming practices (Dulaney et al, 2015). As the Project Area is located to the north of Goyder's Line, rainfall can often be scarce and unreliable. SA's Goyder's Line marks the delineation between lands which receives more or less than 30 cm of precipitation annually, with the land north of the line considered as only suitable for pastoral activities due to minimal rain received.

Meteorological data has been sourced from the Bureau of Meteorology (BoM) and from data collected (by MGT) from two weather stations within the Site (refer Figure 3-7). The closest BoM weather station that provides climate information is Yunta Airstrip (Station ID 020062), located approximately 43 km north of Project. This station provides the most comprehensive, characteristic and quality-assured data for the majority of the Project Area. Note that evaporation rates are not recorded at Yunta Airstrip weather station. BoM weather station details can be found in Table 3-2 (BoM, 2023a).

Table 3-2: Yunta weather station details (BoM, 2023a)

Station	Site Number	Latitude	Longitude	Approximate Location to Razorback	Length of rainfall record	Measured parameters
Yunta Airstrip	020062	-32.57 °S	139.56 °E	43 km north	1998 to current	Temperature, rainfall, daily elements, humidity, wind speed

MGT has collected weather data since May 2013 in the locations shown in Figure 3-7. Note for all weather statistics presented in this Chapter, all available long-range data was used from each data source (e.g., 2018 – 2023 for Yunta airstrip weather station, and 2013 – 2023 for MGT site-based weather stations) to calculate long-term stable averages.



Project Area
Weather stations

Figure 3-7: Location of Razorback weather stations

0 1 2
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 13/12/2024

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3.2.1.1. Temperature

Temperature statistics for the Yunta Airstrip (1998 – 2023) and Razorback Site weather stations (2013 – 2023) are shown in Table 3-3, Figure 3-8 and Figure 3-9. The temperature records from Yunta Airstrip weather station show good correlation to the onsite weather stations.

Table 3-3: Temperature statistics for nearest weather stations

Temperature (°C)	Yunta Airstrip (1998-2023)	Razorback South (2013 – 2023)	Razorback West (2013 – 2023)
Mean maximum temp (°C)	24.6°C	25.2°C	23.8°C
Mean Minimum Temp (°C)	9.5°C	11.4°C	10.2°C

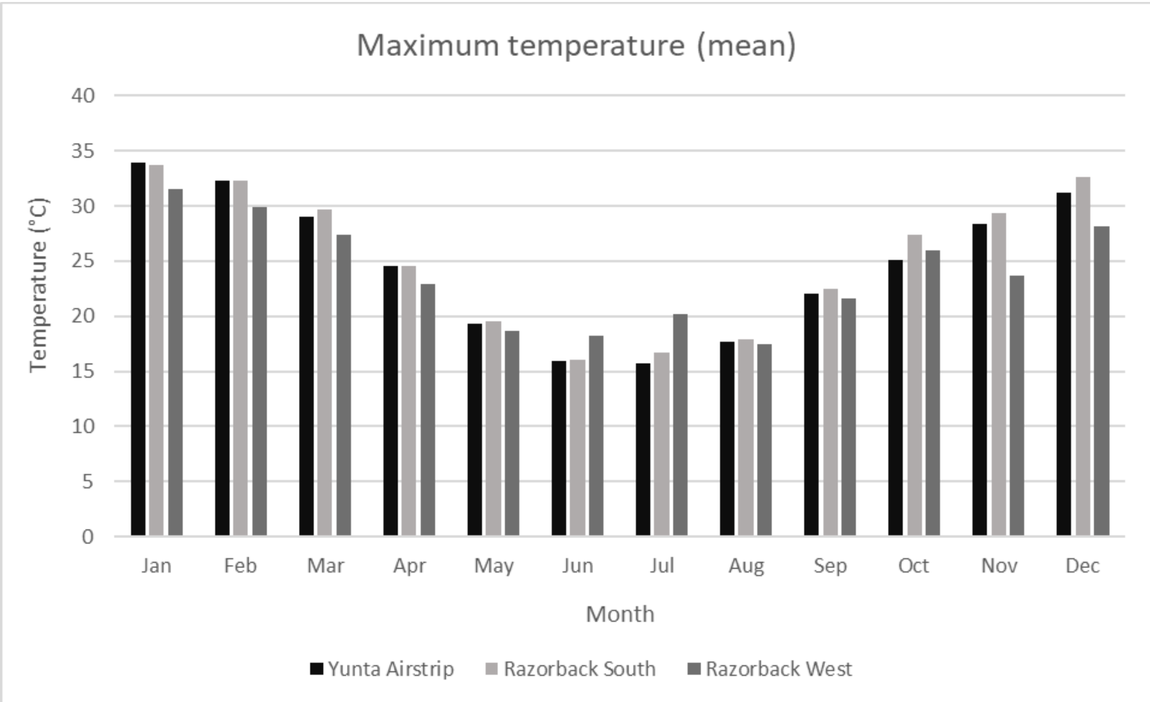

Figure 3-8: Mean maximum temperature by month (Yunta airstrip: 1998 – 2023, Site records: 2013 – 2023)

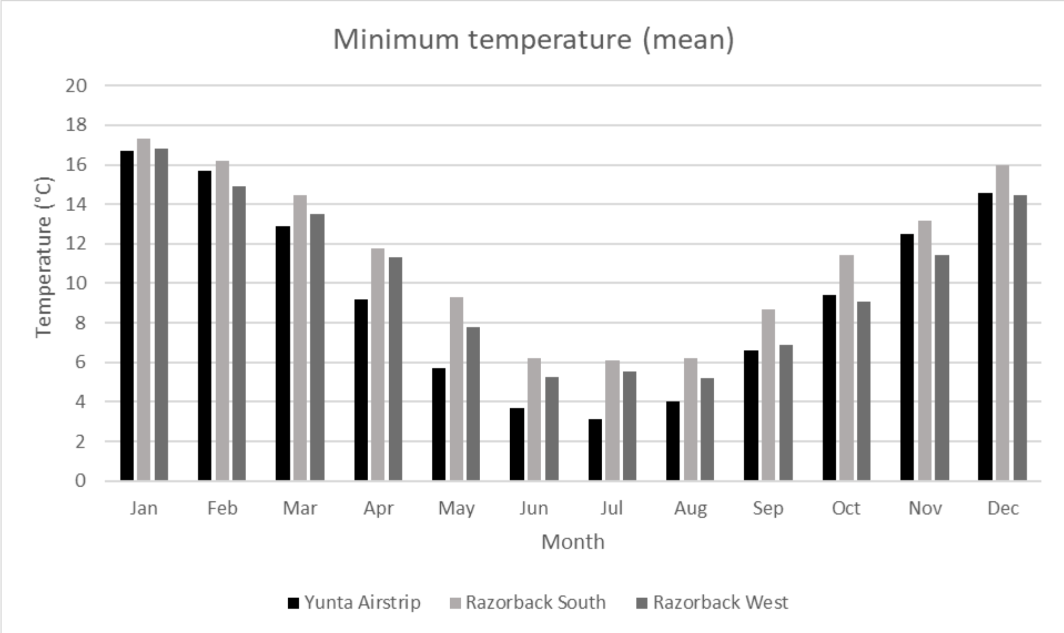

Figure 3-9: Mean minimum temperature (Yunta airstrip: 1998 – 2023, Site records 2013 – 2023)

3.2.1.2. Precipitation

The average annual rainfall recorded at Yunta BoM weather station, and from the two weather stations on Site is shown in Figure 3-10. The weather stations report an average total annual rainfall of 203 mm for Yunta Airstrip (2018 – 2023), 221 mm for Razorback South site (2013- 2023) and 247 mm for Razorback West site (2013 – 2023). The differences between annual rainfall across the weather stations is likely due to the localised and episodic nature of the rainfall, which has a significant impact on results when the total average rainfall is low.

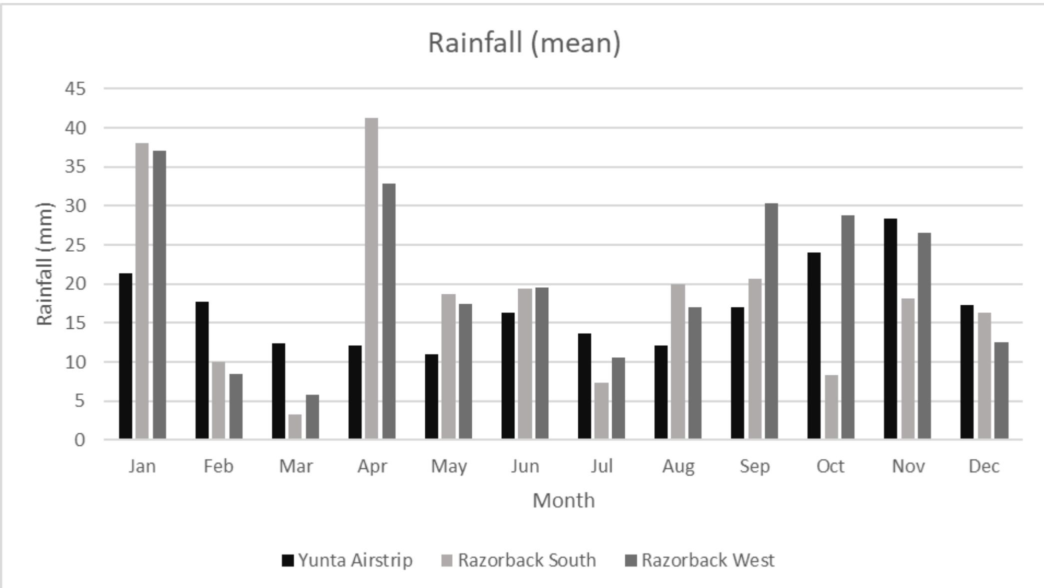

Figure 3-10: Mean average rainfall (mm) (Yunta airstrip: 1998 -2023, Site records: 2013 – 2023)

3.2.1.3. Evaporation

There are no historical observation data for evaporation available for the Site. In the absence of site-specific evaporation data, regional potential evapotranspiration (PET) is reported between 60 and 320 mm/month using the SILO interpolated dataset (Scientific Information for Land Owners; Jeffrey et al., 2001) based on BoM observations, with an annual average PET rate between 1,730 and 2,580 mm/year. Both PET and actual ET (AET) are typically highest during the summer months from November to February (ELA, 2024).

Average monthly PET remains significantly higher than average monthly rainfall throughout the year (refer Figure 3-11). This deficit limits the opportunities for formation of surface runoff (and groundwater recharge) from discrete intense rainfall events where the depth of rainfall exceeds evaporation.

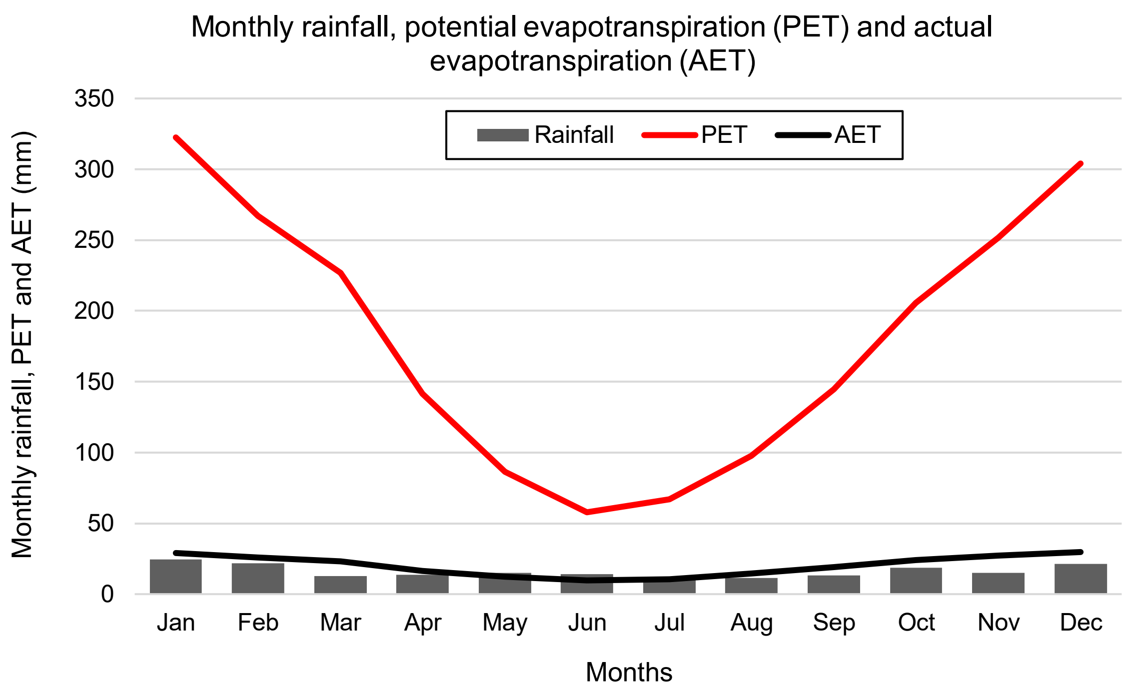

Figure 3-11: Monthly mean average rainfall, PET and AET (Source: ELA, 2024)

3.2.1.4. Humidity and wind

As the Project Area is located within an arid region the humidity is expected to be low, consistent with observations at Yunta Airstrip. Table 3-4 details the wind and relative humidity at Yunta Airstrip (1998 to 2023) (BoM, 2023a) (BoM, 2023b). Further, Table 3-5 details the maximum gust speed and the date of the occurrence at Yunta Airstrip (Katestone, 2024).

Table 3-4: Wind and humidity for Yunta Airstrip station (1998 – 2023)

Statistics	Yunta Airstrip
9:00 am conditions	
Relative humidity (%)	58
Wind speed (km/h)	17
3:00 pm conditions	
Relative humidity (%)	33
Wind speed (km/h)	20.8

SOURCE: BOM 2023A, BOM2023B

Table 3-5: Wind gust speed at Yunta Airstrip

Month (for the period 2003-2023)	Maximum wind gust speed (km/h)	Date of Maximum wind gust speed
January	106	03/01/ 2015
February	76	11/02/2010
March	76	04/03/2014
April	74	25/04/2009
May	89	29/05/2007
June	104	30/06/2009
July	93	24/07/2021
August	91	23/08/2012
September	113	28/09/2016
October	107	27/10/2007
November	111	18/11/2009
December	104	18/12/2017
Annual	113	28/09/2016

SOURCE: KATESTONE 2024

Figure 3-12 shows wind direction and speed at Yunta Airstrip, which has a strong directional favourability to the north and south. Afternoon winds (3 pm) tend to have additional favourability to stronger winds towards the west compared to morning winds (9 am).

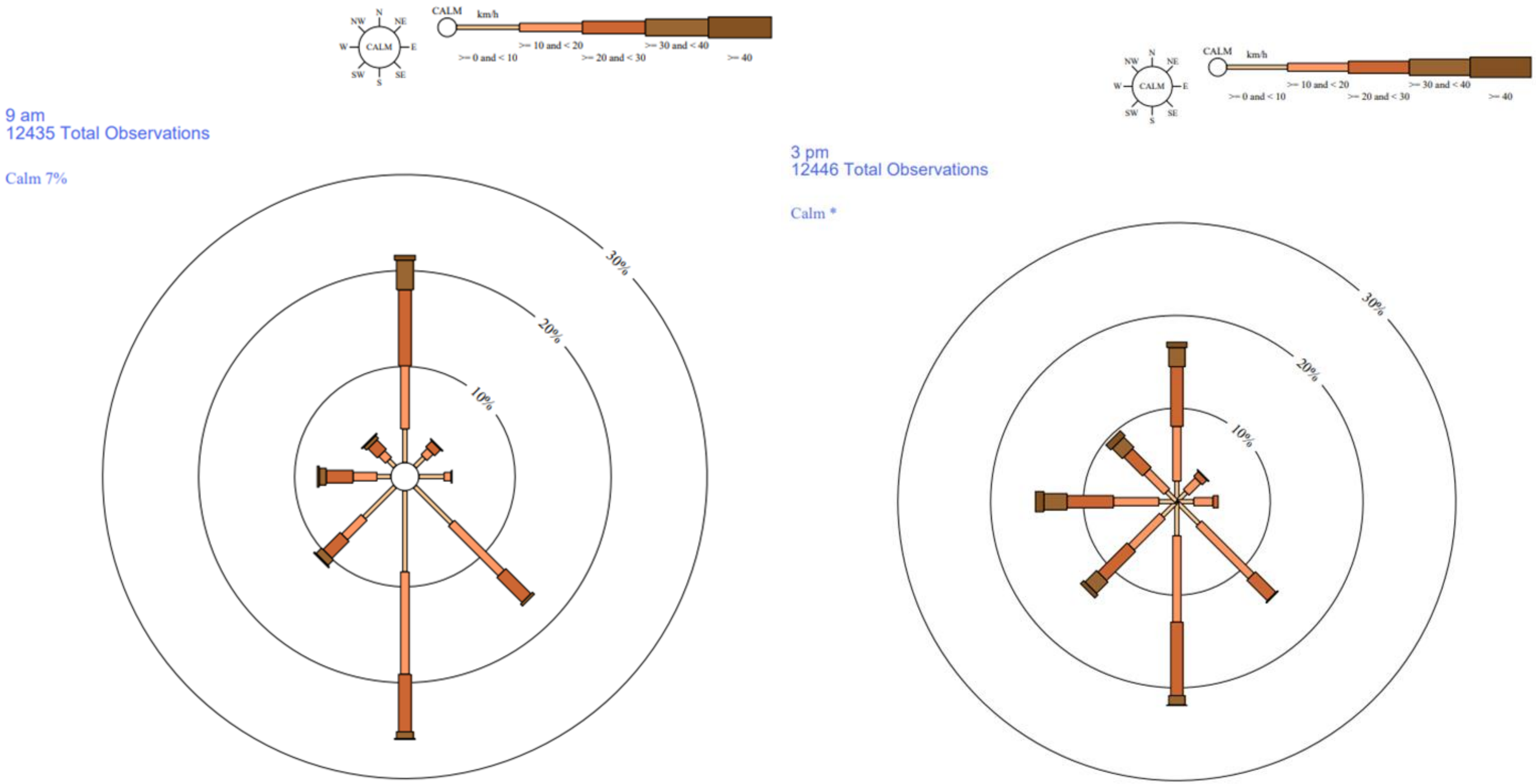

Figure 3-12: Morning (9 am) and afternoon (3 pm) wind directions observed at Yunta Airstrip weather station (1998 to 2023) (BoM, 2023a)

3.2.2. Climate design criteria

Flood immunity considerations have been made during the design and assessment of Project infrastructure, with regional flood dynamics modelling across a range of annual exceedance probabilities (AEP) reported in Appendix C3 (RPS, 2024). Post-development flooding assessments have also been completed by GHD to confirm targeted levels of immunity.

Key facilities, inclusive of the RS, accommodation camp, Razorback ANFO site, Iron Peak ANFO site and magazine are all located outside of/above the AEP1 flood event. Final designs will maintain this protection level to ensure the safe occupation and operation of these Project-critical facilities.

On current design, the pads for the process plant and NPI compound, as well as the Iron Peak HR are above/outside of the AEP1 flood extent. As these facilities have the largest cut-fill balances, there remains opportunity to optimise the respective cut-fill, with final designs to conform to a minimum AEP2 design criteria.

Where relevant, mine roads will have culverts designed for an AEP2 flood event. The main HR has been designed to AEP10 criteria, while post-development modelling indicates that it conforms to an AEP5 criteria, which will be the targeted criteria for final design.

It is noted that the intent for the TSF is to harvest surface water flows; therefore, a specific AEP design criteria is not adopted for the facility as a whole. Importantly, the TSF spillway has been designed to accommodate a probable maximum flood (PMF) event to prevent overtopping of the embankment (refer Section 4.7.2.4).

The principal post-closure Project landforms/voids are considered self-bunded; pit voids are positioned at the apex of the catchment with no predicted inflows from surface water. As such, it is deemed that there is no material flow risk or necessary design factor for these features.

3.3. Topsoil and subsoils

An overview of soils is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B2 *Soils Baseline Assessment Report* (ELA, 2023a) and Appendix B3 *Stage 2 Geotechnical Assessment* (CMW, 2022).

Preliminary geotechnical field investigations were completed in 2022 to obtain shallow and broad-based geotechnical data to support the design development and construction planning of the mine site and associated infrastructure (CMW, 2022). A baseline soil assessment report was undertaken for the Project by ELA (ELA, 2023a) to analyse and characterise the topsoil and subsurface soils within the Project Area. The objective of the assessment was to characterise soil environments in sufficient detail to inform a comprehensive assessment of the Project's potential environmental impacts, and to address TOR requirements for the development of this MLP. The assessment also assisted in project planning and the development of appropriate and effective rehabilitation and soil management strategies that optimise soil resource utilisation and avoid or minimise potential impacts.

The Project Area has a wide geographical extent that required multiple data sources to be reviewed to adequately assess soil characteristics and properties. The best available mapping, State Land and Soil Mapping data (DEW, 2020), partially covers western portions of the proposed TL and HR only. Therefore, for the mining activity areas and the remaining portions of the TL and HR, soil types and their properties and characteristics are derived from the Digital Atlas of Australian Soils and Land Systems mapping provided in Rural Solutions SA (2011; 2013) (refer Figure 3-13). The Soil and Landscape Grid of Australia provides modelled soil attributes at fine spatial resolution across the whole continent and has been used to estimate soil properties across the Project Area.

Whilst a wide range of soils have been identified, the Project Area is dominated by Shallow Soils on Rock (Group L), Calcareous Soils (Group A) and Hard Red-Brown Texture Contrast Soils with Alkaline Subsoil (Group D) depending on landscape position.

Figure 3-13 shows the distribution of SA soil subgroups mapped within the Project Area and adjacent land as determined during the soils assessment (ELA, 2023a), including the 'data source boundary' indicating the border between the two data sets used for soil type mapping as discussed above. Table 3-6 provides a summary of the extent of coverage for each soil type for the Project Area.

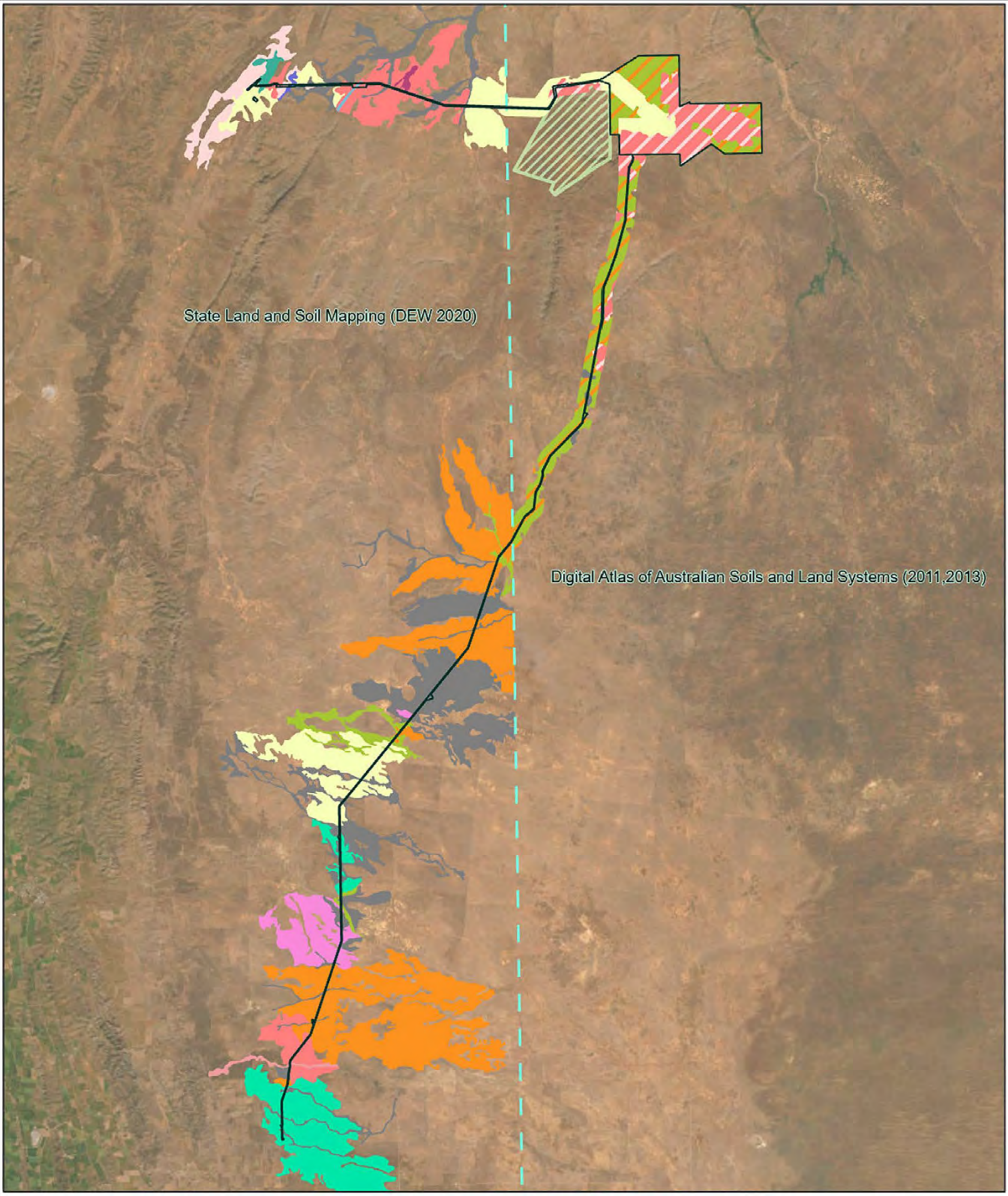

Figure 3-13: Dominant SA soil subgroups intersection Project Area (ELA, 2023a)

Table 3-6: Soil subgroups intersection with Project Area and corresponding proportion of area for each project element (ELA, 2023a)

Soil subgroup	ASC order	Cover of each element (%)		
		Mining activity area	HR	TL
L1 - shallow soils on rock	Basic, Lithic, Leptic Tenosol	0	3.16	0
A2/L1 - calcareous loams on rock & shallow soils on rock	Paralithic, Hypercalcic / Lithocalcic Calcarosol & Basic, Lithic, Leptic Tenosol	53.98	7.29	5.37
A2 - calcareous loams on rock	Paralithic, Hypercalcic / Lithocalcic Calcarosol	0	32.31	3.34
A3 - moderately calcareous loams	Calcic, Lithocalcic and Hypocalcic or Lithocalcic Calcarosol	0	0	3.45
A3/A4 - moderately calcareous loams & calcareous loams	Regolithic, Calcic Calcarosol & Endohypersodic, Regolithic, Lithocalcic Calcarosol	13.21	0	31.12
A4 - calcareous loams	Endohypersodic, Regolithic, Lithocalcic Calcarosol	0	0	16.30
A5 - calcareous loams on clay	Endohypersodic, Regolithic, Lithocalcic Calcarosol	32.81	43.04	7.71
A6 - calcareous gradational clay loams	Vertic, Pedal, Hypercalcic Calcarosol	0	0	3.75
B2 - shallow calcareous loams on calcrete	Epihypersodic, Petrocalcic, Supracalcic Calcarosol	0	0	9.75
C2 - gradational loams on rock	Haplic, Hypercalcic, Red Dermosol	0	1.17	0
D1 - loams over clay on rock	Hypercalcic / Calcic, Red Chromosol	0	1.23	0
D3 - loams over poorly structured red clay	Calcic, Mesonatric, Red Sodosol	0	0.55	0
D4 - loams over pedaric red clay	Calcic, Pedaric, Red Sodosol	0	10.42	19.02
RR - Rockland	Rockland	0	0.83	0
M1 – deep sandy loams	Mottled, Mesotrophic, Grey–Yellow Kandosol	0	0	0.19

3.3.1. Soil properties

3.3.1.1. Soil pH

Within the Site, soil pH (Calcium chloride ($CaCl_2$)) in surface soils is predominately slightly acid or neutral on more elevated hills, and slightly alkaline on lower rises, outwash fans and plains. Soil pH increases with depth and subsoils generally have alkaline to strongly alkaline pH depending on landscape position (ELA, 2023a).

Along the HR, soil pH ($CaCl_2$) in surface soils is predominately neutral to slightly alkaline on more elevated hills and slightly alkaline on lower rises, outwash fans and plains. Soil pH increases with depth and subsoils generally have alkaline to strongly alkaline pH depending on landscape position (ELA, 2023a).

Along the TL, soil pH ($CaCl_2$) in surface soils is predominately slightly alkaline on more elevated hills and alkaline on lower rises, outwash fans and plains. Soil pH increases with depth and subsoils generally have alkaline to strongly alkaline pH depending on landscape position (ELA, 2023a).

3.3.1.2. Clay content

Within the Site, the data indicates that surface textures are generally sandy clay loam or sandier with gradational or abrupt (texture contrast; duplex) increases in clay content with depth. In low lying areas, subsoils may be classified as clays (i.e., at least 35% clay content) (ELA, 2023a).

Along the HR, data indicates that surface textures are generally calcareous loams or gradational loams. In low lying areas, subsoils may be classified as clays (i.e., at least 35% clay content) (ELA, 2023a).

Along the TL, the data indicates that surface textures are generally loams/calcareous loams or abrupt (texture contrast; duplex) increases in clay content with depth. In low lying areas, subsoils may be classified as clays (i.e., at least 35% clay content) (ELA, 2023a).

3.3.1.3. Effective Cation Exchange Capacity (ECEC)

Within the Site, the range of ECEC (a measure of nutrient retention and inherent fertility) values reflects the range of clay content in the soils (clays provide the majority of charged soil surfaces that retain nutrient cations). In general terms, soils with large quantities of negative charge (high ECEC value) are more fertile because they retain more cations (McKenzie et al., 2004). The ECEC values range from very low to moderate within the Site, and along the HR and TL (Viscarra-Rossel et al., 2014). These soils are capable of supporting native vegetation tolerant of low nutrient availability.

3.3.1.4. Soil depth

Test pitting across the processing infrastructure and non-processing infrastructure areas undertaken by CMW Geosciences (CMW, 2022) noted topsoil to be very shallow and consist of a fine to coarse grained brown silty sand, with angular to subangular fine to coarse gravel. The topsoil is underlain with residual Pleistocene Calcrete soils of carbonate silty gravel and in some locations, deeper residual silty gravel soils of residual Wilyerpa formation. Very shallow (to 0.25 m) or shallow soils (to 0.5 m) are present on ridges, grading to moderately deep soils (to 1 m) on lower rises and outwash fans to deep (>1 m) on fans, flats, and drainage depressions (ELA, 2023a).

Along the HR, soil depths range from very shallow (to 0.25 m) to shallow soils (to 0.5 m) on ridges, grading to moderately deep soils (to 1 m) on lower rises and outwash fans to deep (>1 m) on fans, flats, and drainage depressions. Soils are shallower at either end of the HR and deepest in the central portion in the areas with lower relief (ELA, 2023a). Test pitting along the HR recorded topsoil to a maximum depth of 0.3 m consisting of a fine to coarse grained brown silty sand, with angular to subangular fine to coarse gravel and underlain with a calcareous gravelly clay of low to medium plasticity and fine to coarse angular and sub angular nature (residual pleistocene calcrete) (CMW, 2022).

Desktop mapping shows soil depth may be up to >1.50 m across the TL alignment, with soil depth becoming shallower at the north end of the TL (ELA, 2023a). At the northern extent of the TL, topsoil was encountered at between 0 and 0.2 m, and was underlain with residual Pleistocene calcretes consisting of carbonate silty gravels of a fine to coarse angular and subangular nature with fine to coarse sands (CMW, 2022).

3.3.1.5. Surface soil erosivity

The soil erodibility factor (K) values are relatively uniform across the Study Area ranging from 0.029 to 0.032 (ELA, 2023a). These K-factor values are consistent with coarse to medium textured surface soils described by the existing soil mapping and is regarded as "moderately erodible".

Some of the soils encountered are known to be prone to water erosion. Some soil types on shallower slopes have hard-setting soil surfaces (D1, D3 and D4). This property reduces water infiltration, induces higher run-off rates and thus relatively high erosion potential. Given the estimated low clay content of the surface soils, the risk of fine sediment export affecting downstream waterways is low to moderate (ELA, 2023a).

The proportions of the Project Area composed of soils which may be most susceptible to water erosion are outlined in Table 3-7.

Table 3-7: Coverage of soils susceptible to water erosion (ELA, 2023a)

Project area	Coverage of soils susceptible to water erosion
Mining activity area	None (0%)
TL	D4 (19.02%)
HR	D1 (1.23%), D3 (0.55%) and D4 (10.42%)

3.3.1.6. Sodicity and dispersion

The majority of soils present are unlikely to have sodic properties as the cation exchange complex is expected to be saturated by calcium rather than sodium. Therefore, the majority of soils present within the Project Area are not considered to present a significant sodicity or clay dispersion hazard. However, soils A6, D3 and D4 that occur on lower slopes may have sodic subsoil and D3 and D4 are classified as Sodosols under the Australian Soils Classification (ASC).

When undisturbed, these soils should be relatively stable. However, they will be susceptible to clay dispersion, accelerated erosion and gully formation if disturbance exposes subsoils to water (for example through excavation or stripping of surface soils for infrastructure development). If gully formation does occur, these soils pose a fine sediment export risk. The soils baseline assessment work found the following:

- no potential sodic soil types have been identified in the Site
- along the HR, D3 and D4 are found in low lying areas and on fans, covering an area of 10.97%
- along the TL A6 and D4 are found in low lying areas, on fans and adjacent to some drainage lines and cover, a total of 22.77% (ELA, 2023a).

3.3.1.7. Susceptibility to wind erosion

The surfaces of many soils in the Project Area from Groups A, B and C can become powdery when dry and trampled by livestock, leaving them moderately susceptible to wind erosion. The same soils would likely present a wind erosion/dust risk when soils are stripped and/or respread when dry or where informal tracks are created.

3.3.1.8. Non-wetting soils

Non-wetting (water repelling) soil properties are caused by hydrophobic organic materials, mainly waxes, present in plant matter within the soil. The waxes coat the soil particles causing water to bead on the surface. This causes uneven wetting of the upper part of the profile with large masses of soil remaining dry. Water repellence is most common on acid to neutral sands (with 5-10% clay content). Calcareous and more loamy soils can be affected, but not to the same extent. Water repellence is usually low on virgin soils, but increases following development, particularly where the soil is infrequently cultivated, as under permanent pasture (Maschmedt, 2002). Based on the information available, water repellence is not considered to be a significant soil management issue for the Project Area.

3.3.1.9. Acid sulphate soils

There are no known or mapped acid sulfate soil (ASS) within the entire Project Area. ASS is generally confined to low-lying coastal areas. None of the soil types identified during the desktop review have properties consistent with ASS. The presence of ASS within the Project Area is considered highly unlikely.

3.4. Geology

An overview of geology is described within this Section. For a more detailed discussion please refer to Appendix B4 *Surface Water and Groundwater Baseline Assessment* (ELA, 2024) and AppendixB7 *Initial Acid Rock Drainage Assessment* (Royal Resources, 2013).

Descriptions of the regional and local deposit geology, stratigraphy and mineralisation for the Project Area are provided in this Section.

3.4.1. Regional geology

The Project Area sits within a complex geological setting with some localised faulting. The Project is comprised of three adjacent orebodies including:

- Razorback Ridge (central outcropping ore body)
- Razorback West (adjacent western extent of Razorback Ridge) and,
- Iron Peak (eastern extent of the orebody)

The Site covers sedimentary lithologies of the Adelaide Geosyncline (Neoproterozoic), a linear north-south to north-east trending tectonic rift basin (Figure 3-14) comprising sediments deposited during the late Proterozoic and early Cambrian Eras. The Proterozoic Adelaide Geosyncline geological unit exists across the Study Area, comprising tillite, quartzite, siltstone, dolomite and sandstone rocks (ELA, 2024).

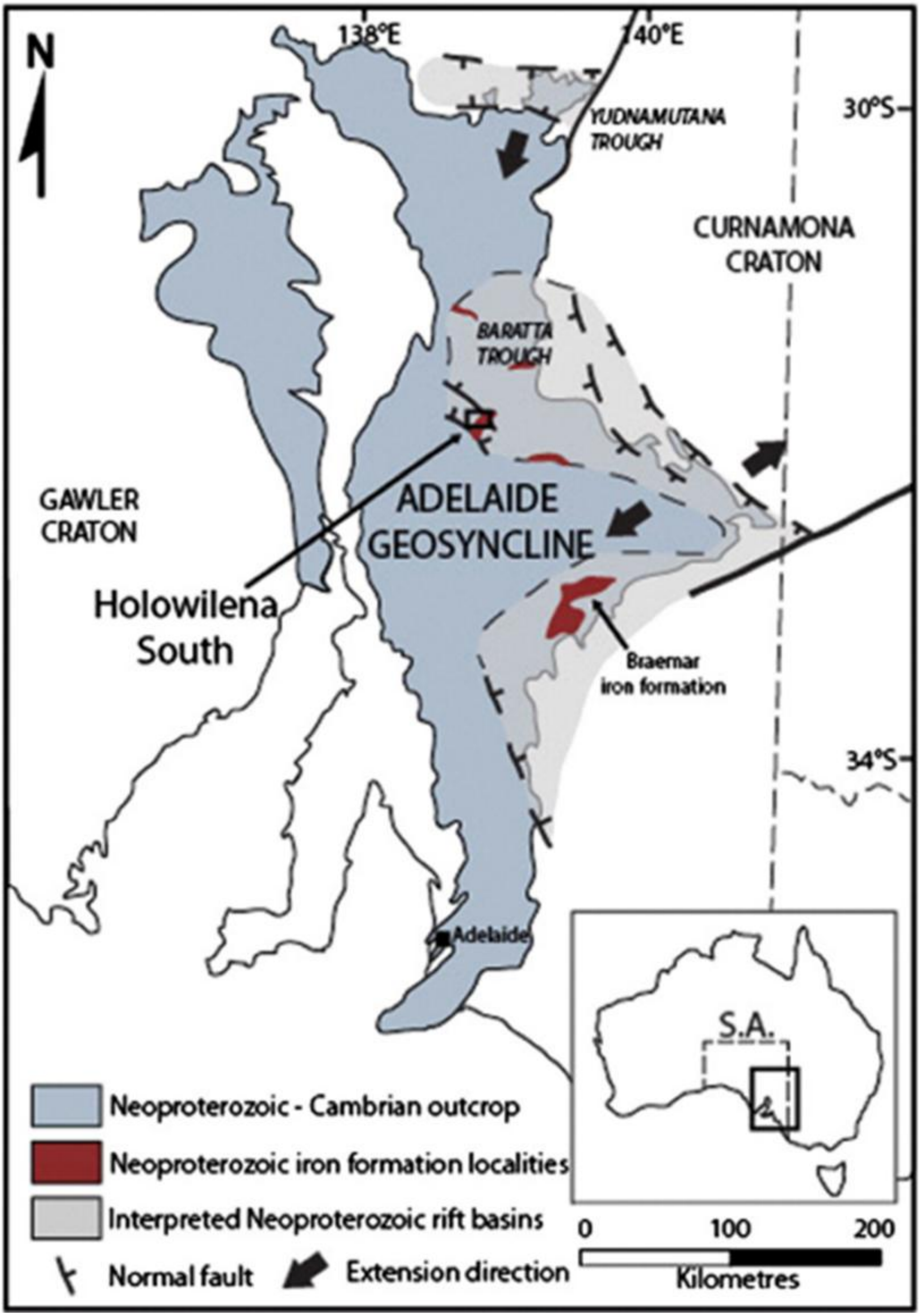

Figure 3-14: Location of the Project Area within the Adelaide Geosyncline (Lechte and Wallace, 2015)

The region is dissected by Quaternary (and possibly Tertiary) drainage features incised into the rock and contain sediments including silt, sand, clay and gravels. This includes the only major surface water feature in the region, Manunda Creek, incised into the ridgelines present along (but outside of) the eastern ML boundary. Large portions of Manunda Creek adjacent to the proposed ML contains outcrop of the Neoproterozoic formations in the creek bed, with fluvial deposits occurring along the banks but eroded within the main drainage line.

Moreover, the region to the south-east (and downstream) of the Site transitions from outcropped rock to lower elevation areas comprising sedimentary units of Neogene sedimentary units of the Murray Basin.

Outcropping areas of Neoproterozoic rocks are present across the Site and are consistent with higher elevation areas associated with the Razorback Ridgeline and adjacent, smaller ridgelines. These areas are considered likely to receive higher groundwater recharge, through the direct infiltration of rainfall and surface water runoff, due to the absence of overlying sediments in these areas (Royal Resources, 2011b).

Divided into sedimentary Supergroups, the Project Area comprises sediments of the Heysen Supergroup unconformably overlying the Burra Supergroup, deposited in a local extension zone recognised as the Baratta Trough, controlled by a regional north-east trending Anabama-Redan Fault Zone. During sedimentation a change in the tectonic style is inferred from the evidence of two major glacial periods (Preiss, 1987) - the Sturtian (750-700 Ma) and the Marinoan Glaciations (650-630 Ma).

The Project Area contains sediments of the Umberatana Group (basal Group of the Heysen Supergroup) which regionally comprise sediments of both glacial periods and extends over the Adelaide Geosyncline and the Stuart Shelf, with equivalents in the Officer and Amadeus Basins in the Northern Territory and in the Kimberley Region of Western Australia (Preiss, 1987). The basal sediments of the Umberatana Group, deposited during the Sturtian Period (750-700 Ma), comprise glacial tillites and interbedded sediments of the Pualco Tillite and the Benda Siltstone, the latter incorporating the Braemar Iron Formation, locally present in the Project Area (Figure 3-15). The Pualco Tillite unconformably overlies the Belair Subgroup of the Burra Supergroup and comprises diamictite feldspathic siltstones with lesser sandstones, greywackes and occasionally iron-rich siltstones. Dropstones vary in shape and origin with compositions of schists, granites and dolomitic sediments.

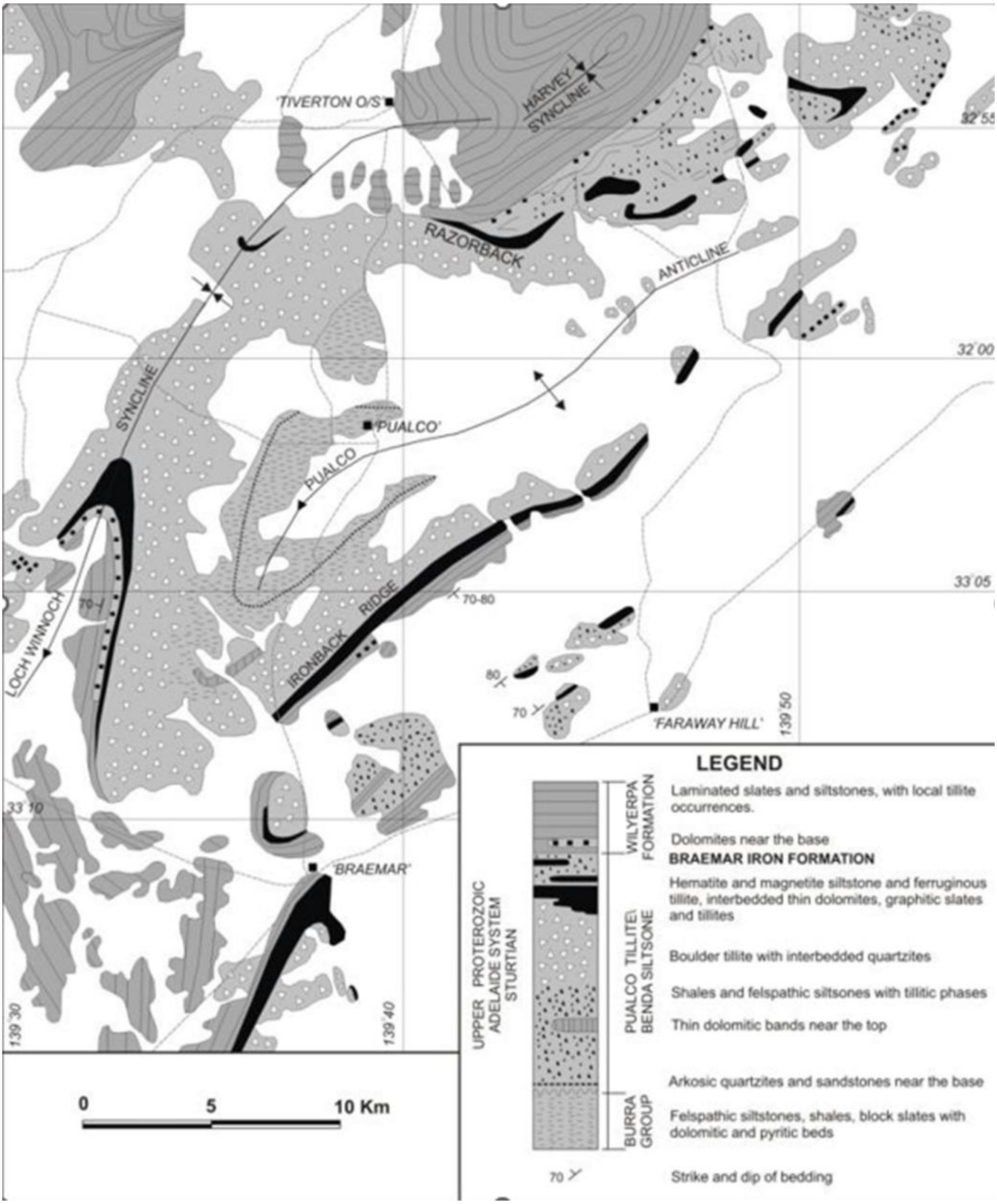

Figure 3-15: Regional geology of the Project Area (modified after Lottermoser and Ashley, 2000)

Within the Project Area, the Pualco Tillite is generally massive, green-grey and brown tillite of a sandy nature, with, on occasion, strong cleavage in places forming both distinct rounded hills and low-lying areas with strong structural control on geomorphology. Toward the top of the Pualco Tillite are thin ironstone layers, however this is not always evident in outcrop, possibly due to lateral discontinuity. Occasional quartzite bands indicate a transgressional period of deposition and erratics can be sourced distal to deposition suggesting an extensive glacial ice-sheet in a marine basin (Preiss, 1987).

Conformably overlying the Pualco Tillite is the Benda Siltstone, which is of a calcareous and iron rich interlayered nature and comprises the Braemar Iron Formation in the basal stratigraphy. The Braemar Iron Formation is typically a gradational, iron-bearing sequence of sediments occurring at the top of the main glacial sequence, (Whitten, 1970). Sediments comprise interbedded siltstones, tillites and on occasion sandstones, and can be described as a “Rapitan-type” banded iron formation with both bedded iron formations and tillitic iron formations. Within the Project Area the Braemar Iron Formation forms predominately distinct ridgelines from uplift during the Delamerian Orogeny.

A thin conformable sequence of dolomites and siltstones (middle to upper sequence of the Benda Siltstone) overlies the Braemar Iron Formation and in turn is unconformably overlain by the Wilyerpa Formation, which consists of a thick dolomite sequence at the base, then a sequence of glacial siltstones, dolomites and shales.

The Delamerian Orogeny was a regional deformation event during the Ordovician (~514 - 500 Ma) which occurred throughout the Adelaide Geosyncline, with three recognised fold phases mapped as broad, open, dome and basin shaped folds (Preiss, 1987). The first generation of folding produced slaty cleavage parallel to the axial plane of regional folds. In the Nackara Arc region this occurred in a north-easterly orientation evident in the Project Area where the Pualco Anticline, an open, asymmetrical fold aligns in a north-easterly orientation. Low grades of metamorphism accompanied the Delamerian Orogeny not exceeding Greenschist facies with predominately chlorite grade; however minor biotite grades occur, particularly around the Nackara Arc and Olary regions (Preiss, 1987). Higher grades were localised around structural corridors and are seen around igneous intrusions. The closest igneous activity to the Project is the Anabama Granite, located approximately 45 km to the northeast and the Bendigo Granite to the south.

Figure 3-16: Regional surface geology (1:2,000,000 scale)

3.4.2. Local geology

The magnetite ore that will be mined for the Project is located within the Braemar Iron Formation. The Braemar Iron Formation forms predominately distinct ridgelines from uplift during the Delamerian Orogeny. The geological sequence is indicated in Figure 3-17 and Figure 3-18. Moreover, it consists of up to seven cycles of glacial and inter-glacial sediments which have been defined as Members A to G. Each cycle consists of up to three units:

- interbedded ironstone magnetite
- tillitic magnetite
- bedded magnetite.

The ironstones found within the Project area are typically fine grained and are composed of magnetite, hematite and quartz, with lesser amounts of sericite, chlorite, dolomite, feldspar and apatite. The non-ferruginous bands within the bedded / interlaminated siltstone consist of quartz, biotite, dolomite, plagioclase, sericite and chlorite, with minor amounts of both hematite and magnetite.

The Pualco Tillite is located on the footwall and comprises brown-grey gritty siltstone (also described as having a sandy, carbonate bearing matrix) and minor thin sandstone with pebble to boulder sized glacial clasts.

Finally, the Wilyerpa Formation is located in the hanging wall and comprises green siltstone and also includes glacial dropstones, medium to coarse grained sandstone, glacial conglomerate and thin dolomites. Pyrite can occur in non-mineralised siltstones as disseminated grains occurring adjacent to and within quartz veining and also found within pitting of (calcareous texture) siltstones. Pyrite is also infrequently found disseminated in the tillitic ironstone units. The sulphide mineralisation in both rock types is minor accounting for <1% rock mass.

The Site encompasses linear and folded units of the resistant outcropping Braemar Iron Formation, which conformably overlies the Pualco Tillite and in turn is overlain by the Wilyerpa Formation. The Site is situated on the northern limb of the Pualco Anticline and the Ironback Hill Prospect is situated on the southern limb. At the north-eastern closure of the Pualco Anticline the Braemar Iron Formation bends to the north around the South Black Hills Syncline (South Black Hills Prospect) where it meanders to the north around the Manunda Anticline (Dragons Head Prospect).

The Site hosts the thickest succession of the Braemar Iron Formation which has locally been separated into 7 horizons of iron interlayered with shales, siltstones, dolomitic beds and thin bedded-iron layers, consisting of Members A to G, derived by Whitten in 1970 (Figure 3-17 and Figure 3-18). MGT geologically mapped the Project Area at 1:25,000 (Razorback Project) and 1:40,000 (Pualco Project) scale to identify the folded nature and to correlate the number of bedded iron and tillitic iron units of the Braemar Iron Formation. This mapping found a similar stratigraphic sequence as that devised by the Geological Survey of SA (Whitten, 1970). Further mapping was completed at 1:5,000 scale over the Razorback – South Black Hills area for the Pre-Feasibility study in 2013 in addition to mapping of the Dragon Head Prospect and Iron Peak. Refer to Figure 3-19 for the geological map of the principal area of resource prospectivity within the ML.

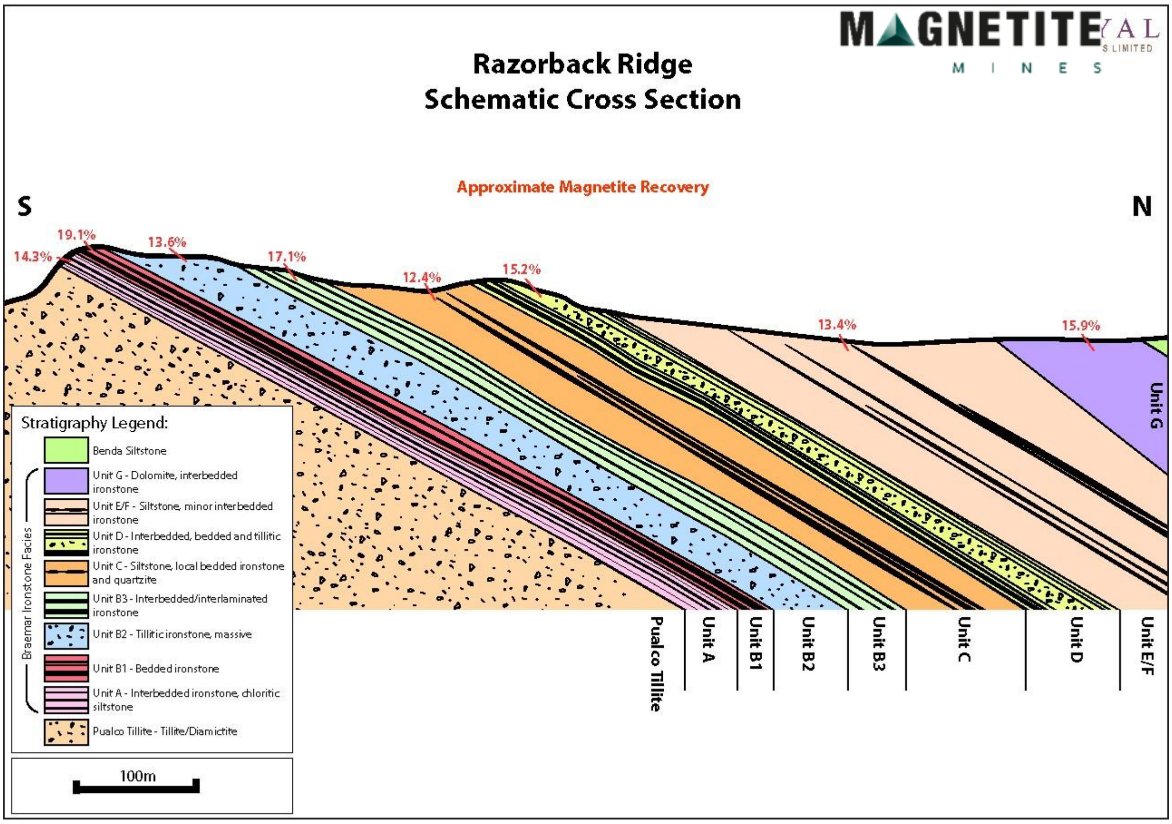

Figure 3-17: Schematic cross-section of the Braemar Iron Formation and approximate DTR grades

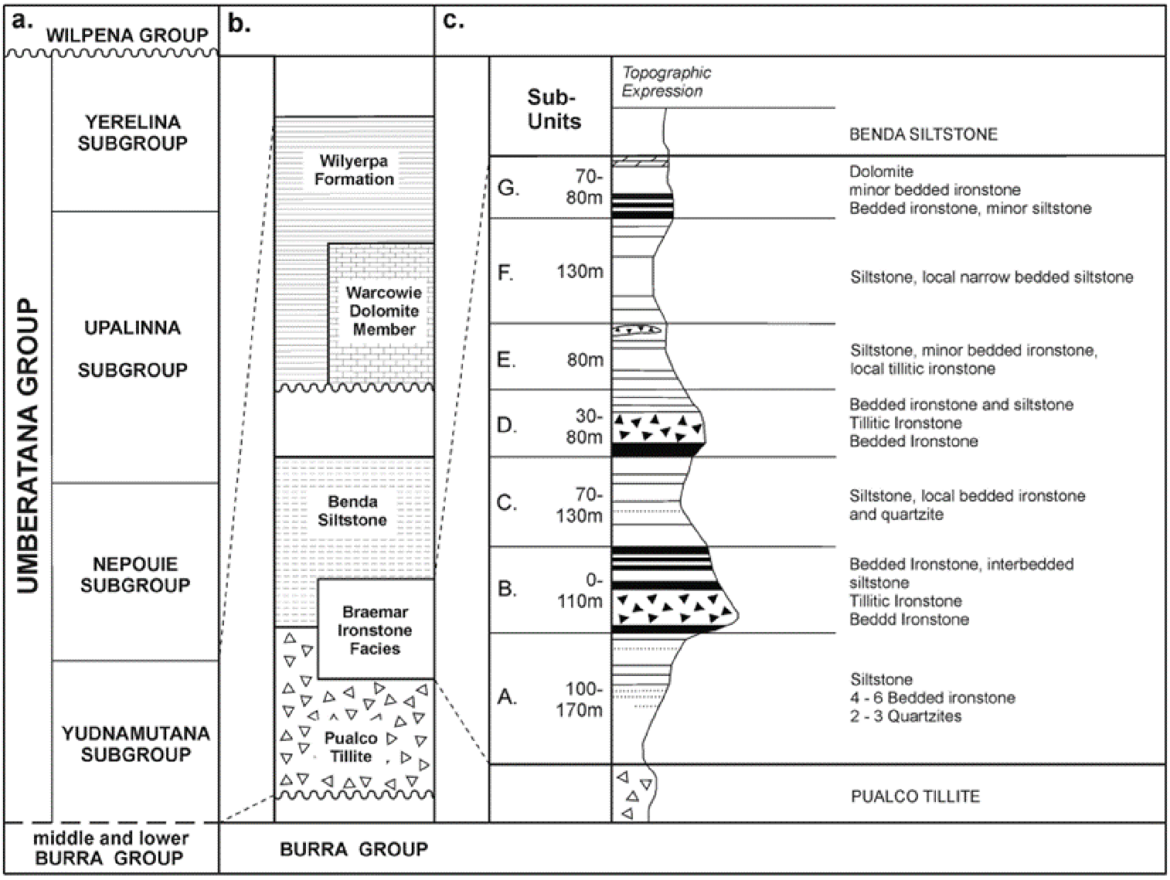

Figure 3-18: Stratigraphic column of the Braemar Iron Formation (Whitton, 1970)

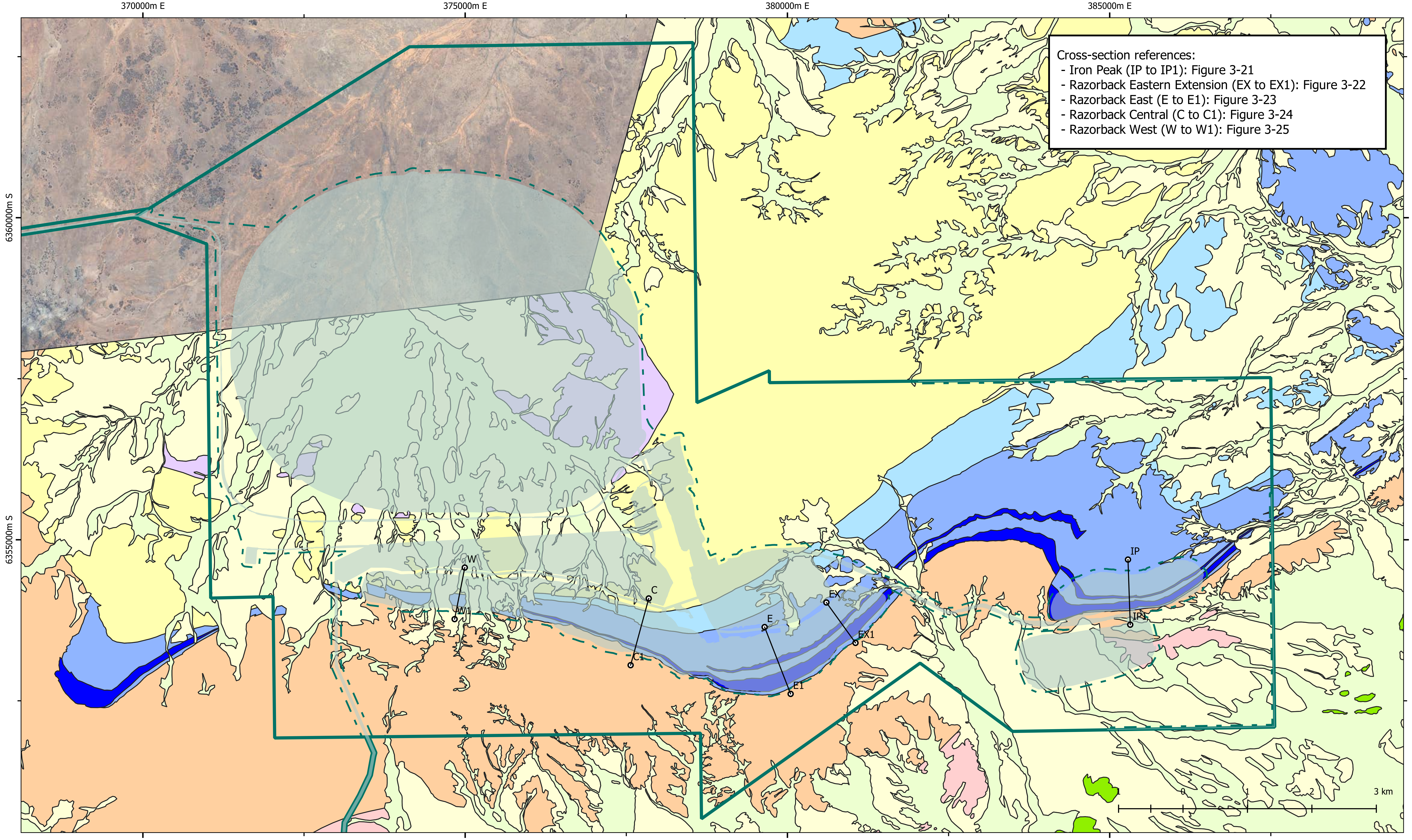

Figure 3-19: Project geology map with cross-section locations

- Project Area
- Conceptual Footprint
- Disturbance Footprint

Resource cross-sections

- Cross-section location
- Cross-section end points

Stratigraphic units

- Belair Subgroup; well bedded/laminated, greyish siltstone and lesser sandstone; feldspathic sandstone and dolomite interbeds; dropstones near the top.
- Benda Siltstone; well bedded/laminated, magnetite siltstone; dark to light grey; thin dolomitic siltstone and sandstone interbeds; rhythmic bedding with ironstone bases.
- Benda Siltstone-upper unit; well beddedsiltstone and shale with rare thin ironstone and dolomite beds; minor tillitic dropstones.
- Braemar Ironstone members of Benda Siltstone; well bedded/laminated magnetite rich (10-60%) siltstone; thin tillite, dolomite and sandstone interbeds.
- Pualco Tillite; coarsely bedded tillite, quartzite, sandstone, siltstone; large lenses of boulder to pebble tillite; no internal bedding locally magnetite bearing; quartzites quartz-veined.
- Quaternary-Recent alluvium; well bedded, loose sand and silt with gravel interbeds commonly with a component of subrounded ironstone after Benda Siltstone; up to 8m thick.
- Saddleworth Formation; well-bedded and locally laminated, shale, siltstone and mudstone, yellow-brown to dark grey (carbonaceous?).
- Tapley Hill Formation; grey, bedded tolaminated shale and dolomitic shale with thin silty dolomite; sandstone.
- Tertiary sand, silt and clay, weakly indurated; commonly with pedogenic calcrete and locally ferricrete/ hardpan; mostly scree covered with saprock exposed in drainage channels.
- Wilyerpa Formation: very well bedded siltstone and lesser sandstone; green to yellow-brown; minor interbeds contain glacial dropstones; dolomite marker beds near base.

GDA 1994 MGA Zone 54 | 1:55,000 @ A3
Author: A Kane | Date: 05/02/2025
Razorback MLP / Referral

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MAGNETITE MINES

Since Razorback preserves an exemplary section through the thickets development of the Braemar Iron Formation, it's considered a geological monument under the Geological Society of Australia (GSA), and is recognised by DEM. It is considered as having one or more geological features and/or processes that are not shown elsewhere or with such clarity. More information related to the Geological monument can be found in Section 3.16.3.

3.4.2.1. Mineralisation

Detailed work on the petrology and mineralogy of the Braemar Iron Formation has been described by Whitten (1970), and Lottermoser and Ashley, (2000), as well as work undertaken for MGT which has included:

- Petrology by Alan Purvis at Pontifex and Associates Pty Ltd (2010-2014)
- a mineralogical study by Martin Griessmann and Andreas Schmidt-Mumm (2011) from Adelaide University.
- Hatch Mineralogy and Processing Report (2021).

The two main facies types that make up the ore horizons at Razorback Project are:

- tillitic / diamictitic ironstone and
- laminated / bedded ironstone with mineralisation stratiform in nature.

While macroscopically, the two facies are quite different, compositionally the iron-rich components are very similar.

The ironstones are typically fine grained (less than 0.05 mm) and are composed of magnetite, hematite and quartz, with lesser amounts of sericite, chlorite, dolomite, feldspar and apatite. The non-ferruginous bands within the bedded / interlaminated siltstone consist of quartz, biotite, dolomite, plagioclase, sericite and chlorite, with minor amounts of both hematite and magnetite. Laminated ironstones often have well defined laminae, varying in thickness from < 0.5 mm to 50 mm, with the iron rich bands containing between 20% - 80% magnetite and hematite.

The three predominant iron species observed at Razorback Project consist of:

- individual hypidio-idiomorphic shaped magnetite grains in the size range of between 20 - 150 micron in diameter
- martised replacements of these magnetite grains and
- microcrystalline hematite grains usually below 10 micron in diameter.

Plate 3-1 is a typical petrographic image of the ore material. Hematite may also occur as subhedral intergrowths with magnetite (metamorphic in origin, rather than due to surface oxidation) and specular hematite associated with faulting or extreme weathering at surface.

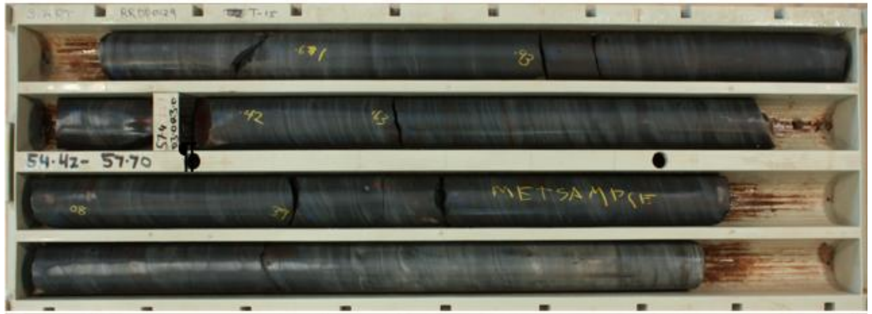
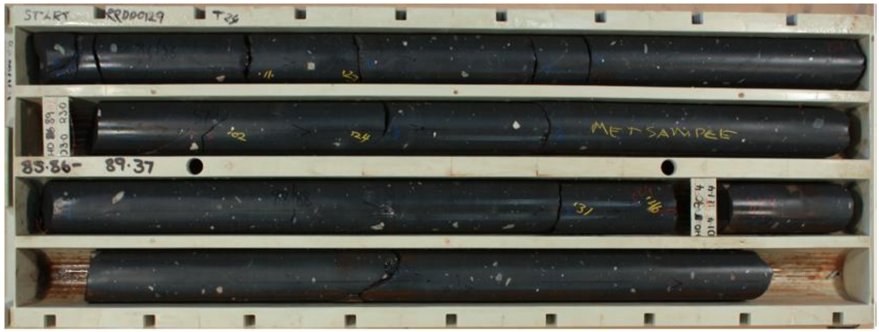
The study of the distribution of magnetite throughout the Razorback Project was completed using a combination of Davis Tube Mass Recovery (DTR) of diamond core and RC chips and the SATMAGAN analysis of XRF pulps. Over 779 composited samples of the geological sub- units were used in DTR analyses at the Project. There was a strong correlation observed between DTR mass recovery % and "SATMAGAN Magnetite %" which enabled a calibration factor to be applied to SATMAGAN to provide an equivalent DTR (eDTR) mass recovery.

The main economic horizons of the Braemar Iron Formation are Unit A, Unit B, Unit D and Unit G which can be further divided into subfacies determined by the following lithologies (see Figure 3-18):

- laminated ironstone
- tillitic (diamicritic ironstone)
- bedded ironstone.

All Braemar Iron Formation units and sub-units (A to G) host the above lithologies with variable stratabound iron (magnetite/hematite) content (see Plate 3-1). Higher grade units such as Unit B, D and G are dominated by bedded and massive lithologies with lower grade units being typically laminated siltstones and fine-grained sandstones and infrequent lenses of high grade, massive-bedded magnetite ore.

The bedded and laminated ores vary in density depending on magnetite content, which is distributed both layered and disseminated, is dark blue, and can show sedimentary features such as slumping and soft-sediment deformation.

	
Unit G	Unit F
	
Unit E	Unit D3
	
Unit D2	Unit D1

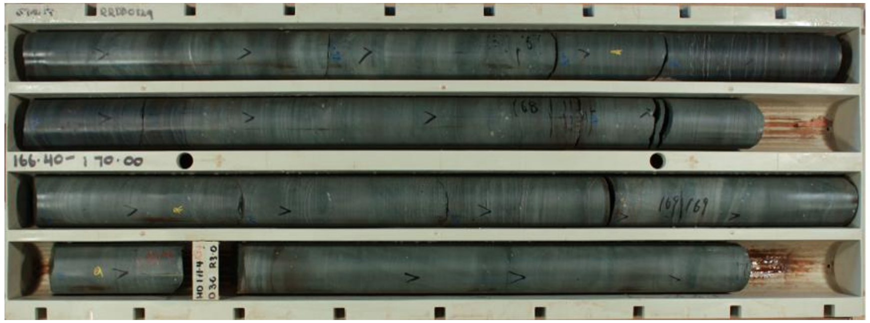
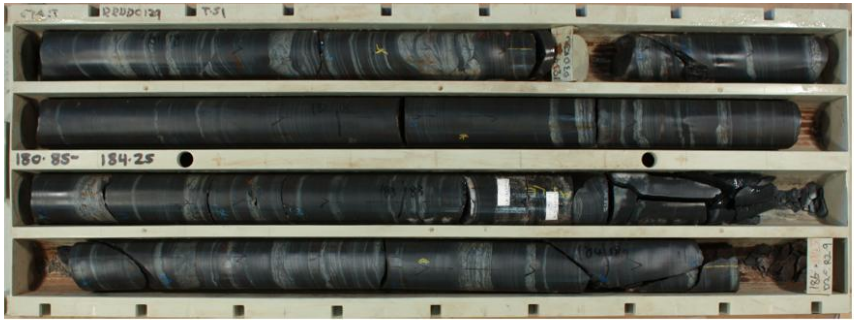
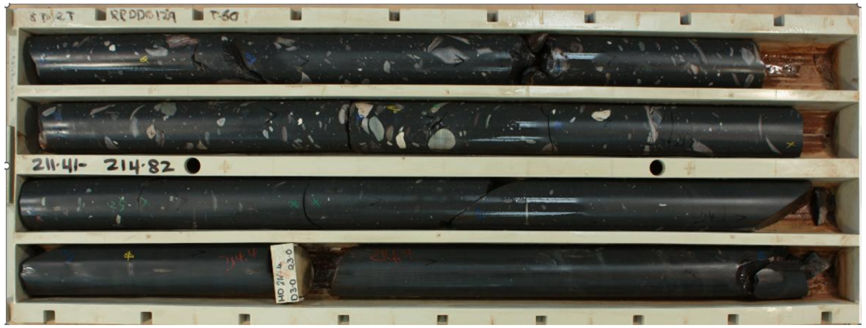
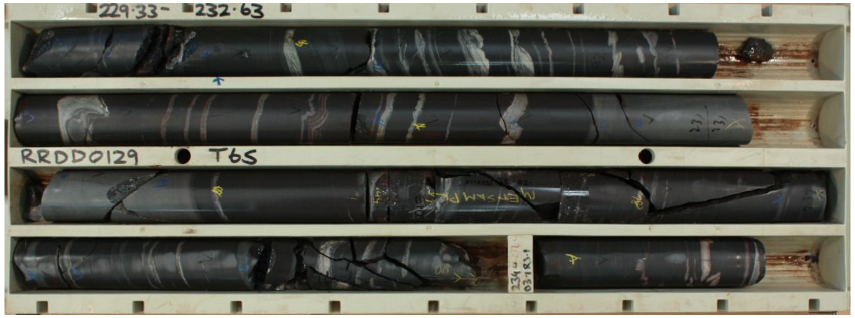
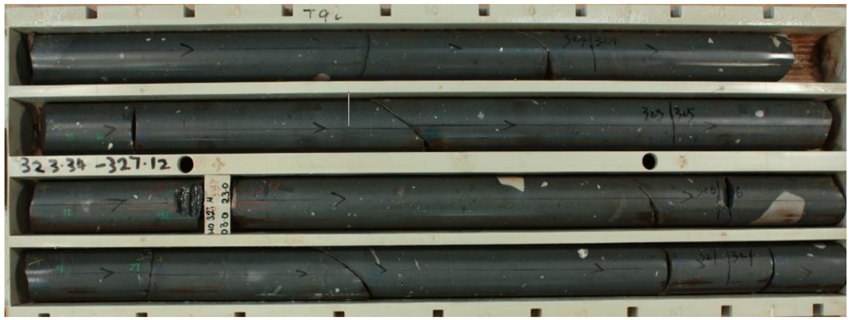
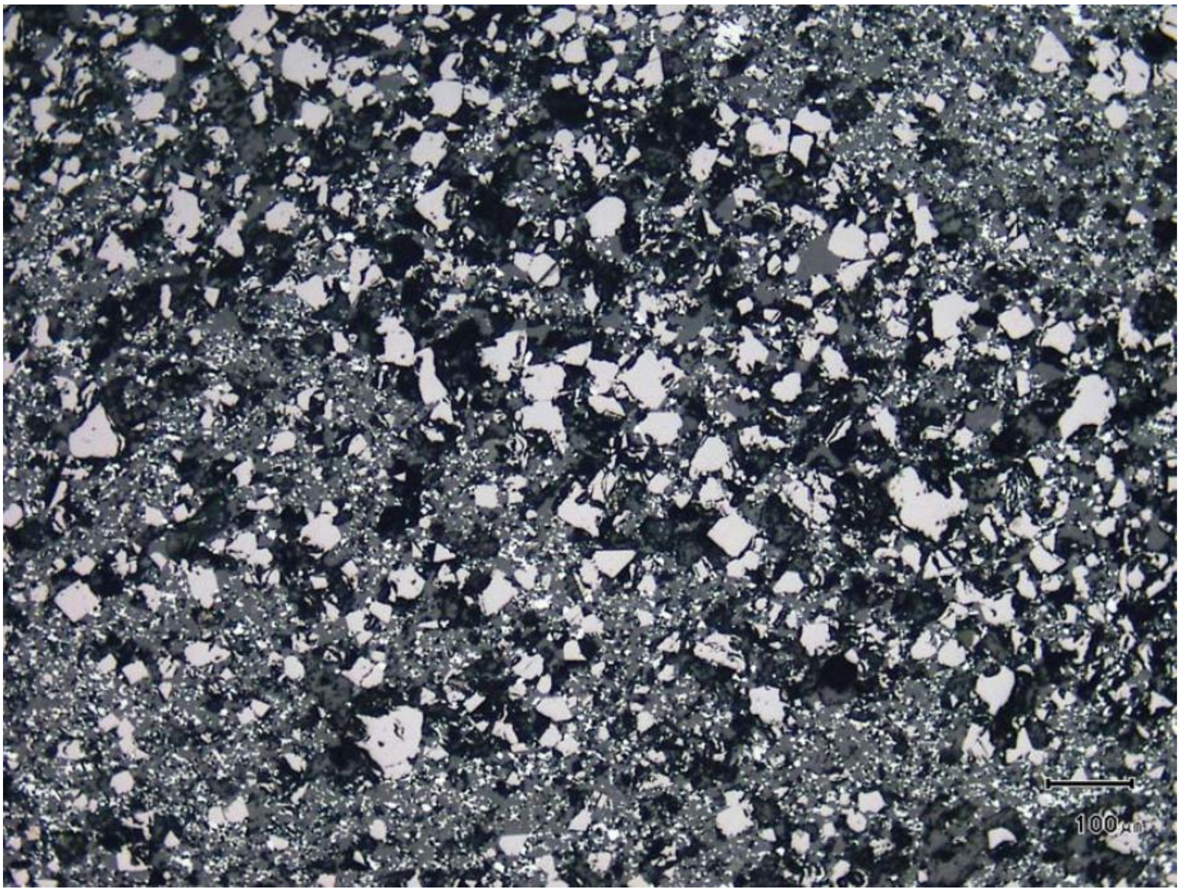
	
Unit C	Unit B3
	
Unit B2	Unit B1
	
Unit A	Pualco Tillite

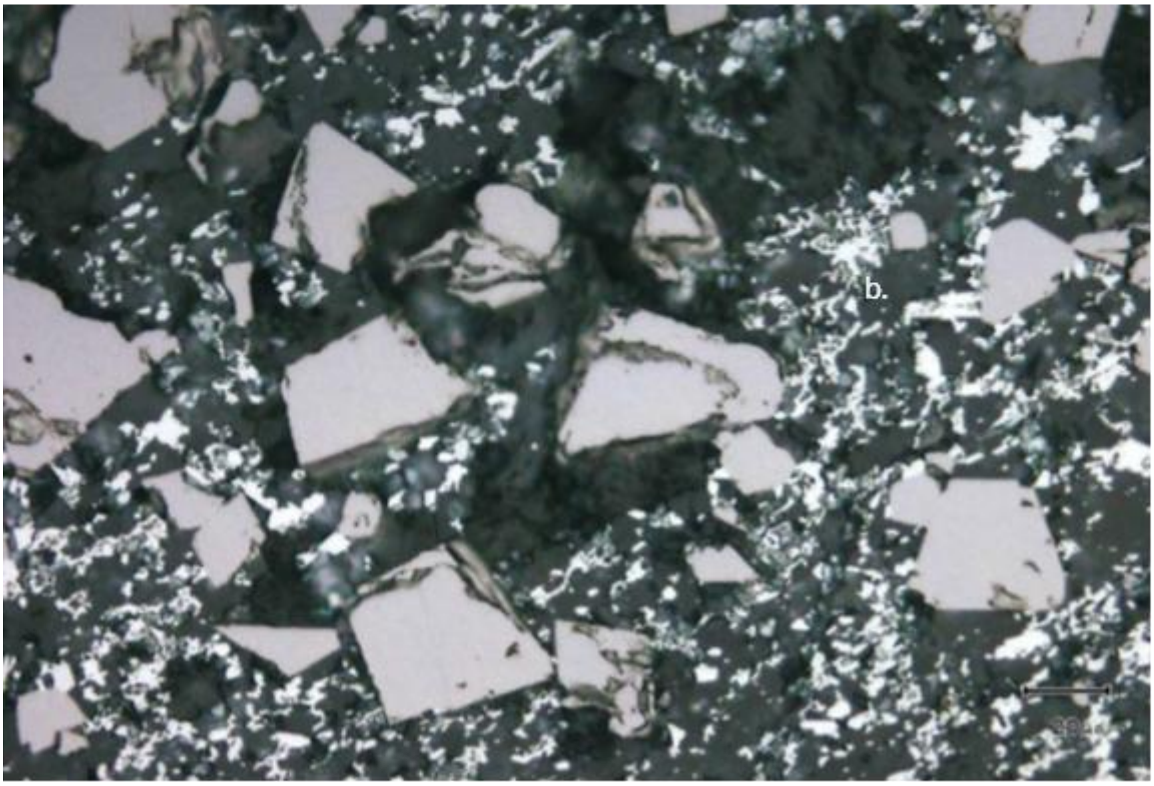
Plate 3-1: Representative photographs of lithology within Project Area

The magnetite grains are 10 to 150 µm (Plate 3-2) in layers up to 500 µm thick, and can form up to 80% of the rock. Of note is the consistent size and habit of magnetite crystals with median grains forming euhedral crystals with sizes in the range or 40-50 µm. Hematite is distributed irregularly through the rock and is thought to be of coeval genesis, with minor amounts possibly related to later diagenesis/metamorphism. Martite is prevalent in the upper ~20-50 m oxidised zone. The tillitic ore is medium to dark grey, massive and contains unsorted erratics from 10 mm to ~10 cm. The fragments are typically metasediments, carbonates, and granites.

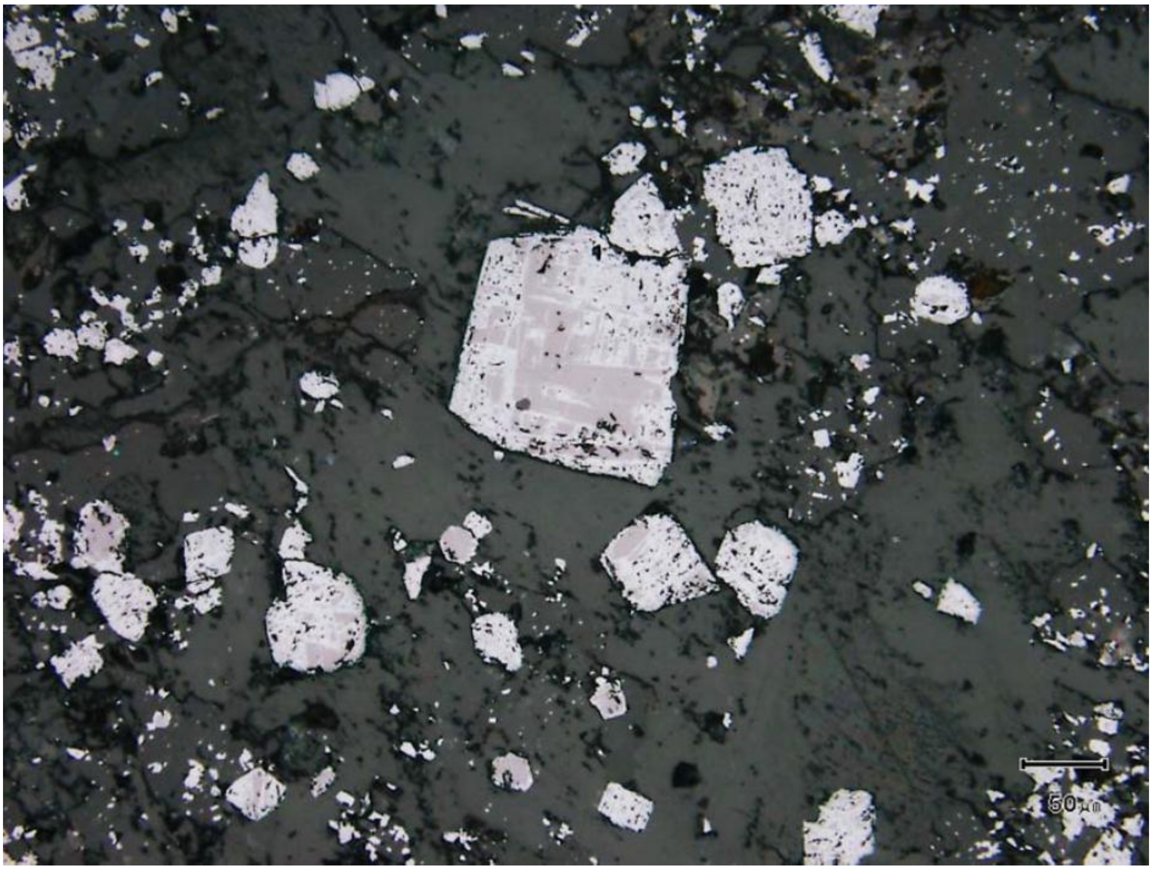
The matrix comprises microcrystalline hematite and coarser magnetite disseminated throughout with irregular enriched zones and micro-composites of carbonate, quartz and sericite/muscovite ± chlorite.



Overview image of iron-rich magnetite-bearing siltstone



Higher magnification image of above image with a) magnetite grains (grey) and b) fine-grained hermatite (white)



Martite grain showing partial replacement of magnetite (grey) by hematite (white)

Plate 3-2: Photomicrographs

3.4.3. Location, dimensions and orientation of the mineral resource and ore reserve

The Razorback and Iron Peak deposits are located ~40km southeast of Yunta, SA. The orebody is stratabound and follows the local strike of the Benda Siltstone which, in the proposed ML area, broadly strikes east-west, dipping between 30° and 70°. Owing to the folded nature of the stratigraphy the dip and strike of the deposits vary, refer to Appendix A1 for detailed mapping.

For detailed dimensions of the resource and ore bodies, refer to Sections 3.4.2.1 and 3.4.4.

3.4.4. Potential for extension to the orebody

Geophysical modelling of the Project Area has been undertaken to generate an exploration target for areas that have insufficient drill spacing to be included in the resource (MGT, 2023b) and several of these are within the proposed ML area. The areas identified for potential to extend the orebody within the proposed ML, in order of prospectivity, include Iron Peak North, Iron Peak East, Razorback North, Iron Peak Expansion, Interzone and Razorback West Extension (Figure 3-20). The unmineralised Pualco Tillite represents the southernmost extent of the pit, however there is sufficient flexibility in the mine model to allow currently unclassified material in the hanging wall and immediately north to be included following further resource definition drilling.

Further mineralisation extends beyond the boundary of the ML area, however the defined resources within the ML already represent in excess of 90 years of mining (based on 5 Mtpa concentrate production from material classified as Inferred and Indicated (JORC, 2012)), and not including unclassified extensions noted above.

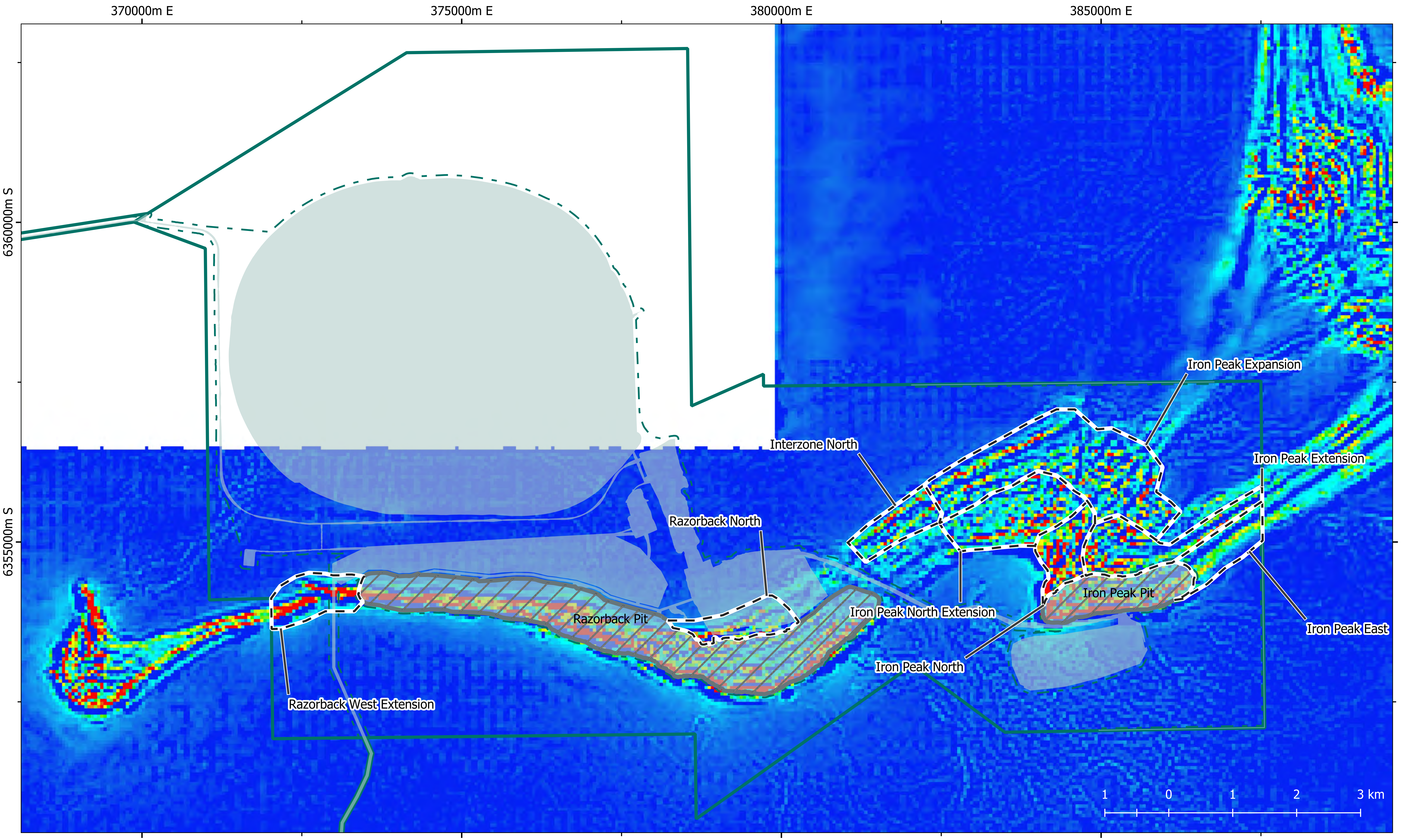


Figure 3-20: Resource extension potential with MGT 38-metre Depth Slice Magnetic Inversion Model

Project Area
Conceptual Footprint
Disturbance Footprint

Mine and resource potential areas
Mine pit
Resource expansion options

38m DS Magnetic Inversion value (B)
Dimensionless
20,000 x 10^-6
0

GDA 1994 MGA Zone 54 | 1:55,000 @ A3
Author: A Kane | Date: 28/01/2025
Razorback MLP/Referral

MAGNETITE MINES

3.4.5. Representative cross-sections

The Project comprises two deposits, Iron Peak and Razorback, divided into five pits, Iron Peak, Eastern Extension, East, Central and West. Figure 3-21 to Figure 3-25 are representative cross-sections of each of these pits, showing the major lithologies and outline of the proposed pit (black outline). The location of the cross-sections are presented in Figure 3-19.

3.4.6. Exploration data on which the geological interpretation was based on

The geological interpretation is based on a combination of mapping and exploration drilling. Mapping was undertaken by Whitten (building on initial work undertaken by Mawson), which also included the digging of the adit into Razorback, on behalf of the Mines department in the 1960's; and detailed mapping commissioned by Royal Resources, undertaken by Cotton in 2009-2011.

Drilling comprised two programs, the larger occurring between 2009 and 2012 by Royal Resources over three phases of drilling across Razorback, Razorback West, Interzone, Iron Peak and other prospects outside the MLA area. The second program, a combined infill and metallurgical program at Iron Peak was undertaken 2021 to 2022.

The first phase of drilling commenced in March 2010, the objective of which was to determine the grade and thickness of magnetite mineralization at Razorback via Reverse Circulation (RC) drilling, with 5 ½ inch (") face sampling, and was undertaken by Budd Contract Exploration using an Explorer 300 rig with ancillary Booster. 66 holes were completed over an ~3.5 km strike length, with an average depth of ~ 110 m and a total of 7,152 m (Figure 3-26). Due to the steep hilly terrain at Razorback, drill hole spacing was strongly dictated by rig access. Dilling fence lines are between 200 to 450 m spacing and generally occur along spurs running up the ridge. Along each fence line, holes are spaced either 50 or 100 m apart. Holes were drilled perpendicular to strike (mostly indicated from outcrop) and majority at 60° inclination to the south, providing drill intersections with near true thickness. Nine diamond drill holes (DDH) were completed as twin holes for RC drilling or areas where RC rig access was found to be too difficult. The drilling was undertaken by Budd Contract Exploration, using a UDR jack-up rig, with HQ standard tube. A total of 990 m were completed at Razorback. This Phase One drilling yielded a Joint Ore Reserves Committee (JORC) inferred resource of 277 Mt Iron ore at 26% Fe.

A second phase of drilling commenced in January 2011. The objective of this drill program was to further delineate the lateral and vertical (down - dip) extents of the Razorback resource. Drilling in this program was concentrated on the western extent of the Razorback prospect which lies immediately to the west of the defined resource achieved through the first phase of drilling. Drilling was also concentrated on the northern edge of the resource with the aim of extending the resource down dip, effectively deepening the resource from ~200 m to ~300 m. In addition to the resource extension, an additional six RC holes were drilled within the known resource in aid of developing the known resource from a JORC Inferred to JORC Indicated Resource. RC drilling, with 5" to 5 ½" bit face sampling, was undertaken by Budd Contract Exploration, using an Explorer 300 rig, with auxiliary booster and by Coughlan Drilling using a UDR 650 rig, also with an auxiliary booster. A combination of hole extensions (deepening) and new holes were drilled throughout the project with the 5" face sampling typically occurring within the extensional section of pre-drilled holes.

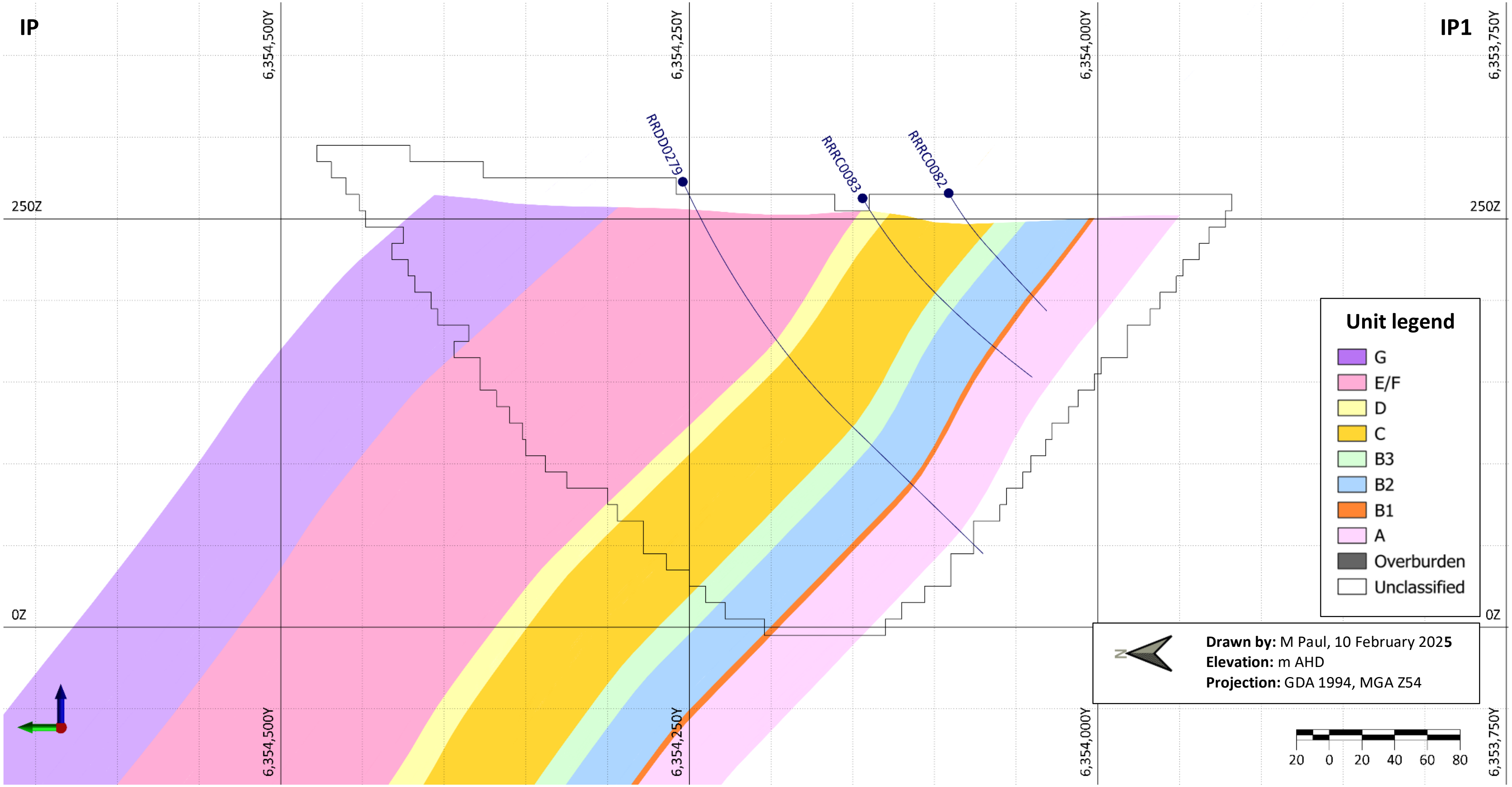


Figure 3-21: Iron Peak deposit, Iron Peak pit - Geological cross-section looking east (m)

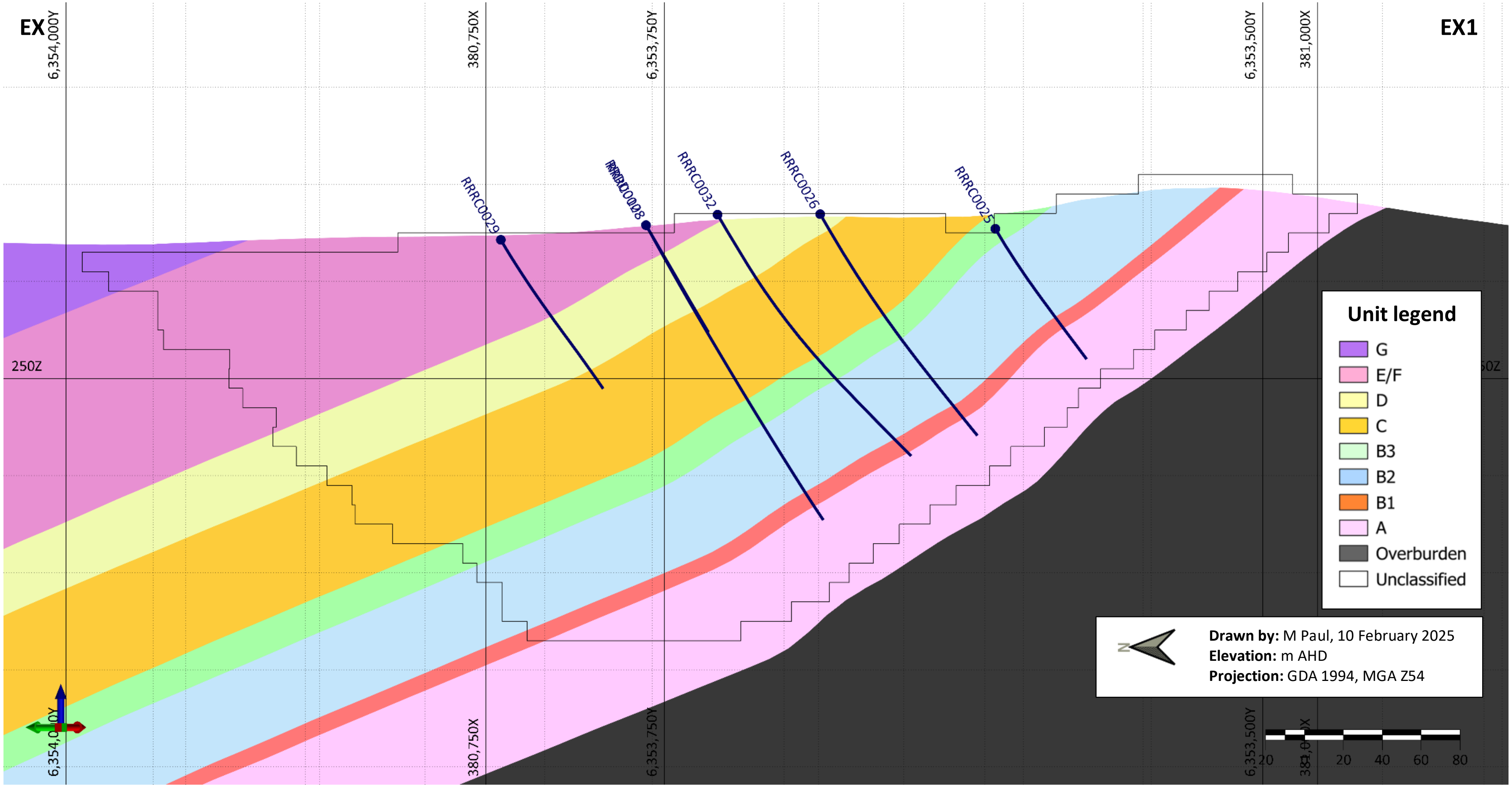


Figure 3-22: Razorback Deposit, Eastern Extension pit - Geological cross-section looking east (m)

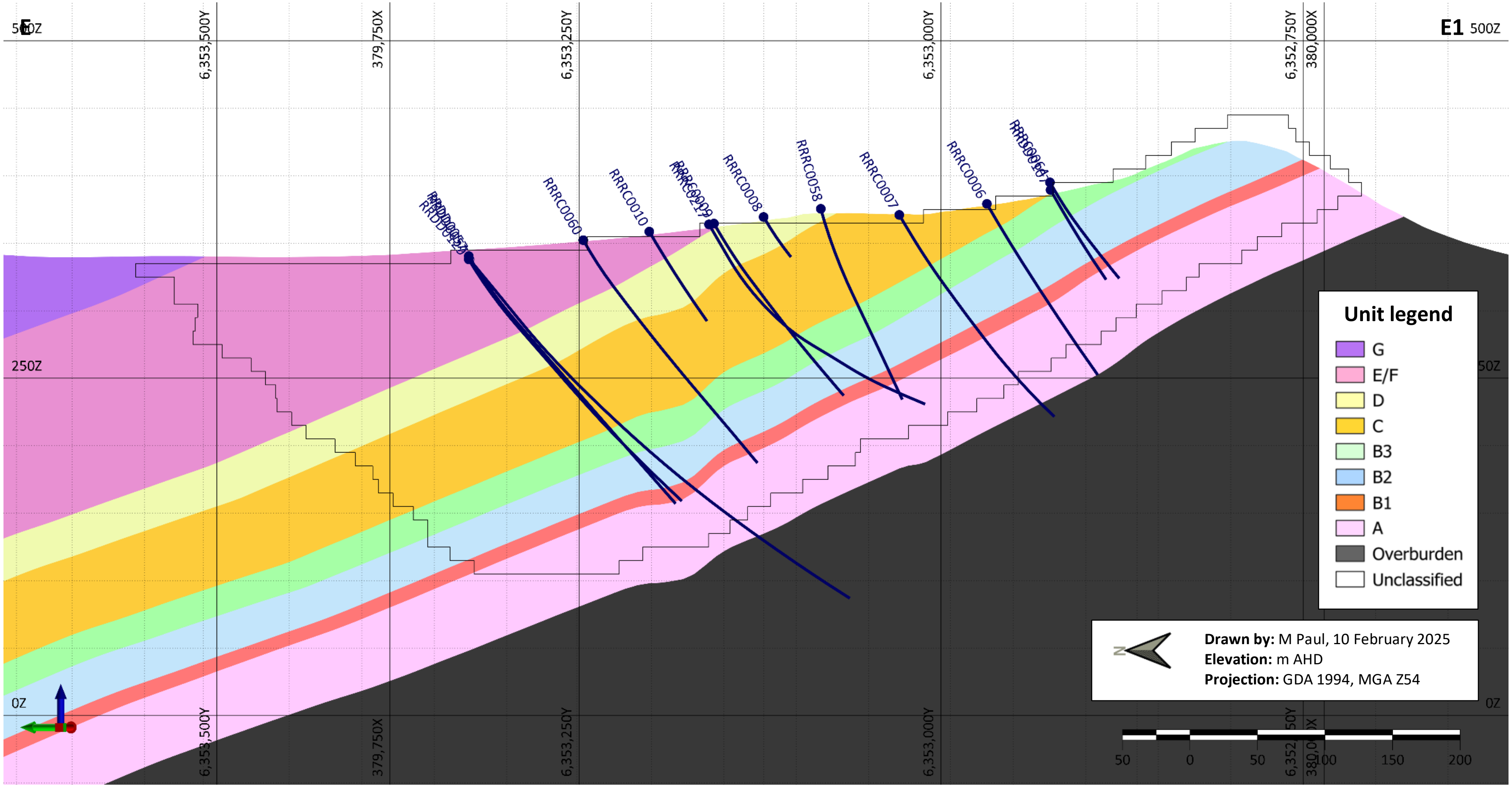


Figure 3-23: Razorback Deposit, East pit -Geological cross-section looking east (m)

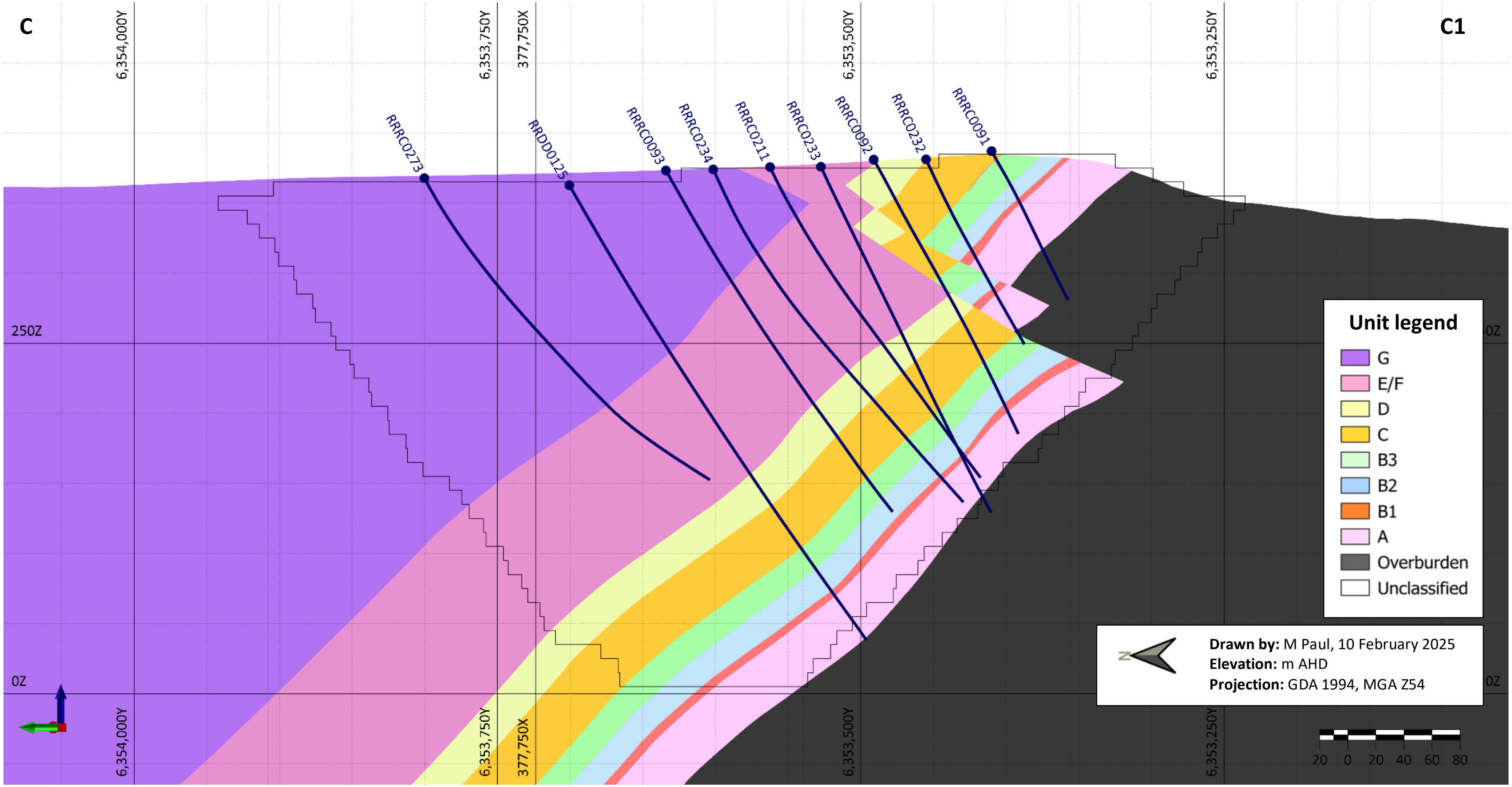


Figure 3-24: Razorback Deposit, Central pit - Geological cross-section looking east (m)

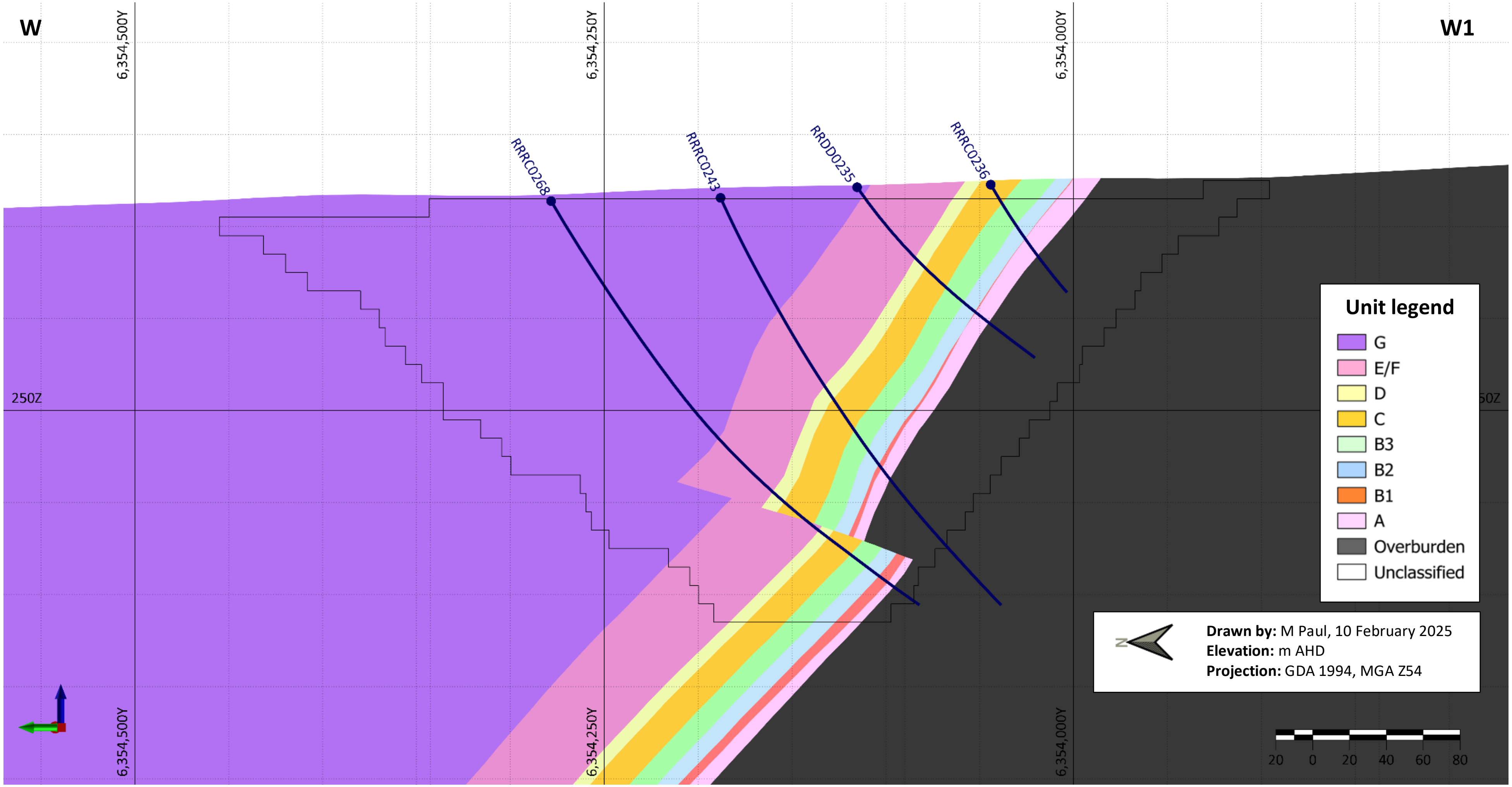


Figure 3-25: Razorback Deposit, West pit - Geological cross-section looking east (m)

In total, 61 RC holes were completed over a ~4.5 km strike length, with an average depth of ~ 170 meters for a total of 8,022 m. Eight of these holes were extensions to previous Phase one drill holes. As per Drilling Phase one, drilling fence lines are between 200 to 450 m spacing and generally occur along spurs running perpendicular to the ridge. Along each fence line, holes are spaced approximately 100 m apart. Holes were drilled perpendicular to strike (mostly indicated from outcrop) and the majority at 60° inclination to the south, providing drill intersections with near true thickness. 11 DDH were completed as twin holes for RC drilling or areas where RC rig access was found to be too difficult. The drilling was undertaken by Budd Contract Exploration, using a UDR jack-up rig, with HQ standard tube as well as by Range/Hodges Drilling using a VK600 truck mounted rig for a combination of PQ, HQ (standard tube) and NQ (triple tube). A total of six HQ, five NQ (extensions to previous RC holes) and one PQ (for metallurgical testing) holes were completed for 2005 m at Razorback (inclusive of the western drilling area).

A third phase of drilling commenced in late September 2011. The objective of this drill program was to further delineate the lateral (to the west - Razorback West and east – Iron Peak) and vertical (down - dip) extents of the Razorback resource. Drilling in this program was concentrated on the Western Razorback Ridge prospect which lies immediately to the west of the Drilling Phase one and two defined resources as well as to the east at the Iron Peak prospect, a continuation of the Braemar Iron formation to the east of the Razorback and Interzone resources.

A combination of DDH and RC extensions (deepening) and new holes (drilled from surface) were drilled throughout the project. RC drilling, with 5" to 5 ½" bit face sampling, was undertaken by Coughlan Drilling, using a UDR 650 rig, with an auxiliary booster. Typically these holes focused on shallow hole depths (0 – 250 m) and for DDH pre-collars. Occasionally the use of DDH extensions were utilized in conditions whereby the RC was not suited i.e. in the event of circulation loss or excess hole inclination variations. Diamond Drilling was undertaken by Range/Hodges Drilling – VK600 truck mounted rig, Coughlans Drilling – UDR 650 and Budd Contract Exploration – Hydrill 100 jack-up rig for a combination of HQ and NQ (standard and triple tube).

As per Drilling Phase one and two, drilling fence line spacing varied due to topography and heritage exclusion zones. Drill lines as a result vary between 200 to 450 m spacing and generally occur along topographical spurs running perpendicular to the ridge. Along each fence line, holes are spaced approximately 100 m apart. Drilling azimuths were orientated to intersect the orebody perpendicular to strike (mostly indicated from outcrop) and the majority at 55-60° inclination to the south, providing drill intersections with near true thickness.

A fourth phase of drilling commenced in October 2021 at Iron Peak. The objective of this drill program was to obtain sample for metallurgical test work and to increase drill density in near-surface material, which represents the early stages of mining, with the aim of bringing this material to JORC 2012 Indicated Resource status. Drilling in this program was carried out by Foraco, focusing on Iron Peak.

Diamond drilling utilizing PQ3 for metallurgical sample and HQ3 for infill was undertaken by Foraco. A total of 11 PQ diamond holes were completed for 1,393.35 m and six HQ diamond holes for 519.3 m over a ~1,500 m strike, totalling 1,912.65 m at Iron Peak.

As per previous drilling phases, drilling fence lines were spaced to effectively cover the Project Area, with specific attention to the geological features and the early stages of the mining material. The precise spacing and orientation of the holes were strategically planned to ensure comprehensive coverage and accurate intersection of the targeted material, aiming to meet the objectives of the drilling program effectively.

For a full list of drillhole details refer to Appendix A2 Exploration drill holes records.

The Mineral Resource Estimate (MGT, 2025) and Probable Ore Reserve (MGT, 2023c) statements produced for the Project was prepared in compliance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC, 2012) ('the JORC Code'). JORC statements for the Project are discussed in more detail in Section 4.3.1 and reports provided as Appendices A3 JORC Mineral Resource Estimate statement and A4 JORC Probable Ore Reserve statement.

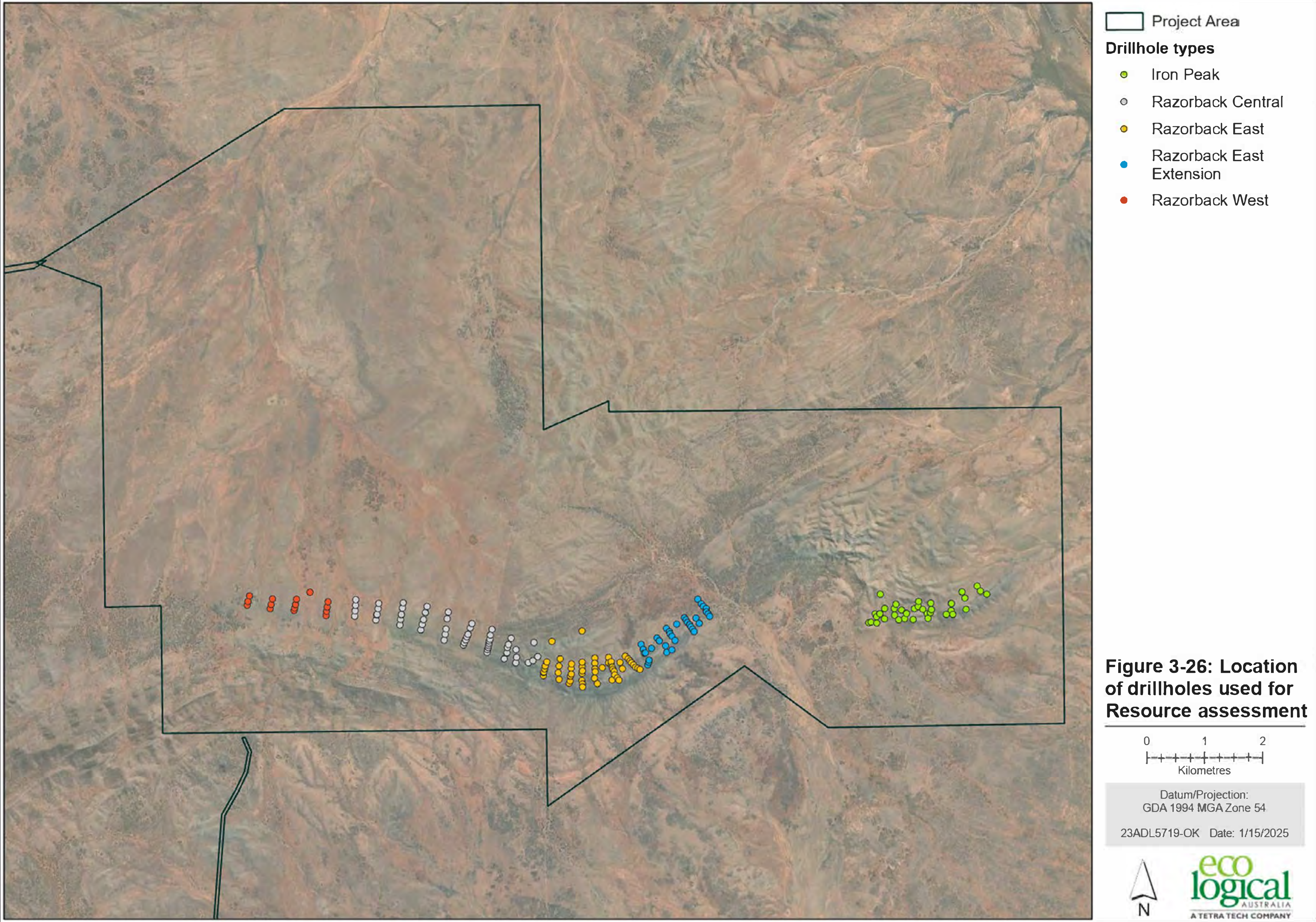


Figure 3-26: Location of drillholes used for Resource assessment

3.5. Geochemistry and geohazards

3.5.1. Geochemistry

The principal rock types and their associated stratigraphic units to be disturbed as part of mining operations are listed in Table 3-8.

Table 3-8: Lithological codes, rock type and associated stratigraphic units

Lithological code	Rock type	Stratigraphic units
Ssl	Siltstone	C, E, F, Benda
Sba	Bedded/laminated Iron Formation	B1, D1
Stf	Tillitic Iron Formation	B2, D2
Sii	Interbedded/laminated Iron Formation	A, B3, D3, G1, G2
Sti	Tillite	PT

MGT has compiled a substantial database comprising 57 diamond drillholes for 4,892.68 m and 151 RC drillholes for 26,678 m, for a total of 208 holes and 31,570.68 m across the pit areas within the proposed ML (Figure 3-26). Refer to Table 3-9 for a breakdown by pit. From this drilling, MGT have received 20,032 multi-element X-ray fluorescence (XRF) assay results (refer to Appendix A5 *XRF assay results* or full results). MGT's independent QA/QC process includes certified reference materials (CRMs) and duplicates in addition to checks performed by the laboratory.

Table 3-9: Summary of drilling

Pit	Hole type (drilling method)	Metres (m)	Number of holes
West	DD	133.25	1
	RC	2,643	14
	Subtotal	2,776.25	15
Central	DD	1,414.7	12
	RC	9,308	44
	Subtotal	10,722.7	56
East	DD	1,293.7	13
	RC	7,030	44
	Subtotal	8,323.7	57
East extension	DD	603.4	6
	RC	3,987	34
	Subtotal	4,590.4	40
Iron Peak	DD	1,447.63	25
	RC	3,710	15
	Subtotal	5,157.63	40
Total		**31,570.68**	**208**

3.5.2. Minerology

Typical mineralogy of the lithologies to be mined within the proposed ML, in descending order of abundance as determined by quantitative X-Ray Diffraction analysis (XRD) from a selection of 30 representative samples across the Razorback and Iron Peak pit areas, comprises quartz, iron oxides (magnetite, hematite and martite), mica (muscovite with minor biotite), carbonates (dolomite with minor calcite), chlorite (chamosite), apatite and rutile. Trace pyrite, chalcopyrite, siderite, monazite and zircon have been observed with optical and Scanning Electron Microscopy (SEM) (refer Table 3-10).

Table 3-10: Summary statistics of XRD analysis

Rock Type	Average	Median	STDev	Minimum	Maximum
Spinel group	13.5	13	6.4634	2	27
Hematite group	15.0	15	7.4115	1	30
Chlorite group	5.8	6	2.1238	1	9
Mica group	11.0	11.5	5.2027	3	21
Quartz	32.6	32.5	5.6422	21	47
Plagioclase	10.5	10	3.4415	5	21
Dolomite group	9.7	9	2.6566	5	18
Rutile group	0.7	0.5	0.2330	0.5	1
Calcite group	1.1	0.5	0.9861	0.5	4
Apatite group	1.4	1	0.6687	1	4

3.5.3. Sulfide minerals

From optical and SEM microscopy, the dominant sulfur-bearing species is pyrite with minor chalcopyrite. The Tailings Management Pre-Feasibility Study conducted by Golder Associates identified that, owing to the presence of carbonates, the composition of the tailings material had an Acid Neutralising Capacity (ANC) of 100 kg H_2SO_4/tonne, with the material in the study containing <0.005% sulfur, and was therefore considered non-acid forming (NAF).

Sulfur concentrations (wt%) vary across the lithologies and the pits however, the results indicate that elevated sulfur concentrations >2 wt% are associated with units A, G2 and BST in the central and west pits and B1 in the central pit.

Refer to Table 3-11 to Table 3-15 for a breakdown of sulfur content by pit and lithology.

Table 3-11: Summary statistics of sulfur values (wt%) from West pit

Unit	Lithology	Count	Minimum	Maximum	Average	STDev
A	Laminated	81	0.002	2.260	0.171	0.263
B1	Bedded	22	0.002	0.076	0.019	0.016
B2	Tillitic	35	0.003	0.304	0.085	0.100
B3	Laminated	79	0.002	0.368	0.044	0.071
C	Siltstone	81	0.004	0.939	0.082	0.129
D1	Bedded	7	0.008	0.172	0.035	0.061
D2	Tillitic	2	0.019	0.041	0.030	0.016
D3	Laminated	41	0.002	0.533	0.066	0.117
E	Siltstone	161	0.003	0.301	0.048	0.058
F	Siltstone	37	0.002	0.340	0.113	0.089
G1	Laminated	19	0.003	0.138	0.045	0.042
G2	Laminated	100	0.002	2.210	0.113	0.283
PT	Tillitic	16	0.012	0.201	0.110	0.073
BST	Fault zone	37	0.007	4.510	0.753	0.920

Table 3-12: Summary statistics of sulfur (wt%) from Central pit

Unit	Lithology	Count	Minimum	Maximum	Average	STDev
A	Laminated	398	0.0005	2.2000	0.1016	0.1770
B1	Bedded	149	0.0005	2.4400	0.0816	0.2575
B2	Tillitic	259	0.0005	0.5370	0.0323	0.0624
B3	Laminated	311	0.0005	1.0250	0.0240	0.0709
C	Siltstone	570	0.0005	1.0700	0.0928	0.1319
D1	Bedded	160	0.0005	0.4000	0.0220	0.0481
D2	Tillitic	158	0.0005	0.2010	0.0162	0.0315
D3	Laminated	128	0.0005	0.4480	0.0184	0.0521
E	Siltstone	954	0.0005	1.2200	0.0734	0.1185
F	Siltstone	382	0.0020	0.6460	0.1032	0.0898
G1	Laminated	253	0.0005	2.1900	0.0440	0.1606
G2	Laminated	629	0.0005	2.8200	0.0491	0.1571
PT	Tillitic	6	0.0580	0.2400	0.1580	0.0731
BST	Fault zone	192	0.0005	4.2600	0.3063	0.5051

Table 3-13: Summary statistics of sulfur (wt%) from East pit

Unit	Lithology	Count	Minimum	Maximum	Average	STDev
A	Laminated	106	0.0020	1.0850	0.0799	0.1579
B1	Bedded	248	0.0005	1.0350	0.0248	0.0744
B2	Tillitic	633	0.0005	0.3080	0.0146	0.0258
B3	Laminated	473	0.0005	1.6700	0.0166	0.0821
C	Siltstone	613	0.0005	0.8030	0.1107	0.1376
D1	Bedded	170	0.0005	0.3700	0.0140	0.0316
D2	Tillitic	242	0.0005	0.2570	0.0123	0.0189
D3	Laminated	89	0.0005	0.0810	0.0073	0.0095
E	Siltstone	472	0.0005	0.5880	0.0865	0.1318
F	Siltstone	9	0.0060	0.3240	0.1119	0.1003
G1	Laminated	0	N/A	N/A	N/A	N/A
G2	Laminated	0	N/A	N/A	N/A	N/A
PT	Tillitic	0	N/A	N/A	N/A	N/A
BST	Fault zone	0	N/A	N/A	N/A	N/A

Table 3-14: Summary statistics of sulfur values (wt%) from East Extension pit

Unit	Lithology	Count	Minimum	Maximum	Average	STDev
A	Laminated	113	0.0005	0.9970	0.0511	0.1297
B1	Bedded	109	0.0005	0.1450	0.0120	0.0234
B2	Tillitic	507	0.0005	0.0900	0.0110	0.0101
B3	Laminated	182	0.0005	0.2980	0.0133	0.0329
C	Siltstone	135	0.0005	0.9350	0.0861	0.1529
D1	Bedded	74	0.0005	0.0270	0.0076	0.0054
D2	Tillitic	75	0.0020	0.0860	0.0130	0.0098
D3	Laminated	36	0.0005	0.0570	0.0102	0.0130
E	Siltstone	53	0.0040	0.2650	0.0243	0.0527
F	Siltstone	0	N/A	N/A	N/A	N/A
G1	Laminated	0	N/A	N/A	N/A	N/A
G2	Laminated	0	N/A	N/A	N/A	N/A
PT	Tillitic	0	N/A	N/A	N/A	N/A
BST	Fault zone	0	N/A	N/A	N/A	N/A

Table 3-15: Summary statistics of sulfur values (wt%) from Iron Peak pit

Unit	Lithology	Count	Minimum	Maximum	Average	STDev
A	Laminated	1187	0.0005	2.1800	0.0583	0.1519
B1	Bedded	315	0.0005	0.1110	0.0085	0.0135
B2	Tillitic	794	0.0005	0.2890	0.0106	0.0151
B3	Laminated	500	0.0005	0.9400	0.0136	0.0541
C	Siltstone	899	0.0005	1.6300	0.1449	0.1776
D1	Bedded	63	0.0005	0.1130	0.0082	0.0153
D2	Tillitic	52	0.0030	0.0300	0.0088	0.0043
D3	Laminated	120	0.0005	0.0510	0.0071	0.0060
E	Siltstone	332	0.0010	0.7360	0.0941	0.1183
F	Siltstone	70	0.0130	0.6050	0.2399	0.1297
G1	Laminated	17	0.0880	0.5400	0.3421	0.1325
G2	Laminated	6	0.0360	0.4270	0.1715	0.1459
PT	Tillitic	50	0.0050	0.0960	0.0494	0.0225
BST	Fault zone	0	N/A	N/A	N/A	N/A

Analysis of the current geochemical data set indicates there is a gap in knowledge regarding the acid producing potential of material reported to have elevated concentrations of sulfur, with historical analysis limited to a small number of lithological samples and tailings material (ore body based). Further work will be undertaken to assess the acid producing potential of the waste rock material with targeted assessment based on the preliminary data. The results will inform the development of any management plans if required.

3.5.4. Acid-base accounting

The generation of Acid Rock Drainage (ARD) depends on the combination of susceptible minerals, and the availability of oxygen and water. Water is both a reactant and the main means by which ARD can spread. In the arid environment of the Project rainfall is sporadic, with long dry periods between rainfall events. As a result, any potential ARD may be ephemeral. During dry periods, evaporation may lead to the formation of precipitates and salts which may store metals, sulfate and acidity. Depending on the neutralisation capacity of the rocks, during high rainfall periods these may be flushed out resulting in the release of acidic waters, with elevated sulphates and metals.

The net acid generation test (NAG) evaluates the acid producing potential of a sample. The test involves the addition of strong oxidising agents such as hydrogen peroxide to the sample. After oxidation, pH (NAGpH) and acidity are measured. As with the Net Acid Producing Potential (NAPP) calculation, a positive NAG indicates potentially acid forming material (PAF). A NAG pH of 4.5 or less (using the classification system in Table 3-16) confirms that sulphide oxidation generates an excess of acidity and classifies the material as higher risk.

Table 3-16: Acid forming potential classification criteria

Primary geochemical type	Final NAG pH	NAP kg H_2SO_4/t
PAF	<4.5	>10
PAF – Low Capacity (PAF-LC)	<4.5	0-10
Non acid forming (NAF)	≥4.5	<0
Acid consuming material (ACM)	≥4.5	<-100
Uncertain (UNC)	≥4.5 or <4.5	Positive Negative

Both NAPP and ANC are expressed as kilograms of sulphuric acid per tonne of sample. A sample with NAPP greater than zero may be classified as PAF. Where the value is close to zero or negative, material is usually classified as NAF. A material with strongly negative NAPP (i.e. ANC considerably greater than total potential acidity) may be ACM. These materials are typically carbonate rich.

Analysis undertaken and presented in Parsons Brinkerhoff (2013), assessed a total of 12 samples and a single duplicate sample for acid formation (Table 3-17).

Table 3-17: Acid formation classification from Razorback rock samples (Royal Resources, 2013)

Sample ID	Lithology	Sample Depth interval (m)	NAAP	ANC/MPA Ration	Classification
RRRC0043	Hanging wall - Wilyerpa Formation	70-71	-124	11.1	ACM
RRRC0043	Footwall - Pualco Tilite	159-160	-129	18	ACM
RRRC0043 duplicate	Footwall - Pualco Tillite	159-160	-138	20.7	ACM
RRRC0060	Footwall - Pualco Tilite	205-206	-106	16.1	ACM
RRRC02.03	Hanging wall - Wilyerpa Formation	95-96	-102	340	ACM
RRRC02.03	Low grade ore	155-156	-97.4	324.7	NAF
RRRC0203	Magnetite ore	165-166	-70.3	234	NAF
RRRC0203	Footwall - Pualco Tillite	180-181	-82.8	11.9	NAF
RRRC0204	Hanging wall - Wilyerpa Formation	55-56	-19.8	66	NAF
RRRC0204	Low grade ore	115-116	-321	1070	ACM
RRRC0204	Magnetite ore	130-131	-90.8	302.7	NAF
RRRC0204	Footwall – Pualco Tillite	140—141	-88.6	5.9	NAF
RRRC0206	Hanging wall - Wilyerpa Formation	89-90	-116	7.2	ACM

All samples tested have a negative NAPP, suggesting that the samples are not acid generating, as assessed against criteria in Table 3-16 and shown in Figure 3-27.

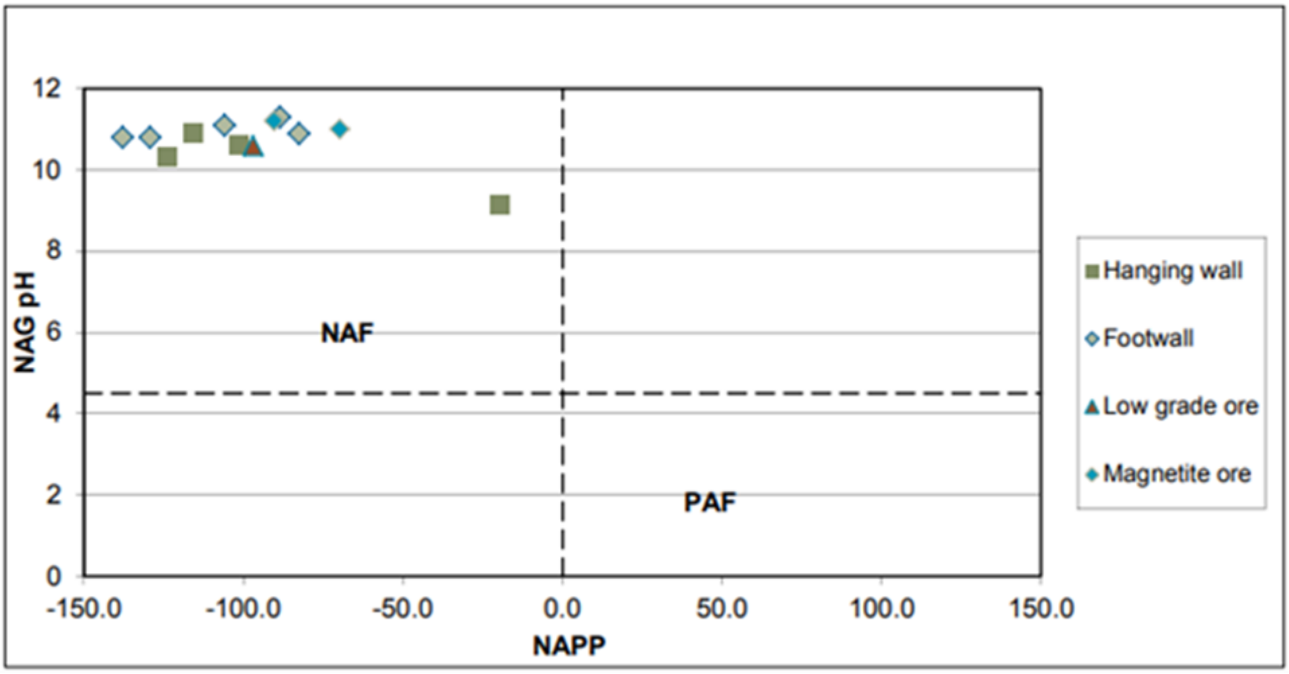


Figure 3-27: Geochemical classification by rock type

Further, materials having an ANC / Mercaptopropionic acid (MPA) ratio of two or more are generally expected to be NAF. As can be seen in Figure 3-28, all samples have a ratio above 3:1 and are therefore not expected to be acid forming.

Of the 13 samples tested, seven (including a duplicate sample) were classified as ACM and six samples were classified as NAF indicating that ARD is highly unlikely to occur.

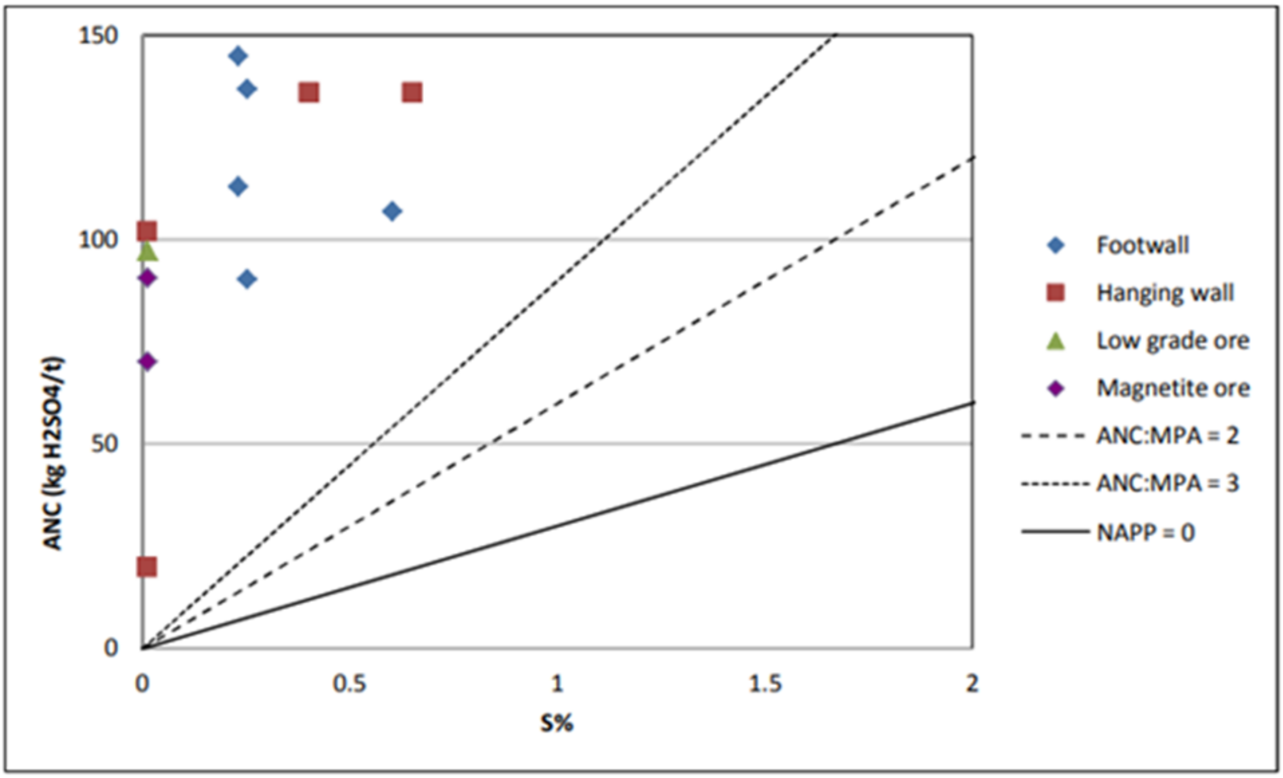


Figure 3-28: Acid neutralising ANC/MPA Ratio

Acid base accounting undertaken to date has focused on the historical dataset available at the time. Since preliminary work was undertaken, further drill core samples are available and additional metallurgical testing has been completed. Results indicate there are four lithologies, primarily associated with the west and central pits that have produced elevated concentrations in sulfur, such that further analysis is required to quantify the acid producing potential of the lithology.

In 2024, further visual assessment and metallurgical analysis was undertaken across of a number of samples which originally reported elevated concentrations of sulfur. The retesting was designed to confirm the elevated concentrations of sulfur. In total 49 high sulfur samples were analysed. Each sample analysed was collected from the 2 m composite split of the RC drill spoil, with samples then compared to the original sample analysed. Due to comparison of slightly different splits, the results do not match perfectly, however statistical analysis provides a R2 value (coefficient of determination) of 0.79 for total sulfur, which shows reasonable agreement between the previous assays and the updated re-splits. The visual examination of the RC chip trays, which contain coarse-grained pyrite, the re-test assay data results and the R2 value of 0.79 confirm elevated sulfur concentrations >1 wt% identified within the current assay data set are not likely the result of sample preparation or laboratory error and as such, further analysis work is required.

3.5.5. Asbestiform minerals

No asbestiform materials or their parent minerals have been observed in any of the extensive geological logs across the proposed MLA area and based on the maximum greenschist-facies metamorphic grade as outlined in Section 3.4, the risk of asbestiform minerals is considered low.

3.5.6. Radioactive minerals

As part of their 2022 groundwater sampling program ELA indicated that all groundwater samples taken from the Project had returned with Gross Alpha and Gross Beta levels above the 0.5 Bq/L guidelines for potable water supply. Until this point no work had been undertaken to determine the level of uranium (U) or Thorium (Th) in ore or waste rock material from the Razorback prospect as these elements are not part of the iron ore assay suite used for resource modelling.

Under advisement of Daniel Emes at Radiation Consulting Australia (RCA), a program was devised to test whether U and Th present a health and safety or regulatory risk to the project, including testing whether U and Th are present, and whether content varied between the different units in the Braemar Iron Formation (and Pualco tillite) and if any variability was present spatially across the Razorback prospect.

Drillhole RRDD0125 was chosen to test stratigraphic variability and the coarse rejects from 7 RC holes across Razorback (refer Figure 3-29) were selected to test spatial variability for a total of 460 readings using an RS-125 gamma ray spectrometer. 42 pulps from RRDD0125 were sent for Aqua regia digestion and mass spectrometry analysis assay as ‘referee’ samples to compare with the results from the RS-125.

Assays returned an average of 0.67 parts per million (ppm) with a maximum of 1.49 ppm U, while the spectrometer readings returned an average of 1.3 ppm average and maximum of 5.2 ppm U. The results were provided to RCA for assessment. It was noted in the RCA report that very low U concentrations, as found in the samples from Razorback, spectrometer readings can be impacted by background dose rates and are often overestimated (refer to Appendix A5 *XRF assay results*).

The findings of the RCA report (refer Appendix B11) indicate that the maximum activity concentration for U, Th and K were well below the threshold to be considered radioactive material under the *SA Radiation Protection and Control Act 2021* (RPC Act) (Table 3-18).

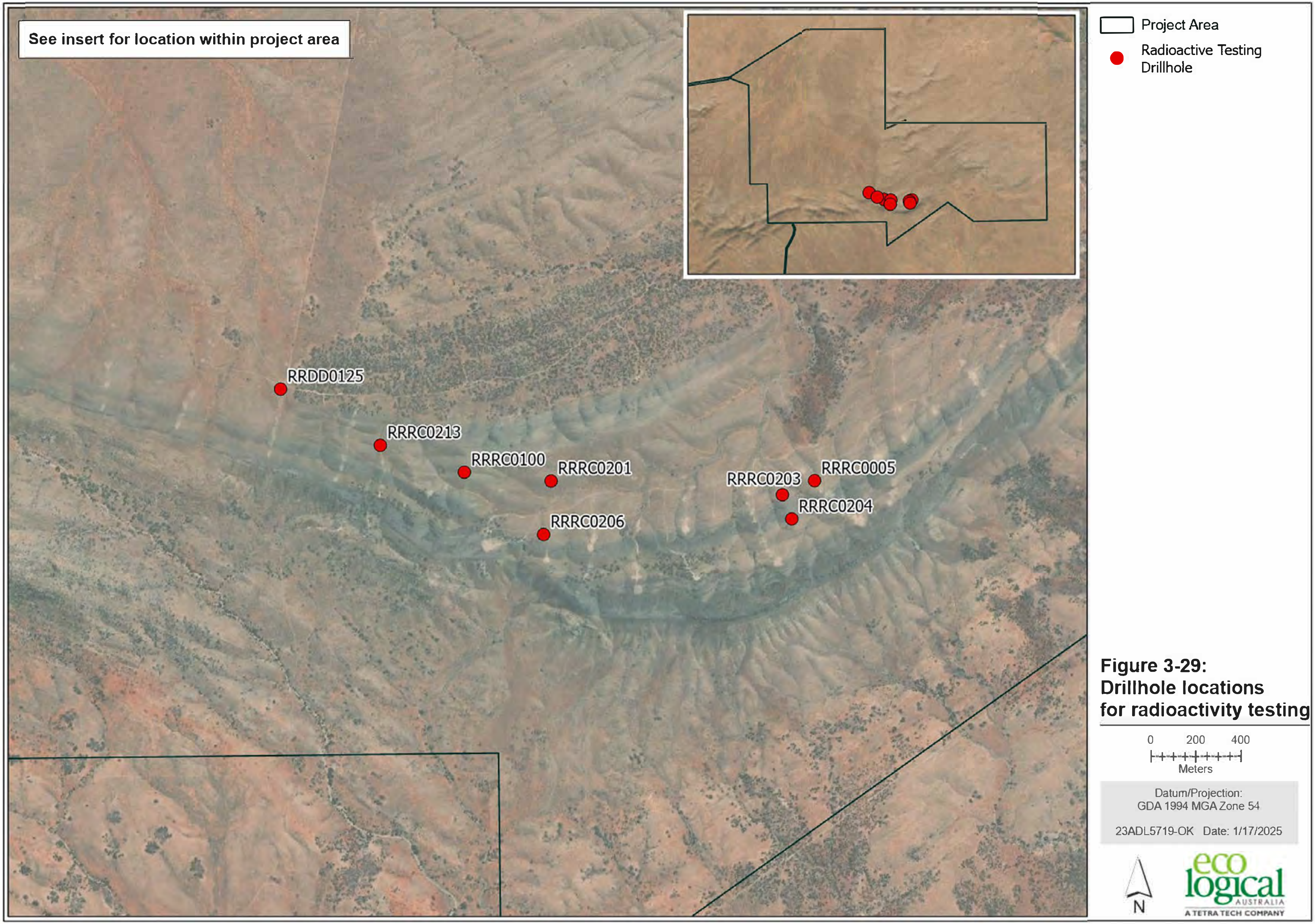


Figure 3-29: Drillhole locations for radioactivity testing

Table 3-18: Radionuclide concentrations in drill samples

Radionuclide	Average Activity Concentration (Bq/g)	Maximum Activity Concentration (Bq/g)	Threshold for 'radioactive material" under SA RPC Act (Bq/g)
U^{238}	0.008	0.019	1
Th^{232}	0.029	0.056	1
K^{40}	0.257	0.527	10

BQ/G - BECQUEREL PER GRAM

3.5.7. Respirable silica

As determined by XRD the material proposed to be mined in the Project Area is on average 32.6% quartz, largely from siltstone, which represents a potential source of respirable silica during construction and mining operations if not adequately managed by dust suppression and PPE.

Air quality modelling for the Project (Katestone, 2024) shows a projected increase in respirable particles (PM_{10} and $PM_{2.5}$) across the LOM. The potential impacts of the emissions on sensitive receptors (people living in the area surrounding the Project Area) have been assessed using a dispersion modelling approach. When allowing for reduction in emissions due to proposed mitigation measures, the modelling shows the predicted ground-level concentrations of pollutants (respirable particles) will comply with the respective air quality criteria at all sensitive receptors for the Project in isolation and inclusive of ambient backgrounds. Hence there is a low possibility that the general public (excluding employees of MGT) will be subject to increased levels of respirable silica. Detailed impact assessment for air quality is presented in Chapter 7.

3.5.8. Structural instabilities

The Project has been subject to several geological mapping and structural interpretation assessments, the outputs of which form the basis for the following structural descriptions. These include:

- Braemar 1 Mile Mapsheet (DEM, 2024a)
- Chowilla - SA. Sheet SI/54-06, International Index. 1:250 000 Geological Series - Explanatory Notes (Rogers, P.A., 1949)
- Olary, SA. Sheet SI/54-02, International Index. 1:250 000 Geological Series - Explanatory Notes. (DEM, 2024b)
- Geological Mapping – Barry Cotton, 2010 (refer Appendix A7)
- Structural Interpretation (MBGS, 2021)
- Razorback Premium Iron Project – Structural Prefeasibility Study Review. (Golder, 2013)

The Razorback Iron Ore Project is situated within the Nackara Arc of the Adelaide Fold Belt, part of the Olary Region in SA. The hosting Braemar Iron Formation is a Neoproterozoic-aged glaciogenic meta-sedimentary unit that forms part of the Adelaide Geosyncline, and is characterised by multiple phases of deformation.

The structural evolution of the Olary Region has been shaped by the Delamerian Orogeny (~514–500 Ma), which imposed tight to isoclinal folding and faulting. These structures are predominantly northeast-striking and associated with greenschist-facies metamorphism, which varies from chlorite-grade in regional areas to localized biotite-grade in structural corridors (Golder, 2013).

The Razorback deposit occurs along the north-dipping limb of the Pualco Anticline, a major fold structure in the Braemar Iron Formation. The orebody is stratiform, displaying extensive continuity along a strike length of ~12 km, with bedding dips generally ranging between 40°–45° in the central and eastern regions. In the Western Razorback area, bedding steepens to 50°–80°, a result of both primary fold geometry and later reverse faulting (Olary, Explanatory notes; MBGS, 2021).

The Razorback deposit is divided into several fault blocks (F0–F4) based on drill core data, geophysical interpretation, and mapping. Reverse faulting plays a significant role in orebody segmentation, with major low-angle thrust faults interpreted across the deposit (refer to selected figures in Section 3.4.5). These faults, detected via downhole geophysics and structural mapping, display northeast-trending orientations, which align with the dominant fold structures of the Adelaide Fold Belt (Golder, 2013; MBGS, 2021).

3.5.8.1. Geotechnical and structural controls for mining

Geotechnical analysis has identified distinct structural domains that influence slope stability at Razorback (Golder, 2013). The deposit's hanging wall exhibits variable stability, with recommended pit slope angles of 42°–48° for the footwall and 45°–46° for the hanging wall (Golder, 2013). The weathering profile indicates partial oxidation of magnetite to a depth of ~25 m, which impacts rock mass strength. The structural framework is further defined by joint sets and fracture networks that correlate with field mapping, including steeply dipping east-west fractures (F1 Set), moderately dipping north-south fractures (F2/J1 Sets), and steeply dipping northwest-southeast fractures (F3/J4 Sets) (MBGS, 2021).

The Razorback deposit exhibits a structurally complex geology, influenced by multiple deformation events associated with the Delamerian Orogeny. The interplay of folding, reverse faulting, and metamorphic overprinting has defined the current orebody geometry, with structural segmentation evident across the deposit. The integration of geophysical and geological data into a 3D faulted model provides a refined framework for resource estimation, geotechnical assessment, and mine planning.

3.5.9. Earthquakes

The most significant seismic events within a 60 km radius of the Project Area include two 4.7 magnitude earthquakes, one in 2023 and the other in 2014, and a 4.1 magnitude earthquake in 2010. A total of 31 events have been recorded within this area, refer to Table 3-19 for a summary. Figure 3-30 provides the NSHA18 hazard map indicating the mean peak ground acceleration (PGA) (expressed as a proportion of the acceleration due to gravity, g) for 10% probability of exceedance in 50-years on AS1170.4 Site Class Be, and all recorded earthquakes in the last 100 years within 60 km of the ML area. Earthquakes recorded in the area range from between a magnitude 1.1 and magnitude 4.7.

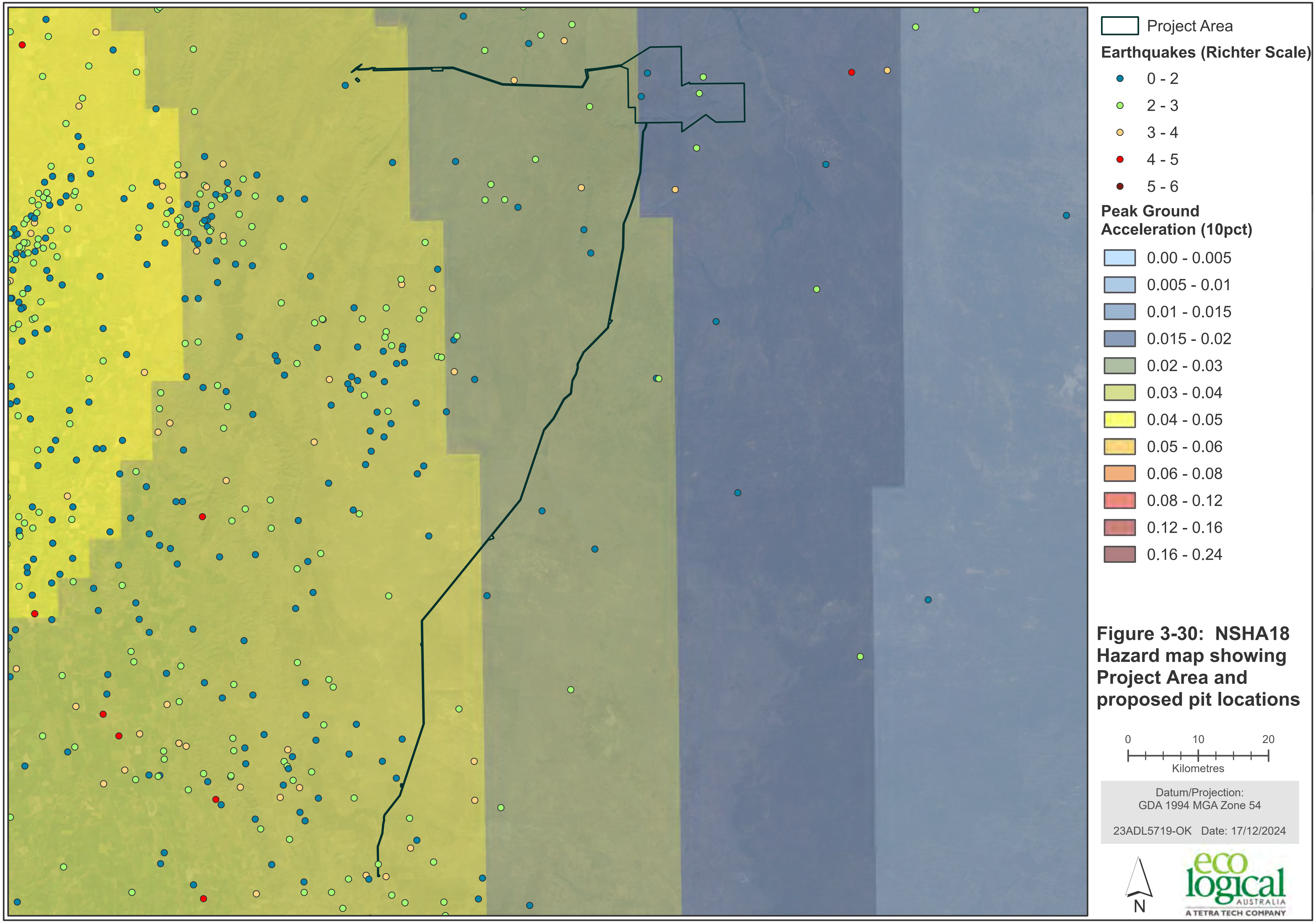


Figure 3-30: NSHA18 Hazard map showing Project Area and proposed pit locations

Table 3-19: Summary of recorded earthquakes within 60 km of the proposed ML area

Date	Magnitude	Date	Magnitude
10/11/2023	2.6	2/05/2005	2.7
23/03/2023	2.8	4/03/2005	3.2
22/03/2023	4.7	25/01/1990	1.9
20/10/2022	2.5	20/02/1989	1.5
13/09/2022	2.3	28/02/1987	1.6
31/05/2022	2.4	2/10/1982	1.6
6/05/2021	2.9	16/05/1980	1.1
1/08/2014	2.1	23/07/1979	1.1
4/06/2018	2.5	23/07/1979	1.1
29/04/2014	4.7	17/07/1973	1.5
29/04/2014	2.6	15/07/1979	2.6
29/04/2014	2.2	14/07/1979	2.6
10/02/2013	2.0	7/02/1979	1.7
9/01/2011	2.3	15/03/1975	3.3
10/10/2010	4.1	13/09/1973	3.1
8/06/2005	3.3		

3.6. Groundwater

An overview of regional and local hydrogeology, groundwater dependent ecosystems (GDEs), the conceptual groundwater model and water quality for the Project Area are provided in this Section. For a more detailed discussion please refer to Appendix B4 *Surface Water and Groundwater Baseline Assessment* (ELA, 2024) and Appendix C2 *Groundwater Impact Assessment* (CDM Smith, 2024).

The Study Area for surface water and groundwater studies includes an area 30 km from the proposed ML boundary as well as smaller buffer areas around the HR and TL (ELA, 2024). There are no groundwater affecting activities anticipated within the linear infrastructure corridors, besides the potential requirement for minor water supply to support construction and maintenance. Therefore, much of the assessment presented in this Section is focused on the 30 km area directly surrounding the Project Area where the primary groundwater affecting activities (e.g., pit dewatering, tailings seepage, mine construction water supply abstraction, etc.) of the Project will occur.

3.6.1. Prescribed water resources

Water resources within SA are managed under the *Landscape SA Act 2019* (LSA Act). The Study Area is located across three LSA regions (refer Figure 3-31):

- SA Arid Lands (SAAL) (Site and HR)
- Murraylands and Riverland (MR) (TL) and
- Northern and Yorke (NY) (HR and TL).

The Study Area is not within any Prescribed Water Resources Areas or Prescribed Wells Areas designated for groundwater resources under any of the Landscape Boards (refer Figure 3-31).

Groundwater resources of the baseline Study Area are covered by the non-prescribed groundwater area of the SA Murray Region Water Resource Plan (DEW, 2018). The SA Government developed a series of Water Resource Plans (WRP) as part of the requirements under Section 63 of the Commonwealth's *Water Act 2007* and the Murray-Darling Basin Plan (MDBP). The WRPs define how the State government manages the water resources, including groundwater, of the SA portion of the Murray-Darling Basin as per the standards set out in the MDBP.

In non-prescribed groundwater resource areas, there are no total limits on annual water take and groundwater resources are regulated under the general management principles of the relevant regional Natural Resource Management (NRM) Plan (now named Regional Landscape Plans) (i.e. SAAL Landscape Board, 2021, MR Landscape Board, 2021; NY Landscape Board, 2021). However, the SA Murray Region WRP does establish Sustainable Diversion Limits (SDL) for non-prescribed resource areas for compliance with MDBP, and notes that it is not expected that the limits will ever be reached. Groundwater resources within the Study Area are covered as part of the SDL resource unit GS6, which has an SDL of 64.8 GL/year and estimated current annual take of 1.8 GL/year (DEW, 2018).

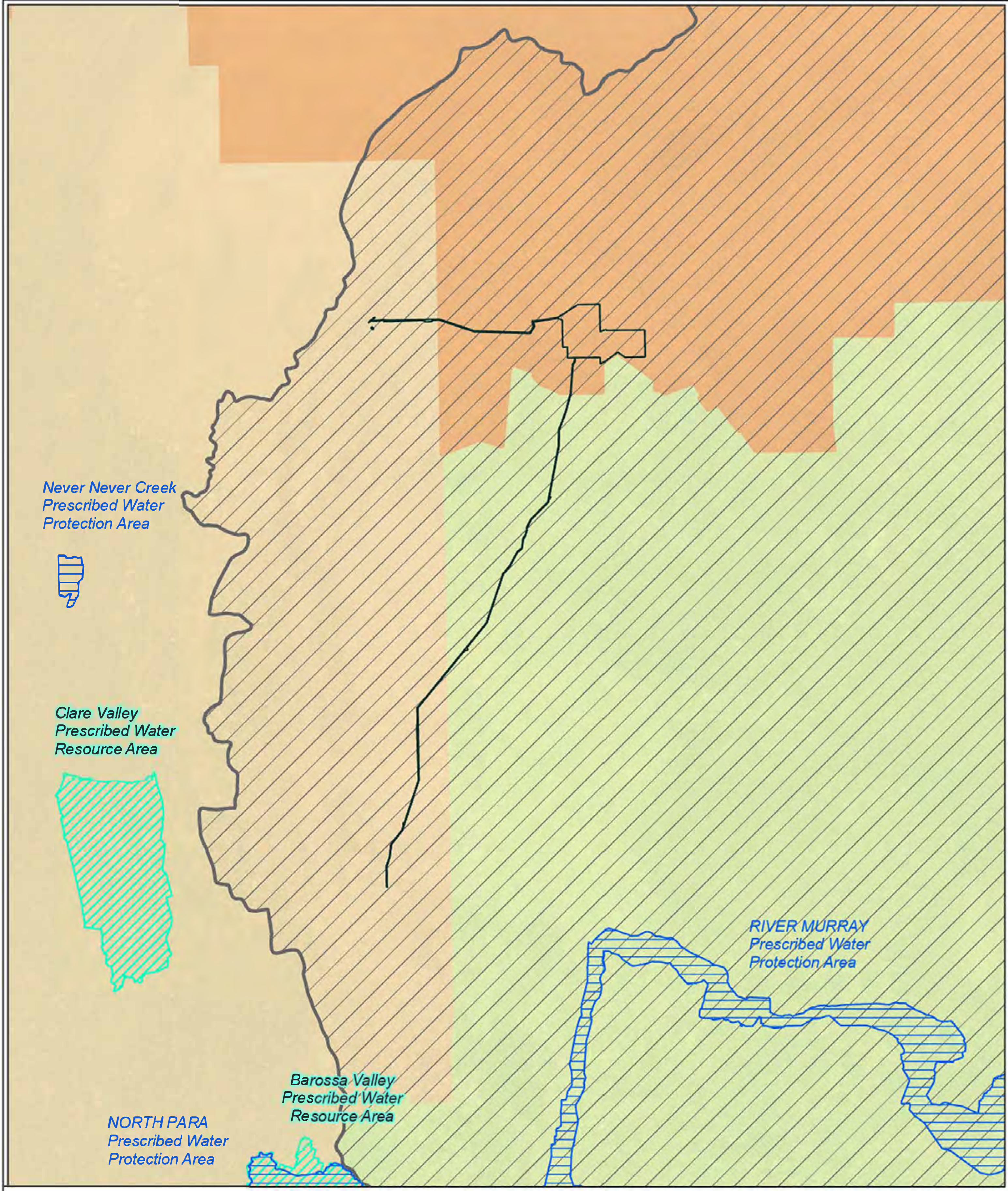
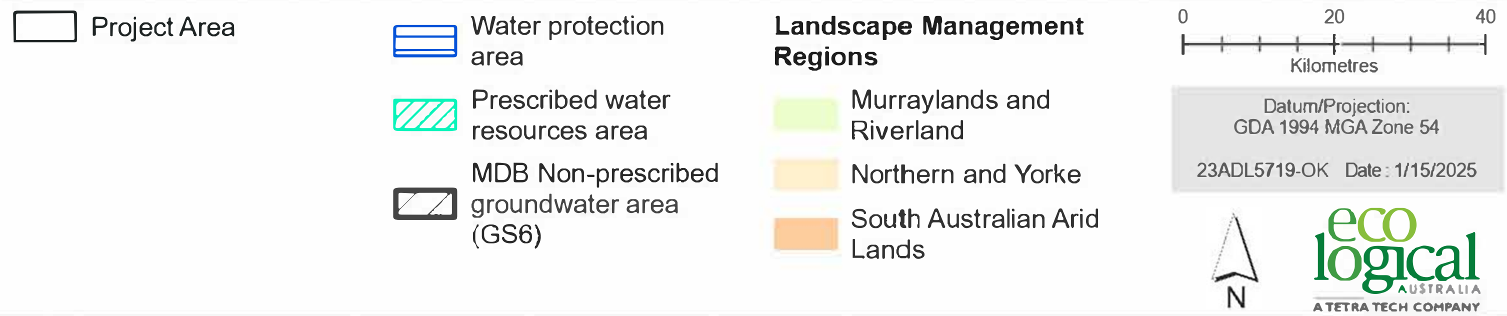


Figure 3-31: Groundwater administrative boundaries



3.6.2. Geology

Detailed description of Study Area and regional geology is presented in Section 3.4.

3.6.3. Hydrogeology

A review of the detailed geology indicates that groundwater in the Study Area sits within a complex geological setting with some localised faulting. The formations of the Proterozoic Adelaide Geosyncline region exist across the Study Area, and are comprised of Neoproterozoic tillite, quartzite, siltstone, dolomite and sandstone rocks. The Neoproterozoic formations are overlain by areas of relatively thin Neogene sediments associated with the region's drainage lines that are incised into the ridgelines.

The following geological formations present in the area have the potential to host groundwater (ELA, 2024):

- Pooraka Formation (Quaternary) comprising red alluvial clays, sands and gravels
- Bakara Calcrete (Quaternary) comprising nodular and sheet calcrete, with areas showing cementation of gravels
- Neogene fluvial deposits associated with watercourses and floodplains in the region, specifically Manunda Creek to the east of the Project
- Wilyerpa Formation (Proterozoic) comprising green siltstone, dolomite, quartzite and scattered erratics (Umberatana Group)
- Yudnamutana Subgroup (Proterozoic) comprising:
  - Benda siltstone (grey siltstone limestone, quartzite, martite-siltstone and rare dropstones)
  - Pualco Tillite (tillite, quartzite, siltstone) with Braemar ironstone.

Outcropping areas of Neoproterozoic rocks are present across the Site and are consistent with higher elevation areas associated with the Razorback Ridgeline and adjacent, smaller ridgelines. These areas are considered likely to receive higher groundwater recharge, through the direct infiltration of rainfall and surface water runoff, due to the absence of overlying sediments in these areas (ELA, 2024).

The region to the south-east (and downstream) of the Study Area transitions from outcropped rock within the high-elevation Razorback Ridge to lower elevation areas comprising Neogene sedimentary units of the Murray Basin.

3.6.4. Hydrostratigraphy

After reviewing all available public data, previous Project studies, and completion of field investigations between 2021 and 2023, it has been found that groundwater in the Study Area is hosted in the following three hydrostratigraphic units (HSU) (ELA, 2024):

- Neoproterozoic fractured rock aquifer(s)
- Tertiary Murray Basin sedimentary aquifer(s)
- Neogene perched aquifers.

Figure 3-32 displays the extent of the major aquifers and the hydrogeological framework for the groundwater Study Area, and presents the line-Section used to construct the conceptual cross-section in Section 3.4.5 (refer Figure 3-48).

NEOPROTEROZOIC FRACTURED ROCK AQUIFER(S)

The Neoproterozoic fractured rock aquifer(s) underlies the entire groundwater Study Area. The saturated depth of the fractured rock aquifer is unknown but is likely limited to the first 100-200 m below ground level (m bgl) where weathering is more pronounced. The Neoproterozoic formations outcrop as ridges within the groundwater Study Area, and transported sedimentary cover is likely only to reach maximum depths of 20-30 m in the lowering lying areas and drainage lines (Figure 3-32). The fractured rock aquifer(s) is unconfined to semi-confined in the groundwater Study Area due to the absence of a laterally-extensive confining unit, and it is likely to be in hydraulic connection to some extent with sedimentary aquifers associated with Manunda Creek and local drainage lines (ELA, 2024).

Groundwater within the fractured rock aquifer is stored in primary and secondary porosity. Given most rock-types in the region are fine-grained and have high proportions of clay and silt (e.g., siltstone, mudstone, and shale), primary porosity is unlikely to account for large amounts of mobile storage. Groundwater is likely to predominantly flow through fractures (secondary porosity) within the metasediments and brittle rocks that are present in the region (ELA, 2024).

Estimated groundwater yields of the fractured rock range from <0.1 to >5 L/s, suggesting the aquifer(s) can be productive where highly connected fractures are intercepted by drilling. Due to the variable occurrence of interconnected porosity, and the irregular, variably sized and connectivity of fractures within the aquifer, groundwater yield is difficult to predict (ELA, 2023; ELA, 2024).

MURRAY BASIN SEDIMENTARY AQUIFER

Groundwater within the Murray Basin sedimentary aquifer(s) is stored in primary porosity with groundwater flow occurring mainly through matrix permeability. Sedimentary layers primarily consist of Tertiary sands and limestone formations (up to 100 m thickness), consisting of the Loxton Parilla Sands, Murray Group Limestone and Renmark Group sand beds (or local equivalents). Available information suggests these formations pinch-out towards the edge of the Murray Basin (south of the Project), where they onlap over the Neoproterozoic fractured rock aquifer, are variably saturated and comprised of marls and clays (ELA, 2024).

The Murray Basin sedimentary aquifer is located >25 km away from Site to the south-east, and reports relatively high porosity and permeability, with estimated bore yields between 0.01-7 L/s but generally <5 L/s (ELA, 2024).

Previously inferred Neogene paleovalley aquifers in the region (Magee, 2009) are now considered unlikely to host significant aquifers and are likely to exist as unsaturated, or variably-saturated, northern extent of the Murray Basin sedimentary aquifers rather than existing as a separate HSU (Mulè et al., 2022; ELA, 2024).

NEOGENE PERCHED AQUIFERS

The final HSU known to occur in the region are small, localised perched aquifers that can form in the Neogene sediments, where shallow impermeable layers underlie more permeable sediments that can store groundwater. Only one occurrence of this type of aquifer is known in the region and is located 12 km north of the northern boundary of the proposed ML (Figure 3-32; 'Spring Dam').

The perched aquifer was identified when the landholder built an earthen dam for stock watering and encountered a hard, thick clay layer at <5 m bgl during excavation (pers. comm. M. Duncan-Tiver, Spring Dam Station to M. Short, ELA, 24 February 2022). After excavation it has been noted by the landholder that water drained into the dam through the sediment that overlies the clay soon after rainfall events. The level of the dam is higher than groundwater level of the underlying fractured rock aquifer (>10 m bgl), and the water quality of the dam is much fresher (<500 mg/L as total dissolved solids (TDS)) compared to underlying groundwater (>5,000 mg/L as TDS). Thus, this feature is very likely a perched system, mostly disconnected from other more regionally extensive HSUs.

It is difficult to determine how common perched aquifers are in the area unless they are intercepted through drilling or excavation works. Given the knowledge of at least one perched aquifer being intersected in the region, it seems reasonable there is likely to be others where similar sedimentary conditions exist. Shallow, fresh perched aquifers may be responsible for the observation of persistent green vegetation along some reaches of Manunda Creek, Ocalia Creek and Yunta Creek (refer Section 3.6.7.1).

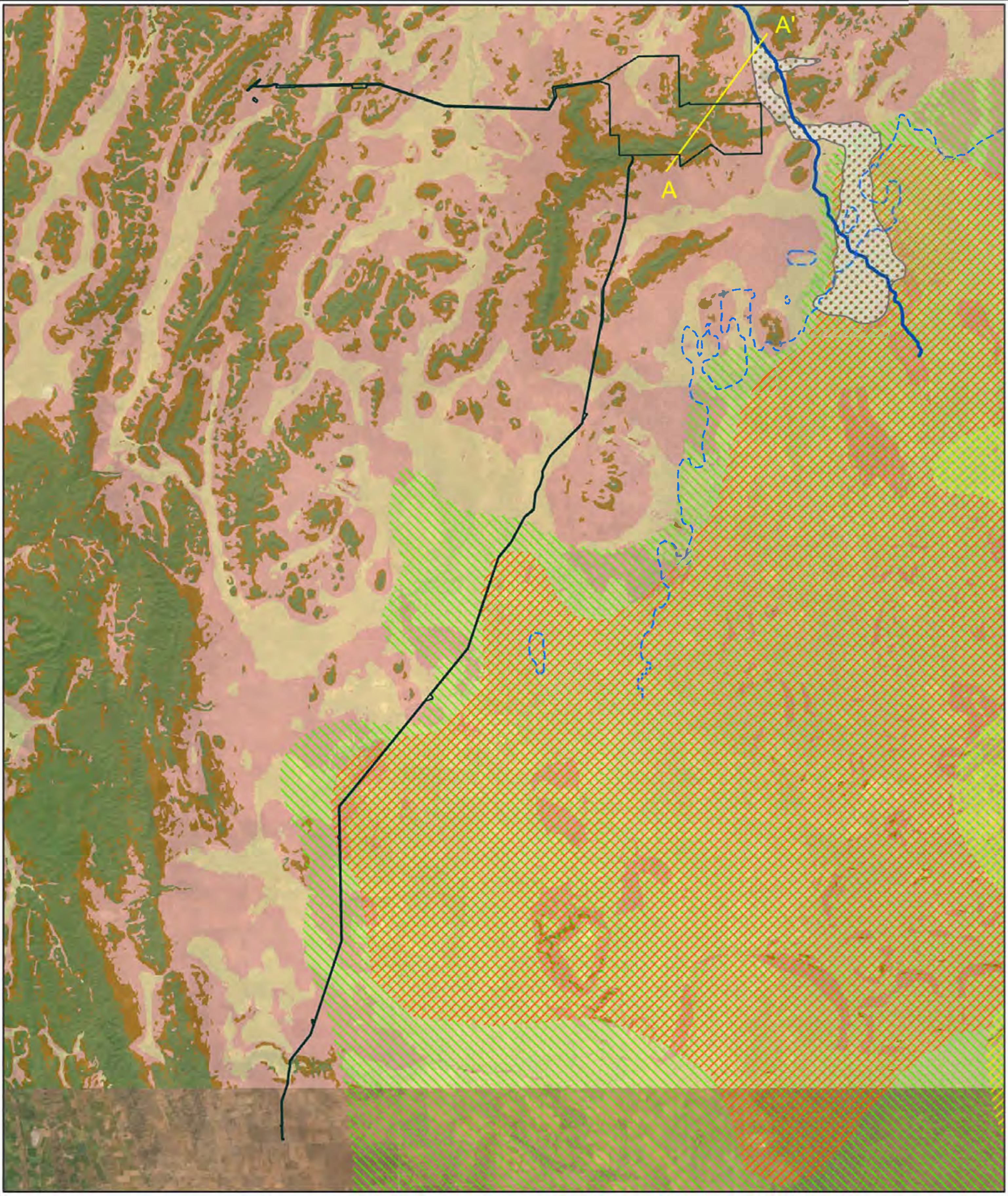


Figure 3-32: Major aquifer extents and hydrogeological framework for the groundwater Study Area

3.6.5. Groundwater characteristics and flow dynamics

A bore census was undertaken for the Study Area using SA Government databases (e.g., WaterConnect and SA Resource Information Gateway (SARIG)) and through MGT consultation with selected landholders directly surrounding the Project Area. The full details of the bore census are provided in ELA (2024; Appendix B4). The bore census identified that there are no bores currently targeting the Murray Basin sedimentary aquifer or perched aquifer HSUs within the Study Area, and that bores are only targeting the fractured rock aquifer HSU. This was expected given that perched aquifers are hard to identify and current information suggests the Murray Basin sedimentary aquifer does not extend into the Study Area in the form of a reliable aquifer. Therefore, the following Sections have only considered the fracture rock aquifer(s) and baseline monitoring obtained for that HSU.

3.6.5.1. Static water levels and groundwater elevations

Available groundwater level measurements of the wide-spread fractured rock aquifer(s) indicate there is a strong relationship with surface topography, with groundwater elevations typically following surface elevations (Figure 3-33 and Figure 3-34). Regionally, groundwater flow is likely to mimic surface water flow, with groundwater moving from the areas around the ridgelines towards the valleys and watercourses. Based on the lack of evident surface discharges (besides some degree of evaporation from shallow water tables), groundwater is likely to ultimately discharge in the sub-surface to the south into the Murray Basin sedimentary aquifers. Ridgelines are likely to act as groundwater flow divides, compartmentalising the fractured rock aquifer into different flow systems.

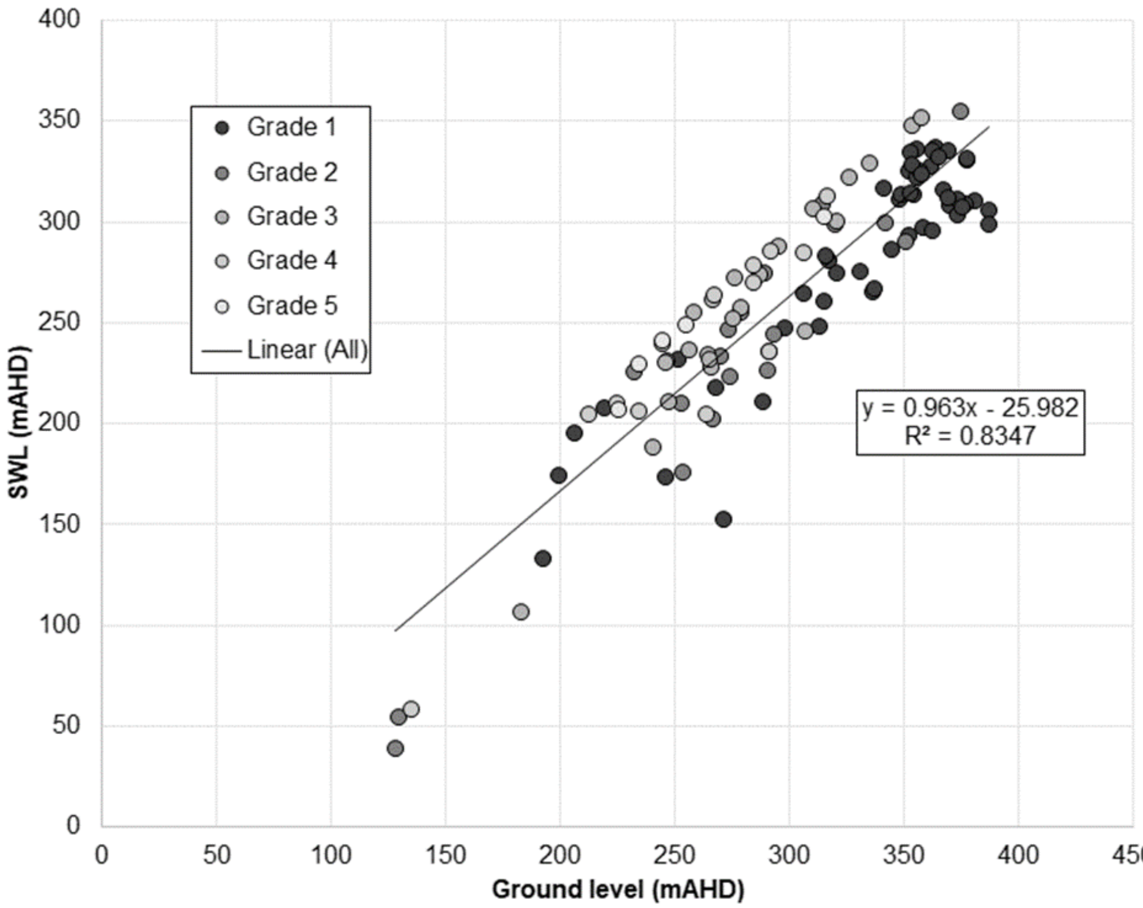


Figure 3-33: Relationship between ground elevation and groundwater level for registered bores including their reliability 'grade'

Recent data collected as part of baseline water monitoring for the Project have been combined with all available historic data of third-party bores to generate an estimate of the potentiometric surface of fractured rock aquifer(s). Data points used to generate the potentiometric surface and inferred flow directions are presented in Figure 3-34. The data points are colour-coded ('graded') based on how recent the data were collected. Groundwater level data collected within the most recent 20 years (typically only Royal Resources or MGT data) is given a grade 1. Bores with data collected longer ago are given progressively lower grades, and bores that have recorded groundwater levels but no recorded date are considered the least reliable (grade 5). Additionally, the reasonable linear relationship between groundwater elevation and surface topography has been used to generate a region-wide estimate of the potentiometric surface (Figure 3-35). These data were also incorporated in the development and calibration of the Project's numerical groundwater flow model, which has generated a more reliable estimate of the baseline (pre-development) potentiometric surface (Figure 3-36; CDM Smith, 2024; also see Appendix B4).

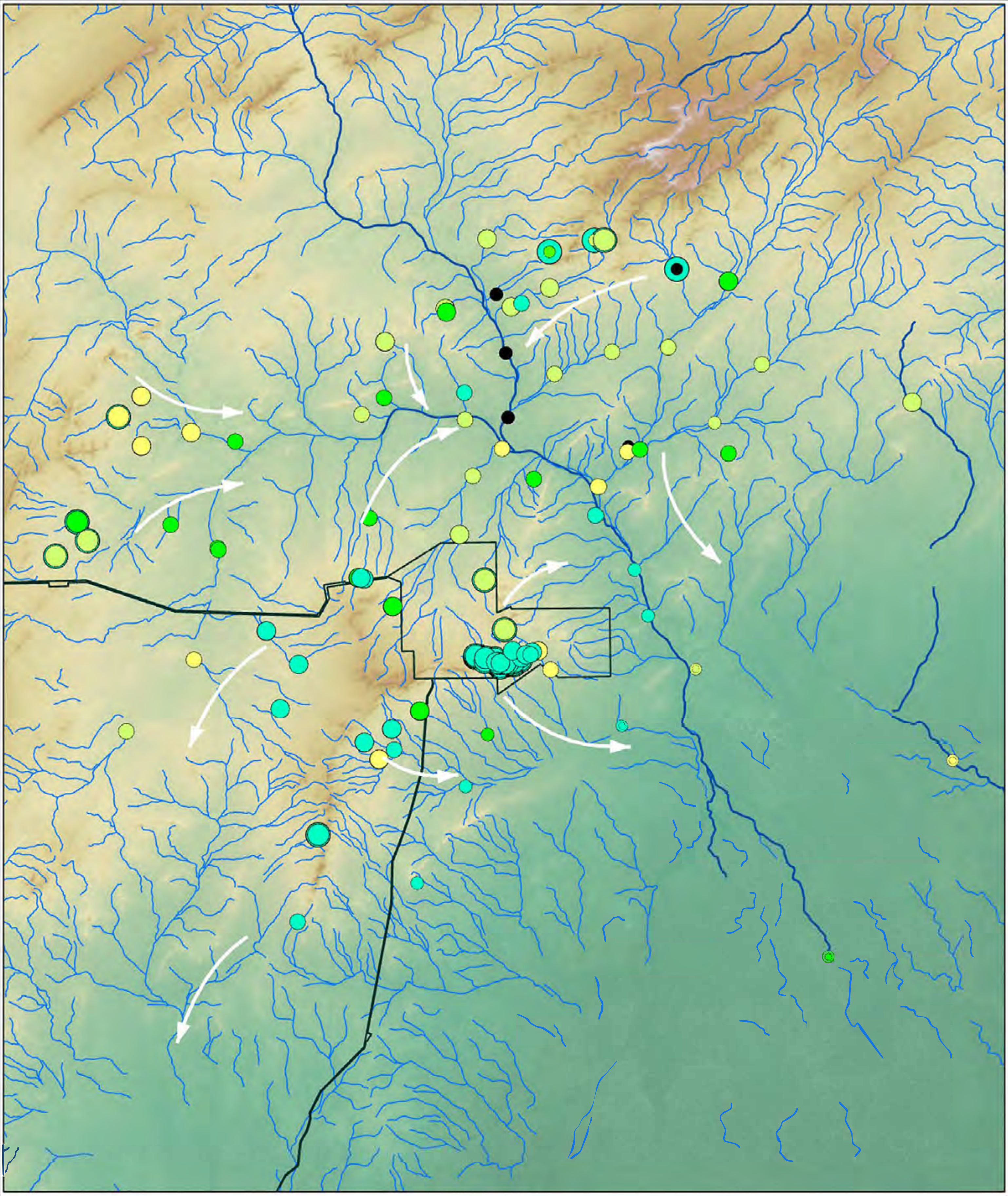


Figure 3-34: Registered bores with groundwater level data and indicative groundwater flow paths

Project Area

Watercourses

Major

Minor

SWL (mAHD)

- >300
- 275-300
- 250-275
- 225-250
- 200-225
- <200

Bore/drillhole grade

- 1 - Good (2002-2022)
- 2 - Fair (1982-2002)
- 3 - Poor (1962-1982)
- 4 - Very poor (<1962)
- 5 - Date not recorded

Elevation (mAHD)

953

0

0 6 12

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 1/15/2025

N

eco logical AUSTRALIA

A TETRA TECH COMPANY

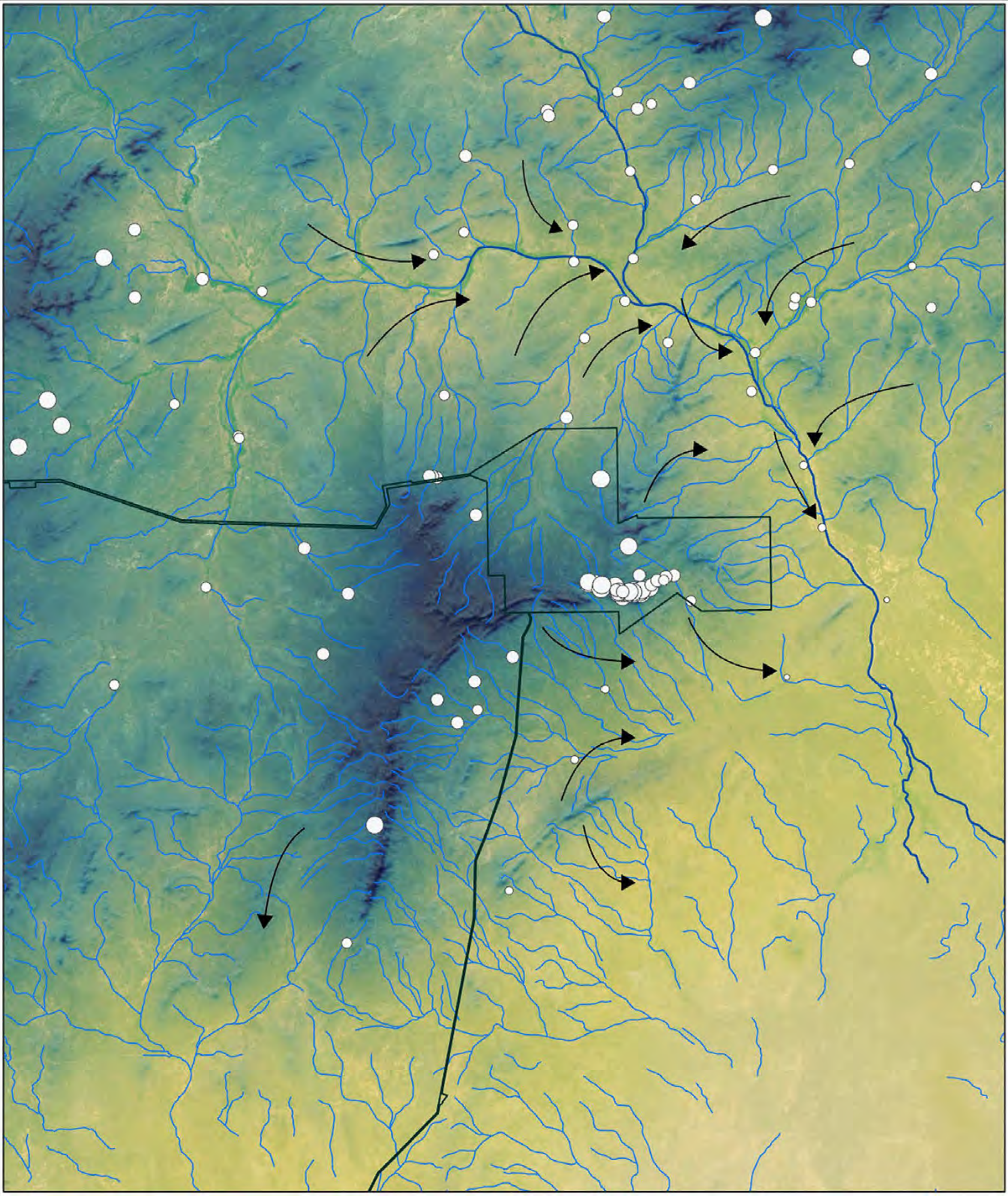
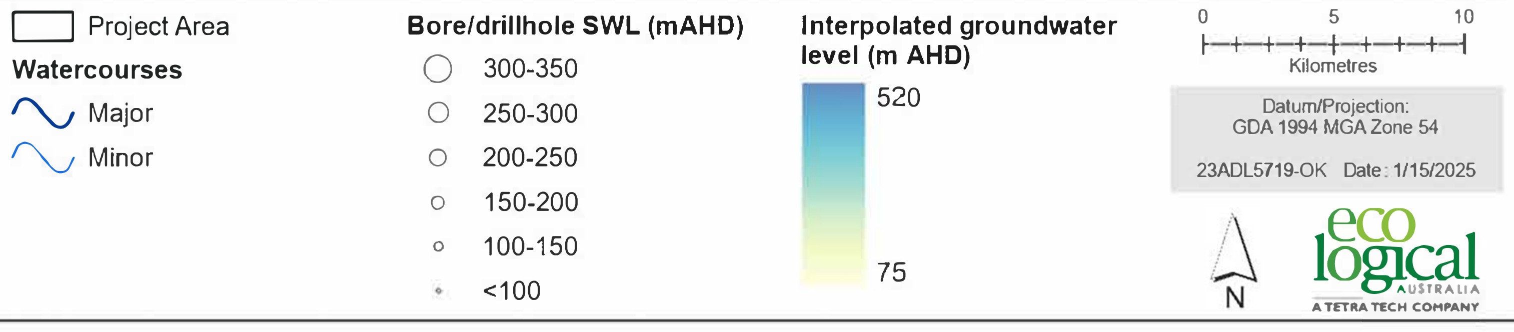


Figure 3-35: Potentiometric surface map for the fractured rock aquifer(s) within the Study Area with inferred flow directions



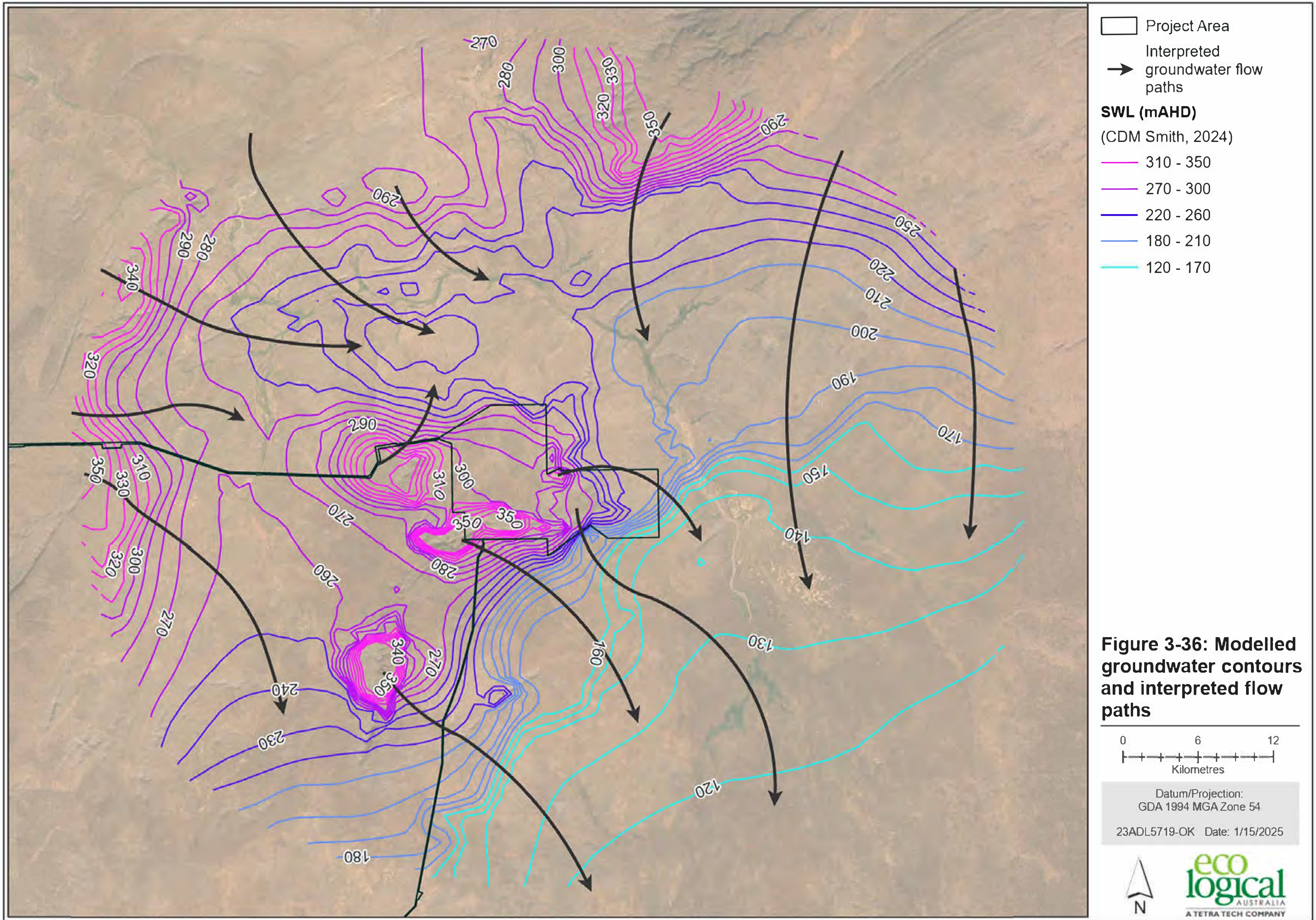


Figure 3-36: Modelled groundwater contours and interpreted flow paths

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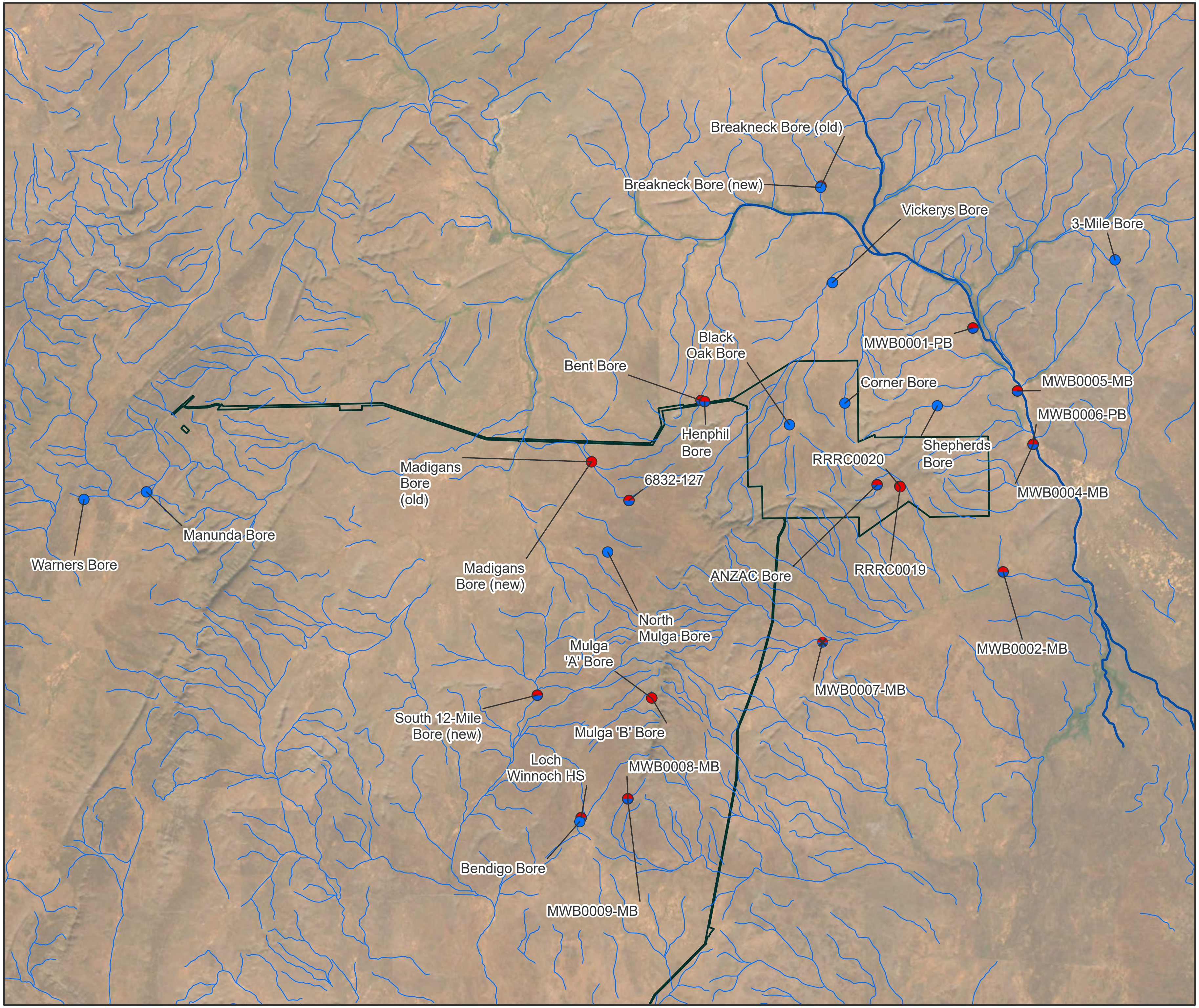
Recent groundwater levels have also been collected seasonally during the Project's baseline water monitoring undertaken during the two-year period of Q1 2022 through Q4 2023 at the locations shown in Figure 3-37. Results for groundwater levels are presented in Figure 3-38 through Figure 3-41. Tabulated water level values are presented in Appendix B4 *Surface Water and Groundwater Baseline Assessment* (ELA, 2024).

Results of the groundwater level monitoring indicate that seasonal responses across the fractured rock aquifer can be grouped into four broad categories. These categories include the following:

- stable groundwater levels (refer Figure 3-38)
  - MWB0002-MB
  - MWB0008-MB and MWB0009-MB
  - Henphil Bore – may also show increased storage effects of a nearby (<15 km) earthquake that occurred on 23 March 2023 (event ID: ga2023fsqpnw)
  - Bent Bore
  - North Mulga Bore
  - Madigans Bore (old)
  - 6832-127
  - Breakneck Bore (old)
  - ANZAC Bore
- reducing groundwater levels (refer Figure 3-39)
  - MWB0001-PB
- affected by pumping (refer Figure 3-40)
  - RRRC0019
  - Mulga 'A' Bore
- recharge (refer Figure 3-41)
  - MWB0004-MB and MWB0006-PB
  - MWB0005-MB

The categories above are based on the available data, and some bores listed in one category may be affected by other stressors. For example, some of the sites listed as having no apparent stressor (stable) may indeed be affected by pumping (e.g., Madigans Bore (old), which is located near an active pastoral bore), or be actively recharged but the discrete measurements do not allow a clear observation of the response (e.g., MWB0001-PB is likely to display similar water levels to those observed by the logger at MWB0005-MB). Furthermore, some of the bores that show clear pumping responses, may also be sites where recharge would be observed if not for the overwhelming influence of pumping (e.g., RRRC0019 is located on an elevated ridge, which is inferred to be a recharge area).



Project Area

Monitoring purpose

SWL only

WQ only

WQ & SWL

SWL and WQ (Collapsed)

Watercourses

Major

Minor

Figure 3-37: Location of bores used for baseline monitoring

0 6 12

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 16/12/2024

N

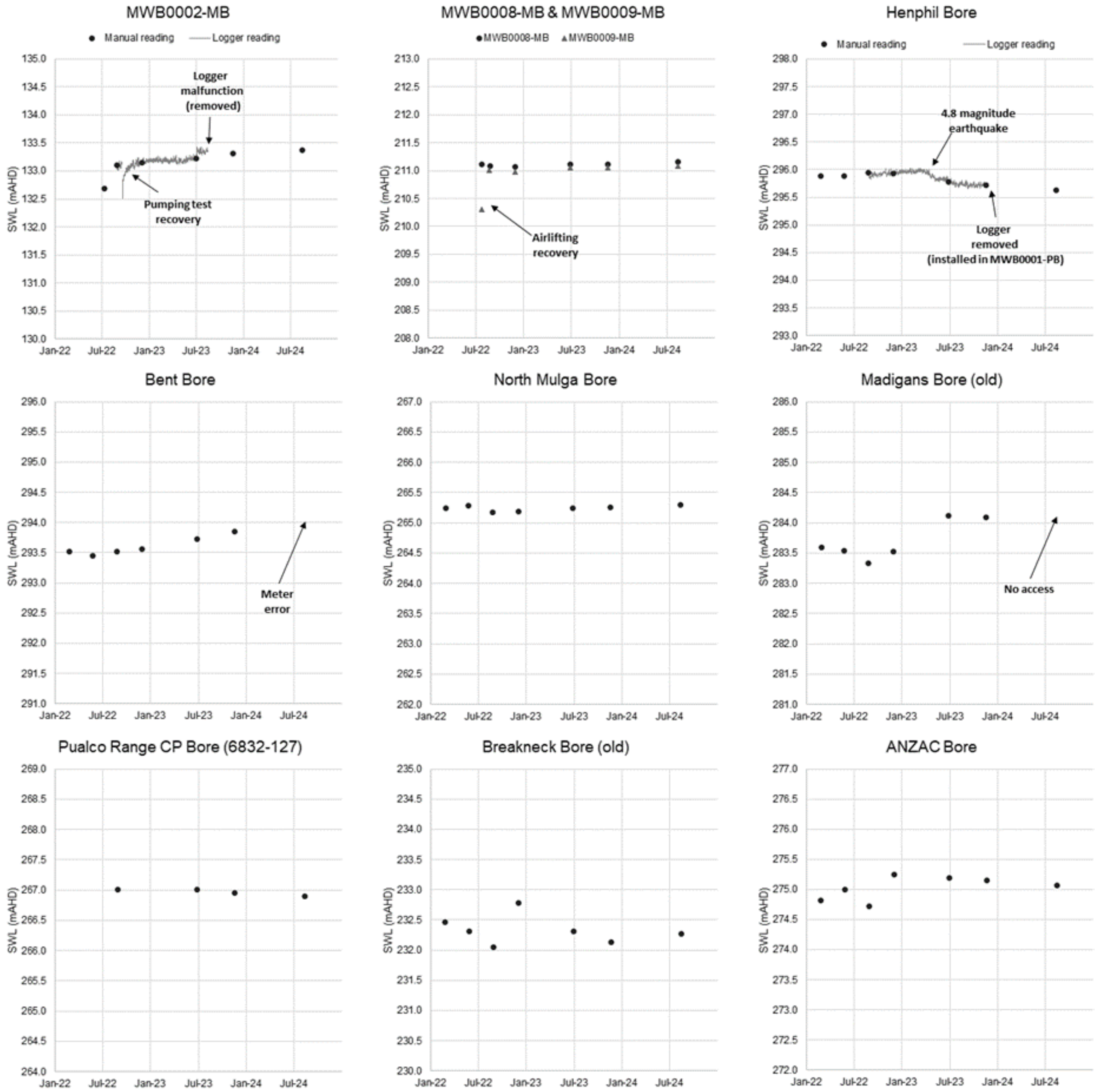


Figure 3-38: Regional bores displaying stable water level trends

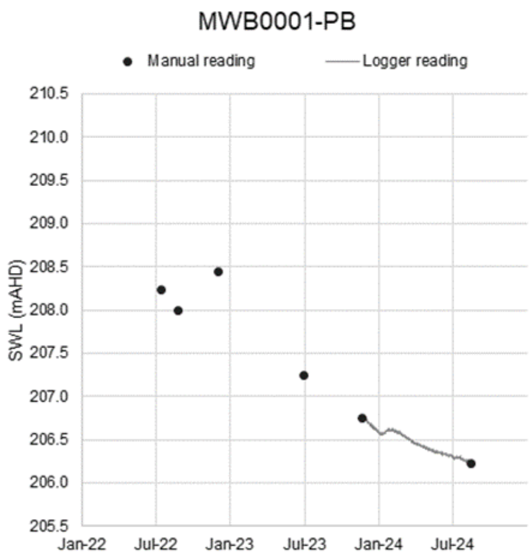


Figure 3-39: Regional bore displaying reducing water level trends

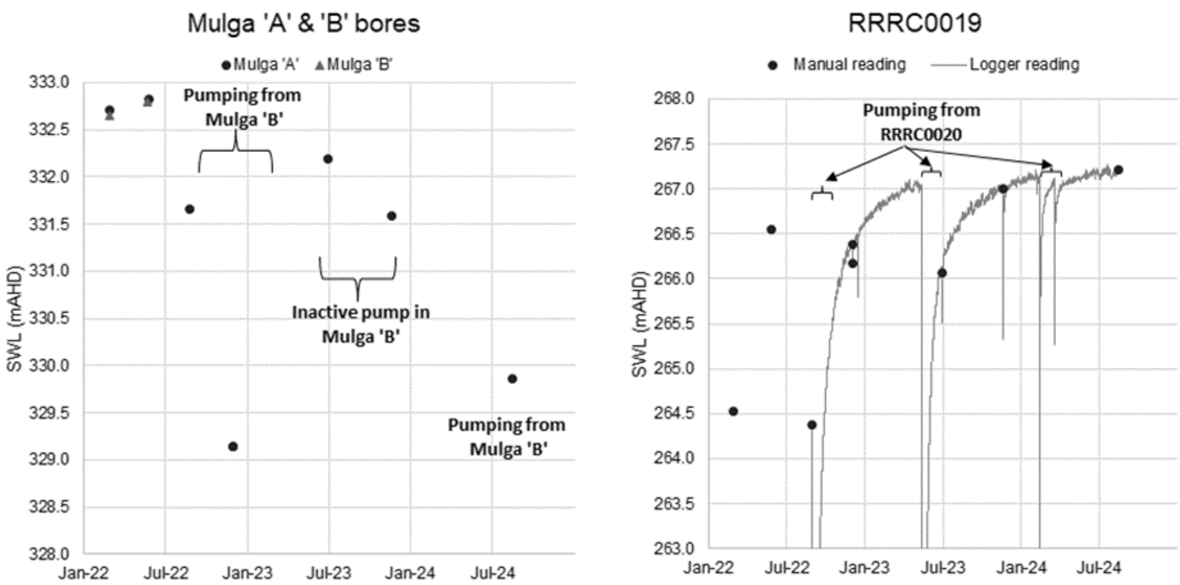


Figure 3-40: Regional bores displaying water level trends affected by pumping

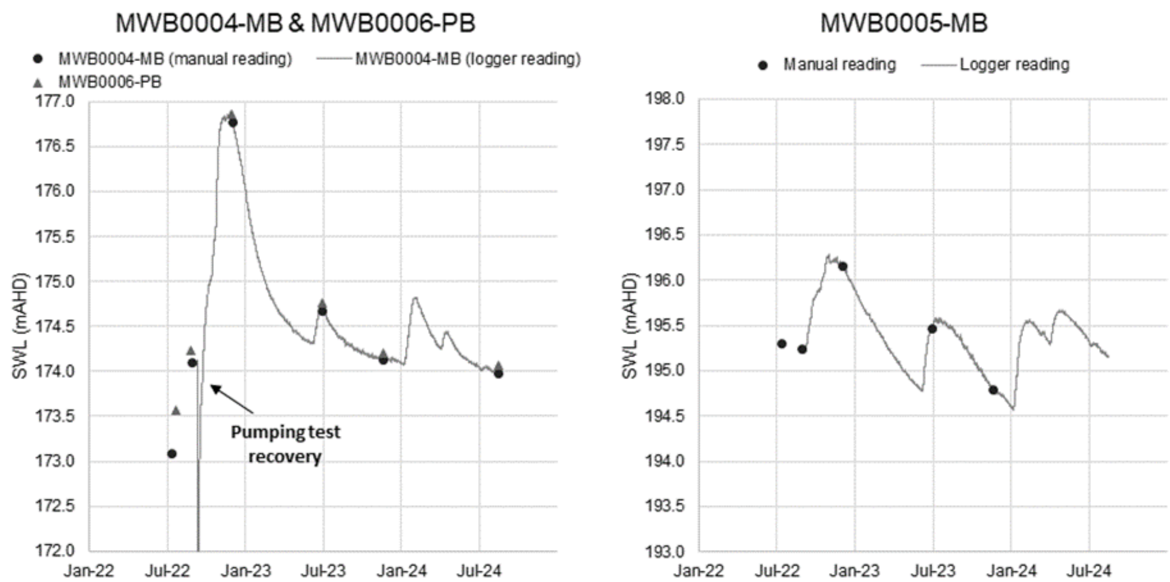


Figure 3-41: Regional bores displaying recharge water level trends

3.6.5.2. Aquifer properties

Aquifer hydraulic properties including hydraulic conductivity (K), transmissivity (T), storativity and specific yield (SY) have been estimated for the Study Area based on publicly available sources and site-specific tests and analysis undertaken by ELA (ELA, 2023; ELA, 2024). These estimates provide a means of assessing the water availability and groundwater flow of an aquifer, and to estimate and predict effects to groundwater receptors due to abstraction. These aquifer parameters have been estimated based on a combination of literature values, that may be representative of the stratigraphy of the fractured rock aquifer and Murray Basin sedimentary aquifer within the Study Area, and also from aquifer testing (slug tests, and short- and long-term pumping tests) of bores targeting the fractured rock aquifers (ELA, 2023; 2024). These values are described below and presented in Table 3-20.

Table 3-20: Estimated aquifer parameters based on available literature values and new analyses

Aquifer	T (m^2/s)	Horizontal K (m/s)	Vertical K (m/s)	Storativity (-)	S_y (-)
Neoproterozoic fractured rock formations					
Benda Siltstone	$9x10^{-6}$ - $5x10^{-4}$	$3x10^{-8}$ - $5x10^{-6}$	-	$8.5x10^{-5}$ - $8.3x10^{-3}$	$1x10^{-3}$
Curdimurka Subgroup	-	$2x10^{-6}$ - $6x10^{-6}$	-	-	-
Tarcowie Siltstone	-	$2x10^{-7}$	-	-	-
Pualco Tillite	$2x10^{-4}$ - $3x10^{-4}$	$8x10^{-7}$ - $2x10^{-4}$	-	-	-
Murray Basin sedimentary aquifers					
Loxton-Parilla Sands	$3x10^{-3}$	$6x10^{-6}$ - $2x10^{-4}$	-	$2x10^{-7}$ - $4x10^{-3}$	-
Geera Clay/ Winnambool Formation	-	$5x10^{-9}$	$2x10^{-10}$	-	-
Renmark Group	$3x10^{-4}$ - $2x10^{-2}$	$5x10^{-5}$ - $9x10^{-4}$	-	$9x10^{-5}$ - $6x10^{-3}$	-

3.6.5.3. Recharge and discharge mechanisms

RECHARGE

The primary sources of recharge to the fractured rock aquifer are diffuse infiltration of rainfall across the region and infiltration of surface water runoff along drainage lines lower in the landscape. Diffuse rainfall recharge is likely enhanced in areas where surface sediments covering the Neoproterozoic rock are thin or absent, such as along the elevated ridge lines where the fractured rock formation outcrop.

Rainfall and runoff infiltration are supported as the primary recharge mechanisms by stable water isotope signatures collected during the baseline monitoring, which are indicative of large rain events and evaporated rainwater. Available estimates of recharge are based on chloride mass balance calculation, regional water balance modelling, and unsaturated zone modelling indicate that the annual average recharge rate is in the range of approximately 2–25 mm, representing only 1–10% of annual average rainfall (ELA, 2024).

Water quality and environmental isotopes collected during the Project’s baseline monitoring indicate groundwater salinity is likely an indicator of recharge rates across the region. Areas of higher salinity indicate relatively slow recharge rates (infiltrating water undergoes appreciable evapo-concentration before reaching the water table), whereas areas of fresher water indicate relatively high rates of recharge (infiltrating water moves more rapidly through the unsaturated zone and undergoes less evapo-concentration).

Surface water features have been found to act as point sources of episodic recharge to the underlying fractured rock aquifer(s), as supported by hourly groundwater level measurements at newly installed bores along Manunda Creek (see recharge hydrographs in Figure 3-41).

DISCHARGE

There are no known areas of groundwater discharge to the surface as springs, seeps or river/creek baseflow within the Study Area. Some degree of groundwater discharge as evaporation may occur along drainage lines where shallow water tables are above the ‘extinction depth’ (i.e., the depth at which evaporation ceases to occur below ground). Evidence of this process is present as salt scalding observed near the Manunda Creek waterholes, which suggests that some degree of diffuse groundwater discharge may be occurring. However, rates of groundwater discharge as water are likely to be very low if they do occur at all, as evidenced by the distinct water quality of the waterholes that show no resemblance to underlying groundwater.

Without any known surface discharge areas, regional groundwater discharge is assumed to occur in the subsurface (lateral throughflow) to the south into the Murray Basin sedimentary aquifers. The rate at which this occurs is not known.

3.6.6. Groundwater quality

In addition to monitoring bores for water levels during the baseline monitoring period (Q1 2022 through Q3 2024), selected existing pastoral bores (16) and new MGT monitoring bores (7) were sampled routinely for water quality parameters. Most bores selected (18 out of 23) were sampled on at least four separate occasions over the baseline period.

Groundwater quality of bores sampled is typically satisfactory for its primary existing use in the Study Area of providing drinking water for livestock (sheep). However, there are several exceedances of the livestock drinking guideline values (ANZG, 2018) for parameters such as salinity and parameters related to elevated salinity (e.g., sulfate, fluoride, selenium and gross radiation).

Brackish to saline groundwater salinity is common in the vicinity of the Project, which limits the environmental value of the aquifer(s) to use for primary industries, and in many areas the aquifer(s) have no environmental value (also see Section 3.6.6.2. 'Environmental Values'). Based primarily on salinity considerations, groundwater in the Study Area is typically unsuitable for human consumption without treatment (desalination).

Summary groundwater quality statistics for the two-year baseline monitoring program (Q1 2022 through Q4 2023) are presented in Table 3-21. Note that the statistics are calculated using all data collected, which means that they are skewed towards the values recorded at bores that were sampled on numerous occasions. However, most of the monitored bores were sampled in more than three or four sampling rounds so any bias is not likely to be significant. Where values are reported as below the laboratory limit of reporting (LOR), it has been incorporated into the statistical calculations by assuming the value is half the LOR. This is a common method for treating censored (i.e., below LOR) data (ANZG, 2018).

EPA (SA) have recently (April 2024) published a guideline relating to establishing baseline water quality (EPA, 2024). This Guideline recommends that at least three wells are monitored for each aquifer of interest, although more wells are likely to be required for large sites with an extensive compliance monitoring network, or sites where spatial heterogeneity or variable groundwater quality is identified. The Guideline also states that the number of data points required to establish a baseline groundwater quality data set is commensurate with the level of risk associated with the regulated activity. The Guideline recommends quarterly groundwater sampling for two years, however, initial baseline data collected in the first twelve months combined with the regional hydrogeological conceptualisation confirmed that the groundwater system is not 'seasonal' but rather episodic, with minor to large recharge events occurring sporadically through the year regardless of season. As a result, ELA (2024) justified the reduction in frequency to bi-annual for the remaining 24 months of the baseline period. Table 3-21 presents the statistical summary of the baseline water quality data set.

Table 3-21: Water quality summary statistics for groundwater sampled at third-party and Project bores

Parameter	n[2]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Physicochemical									
Temperature[3,4]	128	13.5	25.1	20.5	20.7	18.2	19.5	21.6	23.1
EC[3,5]	126	1.70	83.90	9.25	7.63	3.40	5.32	10.20	16.6
Salinity[6,7]	115	1,500	17,700	5,980	5,160	2,300	3,350	6,920	11,700
pH[3,8]	128	4.56	8.23	6.99	6.95	6.41	6.76	7.32	7.64
DO[3,9]	122	0.31	7.31	3.48	3.60	1.26	1.94	4.72	6.01
Turbidity[6,10]	107	0.2	114	8.4	1.2	0.2	0.5	4.8	27.3
Major and minor ions									
Sodium[6,11]	115	226	4,610	1,340	1,180	492	676	1,470	2,902
Potassium[6,11]	115	10	88	31	28	13	17	41	53
Calcium[6,11]	115	50	526	217	186	100	133	253	406
Magnesium[6,11]	115	60	773	290	256	127	175	353	526
Chloride[6,11]	115	372	7,550	2,344	1,900	773	1,230	2,735	5,284
Sulfate[6,12]	115	274	3,990	1,221	797	416	632	1,620	2,920

[2] Number of samples (n) used to calculate summary statistics

[3] Field measurement

[4] Degrees Celsius (°C)

[5] Electrical conductivity @ 25°C as mS/cm

[6] Laboratory measurement

[7] mg/L as TDS

[8] No units

[9] DO as mg/L

[10] Nephelometric turbidity units (NTU)

[11] mg/L

[12] mg/L as SO42-

Parameter	n[2]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Total alkalinity[6,13]	115	245	840	436	394	292	312	570	617
Bromide[6,11]	60	0.8	21.6	5.95	4.52	1.87	3.31	6.58	12.33
Fluoride[6,11]	66	0.2	3.4	1.75	1.80	0.80	1.33	2.00	2.90
Silica[6,14]	60	3.5	12.8	8.2	7.9	6.3	6.8	9.4	11.1
Nutrients									
Nitrate[6,15]	113	0.01	5.76	1.35	0.95	<0.01	0.08	2.06	3.656
Nitrite[6,15]	112	0.01	0.45	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia[6,15]	106	<0.01	58.40	1.25	<0.01	<0.01	<0.01	0.03	0.13
Total nitrogen[6,15]	106	<0.1	64.60	2.88	1.40	0.1	0.5	2.4	4.35
Total phosphorus[6,16]	112	<0.01	11.80	0.25	<0.01	<0.01	<0.01	0.02	0.04
Dissolved (filtered) metals									
Aluminium[6,11]	74	0.01	0.58	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Arsenic[6,11]	80	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium[6,11]	80	0.002	0.047	0.011	0.008	0.002	0.004	0.014	0.021
Beryllium[6,11]	80	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron[6,11]	80	0.59	5.41	1.88	1.44	0.849	1.03	2.4	3.36
Cadmium[6,11]	80	0.0001	0.0049	0.0003	<0.0001	<0.0001	<0.0001	0.0001	0.0003
Chromium[6,11]	80	0.001	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt[6,11]	80	0.001	0.027	0.003	<0.001	<0.001	<0.001	0.001	0.012
Copper[6,11]	80	0.001	0.292	0.006	<0.001	<0.001	<0.001	0.002	0.006

[13] mg/L as CaCO3

[14] mg/L as Si

[15] mg/L as N

[16] mg/L as P

Parameter	n[2]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Iron[6,11]	80	0.05	5.33	0.52	<0.05	<0.05	<0.05	0.08	1.436
Lead[6,11]	80	0.001	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese[6,11]	80	0.001	3.68	0.324	0.011	<0.001	0.002	0.062	1.61
Mercury[6,11]	80	0.0001	0.0010	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum[6,11]	74	0.001	0.010	0.002	0.001	<0.001	<0.001	0.003	0.004
Nickel[6,11]	80	0.001	0.077	0.006	0.002	<0.001	<0.001	0.007	0.015
Selenium[6,11]	80	0.01	0.02	0.01	<0.01	<0.01	<0.01	0.01	0.02
Strontium[6,11]	80	0.83	11.8	3.84	2.62	1.38	1.87	5.52	9.40
Vanadium[6,11]	80	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc[6,11]	80	0.005	4.1	0.264	0.013	<0.005	<0.005	0.049	0.304
Radiation									
Gross alpha[6,17]	16	0.36	6.82	1.51	1.09	0.51	0.62	1.60	2.63
Gross beta[6,17,18]	16	0.17	4.81	0.88	0.51	<0.2	<0.2	0.98	1.77
Hydrocarbons									
NEPM F1[6,19,20]	73	20	20	<20	<20	<20	<20	<20	<20
NEPM F2[6,19,21]	73	520	520	<100	<100	<100	<100	<100	<100

NEPM = National Environment Protection (Assessment of Site Contamination) Measure, Schedule B (1) ‘Guideline on the Investigation Levels for Soil and Groundwater’ (NEPM, 2013)

BTEX = Benzene, toluene, ethylbenzene, xylenes

TRH = Total recoverable hydrocarbons

17 Bq/L

18 Corrected for potassium-40 activity

19 µg/L

20 NEPM Fraction 1 (F1) = C6 – C10 minus BTEX

21 NEPM Fraction 2 (F2) = C10 – C16 minus naphthalene

Parameter	n[2]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
NEPM F3[6,19,22]	73	110	200	<100	<100	<100	<100	<100	<100
NEPM F4[6,19,23]	73	-	-	<100	<100	<100	<100	<100	<100
TRH[6,19,24]	73	160	630	<100	<100	<100	<100	<100	<100
Total BTEX[6,19]	73	12	12	<1	<1	<1	<1	<1	<1
Naphthalene[6,19]	73	-	-	<5	<5	<5	<5	<5	<5
OC pesticides[6,19,25]	12	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

[22] NEPM Fraction 3 (F3) = C16 – C34

[23] NEPM Fraction 4 (F4) = C34 – C40

[24] Sum of C6 – C40 fraction hydrocarbons

[25] Organochlorine (OC) pesticides – 26 individual pesticide compounds

3.6.6.1. Hydrogeochemical characteristics

The general ionic composition of groundwater from the local fractured rock aquifer(s) is broadly similar within the groundwater Study Area based on an initial assessment of major ion compositions using a Piper diagram (Figure 3-42). The main exceptions are: 3-Mile Bore, which has a relatively high proportion of sulfate compared to the other samples and is the only sampling location on the eastern side of Manunda Creek; and Manunda Bore, which also has a higher sulfate proportion and is located outside of the groundwater Study Area near the proposed RS and adjacent to the very upper reach of Manunda Creek. All bores display a sodium chloride or mixed type composition, with 3-Mile Bore tending towards a sulfate type for anions and Manunda Bore tending toward a magnesium type for cations. Only Vickerys Bore, adjacent a pastoral dam, showed variation across sampling events and is likely to be affected by rainfall.

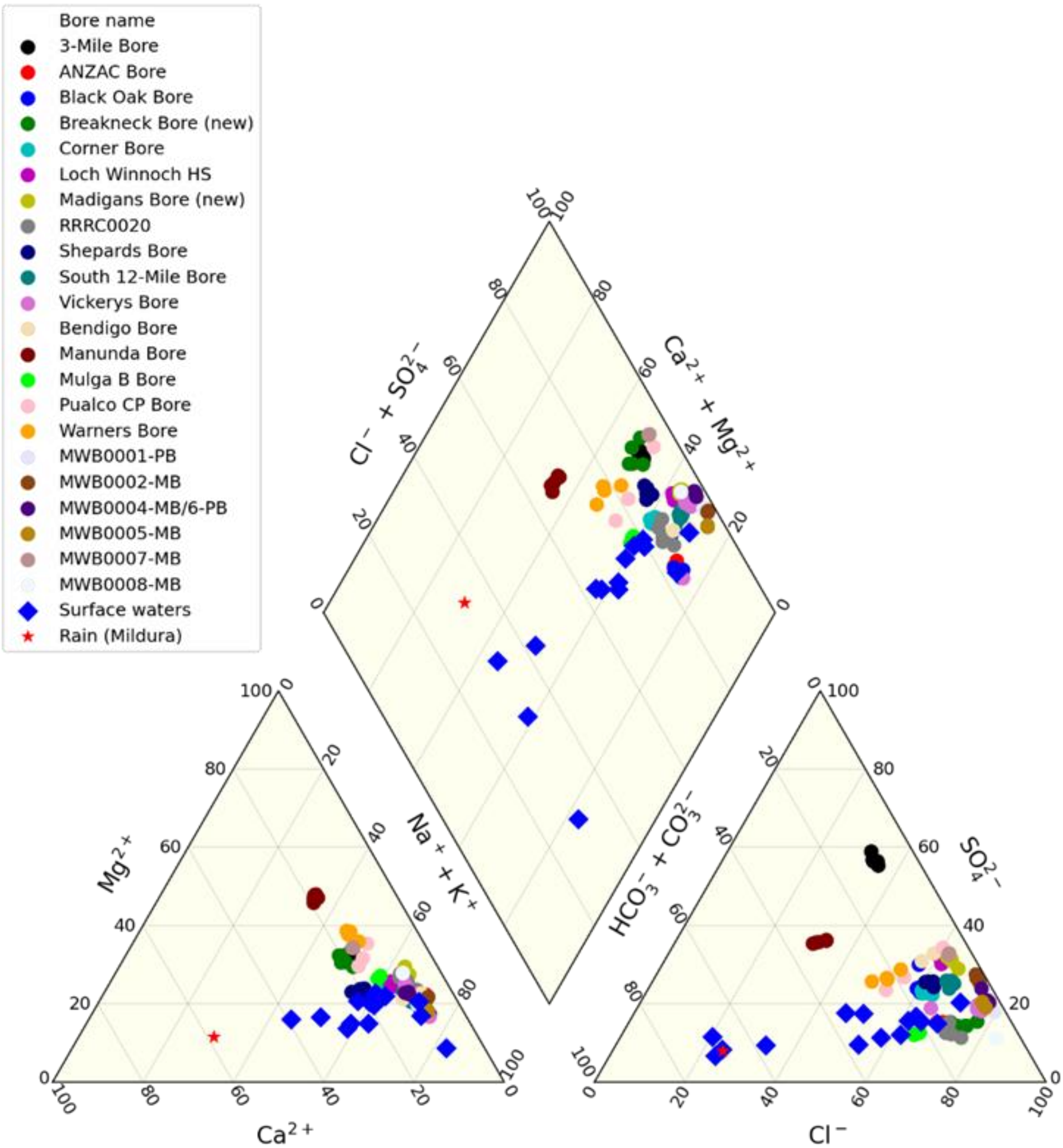


Figure 3-42: Piper diagram showing major ion compositions of groundwater, surface water and rainfall

3.6.6.2. Environmental values

The *Environment Protection (Water Quality) Policy 2015* classifies underground waters (groundwater) by baseline salinity (as TDS). Based on these classifications, groundwater in the Study Area has the following environmental values:

- drinking water for human consumption (<1,200 mg/L: two registered bores)
- primary industries – irrigation and general use (1,200 – 3,000 mg/L: 21 registered bores)
- primary industries – livestock drinking water, and primary industries – aquaculture and human consumption of aquatic foods (3,000 – 13,000 mg/L: 77 registered bores)
- no environmental value (>13,000 mg/L; 11 registered bores)

As illustrated by the bar chart in Figure 3-43, the vast majority of bores targeting the Neoproterozoic fractured rock aquifer(s) in the vicinity of the Project have either value for primary industries or no environmental value (e.g. is unsuitable for human consumption). There is no clear geographical pattern to the distribution of the two classes within the Project Area. The two registered bores with lower salinity are located >20 km from the proposed ML boundary and the water quality data was recorded in 1952 using unknown methods. It is unlikely that there are any aquifers in the vicinity of the project with human drinking water as an environmental value based on their salinity (TDS).

The data presented in Figure 3-43 are only for the Neoproterozoic fractured rock aquifer(s) because there are very few recorded salinity records for bores in the northern Murray Basin aquifer(s). The limited information available for the salinity of the northern Murray Basin aquifer(s) indicates that they are likely more saline than the Neoproterozoic fractured rock aquifer(s), which means it is likely to have an equivalent or lesser environmental value.

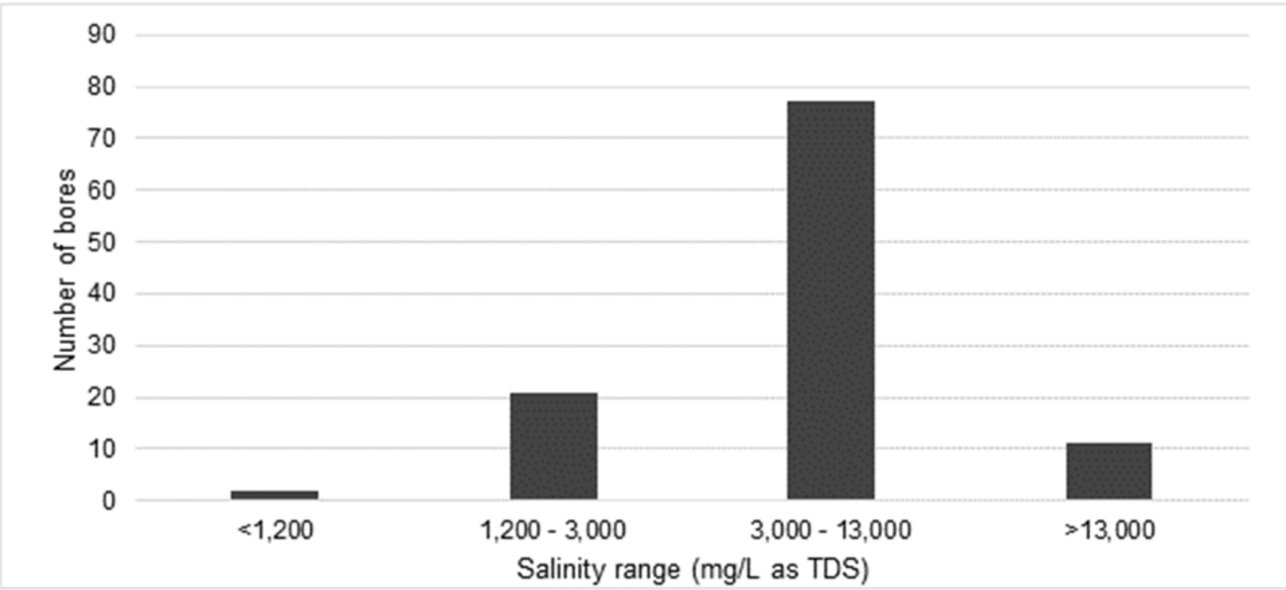


Figure 3-43: Salinity ranges of registered bores within the groundwater Study Area

3.6.7. Groundwater dependent ecosystems

The BoM GDEs Atlas was used to identify the potential locations for GDEs in the vicinity of the Study Area. This was then supplemented by assessment of satellite imagery, field observations and data collected during the baseline monitoring and recent groundwater exploration drilling (ELA, 2024), and an aquatic ecology survey (Lateral Environmental, 2023; Appendix B8).

3.6.7.1. Terrestrial GDEs

The GDE Atlas identified the following categories of potential terrestrial GDEs (refer Figure 3-44):

- high potential
    - *Eucalyptus socialis ssp*. Mallee woodland
    - *Maireana pyramidata* (mixed) shrubland <1 m
- moderate potential
    - *Eucalyptus socialis ssp.* Mallee woodland
    - *Maireana pyramidata* (mixed) shrubland <1 m
    - *Casuarina pauper* (mixed) woodland
    - *Sida petrophila* (mixed) shrubland <1 m
    - *Eucalyptus camaldulensis* var. woodland
    - *Dodonaea viscosa ssp. Angustissima* (mixed) shrubland >1 m
- low potential
    - *Eucalyptus socialis ssp*. Mallee woodland
    - *Maireana pyramidata* (mixed) shrubland <1 m
    - *Casuarina pauper* (mixed) woodland
    - *Atriplex vesicaria ssp.* (mixed) shrubland <1 m
    - *Sida petrophila* (mixed) shrubland <1 m
    - *Eucalyptus camaldulensis* var. woodland
    - *Maireana sedifolia* shrubland <1 m
    - *Eucalyptus gracillis* mallee woodland
    - *Dodonaea viscosa ssp. Angustissima* (mixed) shrubland >1 m.

The GDE Atlas does not list any 'known' terrestrial GDEs in the Study Area.

Following the identification of the above areas, Sentinel 2 satellite imagery was used to refine the areas based on where terrestrial vegetation appears to be persistently green (Figure 3-45) and may be accessing a non-rainfall source of water. The areas identified by the Sentinel 2 imagery are riparian corridors that are dominated by *E. camaldulensis* (River Red Gums), which can be relatively deep-rooted and are known to access shallow groundwater in nearby areas of the Flinders Ranges. Groundwater levels underlying the areas of persistent green vegetation communities are estimated to be within the typical rooting depth of *E. camaldulensis* (<15 m bgl) but the elevated salinity of the underlying groundwater may mean that the trees only utilise groundwater once all other sources of fresh water (e.g., soil water or fresher perched aquifers) have been exhausted during drought periods. Given there is still uncertainty regarding the dominant water source for this vegetation, a pre-cautionary approach is considered appropriate, and riparian vegetation in areas of shallow groundwater (<15 m bgl) are considered to be potential groundwater receptors.

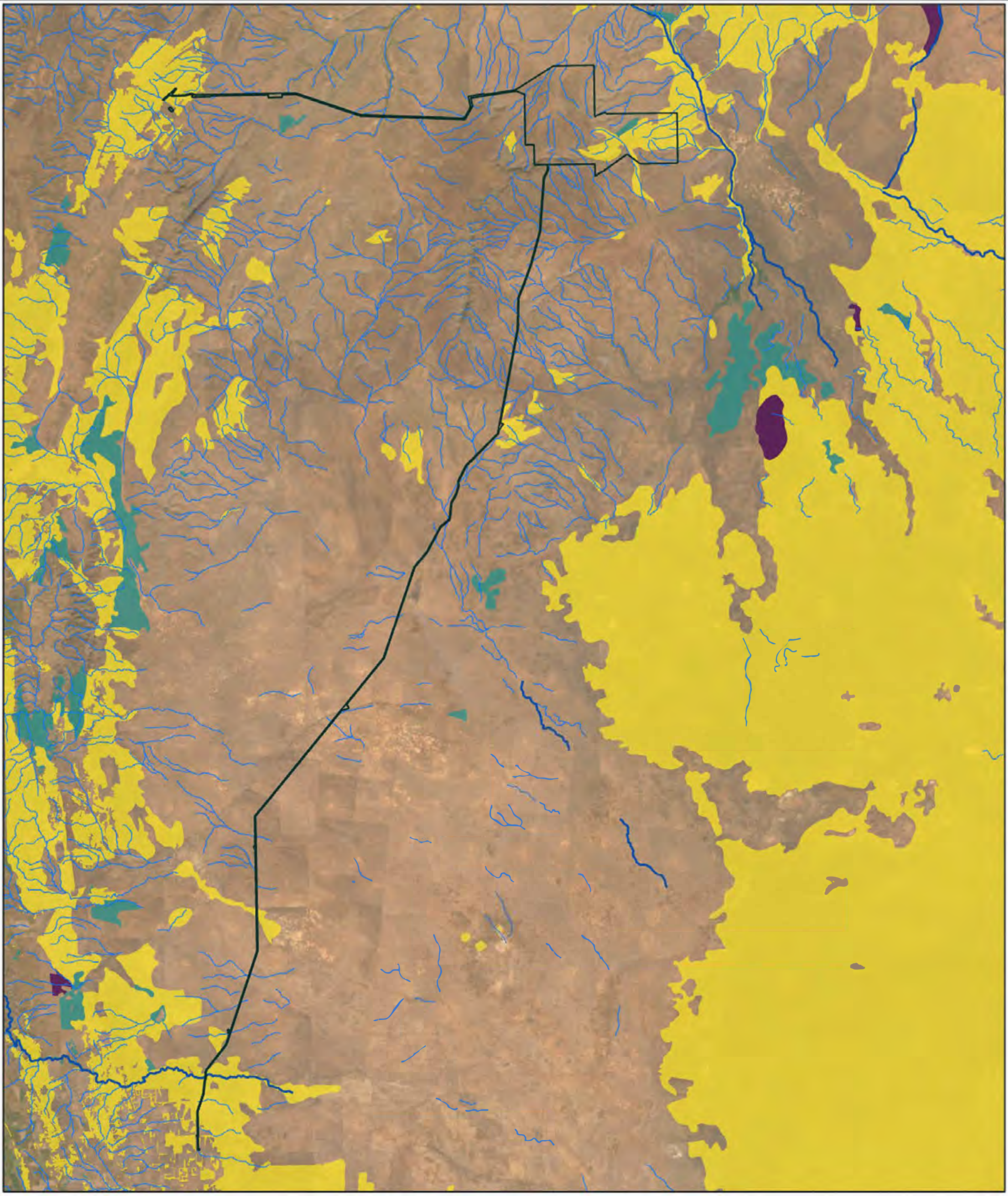


Figure 3-44: Potential terrestrial GDEs as identified by the BoM GDE Atlas

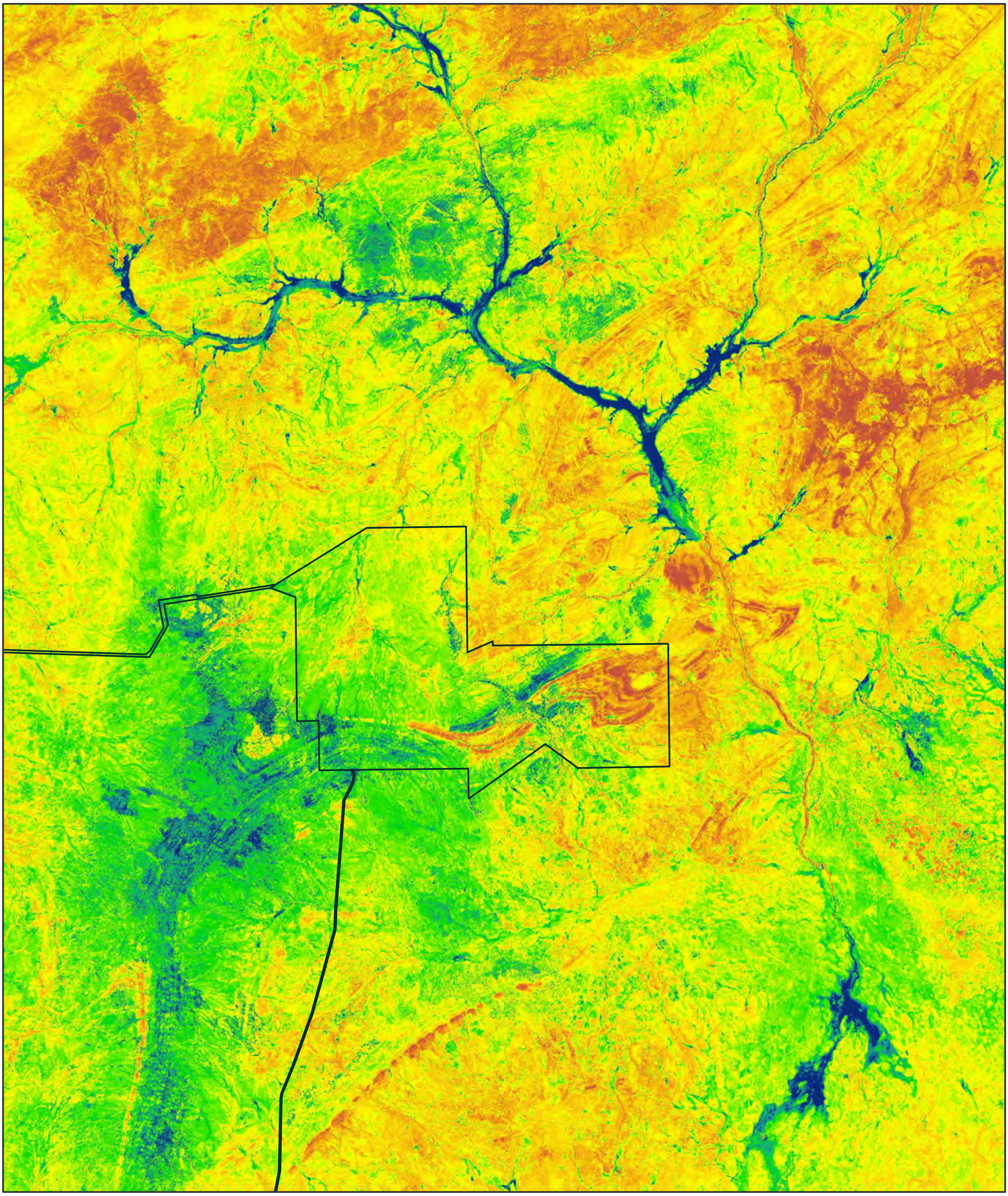


Figure 3-45: Summer geomedian EVI imagery showing persistent green vegetation (dark blue)

3.6.7.2. Aquatic GDEs

The GDE Atlas identified the following potential aquatic GDEs (Figure 3-46):

- wetlands
  - high, moderate and low potential aquatic GDEs in the flood out areas (equivalent to 'Land subject to flooding') of the upper Manunda Creek catchment
- rivers
  - high, moderate and low potential aquatic GDEs associated with the more significant drainage lines of Manunda Creek and its tributaries (Yunta, Pine, Palina, Ocalia, Pualco, Vickery, Galah, Tiverton, Block Seven, Braemar, Paratoo, Ironback and Winnininnie creeks)

The GDE Atlas does not list any 'known' aquatic GDEs in the Study Area.

As discussed previously, field assessments undertaken on known persistent surface water features in 2022 and 2023 (ELA, 2024) has shown that there are no known areas of groundwater discharge to the surface as springs, seeps or river baseflow within the Study Area. Therefore, there are no identified aquatic GDEs within the groundwater Study Area.

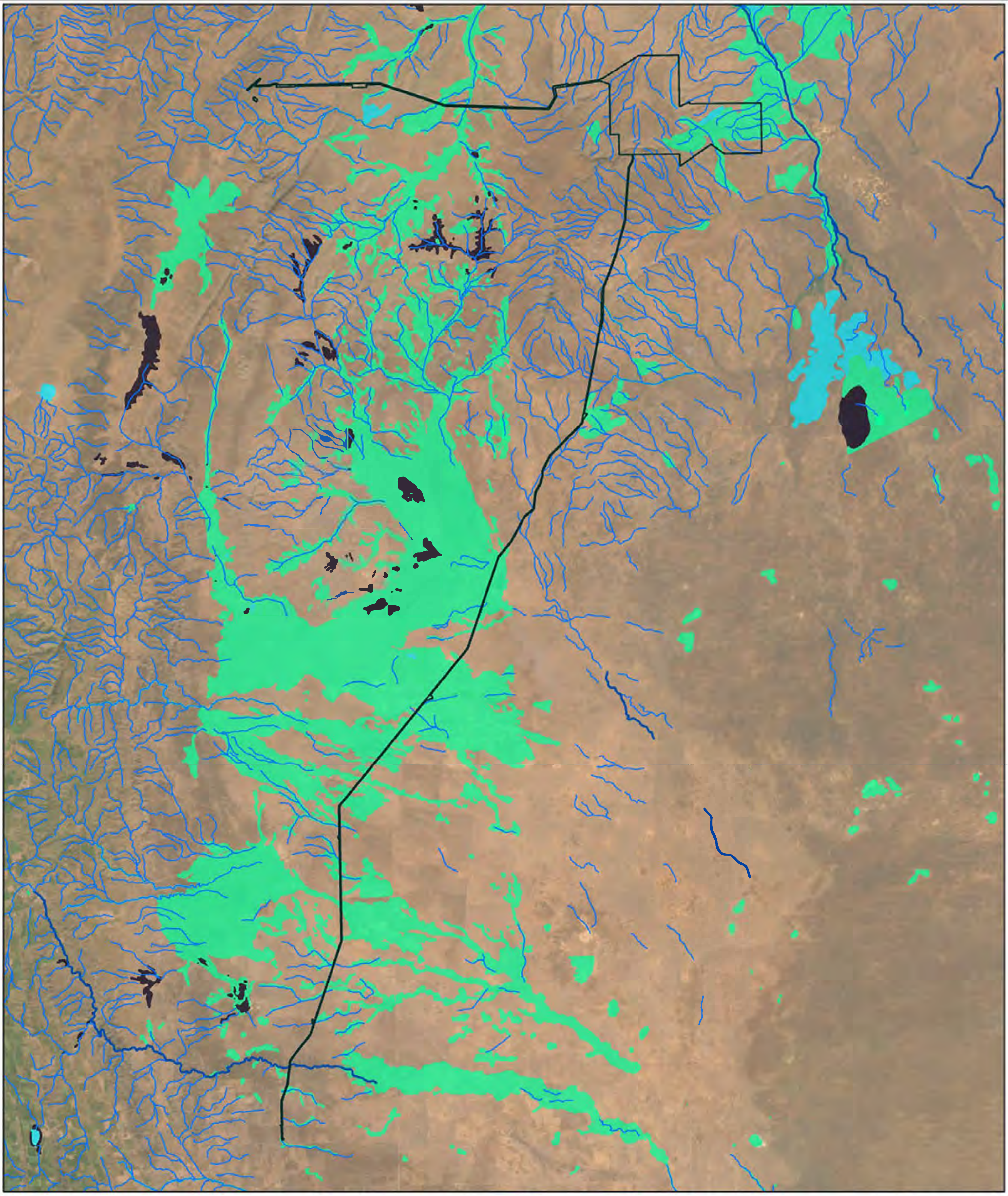


Figure 3-46: Potential aquatic GDEs as identified by the BoM GDE Atlas

3.6.7.3. Stygofauna

An overview of stygofauna is described within this Section. For a more detailed discussion please refer to Appendix B8 *Aquatic and Subterranean Fauna Assessment* (Lateral Environmental, 2023).

A preliminary assessment of the likelihood of stygofauna occurrence concluded that it could not be ruled out. This conclusion was reached based on the following characteristics of the fractured rock aquifer:

- significant fractures can exist, allowing stygofauna movement through the aquifer matrix
- the aquifer is relatively shallow and unconfined to semi-confined across the region
- groundwater levels are known to occur within 20 m of the surface
- rapid episodic recharge is known to occur along some drainage lines following creek flow events. This represents an opportunity for regular transport of dissolved oxygen (DO) and nutrients to the aquifer
- although the regional groundwater quality is brackish to saline, the salinity is still well within the recorded range of many stygofauna species.

As a result of the above observations, a stygofauna survey was undertaken in the Study Area during August 2023 and comprised of sampling at 11 bores that were also part of the baseline monitoring program. A total of 18 individual stygofauna specimens were retrieved from four out of the eleven bores sampled. The specimens comprised of five species from four higher level taxonomic groups (*Amphipoda, Bathynellacea, Harpacticoida* (*Copepoda*), and *Oligochaeta*) (Lateral Environmental, 2023).

The stygofauna specimens were recorded at four sites (Black Oak Bore, Corner Bore, MWB0004-MB and MWB0005-MB) located in lower lying areas of the landscape where groundwater levels are <30 m bgl (refer Figure 3-47). No stygofauna were recorded in the more elevated regions or where groundwater levels were >30 m bgl (Lateral Environmental, 2023). The two third-party bores where stygofauna were recorded are located in the lower plains to the north-north-east of Razorback Ridge (Black Oak Bore and Corner Bore). However, the highest diversity of recorded stygofauna species were found at MGT monitoring bores MWB0004-MB and MWB0005-MB located outside of the Project Area and adjacent to Manunda Creek.

As the stygofauna survey has confirmed that subterranean GDEs are present in the Study Area, consideration of potential impacts to stygofauna will be completed. Impacts to stygofauna will be considered as part of the assessment of overall groundwater impacts in recognition of the dependence of stygofauna on the groundwater system. Stygofauna will be considered as a receptor to potential changes in groundwater quality and quantity in a similar way to that in which potential impacts to aquatic ecosystems are assessed by water quality impacts.

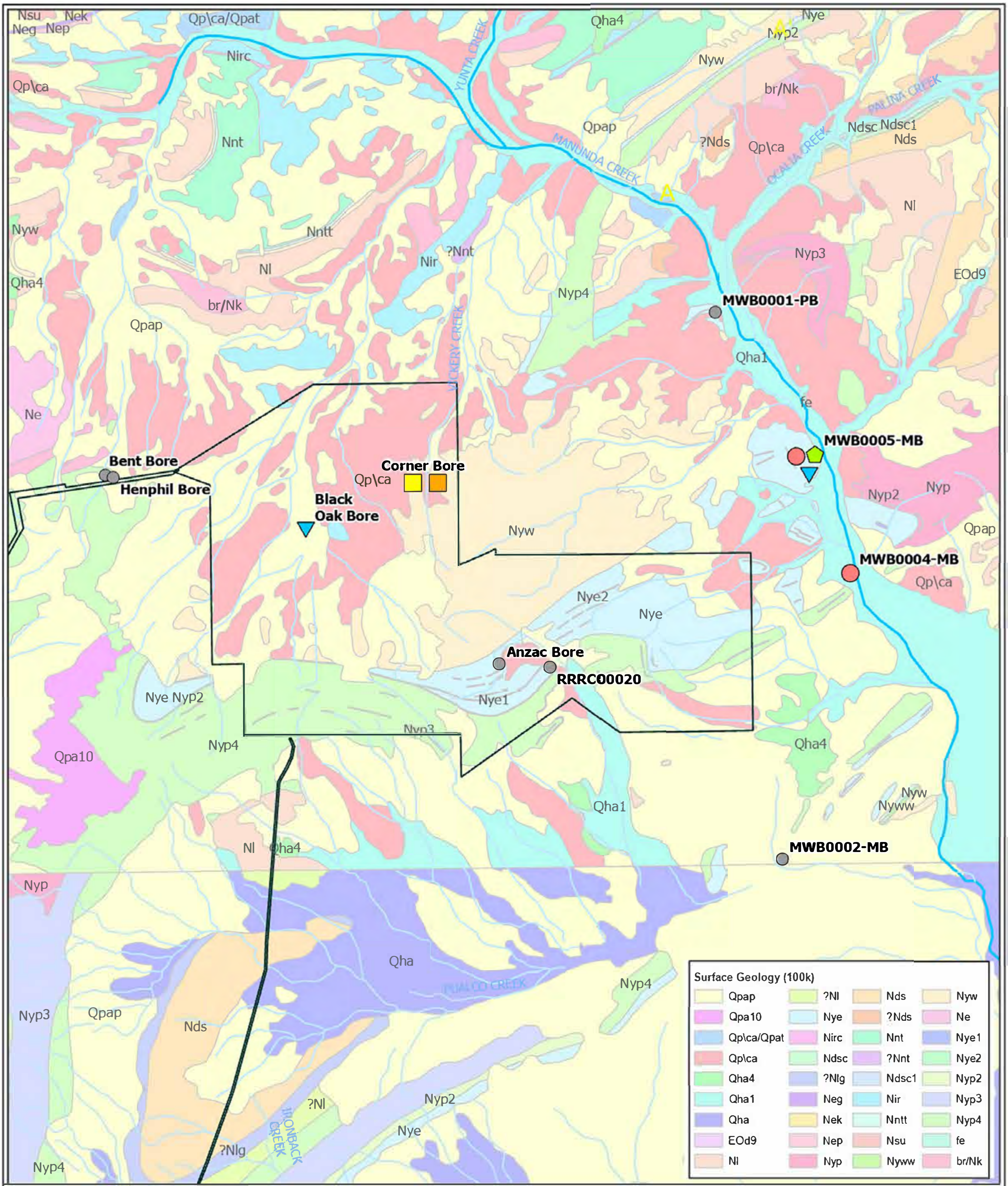


Figure 3-47: Distribution of recorded stygofauna taxa

Project Area

Stugofauna Results

- Arkaroolabathynella nr remkoi RB01
- Chiltoniidae RB01
- Harpacticoida RB01
- Oligochaeta indet. 2
- Oligochaeta indet.1
- No Species Recorded

0 2.5 5

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-CD Date: 1/17/2025

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3.6.8. Conceptual hydrogeological model

A conceptual hydrogeological model has been created for the Study Area (ELA, 2024; CDM Smith, 2024). Table 3-22 provides a summary of the hydrogeological framework, groundwater recharge and discharge, flow directions, water quality and hydrochemistry. The hydrogeological conceptual model is represented in Figure 3-48, showing the main aquifer, flow directions, water balance components and bores used to develop the conceptualisation. Note that the groundwater level in the conceptual diagram represents measured levels, where possible, and modelled levels where no bore monitoring data were available. The northwards cross-section has been chosen as the representative diagram because it demonstrates the majority of the process described in this Section, including the location of Project activities and potential sensitive receptors (third-party bores and identified GDEs).

Table 3-22: Summary of regional conceptual hydrogeological model

Feature	Summary of knowledge
Hydrogeological framework	The following HSUs are present within the area: • Neoproterozoic fractured rock aquifer(s) • Tertiary Murray Basin sedimentary aquifer(s) • Neogene perched aquifers.
Aquifer properties	The Neoproterozoic fractured rock aquifer(s) are comprised of formations such as Pualco Tillite, Benda Siltstone, Curdimurka Subgroup, and Tarcowie Siltstone, which have low primary porosity (intergranular porosity) and are reliant on the development of secondary porosity (fractures) for flow and productive yields. The Murray Basin sedimentary aquifers contain the Loxton-Parilla Sands, Geera Clay/ Winnambool Formation and the Renmark Group, which are likely unsaturated in the vicinity of the Project. The Murray Basin HSU is not known to be targeted by third-party users for water supply within the Study Area. The Neogene perched aquifers are not believed to be common or extensive in the vicinity of the Project Area but one known occurrence of this HSU suggests that the Neogene sediments have potential to form these localised aquifer systems. They are not likely to be connected to the other two HSUs.
Groundwater level and flow	Groundwater levels tend to mimic surface topography with high water levels underlying ridgelines and lower levels in the low-lying areas and along drainage lines. As a result, groundwater flow is likely to mostly mimic surface water flow across the region. Three flow systems are apparent in the area: • localised-scale flow systems within alluvial sediments • catchment-scale flow systems confined by ridgelines, elevated areas and structural features • regional flow system towards the Murray Basin at depth.
Recharge mechanisms	• Recharge is expected to be low due to climate and geology • diffuse rainfall recharge occurs across the landscape. (potentially higher where Neoproterozoic formation outcrop) • localised/episodic recharge to alluvial sediments and the fractured rock aquifer(s) may occur along drainage lines during flow event • regional estimates of recharge indicate that the annual average is in the range of approximately 2-25 mm, which represent on 1-10% of annual rainfall.

Feature	Summary of knowledge
Water quality	• Historic and recent bore records indicate that there is variable salinity across the region, but it typically ranges from brackish to saline • the brackish to saline water quality is likely related to hydrological processes (i.e., rainwater evapo-concentration during recharge and evapotranspiration along flow paths) rather than through local geology contributing to the dissolved load. However, some bores have been recorded with distinct sulfate compositions, which may be due to local geochemical anomalies • groundwater in the region is typically not suitable for long term human consumption without treatment • groundwater is typically satisfactory for its current existing use as drinking water for sheep. However, there are some exceedances of stock drinking water guideline values.

Identified groundwater receptors	• Existing human users
	  ◦ third-party bores used for stock watering
	• potential terrestrial GDEs
	  ◦ deep-rooted tree communities (*E. camaldulensis*) found in large areas of the Manunda Creek riparian zone
	• known stygofauna communities.

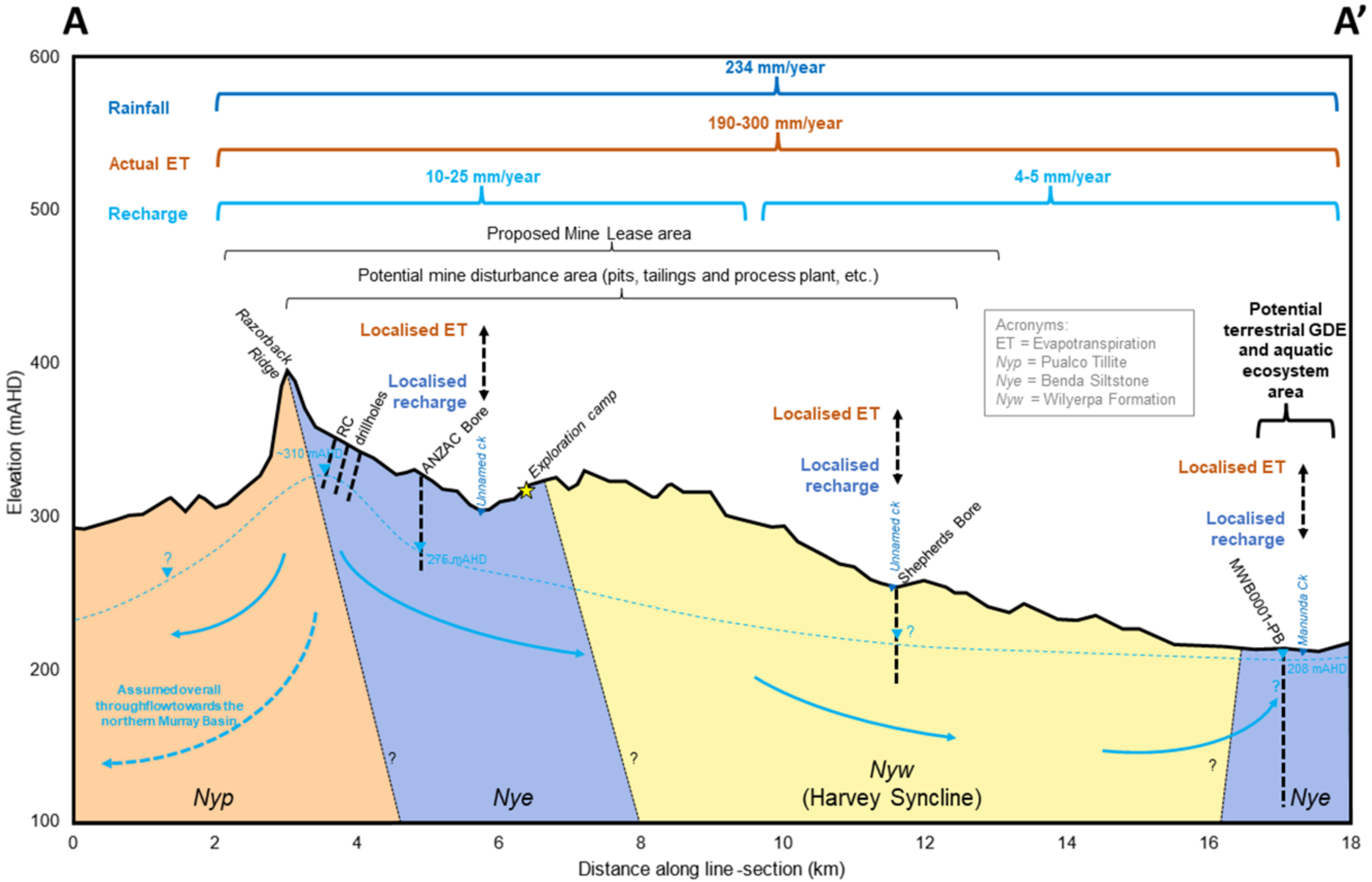


Figure 3-48: Conceptual hydrogeological cross-section for the groundwater Study Area. Line-Section shown in Figure 3-32

3.7. Surface water

An overview of surface water hydrology is described within this Section. For a more detailed discussion please refer to Appendix B4 *Surface Water and Groundwater Baseline Assessment* (ELA, 2024). While this Section is primarily aimed at addressing the TOR 006 requirements for characterising the existing surface water environment, other Project surface water assessments have been completed that estimate regional flood dynamics. For these assessments, please refer to Appendix B10 *Flood Modelling Baseline Assessment* (EMM, 2022), and Appendix C3 *Surface Water Impact Assessment* (RPS, 2024).

The topography of the Study Area is shown in Section 3.1, the regional and local hydrogeology for the Project Area is discussed in Section 3.6.3 and the relevant climate information is presented in Section 3.2.

3.7.1. Prescribed water resources

As previously discussed (Section 3.6.1), water resources of the Study Area are located within the SAAL, MR and NY LSA regions (Figure 3-49). The Project Area is not within any Prescribed Water Resources Areas or Prescribed Surface Water Areas designated under any of the Landscape Boards (Figure 3-49). Furthermore, the Project Area is not within any Water Protection Areas under the EP Act, *Environment Protection (Water Quality) Policy 2015*, nor the *River Murray Act 2003* (Figure 3-49).

The Study Area lies within an area of the SA Murray Region WRP (DEW, 2018). Similar to the region's groundwater resources, the surface water resources of the Study Area are covered by a non-prescribed resource area of the WRP - SDL resource unit SS10 (non-prescribed surface water resource area). The non-prescribed surface water resource area of the SA Murray Region WRP (SS10) has an SDL of 55.2 GL/year and estimated current annual take of 23.34 GL/year (assumed to be solely from pastoral dams). As noted in Section 3.7.4.1, pastoral dam usage in the Study Area (covering only part of the SS10 area) is estimated at 0.53-1.05 GL/year (using equivalent methods to DEW (e.g., multiplying the estimated dam storage volume (obtained using geographic information system (GIS) analysis) by a nominal factor of 1.1)), with 0.19-0.39 megalitres per year (ML/year) of that usage for dams located within or downstream of the proposed Project footprint. Therefore, a total of 31.86 GL/year remains for the SS10 SDL resource unit, which vastly exceeds any of the likely small surface water diversions that will result from the Project.

The LSA Act outlines the water affecting activities that may require a permit. In the context of surface water, these include, but are not limited to:

- construction, enlargement or removal of dams or structures to collect or divert water
- building structures, or obstructing, or depositing solid materials in a watercourse, lake, or floodplain (e.g., depositing material for erosion control or construction of water crossings)
- excavating material from a watercourse, lake, or floodplain (e.g., excavating or cleaning soaks, waterholes, and on-stream dams)
- destroying vegetation in a watercourse, lake, or floodplain (e.g., removal of reeds)
- draining or discharging water or brine into a watercourse or lake (e.g., desalination waste, stormwater including urban discharge, drainage, and salinity control).

MGT will apply for a permit for any water affecting activities resulting from the Project post submission of this MLP as part of the secondary approvals process.

Landholders, property managers, local government, industry, and organisations must lodge permit applications for the above-mentioned activities with the relevant Landscape Board. In SA, everyone has a general statutory duty of care to act reasonably and responsibly in relation to LSA Act. This includes an obligation to maintain and not damage a watercourse, floodplain, or lake.

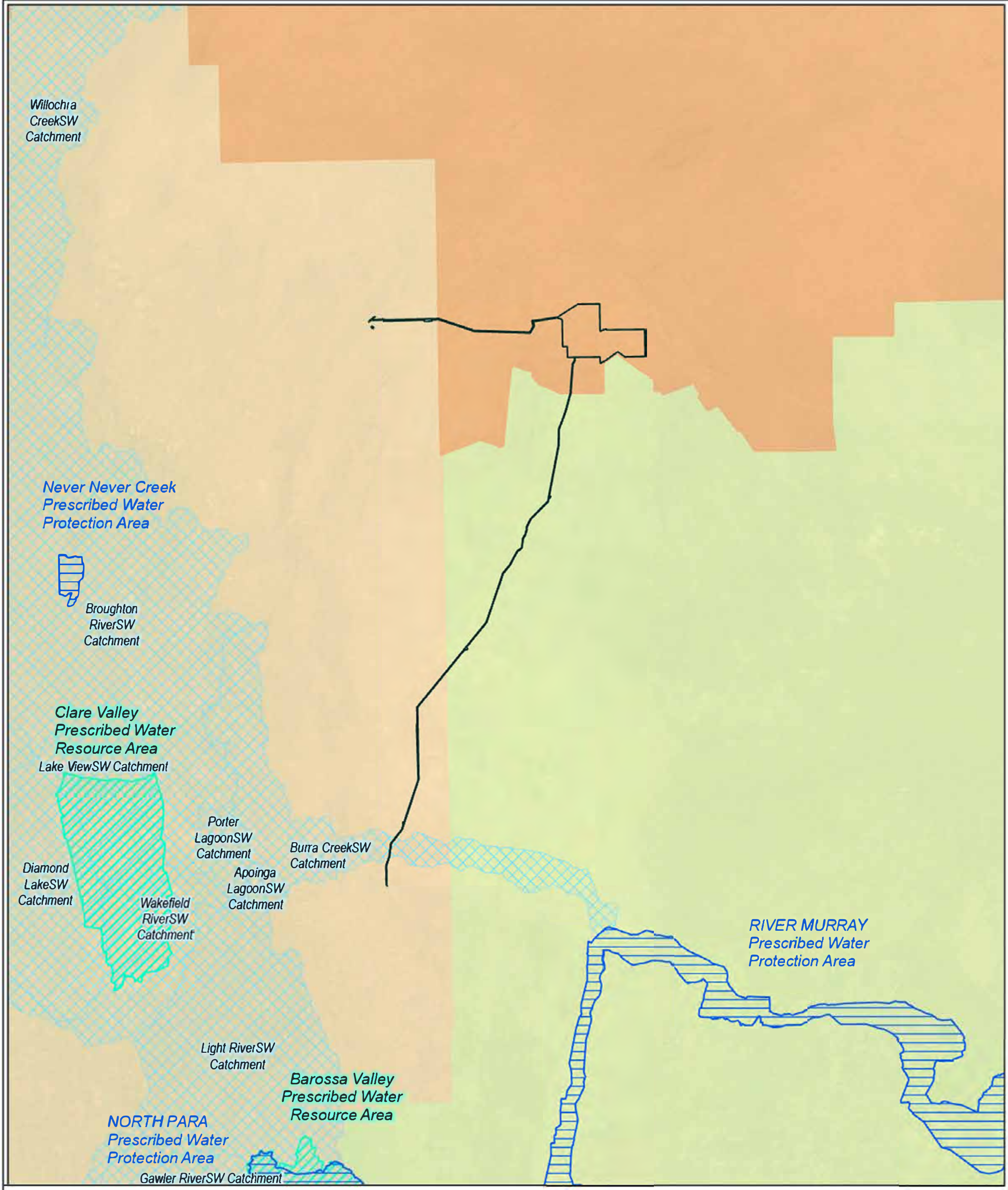
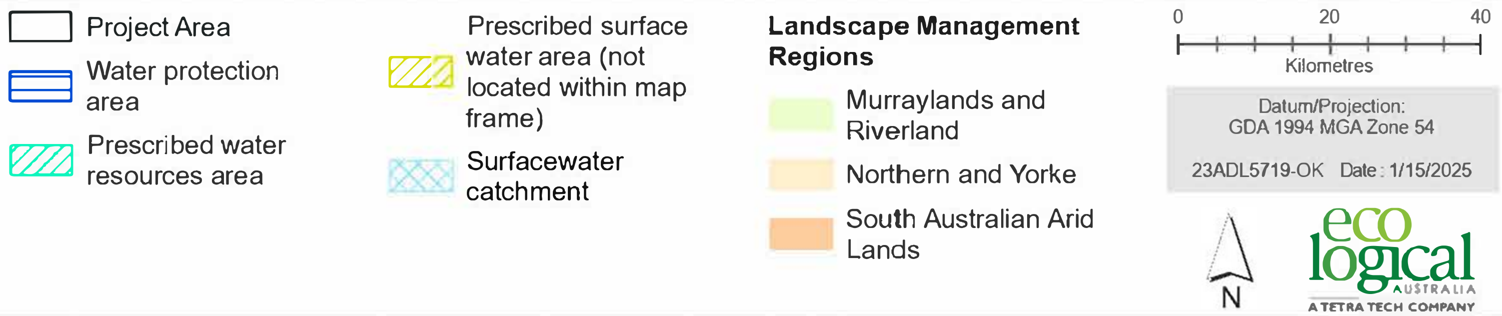


Figure 3-49: Surface water administrative boundaries



3.7.2. Catchment description

The following Section provides maps and detailed descriptions of the surface water drainage system within the Study Area.

3.7.2.1. Catchment boundaries

The Study Area is located within the Murray-Darling Basin drainage division (Figure 3-50). Although, the wider Study Area covers the Lower Murray catchment and the Lower Mallee catchment, the Project Area is confined entirely to the Lower Murray catchment (Figure 3-50). Therefore, this Section primarily focuses on the surface water networks of the Lower Murray catchment because the Project is unlikely to interact with any surface water in the Lower Mallee catchment.

Although the Project lies within the geographic area of the Murray-Darling Basin, the Study Area's drainage lines become poorly-defined beyond the southern reaches of Manunda Creek catchment and appear to terminate at a series of shallow floodout areas and unnamed lakes to the west of the Danggali Conservation Park and Wilderness Protection Area (Figure 3-50 and Figure 3-51). This means runoff from the Project Area is unlikely to connect with River Murray channel on a regular basis.

3.7.2.2. Natural drainage network and waterbodies

Manunda Creek and Yunta Creek (a tributary of Manunda Creek) are the main watercourses located within the Study Area (but outside of the Project Area). A small part of the southern Project Area (transmission corridor) also interacts with the drainage line of Burra Creek.

Manunda Creek exists within approximately 3 km of the eastern ML boundary, extending from the north-west (upstream) of the Project Area to the east, before discharging downstream to the Murray Basin further to the south-east. However, surface water in the Manunda Creek catchment would very rarely (if ever) make its way to the River Murray channel (ELA, 2023b), located approximately 100 km south of the last clearly-defined Manunda Creek channel.

Yunta Creek extends from the town of Yunta (approximately 37 km north of the Project) to the south-east where it meets Manunda Creek at its confluence, approximately 12 km upstream from the Project. The Project Area is not within the catchment area of Yunta Creek and its tributaries. Due to its upstream location, Yunta Creek has been incorporated in the baseline assessment in terms of a 'control' location for baseline monitoring (i.e., providing reference data from a site not anticipated to receive any surface water related impacts due to the Project). Minor named tributaries of Yunta Creek include Tiverton Creek, Galah Creek, Pine Creek and Winnininnie Creek.

Other named minor watercourses of Manunda Creek in the vicinity of the Project include the following, in order of upstream to downstream:

- Paratoo Creek: joins with Manunda Creek from the north-west and its catchment area does not contain any part of the Project Area.
- Vickery Creek: joins with Manunda Creek from the south-west, and its catchment area contains a large portion of the proposed TSF area.
- Ocalia Creek: joins Manunda Creek from the north-east, and its catchment does not contain any part of the Project Area. Locations within Ocalia Creek catchment have been considered as 'control' locations for the baseline monitoring. The Ocalia Creek catchment includes a minor named tributary, Palina Creek that join Ocalia Creek near Manunda Station's homestead.
- Pualco Creek: joins with Manunda Creek from the west. Parts of the catchment area of Pualco Creek interact with the TL corridor and drain the southern face of Razorback Ridge.

In the southern part of the Study Area, the TL corridor interacts with the following named watercourses that also comprise part of the Lower Murray drainage network:

- Upper reaches of Ironback Creek, Block Seven Creek and Braemar Creek. Classified as minor watercourses. Drain from the west and north-west across the TL corridor approximately 15-30 km south-south-west of Razorback Ridge.
- Lower reaches of Newikie Creek, Baldina Creek and Stone Chimney. Classified as minor watercourses. Drain from the west across the TL corridor approximately 70-90 km south-west of Razorback Ridge.
- Middle reaches of Burra Creek. Classified as a major watercourse. Drains from the west across the TL corridor approximately 110 km south-west of Razorback Ridge.

The Study Area contains no Ramsar wetlands, and the BoM Geofabric only identifies the presence of areas classified as 'Land Subject to Inundation' in the upper reaches of Manunda Creek, unnamed 'Lakes' downstream of the terminus of Manunda Creek (mentioned above), and pastoral dams.

Based on observations during field surveys and engagement with landholders there is only a small Section of Manunda Creek to the south of the confluence with Ocalia Creek where semi-permanent in-stream pools and waterholes are known to exist. This Section of Manunda Creek has significant areas where the creek bed is comprised of Neoproterozoic rock outcrop compared to more sandy/gravelly reaches further to the south. The creek bed reaches comprised of rock outcrop have the potential to hold water if bowl-like features have been eroded into the rock, such as at the waterholes.

The features described above are presented on the map in Figure 3-50 and Figure 3-51.

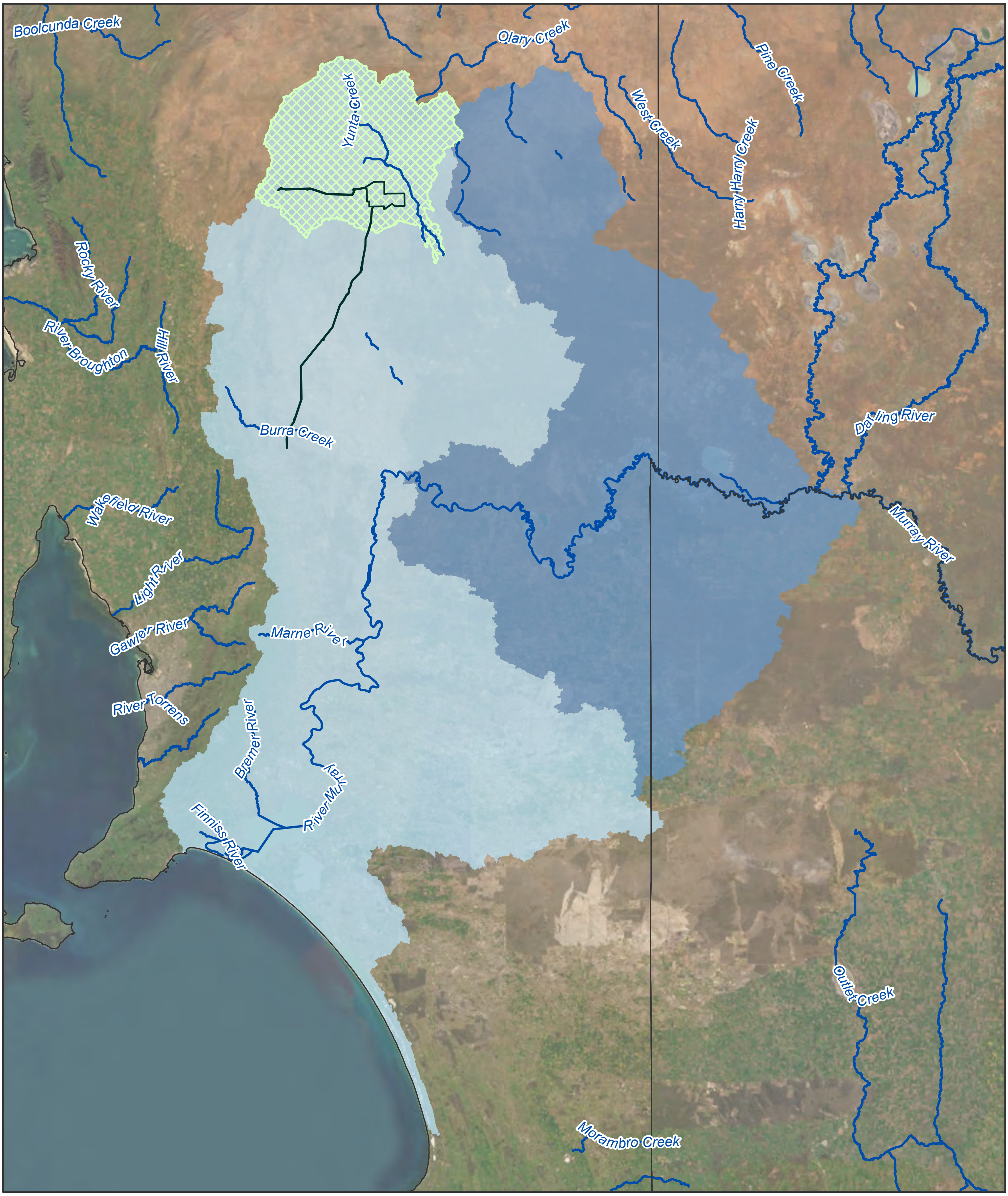


Figure 3-50: Regional catchments and major natural surface water features

Project Area
State border
Watercourses
Major
Manunda Creek catchment
Lower Mallee catchment
Lower Murray catchment

0 40 80
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 16/12/2024

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eco logical AUSTRALIA
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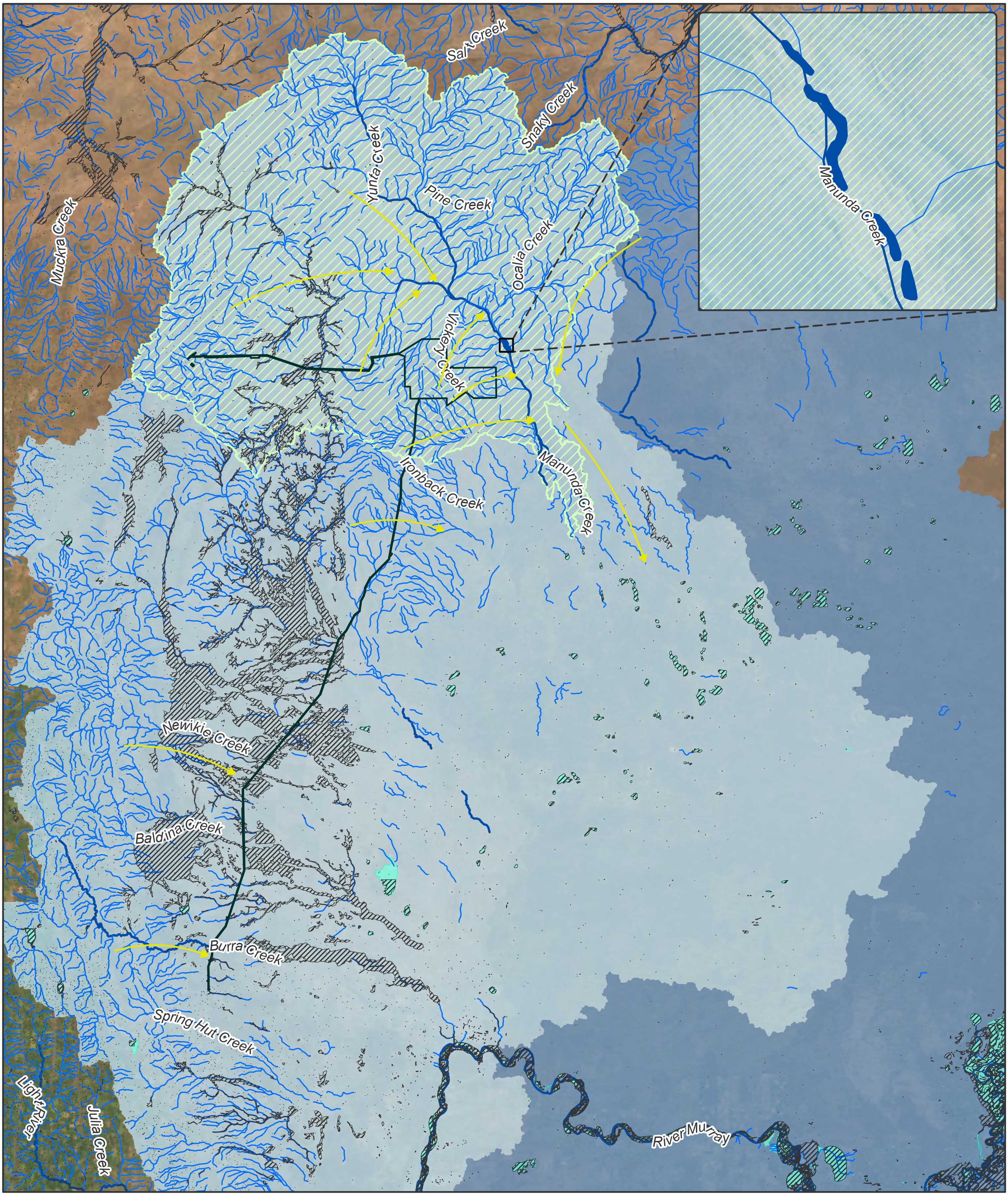

Figure 3-51: Major and minor watercourses and natural surface water features

Project Area
Indicative flow direction

Manunda Creek Waterholes

Watercourses
Major
Minor

Lakes
Land subject to flooding
Manunda Creek catchment
Lower Mallee catchment
Lower Murray catchment

0 15 30
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

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N

3.7.2.3. Flow regimes

The region is semi-arid and, therefore, is typically dry with infrequent but large rainfall and flood events. All watercourses in the area are ephemeral and therefore only flow following major rainfall events. Manunda Creek drains to the south-east of the Project, however, limited surface water information regarding flow volumes, rates, durations, frequencies and quality is available to quantitatively characterise the local flow regimes within the vicinity of the Project Area.

The BoM landscape water balance model (AWRA-L version 5; Frost et al. 2016) estimates average annual runoff (aggregated for 1911-2021) over the Manunda Creek catchment is approximately 4 mm/year (or 20 GL/year over the entire catchment area). The runoff rate in the ridge areas (in the centre and to the north of the catchment) is predicted to be higher at about 10-30 mm/year but those areas only comprise a small portion of the overall catchment. By comparison, the AWRA-L model estimates average annual runoff over the entire Lower Murray River and Lower Mallee catchments as approximately 6 mm/year (274 GL/year over the entire catchment) and 1 mm/year (28 GL/year over the entire catchment), respectively.

Preliminary site investigations as part of the Project baseline surveys suggest that the catchment has a varied and complex hydrologic history, where major flooding events (and associated sedimentation) were common in its Tertiary to Quaternary history. This is based on multiple layers of large (pebble- to boulder-sized) and well-rounded sediments that are exposed along most of the creek banks. In modern times, Manunda Creek still occasionally receives high flows as evidenced by the observed significant erosion into modern-day riverbanks (approximately 2 m) and large creek widths (estimated at approximately 175 m in areas immediately east of the Project), in addition to the presence of debris throughout the creek bed and large washout areas.

The Manunda Creek bed itself ranges from being sandy and gravelly with river stones, to areas dominated by outcropping Neoproterozoic rock (typically Benda Siltstone or Pualco Tillite near the Project area) with only a minor amount of alluvial material. The sandy/gravelly Sections typically begin directly east of the Project and continue to the south as the thickness of Quaternary/Tertiary sediments increase, whereas drainage lines to the north-east and east of the Project more commonly have Neoproterozoic outcrop as their creek bed.

MANUNDA CREEK WATERHOLES

The only known location of semi-permanent surface water in the Study Area is at a series of small waterholes along Manunda Creek, south of the Ocalia Creek confluence (Figure 3-51). In this area, recent surface water flows collect in bowl-like depressions in outcropping Neoproterozoic rock. Following inundation, the waterholes contract due to evaporation if no subsequent flows top up water levels. Isotopic water quality sampling at the waterholes and groundwater level measurements at nearby monitoring bores have confirmed that the waterholes do not receive groundwater discharge.

As a means of assessing streamflow in this Section of Manunda Creek, public satellite imagery has been used to assess the size and timing of inundation at the waterholes over the last eight years (ELA, 2024). Water indices calculated using the reflectance data of Sentinel 2 satellite imagery were used because the resolution of the imagery (approximately 10x10 m pixels) was sufficient to distinguish the waterholes from the surrounding landscape. By contrast, the poorer resolution of satellite imagery products that have been collected for a longer time period (i.e., Landsat and MODIS) were unable to sufficiently distinguish the waterholes.

The results of the satellite imagery analysis are presented in Figure 3-52, where they are compared to nearby daily rainfall data. From the time series, it is apparent most years since late-2015 (except 2019) have recorded at least one filling event at the waterholes. Spatial analysis of the data indicates that open water was present in the lower areas of the waterholes for at least 80% of Sentinel 2 images between 2015 and 2023. Due to this method being dependent on clear satellite images, which may not capture peak creek flows due to rain clouds, this percentage may represent a lower range for waterhole persistence. However, it is apparent from the limited dataset (only eight years of data availability) that the waterholes do evaporate entirely during extended dry periods and are not permanent features.

In 2019, the waterholes completely dried because only very small daily rainfall events were recorded (maximum of 6 mm/day) during the year. It is likely waterhole filling events can be treated as a proxy for surface water flow in this reach of the catchment (i.e., waterholes are filled through a combination of local rainfall and creek flows), and therefore, waterhole filling events likely coincide with larger flow events for most of the broader catchment. The years 2021 through 2023 were relatively wet, with at least three filling events being recorded at the waterholes. Waterhole filling has typically coincided with years with a relatively high frequency of days with >10 mm of rain, which appears to be the approximate threshold to initiate a filling event.

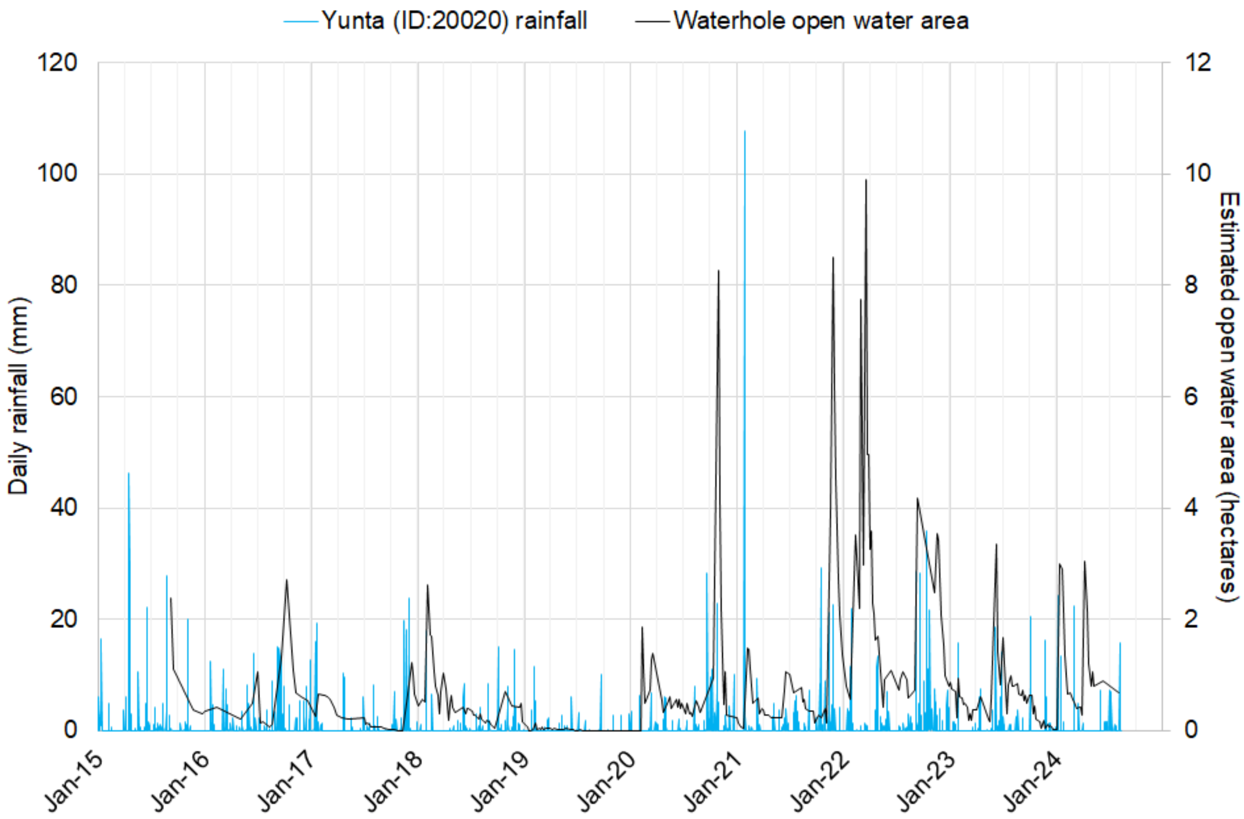

Figure 3-52: Time series of Sentinel 2 open water estimates for the Manunda Creek waterholes

SURFACE WATER MODELLING

In addition to the above analysis of the existing surface water environment that is based on public data and recent field observations, surface water modelling has been undertaken to better assess the pre-development hydrologic and hydraulic behaviour of the catchment and drainage network. Initial flood modelling, conducted by EMM Consulting in 2022 to support the Definitive Feasibility Study of the Razorback project (refer Appendix B10), was updated by RPS in 2023 to focus on the current Project Area. Detailed information on model configuration is available in Appendix C3 *Surface Water Impact Assessment* (RPS, 2024).

As part of the hydrology and hydraulic modelling of the Site, several hypothetical rainfall events were selected (as per the methodology of Australian Rainfall and Runoff Guidelines (ARR); Ball et. al., 2019) to compare pre- and post-development flood dynamics. The hypothetical rainfall events have an AEP of 5% (AEP5), 2% (AEP2) and 1% (AEP1). These events are equivalent to annual recurrence intervals (ARI) of 1-in-20 years, 1-in-50 years and 1-in-100 years. These selections were based on the recognition that they represent the highest flood depths for a substantial portion of the downstream floodplain across the majority of examined storm durations and temporal patterns. The selected temporal patterns represent those resulting in mean maximum flood depths.

Pre-development flood inundation extents for the AEP5, 2 and 1 were estimated for the areas draining the proposed mine area and proposed HR corridor, and are displayed on the maps in Figure 3-53 through Figure 3-58 respectively.

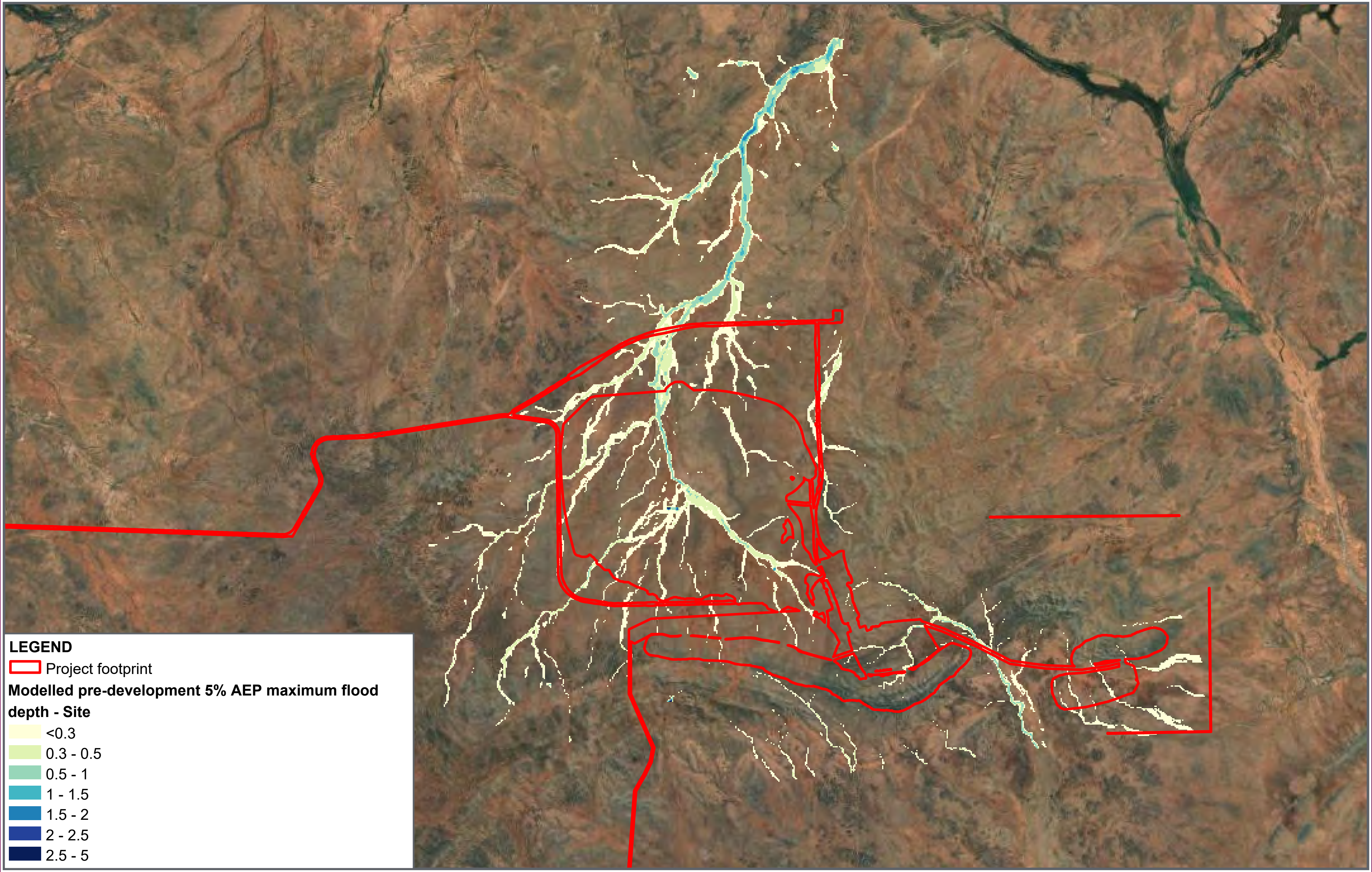

Figure 3-53:
Modelled pre-development 5% AEP maximum flood depth - Site

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Doc Number: 001
Date: 12/01/2024
Scale: Map 1:120,000 @ A4
Created by: Jackie.Chan
Source: Orthophoto - ESRI 2023

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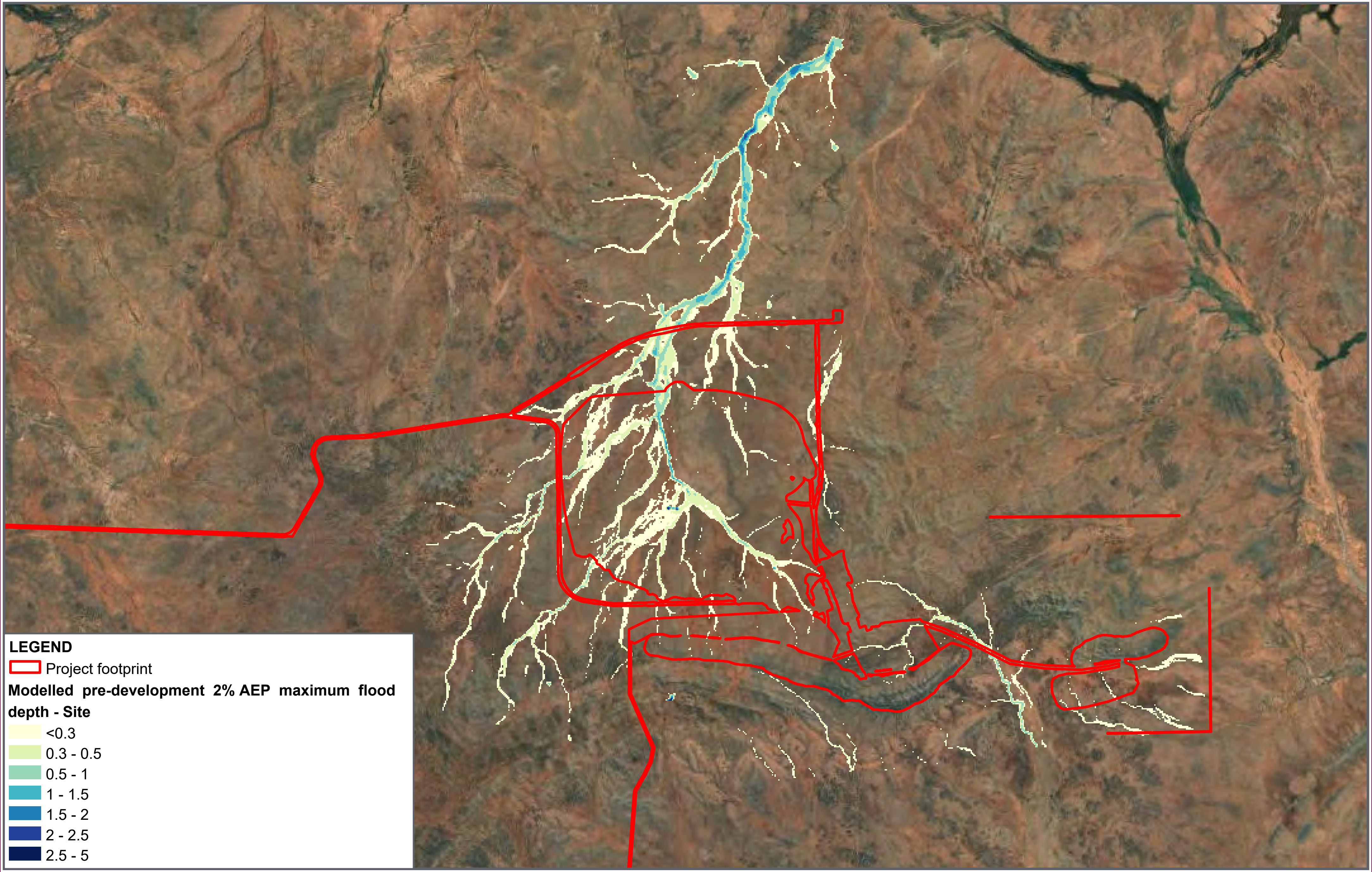

Figure 3-54:
Modelled pre-development 2% AEP maximum flood depth - Site

GDA 1994 MGA Zone 54

0 1.25 2.5 5 km

Job Number: AU213012380
Doc Number: 001
Date: 12/01/2024
Scale: Map 1:120,000 @ A4
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Source: Orthophoto - ESRI 2023

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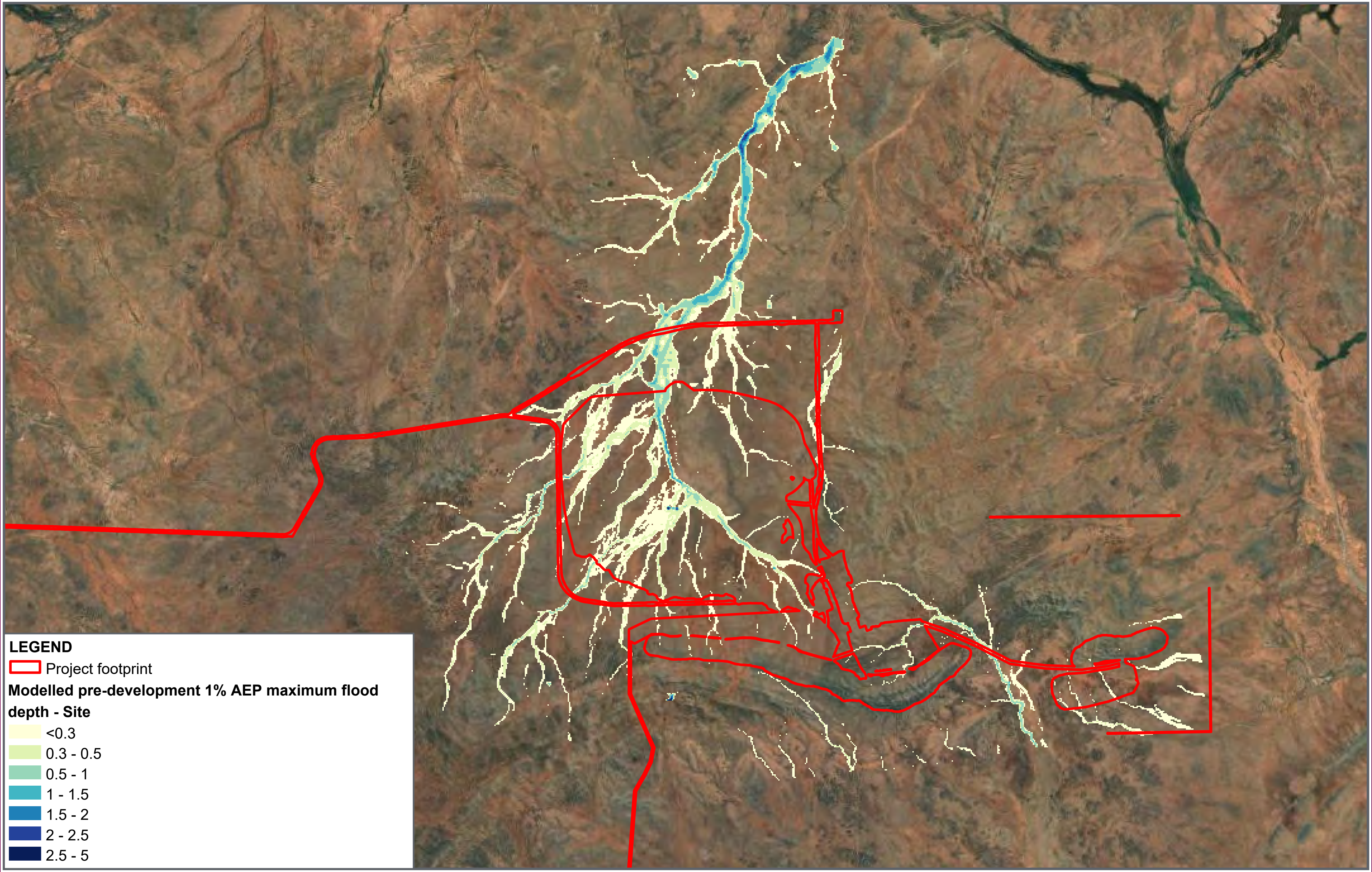

Figure 3-55:
Modelled pre-development 1% AEP maximum flood depth - Site

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Doc Number: 001
Date: 12/01/2024
Scale: Map 1:120,000 @ A4
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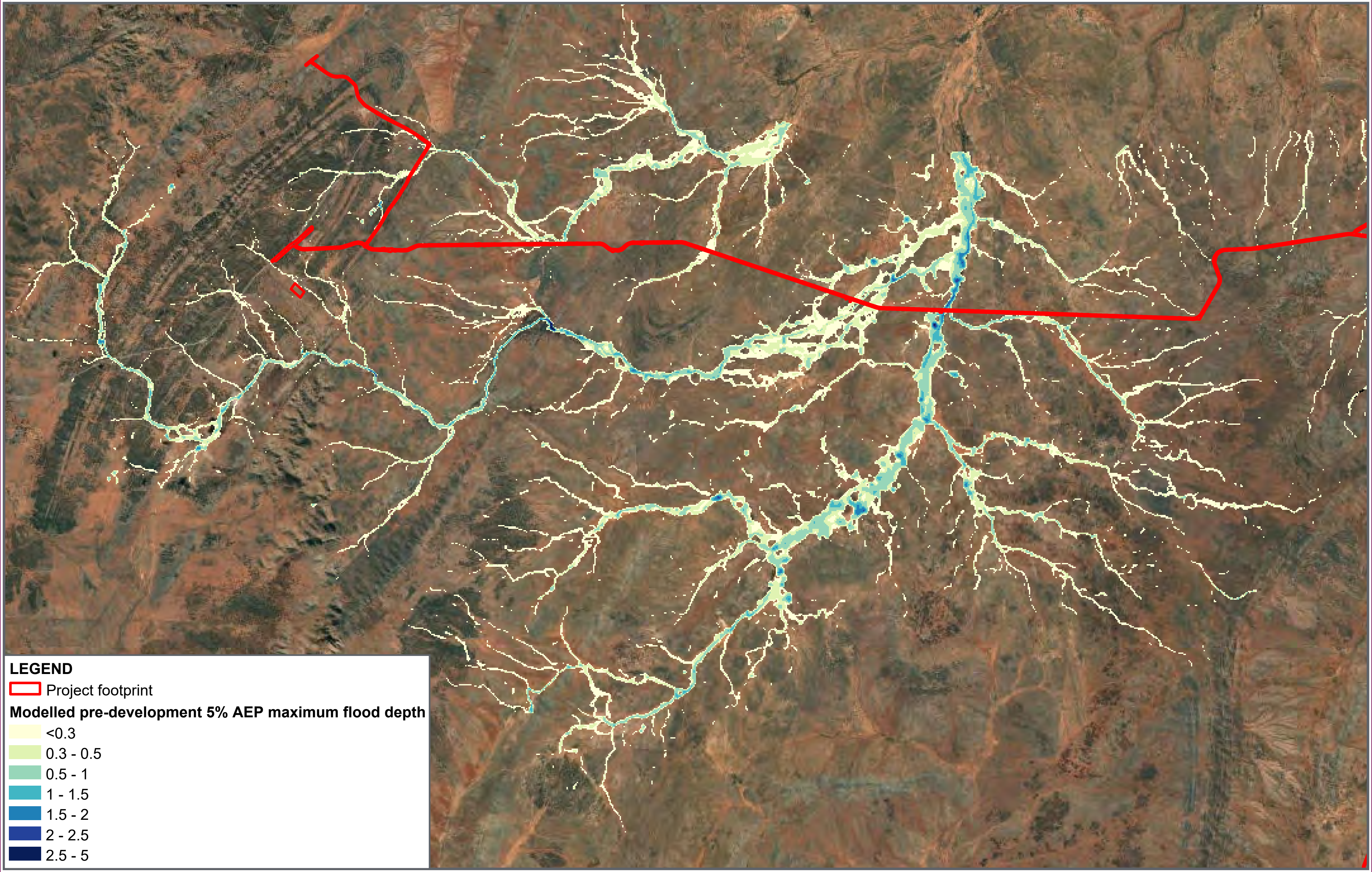

Figure 3-56:
Modelled pre-development 5% AEP maximum flood depth – HR and RS

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Doc Number: 001
Date: 20/12/2023
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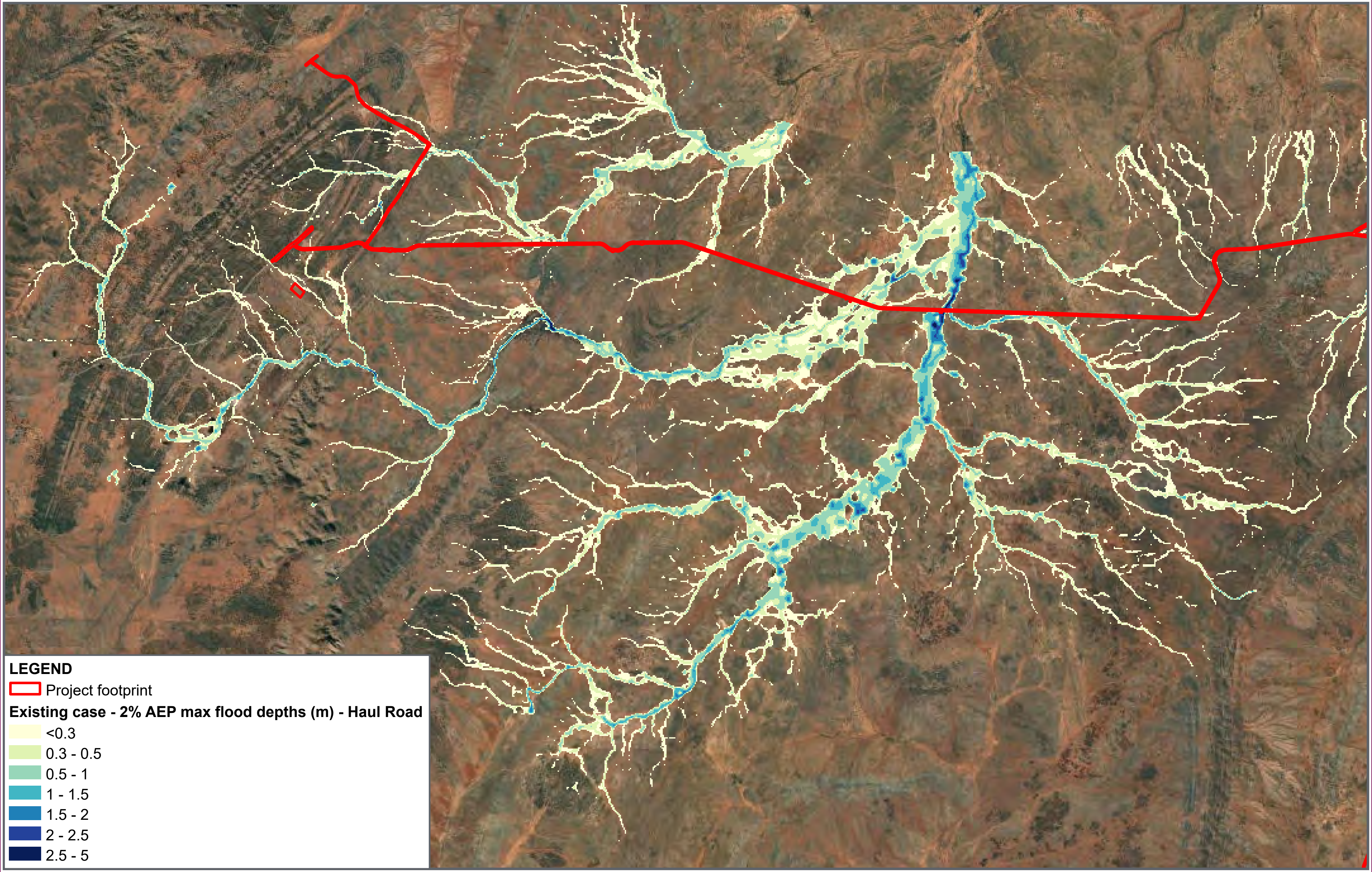

Figure 3-57:
Modelled pre-development 2% AEP maximum flood depth – HR and RS

GDA 1994 MGA Zone 54

0 1.25 2.5 5 km

Job Number: AU213012380
Doc Number: 001
Date: 20/12/2023
Scale: Map 1:170,000 @ A4
Created by: Jackie.Chan
Source: Orthophoto - ESRI 2023

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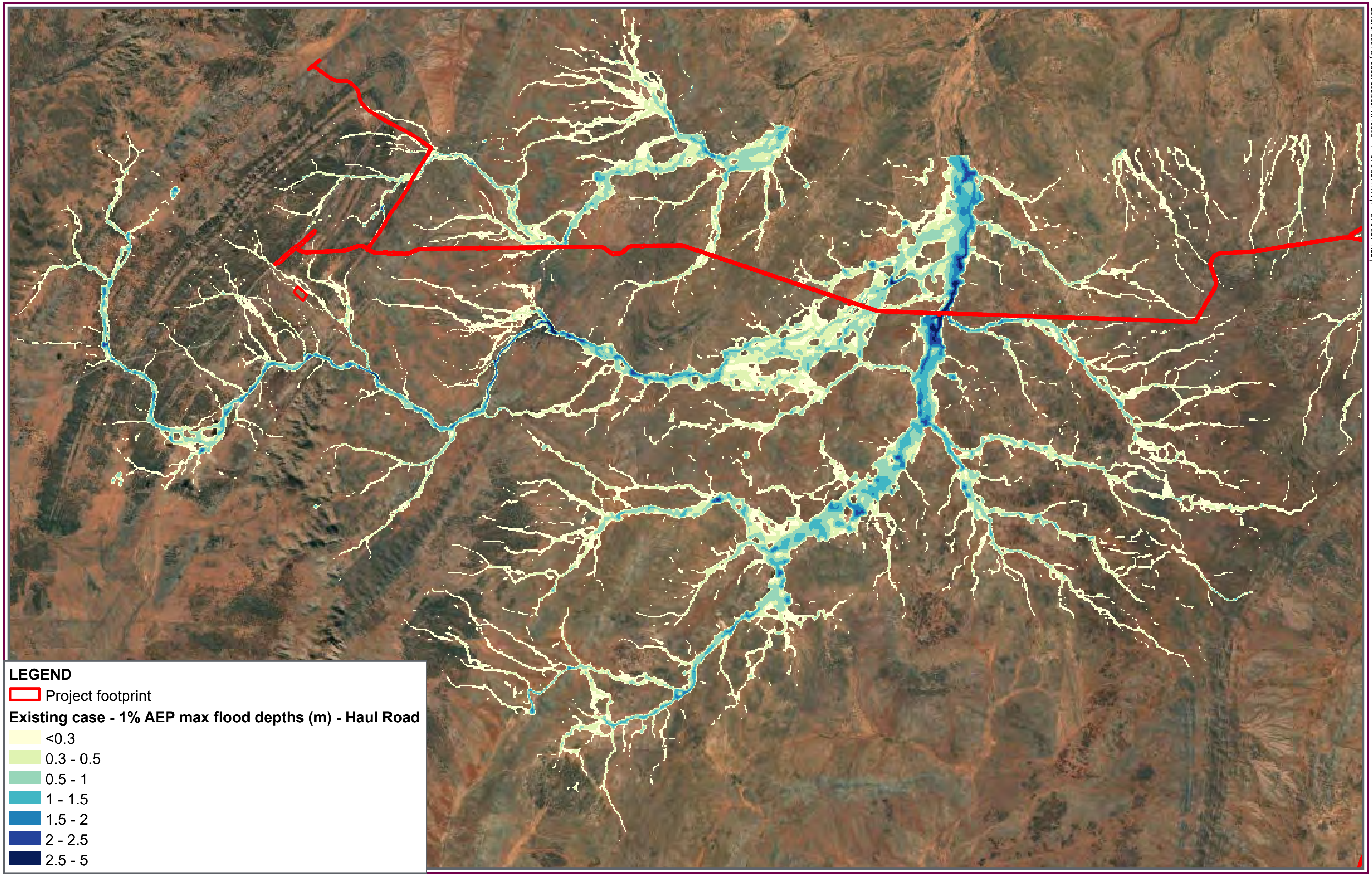

Figure 3-58:
Modelled pre-development 1% AEP maximum flood depth – HR and RS

Job Number: AU213012380
Doc Number: 001
Date: 20/12/2023
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Created by: Jackie.Chan
Source: Orthophoto - ESRI 2023

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3.7.2.4. Groundwater – surface water interactions

There are no known locations of groundwater discharge (i.e., springs, seeps or baseflow) within the Study Area. The only known area of semi-permanent surface water in the region; Manunda Creek waterholes has been investigated and found to be solely reliant on rainfall and surface water flows (refer Section 3.7.2.3).

Drainage lines in the Study Area do, however, have the potential to act as point sources of groundwater recharge to the fractured rock aquifer(s). This has been observed at two of the Project's groundwater monitoring locations that are adjacent to Manunda Creek (see Section 3.6.5), where on two occasions in 2023, pressure loggers installed in the monitoring bores recorded rapid groundwater recharge (peaking over approximately a one-week period) following rain events of 10-40 mm. Analysis of the groundwater level response at these locations indicate variable rates of recharge (depending on local connectivity with the surface) of approximately 4-15 mm. However, this recharge is likely restricted to the very near vicinity of the drainage line and does not represent an aquifer-wide response. This was also apparent from the groundwater level monitoring data, with levels receding to baseline levels in the months following the recharge event as the limited areal extent of the recharge 'mound' dissipates relatively quickly into the surrounding aquifer.

3.7.3. Surface water quality

Given the region is semi-arid and the surface water system is ephemeral, baseline surface water quality monitoring has adopted the TOR 006 methodology of collecting watercourse sediment samples as a proxy. Beginning in Q1 2022, MGT have been collecting baseline sediment samples from six baseline sediment sampling locations (SW01 through SW06, refer Figure 3-59) that were sited across the Manunda Creek catchment at upstream ('control') and downstream ('impact') locations relative to the Project Area. In Q2 2023, when greater details for Project design was available, a further eight sediment sampling locations were established and were sited to target additional tributaries and specific proposed Project infrastructure (i.e., tailings storage area). Sampling at the 14 sediment quality monitoring locations (Figure 3-59) has been undertaken bi-annually over the period Q1 2022 and Q3 2024 – five samples have been collected at each of the SW01-06 locations and three samples have been collected at each of the SW07-14 locations.

In addition to the 14 ongoing baseline sediment sampling locations, nine one-off sediment samples were collected from along the HR corridor. The nine HR sediment locations (SW-HR) were cited to targeted three creek crossings classified as 'Land subject to flooding' by SA Government dataset (SARIG) and the BoM Geofabric. At each of the three creek crossings, one sediment sample was collected upstream of the planned HR centre point, one sample from the planned HR centre point and one sample downstream of the HR centre point.

Sediment sampling locations have not been established along the TL corridor because it is not anticipated that this corridor will have any potentially ongoing impacts to surface water. Any required baseline sediment sampling along this corridor can be conducted immediately prior to any works requiring a water affecting activity permit.

Opportunistic surface water sampling locations have also been established at the Manunda Creek waterholes (WH01 and WH02) and at one of the larger pastoral dams in the Study Area (MD01; Manunda Station homestead dam located at the confluence of Palina and Ocalia creeks). Regular sampling at the waterholes began in Q2 2022, while sampling at the Manunda Station pastoral dam began in Q2 2023.

The baseline sediment and surface water sampling locations are shown in Figure 3-59, and colour-coded based on whether they are considered 'control' (upstream of, or in a different sub-catchment to, proposed Project activities) or 'impact' (downstream of proposed Project activities) locations.

The concentrations of dissolved parameters for the Manunda Creek waterhole samples are below all Australian and New Zealand Guidelines (ANZG) (2018) livestock drinking water guidelines. However, some background metal concentrations were naturally elevated above ANZG default Guideline values (DGVs) for freshwater systems for copper (Cu), arsenic (As) and zinc (Zn) for various levels of species protection.

There are exceedances for Australian and New Zealand Environment and Conservation Council (ANZECC) surface water sediment DGV for nickel concentrations for most samples along Manunda Creek and its tributaries, including along the proposed HR route. There are no other exceedances for other toxicant metals or for any hydrocarbon species and pesticides.

Summary statistics for key water and sediment quality parameters are presented in Table 3-21 and Table 3-22 respectively. Note that the statistics are calculated using all data collected, which means that they are skewed towards the values recorded at locations that were sampled on numerous occasions. However, most of the sites were sampled on more than two sampling rounds so any bias is not likely to be significant. Consistent with methods used for groundwater monitoring, where surface water values are reported as below the LOR, it has been incorporated into the statistical calculations by assuming the value is half the LOR. This is a common method for treating censored (i.e., below LOR) data (ANZG, 2018).

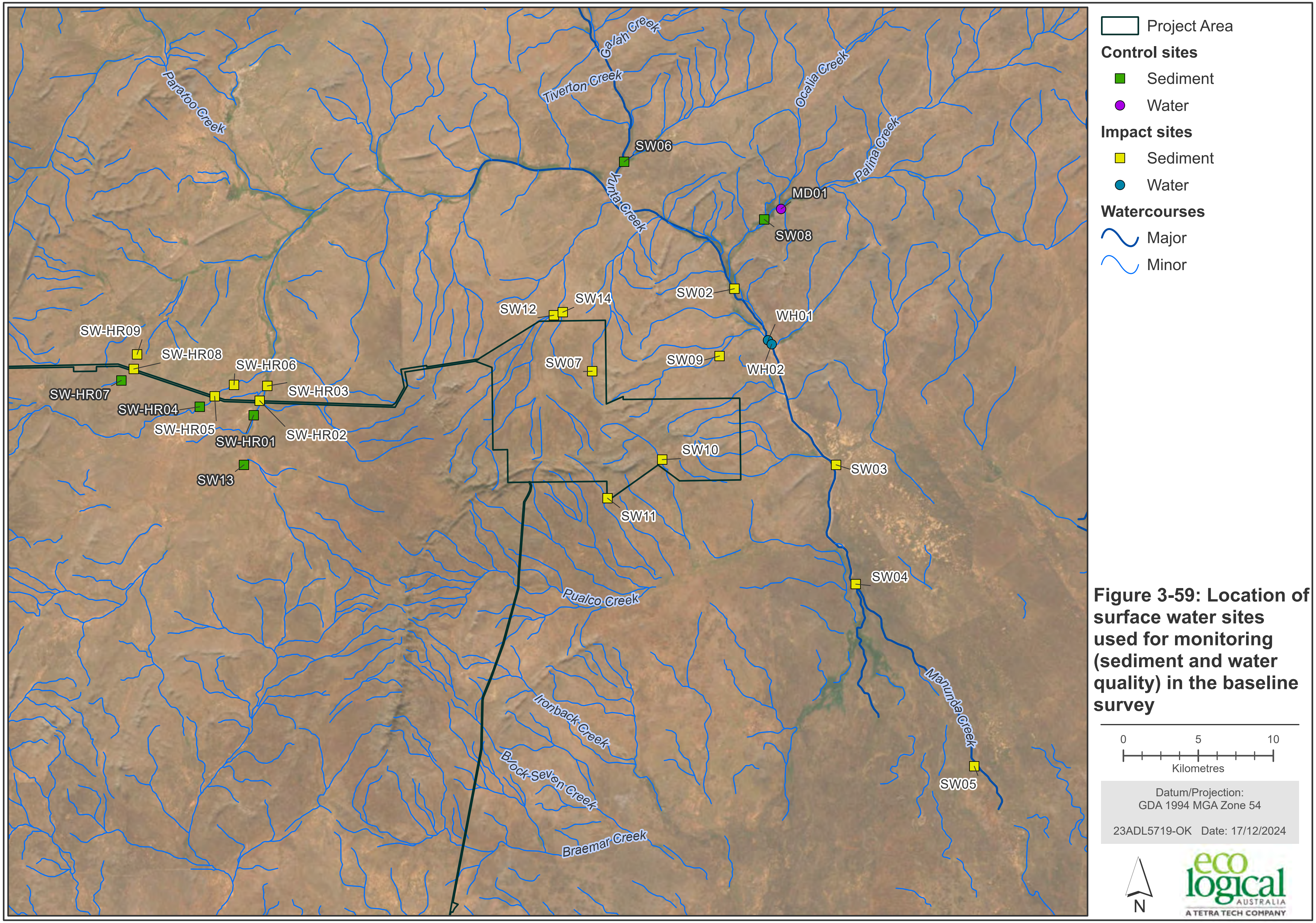

Figure 3-59: Location of surface water sites used for monitoring (sediment and water quality) in the baseline survey

Table 3-23: Water quality summary statistics for surface water baseline locations

Parameter	n[26]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Physicochemical									
Temperature[27,28]	18	8.0	24.5	16.9	17.3	9.1	12.1	22.3	23.6
EC[3,29]	18	0.25	2.87	0.93	0.70	0.41	0.58	1.17	1.51
Salinity[30,31]	16	205	1,510	580	590	271	394	664	789
pH[3,32]	18	7.66	8.90	8.40	8.44	7.87	8.19	8.67	8.84
DO[3,33]	16	5.79	11.31	9.26	9.45	7.68	8.33	10.56	10.77
Turbidity[6,34]	14	4.6	273.0	48.9	25.3	4.8	6.6	62.9	86.2
Major and minor ions									
Sodium[6,35]	16	33	406	130	118	47	90	141	194
Potassium[6,11]	16	6	15	8	8	7	7	8	11
Calcium[6,11]	16	8	44	33	36	24	28	39	43
Magnesium[6,11]	16	5	64	21	19	7	12	27	29
Chloride[6,11]	16	22	645	201	185	41	107	255	310

[26] Number of samples (n) used to calculate summary statistics

[27] Field measurement

[28] °C

[29] Electrical conductivity @ 25°C as µS/cm

[30] Laboratory measurement

[31] mg/L as TDS

[32] No units

[33] DO as mg/L

[34] NTU

[35] mg/L

Parameter	n[26]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Sulfate[6,36]	16	15	252	74	67	18	36	93	106
Total alkalinity[6,37]	16	104	207	137	133	113	115	148	171
Bromide[6,11]	6	0.08	1.13	0.45	0.36	0.13	0.20	0.58	0.88
Fluoride[6,11]	6	0.2	0.8	0.4	0.4	0.3	0.3	0.5	0.7
Silica[6,38]	6	0.14	3.38	1.83	1.94	0.41	0.78	2.86	3.14
Nutrients									
Nitrate[6,39]	12	0.02	0.89	0.13	0.07	0.02	0.03	0.08	0.13
Nitrite[6,15]	12	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	0.02
Ammonia[6,15]	10	<0.01	0.14	0.06	0.05	0.01	0.02	0.10	0.12
Total nitrogen[6,15]	12	0.20	1.60	0.69	0.55	0.20	0.35	0.80	1.55
Total phosphorus[6,40]	12	<0.01	0.10	0.06	0.06	0.01	0.03	0.09	0.10
Dissolved (filtered) metals									
Aluminium[6,11]	12	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	0.01
Arsenic[6,11]	12	<0.001	0.003	0.002	0.002	<0.001	0.001	0.002	0.002
Barium[6,11]	10	0.019	0.112	0.056	0.056	0.033	0.037	0.068	0.078
Beryllium[6,11]	10	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron[6,11]	12	0.10	0.91	0.30	0.25	0.13	0.17	0.33	0.47
Cadmium[6,11]	12	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium[6,11]	12	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

[36] mg/L as SO42-

[37] mg/L as CaCO3

[38] mg/L as Si

[39] mg/L as N

[40] mg/L as P

Parameter	n[26]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Cobalt[6,11]	10	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Copper[6,11]	12	<0.001	0.006	0.004	0.004	0.003	0.003	0.004	0.005
Iron[6,11]	12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead[6,11]	12	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese[6,11]	12	0.002	0.096	0.028	0.014	0.004	0.008	0.030	0.083
Mercury[6,11]	12	<0.00004	<0.0001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0001
Molybdenum[6,11]	10	<0.001	0.004	0.002	0.002	0.001	0.001	0.002	0.002
Nickel[6,11]	12	0.002	0.004	0.002	0.002	0.002	0.002	0.003	0.003
Selenium[6,11]	12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium[6,11]	10	0.110	1.140	0.444	0.431	0.133	0.242	0.538	0.692
Vanadium[6,11]	10	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc[6,11]	12	<0.005	0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hydrocarbons									
NEPM F1[6,41,42]	10	<20	<20	<20	<20	<20	<20	<20	<20
NEPM F2[6,19,43]	10	<100	<100	<100	<100	<100	<100	<100	<100
NEPM F3[6,19,44]	10	<100	<100	<100	<100	<100	<100	<100	<100
NEPM F4[6,19,45]	10	<100	<100	<100	<100	<100	<100	<100	<100

NEPM = National Environment Protection (Assessment of Site Contamination) Measure, Schedule B (1) 'Guideline on the Investigation Levels for Soil and Groundwater' (NEPM, 2013)

BTEX = Benzene, toluene, ethylbenzene, xylenes

[41] NEPM Fraction 1 (F1) = C6 – C10 minus BTEX

[42] µg/L

[43] NEPM Fraction 2 (F2) = C10 – C16 minus naphthalene

[44] NEPM Fraction 3 (F3) = C16 – C34

[45] NEPM Fraction 4 (F4) = C34 – C40

Parameter	n[26]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
TTRH[6,46,47]	10	<100	<100	<100	<100	<100	<100	<100	<100
Total BTEX[6,19]	10	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene[6,19]	10	<5	<5	<5	<5	<5	<5	<5	<5

Table 3-24: Sediment quality summary statistics for surface water baseline locations

Parameter	*n*[48]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Physico-chemical									
EC[49,50]	49	50	2,150	225	117	59	68	221	342
pH[50,51]	49	7.3	10.0	8.8	9.0	7.8	8.5	9.4	9.6
Total major ions									
Sodium[52]	49	<10	520	61	40	<10	10	70	100
Potassium[52]	49	<10	160	41	30	<10	10	60	80
Calcium[52]	49	10	990	97	50	20	30	80	132
Magnesium[52]	49	<10	300	24	10	<10	<10	20	30
Chloride[52]	49	<10	2,320	89	<10	<10	<10	20	42
Sulfate[52]	49	<10	380	23	<10	<10	<10	10	20
Total alkalinity[53]	35	89	4,640	1,167	586	230	330	1,415	3,038

[46] TRH - C6 – C40 fraction hydrocarbons

[47] µg/L

[48] Number of samples (*n*) used to calculate summary statistics

[49] Electrical conductivity (EC) @ 25°C as µS/cm

[50] Measured on a 1:5 sediment-water mix

[51] No units

[52] mg/kg

[53] mg/kg as $CaCO_3$

Parameter	n[48]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Exchangeable major cations									
Ex. sodium[54]	28	<0.2	24.5	7.6	0.3	<0.2	<0.2	18.4	23.1
Ex. potassium[54]	28	<0.2	4.6	1.0	0.2	<0.2	<0.2	1.6	3.2
Ex. calcium[54]	28	<0.2	40.8	8.2	2.9	<0.2	1.1	6.3	30.3
Ex. magnesium[54]	28	<0.2	27.2	4.8	1.5	<0.2	<0.2	2.9	23.9
CEC[55]	28	<0.2	77.0	17.3	7.0	1.1	2.1	17.8	61.3
Nutrients									
Total nitrogen	14	<0.1	17.6	2.7	0.6	0.2	0.3	2.3	6.8
Total phosphorus	14	170	688	361	375	228	305	383	439
Total metals									
Aluminium[52]	28	3,150	36,900	15,121	8,585	3,956	4,988	24,475	30,730
Antimony[52]	49	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic[52]	49	1.2	12.0	5.7	5.4	4.0	4.6	6.6	8.6
Cadmium[52]	49	<0.1	0.3	<0.1	0.1	<0.1	<0.1	0.1	0.1
Chromium[52]	49	6.2	37.9	20.7	20.3	8.7	10.6	31.3	35.2
Cobalt[52]	49	5.6	61.8	23.9	23.3	11.1	17.3	29.5	34.1
Copper[52]	34	5.8	30.3	16.3	16.2	10.4	12.6	19.1	23.3
Iron[52]	28	12,200	55,800	35,096	34,500	21,220	27,725	44,300	49,280
Lead[52]	49	3	22	11	12	6	9	14	15
Manganese[52]	34	264	829	540	540	345	396	659	737
Mercury[52]	49	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.02	0.02
Nickel[52]	49	7.2	55.1	25.9	27.2	17.5	20.2	30.0	36.0

[54] meq/100g

[55] Cation exchange capacity

Parameter	n[48]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
Silver[52]	34	0.1	2.0	0.5	0.4	0.3	0.3	0.5	0.8
Selenium[52]	49	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Vanadium[52]	34	10.9	66.1	41.6	41.1	25.6	34.3	50.2	60.6
Zinc[52]	40	10.4	75.2	38.1	34.7	12.3	17.1	56.4	70.1
ANZG (2018) trace toxicants									
Tributyltin[56]	21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total PAH[57]	49	<4	5	<4	<4	<4	<4	<4	<4
Total PCB[52]	49	<5	<100	<100	<5	<5	<5	<100	<100
Individual OC pesticides[52]	49	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Individual OP pesticides[52]	28	<10	<10	<10	<10	<10	<10	<10	<10
Hydrocarbons									
NEPM Fraction 1[58,59]	49	<3	8	<3	<3	<3	<3	<3	<3
NEPM Fraction 2[60]	49	<3	11	<3	<3	<3	<3	<3	<3

PAH = polycyclic aromatic hydrocarbons

PCB = polychlorinated biphenyls

OC = organochlorine

OP = organophosphorus

[56] µg/kg as tin (Sn)

[57] µg/kg

NEPM = National Environment Protection (Assessment of Site Contamination) Measure, Schedule B (1) 'Guideline on the Investigation Levels for Soil and Groundwater' (NEPM, 2013)

BTEX = Benzene, toluene, ethylbenzene, xylenes

[58] mg/kg

[59] C6 – C10 minus BTEX

[60] C10 – C16 minus naphthalene

Parameter	n[48]	Minimum	Maximum	Mean	Median	10th percentile	25th percentile	75th percentile	90th percentile
NEPM Fraction 3[61]	49	<3	73	10	5	<3	<3	11	27
NEPM Fraction 4[62]	49	<5	24	5	<5	<5	<5	7	11
TRH[63]		<3	108	14	5	<3	<3	17	41

[61] C16 – C34

[62] C34 – C40

[63] Total recoverable hydrocarbons – >C10-C40 fraction hydrocarbons

3.7.4. Identified surface water receptors

3.7.4.1. Third-party users

A review of the available public datasets from SA WaterConnect, BoM and aerial imagery for the region found over 300 (328 identified as of January 2024) pastoral dams exist within the Study Area (Figure 3-60) with a combined areal coverage of approximately 119 ha. Most of the dams are utilised for stock watering and rainwater catchments for pastoralists, due to the elevated salinity of the groundwater in the area. Typical dam storage setups include a mounded earth wall constructed on a low order stream or along roadsides to divert and capture surface water runoff. The individual dams cover an area between 0.02 and 2.89 hectares but most (i.e., the median) cover an area of 0.30 ha. Assuming a typical dam water depth of 1-2 m and using a factor 0.4 to account for dam wall slope, the combined storage of full pastoral dams in the Study Area equates to approximately 478-956 ML.

Of the >300 pastoral dams identified in the Study Area, 103 are within or downstream of the proposed Project disturbance footprint. These dams cover an area of 0.02–2.89 ha with a median of 0.35 ha, and an estimated full storage volume of 176-352 ML.

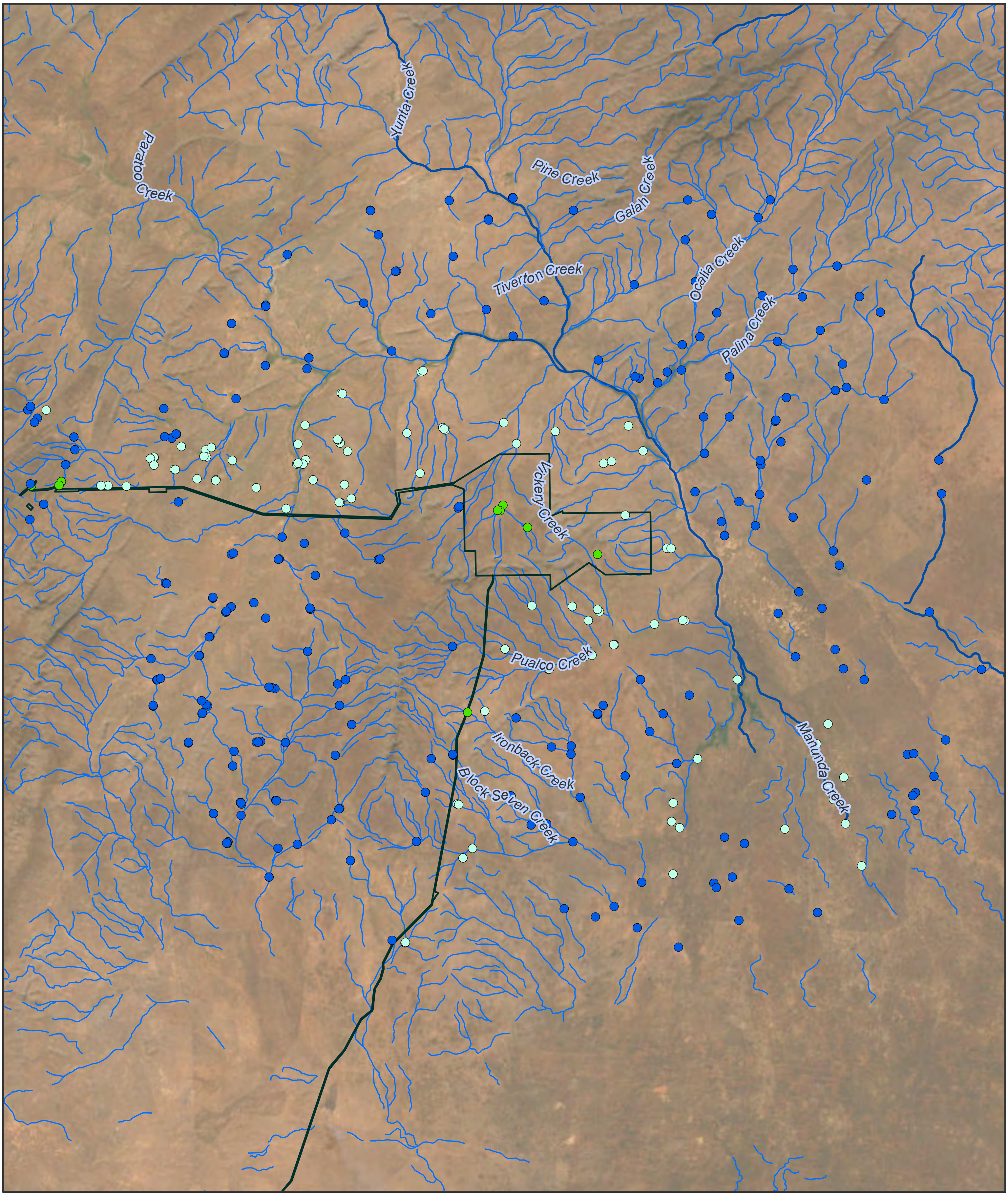

Figure 3-60: Location of identified pastoral dams and water storages within the Study Area

Project Area

Watercourses

Major

Minor

Pastoral Dams

Relative location to site:

Downstream

Upstream

Within

0 8 16

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 17/12/2024

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3.7.4.2. Water-dependent ecosystems

AQUATIC ECOSYSTEMS

An aquatic ecology study was completed in the Study Area in 2023 (Lateral Environmental, 2023, Appendix B8). The results of this study recorded at least 51 invertebrate taxa, representing macroinvertebrate (zooplankton) and macroinvertebrate groups were recorded from inland waters associated with Manunda Creek to the east of the Project Area during the assessment. No taxa of conservation significance were recorded during the assessment, with all species recorded widespread throughout inland waters of Central Australia, or with a broader distribution across Australia and/or overseas.

Overall aquatic invertebrate community comprised ten higher level taxonomic groups, dominated by widespread, tolerant insect taxa as well as resident crustacea. Most taxa were adapted to utilise temporary wetland habitat through either high dispersal capability or drying tolerance (i.e., burrowing or desiccation resistant life stages). Dominant / abundant taxa recorded during the assessment included Copepods, Cladocerans and Ostracods for microinvertebrates; and a segmented worm, *Temnocephalid* flatworm, biting and non-biting midges, caddisflies, true bugs and aquatic beetles for macroinvertebrates.

No freshwater fish were encountered during the assessment, and inland waters of the Project Area are not considered to provide critical habitat for the most likely to occur species, the Lake Eyre Hardyhead (*Craterocephalus eyresii*). In addition, the species has a widespread distribution, is halotolerant, and is known to exist in local and/or regional Inland Waters.

While inland waters of Manunda Creek act as a dry season refuge for many aquatic invertebrate taxa represented in other parts of arid and semi-arid SA, diversity (taxa richness) was considered low in a regional context. This likely reflects limited fringing riparian vegetation inputs, low in-stream habitat diversity and basal resource availability, and high turbidity. It is also expected that the aquatic invertebrate community recorded during the assessment is largely adapted to the natural variability of inland waters of the Project Area.

TERRESTRIAL ECOSYSTEMS

The riparian corridors and watercourse embankments of Manunda Creek and its tributaries provide habitat for native fauna that use the clay banks for nesting purposes. These nesting hollows could provide potential breeding resources for irruptive and nomadic bird species (i.e., budgerigars and cockatiels). As such, these riparian corridors and watercourses have ecological value, as they provide movement corridors for these fauna species (ELA, 2023b), although the value of these corridors within the Study Area is limited by prior and ongoing disturbance.

The surrounding landscape at Manunda creek is heavily degraded, both at landscape scale from clearing of riparian vegetation and erosion, and at site-specific level with localised impacts from unrestricted stock and feral species (goat) access to the creek.

3.8. Vegetation and flora

An overview of the native and non-native flora within the Project Area is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B5 *Baseline Flora and Fauna Survey Report* (ELA, 2024a) and *Appendix B6 Addendum Flora and Fauna Baseline Assessment* (ELA, 2024b).

For information on fauna species within the Project Area, refer to Section 3.9.

3.8.1. Survey effort

Numerous flora, fauna and vegetation field assessments have been undertaken in and around the Project Area between 2010 and 2024. The baseline surveys are spread over several years and all seasons to ensure adequate temporal distribution. The ecology Study Area and targeted species surveys have evolved as a result of alterations in the Project disturbance footprint and new listings under EPBC legislation. A summary of all baseline surveys to date is provided in Table 3-25.

The analysis of the existing ecological environment within the Project Area presented in this Section is generally reliant on information provided by the site surveys completed between 2020 and 2024. This is to ensure the information provided is geographically accurate (due to earlier surveys covering slightly different areas) and current for the MLP submission. However, records of importance from surveys prior to 2020 have been included in the following discussion.

Table 3-25: Total ecology survey effort for the Project (2010 – 2024)

Consultant	Survey	Dates	Survey method	Survey effort	Location
Rural Solutions SA	Flora and fauna and vegetation condition assessments	February – March 2010	Four designated flora and fauna field sites, photo point establishment, opportunistic surveying and general tenement vegetation surveying.	7 days (4 personnel)	Razorback Iron Deposit mining tenement
Rural Solutions SA	Supplementary flora and fauna surveys	June 2010 (winter) and November 2010 (spring)	Four designated flora and fauna field sites, photo point establishment and opportunistic surveying, survey of additional field sites associated with extension.	June – 4 days November – 4 days	Razorback Iron Deposit mining tenement
EBS	Environmental Management Plan	2012	EMP to support 2012 exploration phase and provide environmental control measures.		
Rural Solutions SA	Spring baseline flora and fauna surveys	21 – 24 October 2013	Re-monitoring of photo points, vegetation mapping, opportunistic sightings, flora and fauna surveys.	4 days (4 personnel)	'Red Dragon' exploration area
ELA	Vegetation and habitat assessment	24-27 November 2020 11-22 July 2022 21-24 November 2022 22-25 August 2023 20-23 February 2024	Native vegetation assessment using Rangelands Assessment Method (RAM), Biodiversity Assessment Method (BAM) and rapid assessment techniques, targeted threatened floristic searches across different vegetation types, and field-based habitat assessment for fauna	25 days (460 person hours)	Whole Project Area (ML area, HR and TL)

Consultant	Survey	Dates	Survey method	Survey effort	Location
ELA	Targeted bat survey (trapping and ultrasonic monitoring)	13 – 16 October 2021 3 – 7 April 2022 10 – 15 August 2023	Harp trapping, mist netting, Anabats	17 nights	Within suitable habitat (mallee) within the proposed ML area
			Anabats	44 hours	Within ML
ELA	Targeted Peregrine Falcon survey	9 – 13 August 2021	Active search of known habitat	5 days (100 person hours)	Within ML
ELA	Fauna	5 – 8 December 2021 22 – 25 August 2023	30-minute 5 ha area bird searches	4 days (120 person hours)	Within ML
			Opportunistic surveys	8 days (200 person hours)	Whole
			Spotlighting Thermal Scope Spotlighting	21 hours	Within ML
			Song Meters	88 hours	Within ML
			Remote sensor cameras	140 hours	Within ML
			20-minute 2 ha area bird searches	4 days (80 person hours)	Within ML
			Rock rolling	4 days (40 person hours)	Within ML
ELA	Fauna	10 – 15 October 2023	Thermal scope Spotlighting	12 hours over 3 days	Whole (areas of suitable habitat (i.e. open grassy chenopod shrubland))
			Song Meters	5:00 am – 6:00 pm, over three days	Whole
			Passive ultrasonic call detection, harp trapping and mist netting	Harp traps set at 6:00 pm – 7:30 pm and removed 2:00 am – 4:00 am or six nights	Within ML
ELA	Baseline assessment (flora and fauna)	20-23 February 2024	Native vegetation assessment using RAM, BAM and rapid assessment techniques, targeted threatened floristic searches	3 days (2 personnel)	Additional areas of HR, RS and TL (due to small changes in design)

Consultant	Survey	Dates	Survey method	Survey effort	Location
			across different vegetation types, and field-based habitat assessment for fauna.		

3.8.2. Regional vegetation

3.8.2.1. IBRA Classification

The IBRA regions covered by the Project Area have been discussed in Section 3.1.

3.8.3. South Australian Landscape Management Boards

The SA Landscape Management Boards which cover the Project Area have been discussed in Section 3.6.1.

3.8.4. Land Use

The predominant current and historic land use of the Project Area and surrounding areas is for low intensity grazing. This land use as grazing and managed pastoral lands has changed the structure and function of the vegetation within the Project Area due to continued grazing, trampling and disturbance by stock.

A detailed description of historic and current land uses is presented in Chapter 1.

3.8.5. Vegetation associations

The Baseline Flora and Fauna field survey (ELA, 2023b; ELA, 2024) mapped seven vegetation associations (VAs) and a variety of habitats suitable to support native flora and fauna within the Project Area. During the 2023 surveys, it was noted that VAs were in reasonable condition after recent rains, although evidence of grazing was present throughout. The 2024 survey noted that the southern section of the Study Area (adjoining Bundey Substation) was in poorer condition largely as a result of much reduced summer rainfall and ongoing grazing from sheep, goats and macropods.

The VAs for the Project Area are presented in Figure 3-61, summarised in Table 3-26 (including the area and % cover of each) and shown in Plate 3-3. Each VA is described in detail in Appendix B5 and B6.

Table 3-26: Area of vegetation associations recorded in the Project Area

VA reference	Description	Total area (ha)	% Cover
N/A	Pre-existing clearing	1.45	0.011%
VA1	*Maireana sedifolia +/- Maireana pyramidata* low open grassy shrubland	10,227.39	76%
VA2	Ridgeline - *Xanthorrhoea quadrangulata* very low open woodland with emergent *Callitris glaucophylla +\- Eucalyptus gracilis*	44.79	0.33%
VA3	*Myoporum platycarpum* low open woodland	21.85	0.16%
VA4	*Casuarina pauper* low woodland	1,031.77	7.67%
VA5	Mixed *Eucalyptus leptophylla +\- E. gracilis* open mallee	1,751.06	13.01%
VA5 (b)	Mixed *Eucalyptus leptophylla +/- E. gracilis* open mallee (MBC TEC)	25.13	0.19%
VA6	*Triodia scariosa* very open mixed mallee	24.45	0.18%
VA7	*Eremophila sturtii* tall open shrubland over *Maireana pyramidata* open chenopod shrubland	328.44	2.4414%
	Total	**13,456.33**	

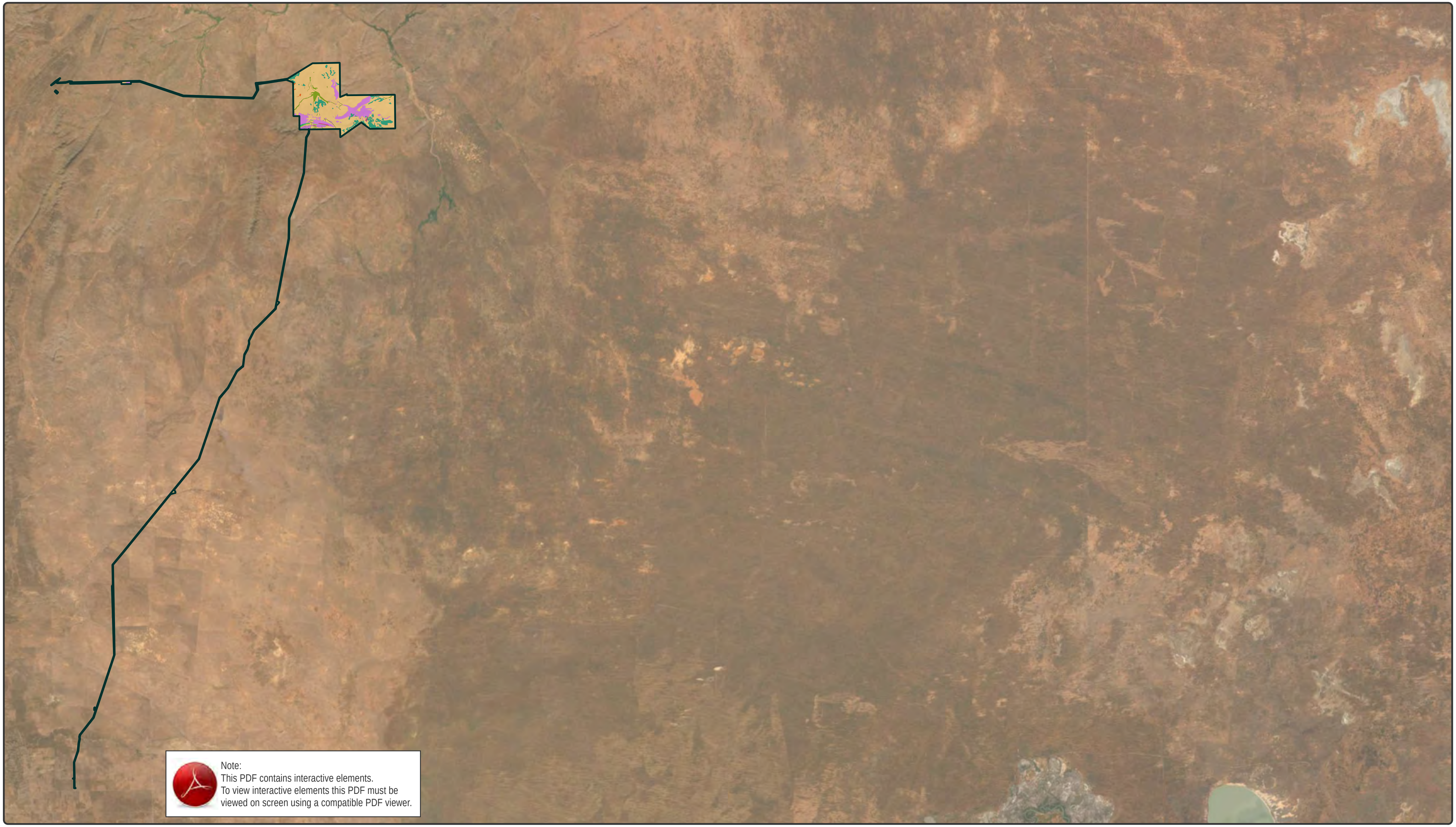

Figure 3-61: Native vegetation associations (ELA, 2023b)

Project Area

Vegetation associations

- Existing clearance
- VA1: *Maireana sedifolia* +/- *Maireana pyramidata* low open grassy shrubland
- VA2: *Ridgeline Xanthorhea quadrangulata* very low open woodland with emergant *Callitris glaucophylla* +\- *Eucalyptus gracilis*
- VA3: *Myoporum platycarpum* low open woodland
- VA4: *Casaurina pauper* low woodland
- VA5: Mixed *Eucalyptus leptophylla* +\- *E. gracillis* open mallee
- VA5(b): Mixed *Eucalyptus leptophylla* +\- *E. gracillis* open mallee / TEC
- VA6: *Triodia scariosa* very open mixed Mallee
- VA7: *Eremophila sturtii* tall open shrubland over *M. pyamidata* open chenopod shrubland

0 15 30
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54
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VA1 - *Maireana sedifolia* +/- *Maireana pyramidata* low open grassy shrubland (76%)

VA4 – *Casuarina pauper* low woodland (8%)

VA5a - Mixed *Eucalyptus leptophylla* +\- *E. gracilis* open mallee (13%)

VA7 - *Eremophila sturtii* tall open shrubland over *M. pyramidata* open chenopod shrubland (2.4%)

Plate 3-3: Vegetation associations within the Project Area

3.8.6. Flora species

A total of 341 flora species were identified during surveys of the Project Area conducted between 2020 and 2023. Of these, 299 were native species and 42 were introduced. A full list of flora species recorded within the Project Area is provided in Appendix B5 andB6. Importantly, no threatened flora species under the NPW Act or EPBC Act have been identified in the Project Area during any of the surveys.

3.8.6.1. Threatened Ecological Communities

Site surveys identified one TEC within the ML and TL; the Mallee Bird Community of the Murray Darling Depression Bioregion (MBC of the MDDB) (listed as Endangered under the EPBC Act). A TEC, as listed under the EPBC Act, is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat, and that are at risk of degradation, decline or extinction.

VA5(b) (as listed in Table 3-26 and shown in Figure 3-61) has been identified as MBC of the MDDB TEC, as it meets the diagnostic criteria for the community, as defined in the Approved Conservation Advice (DAWE, 2021). Note the Project occurs in both FLB and MDD IBRA regions (as discussed in Section 3.1), however FLB is not listed as an IBRA region in which the TEC occurs, hence any occurrence of the TEC is limited to the southern section of the ML, within the MDDB region. Approximately 25.1 ha of this TEC was recorded within the Project Area in the ML and TL (none recorded in the HR). A detailed list of TEC diagnostic criteria and Project vegetation analysis can be found in Chapter 8. No other TECs were identified within the Project Area.

As discussed in Chapter 2 and Chapter 8, a referral under the EPBC Act has been undertaken as a result of the presence of the MBC of the MDDB within the Project Area.

3.8.6.2. EPBC Listed flora species

No EPBC listed threatened flora species (or suitable habitat for these species) were recorded within the Project Area during field surveys.

3.8.6.3. State Listed flora species

No State listed threatened flora species were recorded during field surveys.

3.8.6.4. Introduced species

Of the 42 introduced species recorded, four are listed as Weeds of National Significance (WoNS) and declared under the LSA Act. An additional two species are declared under the LSA Act only. These six species, and the locations of recordings within the Project Area, have been listed in Table 3-27.

Table 3-27: National and State listed introduced flora species within the Project Area

Scientific name	Common name	Recorded location within the Project Area	WoNS	LSA Act
Enchium plantagineum	Salvation Jane	VA1		X
Lycium ferocissimum	African Boxthorn	Widespread throughout the Study Area, recorded within VA1, VA2 and VA4-VA7	X	X
Marrubium vulgare	Horehound	VA1, VA2 and VA3		X
Optunia robusta	Wheel pear	VA1 and VA5	X	X
Optunia sp.	-	VA4 and VA5	X	X
Solanum elaeagnifolium	Silver-leaf nightshade	VA1	X	X
Tribulus terrestris	Caltrop	VA1 and VA5		X
Xanthium spinosum	Bathurst Burr	VA7		X

3.8.6.5. Pathogens

There was no evidence of plant pathogens during field investigations. The Project Area is not located in a high-risk *Phytophthora cinnamomi* (root-rot fungus) or Mundulla Yellows area due to the low annual rainfall and minimal human disturbance.

3.9. Fauna

An overview of the fauna within the Project Area is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B5 *Baseline Flora and Fauna Survey Report* (ELA, 2024a) and Appendix B6 *Addendum Flora and Fauna Baseline Assessment* (ELA, 2024b).

Numerous general and targeted fauna assessments have been undertaken as part of the survey efforts for the Project (refer Section 3.8.1).

A total of 140 fauna species were recorded through field investigations conducted by ELA between 2020 and 2023 (ELA 2023b), consisting of 101 birds (93 non-threatened species and 8 EPBC or State listed species), 19 mammal species (14 native (including two State listed species)) and 5 introduced species), 9 non-threatened reptile species and two non-threatened amphibian species.

A total of 51 invertebrate taxa representing microinvertebrates (zooplankton) and macroinvertebrate groups were recorded during field investigations undertaken in 2023 (Lateral Environmental, 2023). No taxa of conservation significance were recorded, with all species recorded during the assessment considered widespread throughout Inland Waters of Central Australia, or with a broader distribution across Australia.

3.9.1. Habitat

During field investigations of the Project Area, numerous habitats were identified across the landform features and vegetation associations.

Environmental conditions within the Project Area have been variable across the years of survey. Native shrubs (chenopods) and grasses have been recorded flowering and fruiting during some surveys, providing readily available food sources for native fauna including *Psephotellus varius* (Mulga Parrot), *Barnardius zonarius* (Mallee Ringneck) and *Melopsittacus undulates* (budgerigars).

A variety of fauna habitat was observed within the Study Area including leaf litter, fallen logs and hollows provided in the woodlands and scrubland, dry creek lines and pastoral dams, cliff faces and rocky outcrops. Small hollows were predominantly found within mallee trees throughout the ML (VA5 and VA6) which may provide breeding resources for small irruptive and nomadic bird species such as budgerigars and *Nymphicus hollandicus* (cockatiels).

The ridgeline has a cliff face on the southern side, which provides roosting and breeding habitat for *Falco peregrinus* (Peregrine Falcon) (refer Plate 3-4). One *Aquila audax* (Wedge-tailed Eagle) nest was recorded in VA6, with evidence recorded of a likely breeding area consisting of a small cave and evidence of white-wash (white bird excrement).

Plate 3-4: Peregrine Falcon and white-wash sites showing high use areas

There are several riparian corridors throughout the Study Area, all of which were dry during the field investigations. However, these riparian corridors still provide movement corridors for fauna. The pastoral dams located within the ML provide a permanent water source for fauna species.

Occurrences of VA3 (Table 3-26) have been mapped within the TL buffer area. This community occurs as isolated stands of *Myoporum platycarpum* usually surrounded by large areas of low chenopod shrubland (VA1). The trees within VA3 are often the only trees in the landscape for large distances meaning that the trees in this VA are often densely populated with stick nests from locally occurring (nest building) birds: raptors including Wedge-tailed Eagle, *Falco cenchroides* (Nankeen Kestrel) as well as *Artamus personatus* (Masked Woodswallow) and *Taeniopygia guttata* (Zebra Finch).

3.9.2. Birds

A total of 101 bird species have been recorded in the Project Area through a series of general and targeted field investigations (ELA, 2023b). This includes 93 non-threatened bird species, and three EPBC listed species, and eight State-listed species. A full list of bird species recorded within the Project Area is provided in Appendices B5 and B6.

3.9.2.1. EPBC listed bird species

Of the bird species observed in the Project Area, three species listed under the EPBC Act were recorded. These species are detailed in Table 3-28, with *Lophochroa leadbeateri leadbeateri* (Eastern Major Mitchell's Cockatoo) shown in Plate 3-5. These three bird species were included in the referral under the EPBC Act, as discussed in Chapter 8.

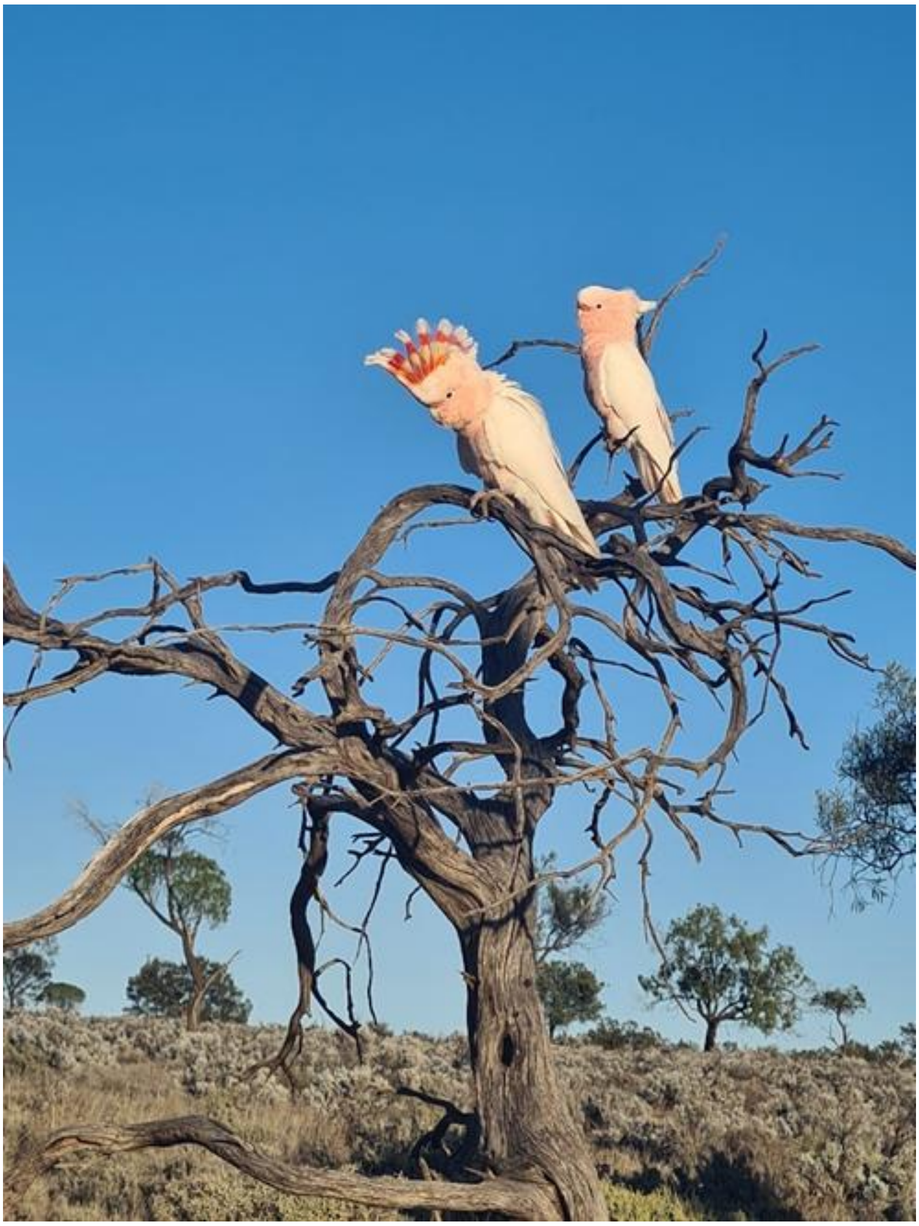


Plate 3-5: Eastern Major Mitchell's Cockatoo

Table 3-28: EPBC Act listed bird species recorded within the Project area

Scientific name	Common name	EPBC listing Status (as of December 2023)
Aphelocephala leucopsis	Southern Whiteface	V
Melanodryas cucullata cucullata	South-eastern Hooded Robin	E
Lophochroa leadbeateri leadbeateri	Eastern Major Mitchell's Cockatoo	E

V = VULNERABLE, E = ENDANGERED

3.9.2.2. TEC bird species

Four of the bird species detected within the Project Area are component bird species of the Mallee Bird TEC (refer Chapter 8). The Mallee Bird TEC is an assemblage of 20 bird species that rely on mallee habitats for their continued persistence within the MDDB bioregion. Two groupings of species (mallee specialists and mallee dependents) are broadly recognised within the assemblage, based on species' reliance on mallee habitats as determined by available biological information (DAWE, 2021).

Mallee specialists are found exclusively in mallee habitats, especially within the MDD region (DAWE, 2021). One mallee specialist species has been recorded with the Project Area; *Cinclosoma castanotum* (Chestnut Quail-thrush). This species is not individually EPBC listed, however is State listed under the NPW Act (rare).

Mallee dependent species are dependent on mallee where it is present but have a wider range extending into non-mallee woodland and shrubland habitats that integrate with mallee vegetation (DAWE, 2021). Six mallee dependent species have been recorded within the Project Area:

- *Oreoica gutturalis* (Crested Bellbird)
- *Ptilotula plumula* (Grey-fronted Honeyeater)
- *Microeca fascinans* (Jacky Winter)
- *Lichenostomus cratitius* (Purple-gaped Honeyeater)
- *Malurus splendens* (Splendid Fairy-wren)
- *Ptilotula ornata* (Yellow-plumed Honeyeater)

These six species (although considered dependent on the mallee vegetation that comprises the TEC) are not individually listed under the EPBC Act nor the NPW Act.

Note, these six bird species, as part of the MBC of the MDDB were included in the referral under the EPBC Act, as discussed in Chapter 8.

3.9.2.3. State listed bird species

Bird species listed under the NPW Act were also detected in the Project Area. These included definite detection of five species, as listed in Table 3-29.

Table 3-29: NPW Act listed bird species, recorded within the Project Area

Scientific Name	Common Name	NPW Act Status
Myiagra inquieta	Restless Flycatcher	R
Megalurus cruralis	Brown Quail	V
Climacteris affinis	White-browed Treecreeper	R
Corcorax melanorhamphos	White-winged Chough	R
Falco peregrinus macropus	Peregrine Falcon	R

R = RARE, V = VULNERABLE

Peregrine Falcons have been known to occur at Razorback Ridge from 2010 (Brumfield, 2010) and were observed at Razorback Ridge throughout multiple surveys. Two Peregrine Falcons have been observed flying over, and perched on top of the Razorback ridgeline. A potential breeding area has been identified consisting of a small rock cave within close proximity to white-wash sites indicating areas of high use.

Jacky Winter has also been recorded in the Project Area (as per Section 3.9.2.2) but has either been identified as subspecies *Microeca fascinans assimilis* or has not been identified to subspecies level. Only the subspecies *Microeca fascinans fascinans* is listed under the NPW Act and the Project Area is well outside the distribution of this subspecies; therefore, it is thought unlikely this NPW-listed species occurs in the Study Area.

3.9.3. Mammals

A total of 19 native mammal species, comprising14 native species and five exotic species have been recorded within the Project Area. All recorded mammal species are listed in Table 3-30.

No EPBC listed mammal species have been recorded in the Project Area. Two NPW Act listed fauna species *Chalinolobus picatus* (Little Pied Bat) and *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat) have been recorded within the Project Area.

Table 3-30: Mammal species recorded during the survey

Scientific name	Common name	Conservation status	
		EPBC Act	NPW Act
Austronomus australis	White-striped Free-tailed Bat	-	-
**Capra hircus*	Goat	-	-
Chalinolobus morio	Chocolate Wattled Bat	-	-
Chalinolobus picatus	Little Pied Bat	-	E
**Lepis capensis*	Brown Hare	-	-
Macropus fuliginosus	Western Grey Kangaroo	-	-
Macropus robustus	Euro Kangaroo	-	-
Macropus rufus	Red Kangaroo	-	-
Mormopterus planiceps	South-eastern Free-tailed Bat	-	-
Nyctophilus geoffroyi	Lesser Long-eared Bat	-	-
**Ovis aries*	Sheep	-	-
**Oryctolagus cuniculus*	European Rabbit	-	-
Pseudomys bolami	Bolam's Mouse	-	-
Saccolaimus flaviventris	Yellow-bellied Sheath-tailed Bat	-	R
Scotorepens sp.	Little Broad-nosed Bat	-	-
Sminthopsis macroura	Stripe-faced Dunnart	-	-
Tachyglossus aculeatus	Echidna	-	-
Vespadelus baverstocki	Inland Forest Bat	-	-
**Vulpes vulpes*	Red Fox	-	-

*DENOTES AN INTRODUCED SPECIES.
R = RARE, V = VULNERABLE, E = ENDANGERED

3.9.4. Reptiles

A total of nine reptiles have been recorded through the various field investigations (targeted survey and opportunistic records) conducted by ELA (ELA, 2023b). *Heteronotia binoei* (Pricky Gecko) was the most common species observed, followed by *Underwoodisaurus milii* (Thick-tailed Barking Gecko) and *scincidae* (Skink sp.). A full list of recorded reptile species is provided in Table 3-31.

Plate 3-6: Prickly gecko recorded within the Study Area

Although *Aprasia pseudopulchella* (Flinders Ranges Worm-lizard) (EPBC listed reptile species, status Vulnerable) was previously recorded in 2010 and 2013 during surveys conducted by Rural Solutions, the species was not detected during any of the surveys undertaken by ELA between 2020 – 2023, including during targeted surveys.

No EPBC or NPW Act listed reptiles were recorded within the Project Area between 2020 and 2023.

Table 3-31: Reptile species list recorded within the Project Area

Scientific name	Common name	Conservation status	
		EPBC	NPW
Ctenophorus decresii	Tawny Dragon	-	-
Ctenophorus pictus	Painted Dragon	-	-
Ctenotus sp.	-	-	-
Heteronotia binoei	Pricky Gecko	-	-
Liopholis margaretae personata	Flinders Ranges Rock-skink	-	-
Pogona vitticeps	Central Bearded Dragon	-	-
Scincidae sp.	-	-	-
Tiliqua rugosa	Sleepy Lizard	-	-
Underwoodisaurus milii	Thick-tailed Barking Gecko	-	-
Varanus gouldii	Sand Goanna	-	-
Varanus sp.	-	-	-

3.9.5. Amphibians

One amphibian ((*Neobatrachus sudellae*), Sudell's Frog) was recorded in the Project Area. This species is not EPBC listed nor NPW Act listed.

3.9.6. Aquatic ecology

An aquatic ecology survey was conducted by Lateral Environmental in 2023. Detailed results of this survey are shown in Section 3.7.4.2 and Appendix B8 *Aquatic and Subterranean Fauna Assessment* (Lateral Environmental, 2023).

3.9.7. Pest species

Five introduced mammal species were recorded within the Study Area:

- *Vulpes vulpes* (Red Fox)
- *Ovis aries* (Sheep)
- *Oryctolagus cuniculus* (European Rabbit)
- *Lepis capensis* (Brown Hare)
- *Capra hircus* (Goat)

All pest species are common to the semi-arid region and do not represent unexpected records for the habitat types present.

3.10. Caves

There are no known caves within the project Area, nor significant limestone formations known within the Razorback Project Area or the broader area. While carbonate interbeds exist in the Benda Siltstone and the Wilyerpa Formation, these are typically <0.2 m and are not conducive to karst formation. Previous tenement holders described cavities encountered during drilling, however the descriptions more closely match poorly consolidated sediments than voids.

An adit has been recorded running from the northern side of Razorback Ridge into the ridge. The adit is understood to have been constructed by the then SA Department of Mines in the late 1960s for mineral investigation purposes (DoM, 1970) (for more detail refer 3.16.3). No bat activity was observed at the adit (ELA, 2022), however it may provide occasional refuge for mammals and birds. The adit will be extinguished through Project mining activity.

3.11. Community

A social impact assessment was undertaken with the Project influence area, which was split into primary and secondary Study Areas to represent communities that may experience changes to the social environment as a result of Project construction, operation and closure. The primary social Study Area comprises communities within localities surrounding the Project Area (e.g., landholders and residents of rural, agricultural and pastoral properties), and the nearby towns of Yunta, Peterborough, Robertstown and Burra. The secondary Study Area comprises communities in the wider region, whereby interaction with the Project will occur as people move about the region for work, education and leisure.

The population across the pastoral district surrounding the Project is sparse, with less than 120 people permanently residing in the census statistical areas of Yunta (including the Yunta township), and the ABS defined 'suburbs and localities' of Warnes, Faraway Hill, Nackara, Hardy, Grampus, Kia Ora, Bundey and Burra Eastern Districts. Communities associated with the TL of the Project include Burra, Robertstown and Bundey. Economic activity is principally focused on pastoral pursuits, including wool and primary meat production.

The nearest permanent settlement is Yunta, approximately 37 km to the north of the Project Area. Yunta provides essential services for the region around the proposed ML, including emergency services, primary level education and limited retail/hospitality offerings.

Most of the Project sits within an area overseen by the OCA, however, parts of the TL sit within the RC Goyder area. Further, the RS and parts of the HR sit within the DC Peterborough area (see Figure 3-62). The zoning and relevant policies for the Project Area under each local government area are described in Section 2.7.

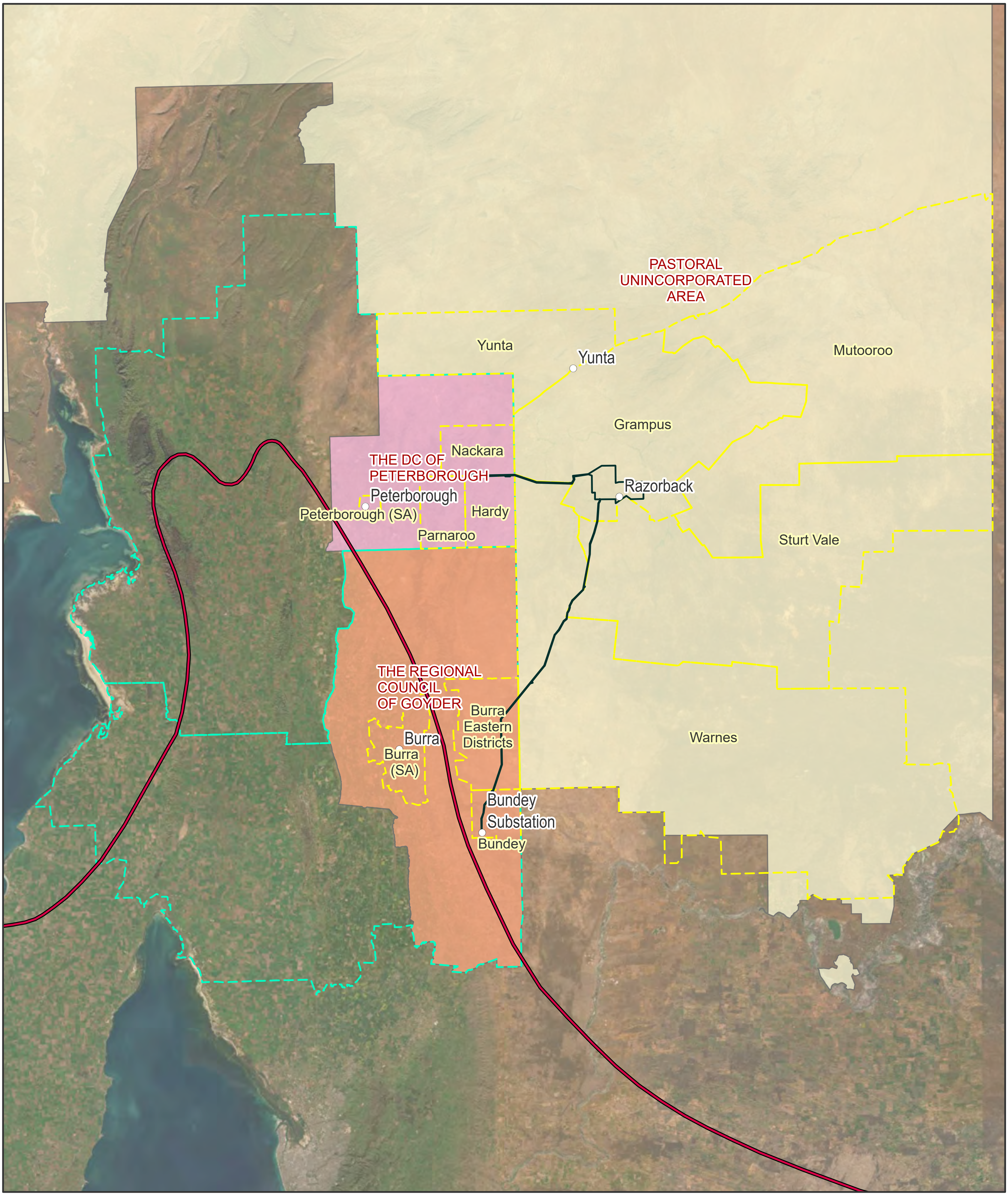


Figure 3-62: Local community areas

3.11.1. Region

An overview of regional demographics is described within this Section. For a more detailed discussion on baseline information, refer to Appendix C4 *Social Impact Assessment* (Tetra Tech Coffey, 2024).

3.11.1.1. South Australia

SA is home to a wide variety of major operating mines across the state, for commodities including gold, copper, iron, coal, zinc, silver. In the 22/23 financial year, mining in SA contributed to approximately $9.7 billion (DEM, 2023) corresponding to 7.1% of SA's total economic output. Mining is the second highest export industry behind agriculture, forestry, and fishing, with agriculture and mining comprising 70% of SA's total exports (Government of SA, 2023).

3.11.1.2. Region

The ML area, the eastern section of the haulage road and northern section of the electricity TL are located in the Unincorporated Area of SA, which covers an area of approximately 619,426 km^2 (ABS, 2021). The area had an estimated resident population of 3,024 people as of 30 June 2022 (ABS, 2022), living in small townships and settlements (e.g., pastoral stations, farms, and tourism enterprises).

The rail loading facility and western section of the haulage road is within the Peterborough LGA. The LGA covers an area of approximately 2,995 km^2 (ABS, 2021) and is bounded by the DC of Orroroo Carrieton to the northwest, Northern Areas Council to the southwest, Goyder LGA to the south, and the Unincorporated Area of SA to the north and east. Peterborough LGA had an estimated resident population of 1,672 people in June 2022 (ABS, 2022). The Peterborough LGA is predominantly rural, with the main towns in the LGA being Peterborough, Yongala and Oodla Wirra. Key challenges for the Peterborough LGA include maintaining the economic viability of the LGA, a declining and ageing population, the low socio-economic status of the towns, and maintaining services and infrastructure for the surrounding agricultural area (DC Peterborough, 2020).

The Bundey Substation and southern part of the electricity TL is within the Goyder LGA. The Goyder LGA covers an area of approximately 6,715 km^2 and had an estimated resident population of 4,144 people as of 30 June 2022 (ABS, 2022). Burra is the main town, with various other small towns and villages, including Eudunda, Booborowie, Robertstown, Terowie, Farrell Flat, Hallett, Mount Bryan, Point Pass, and Whyte Yarcowie. The Goyder LGA is primarily rural in nature with the main rural uses being cereal cropping, sheep grazing, and cattle grazing. Other key industries are tourism, which is centered around the region's mining heritage and renewable power generation (RDA, 2023) with several wind farms in operation or currently under construction.

There are numerous towns within the Mid-North and Lower-North (within the secondary Study Area) that have connections to communities in the primary Study Area for housing, services and sporting clubs, including Orroroo, Jamestown and Clare.

3.11.1.3. Local communities

FIRST NATION'S PEOPLE

First Nation's people present and with interest in the Project Area are Ngadjuri People and First Peoples of the River Murray and Mallee Region. Refer Section 3.16 for detailed information.

YUNTA

Yunta is the closest town to the ML, located approximately 37 km to the northwest. Yunta is an outback town located on the Barrier Highway approximately 320 km by road from Adelaide and 200 km from Broken Hill in New South Wales (NSW). At the 2021 Census, the town had a population of about 60 people (ABS, 2021).

The town was established in 1887 following the discovery of gold at Teetulpa and Waukaringa and in the early 1890s grew into a railway town, providing a link between Adelaide and Broken Hill. Today, Yunta is a small service centre for surrounding pastoral stations and a stop-over for tourists and truck drivers travelling on the Barrier Highway (Yunta SA, 2023).

Yunta is located within the Unincorporated Area of SA and is managed by the OCA in conjunction with the Yunta Town Hall committee. Community infrastructure in the town is limited and includes emergency services (police, volunteer ambulance and Country Fire Service (CFS) station), tennis courts, district hall, racecourse, and Yunta Campus of Peterborough Primary School. Local businesses include a hotel with accommodation, three fuel stations, and a post office/telecentre.

PETERBOROUGH

Peterborough is located approximately 85 km west of the ML within the DC of Peterborough LGA. It is the largest town near the ML and will form an important service centre for the Project. The town is located approximately 250 km by road north of Adelaide and is the main town and administrative centre in the Peterborough LGA. In 2021, Peterborough had a population of approximately 1,490 people, representing nearly 90% of the LGA's population (ABS, 2021).

The town of Peterborough was settled in 1875 to support agricultural and pastoral activities in the district. Opening of the railways from the 1880s saw Peterborough being the crossroads of Australia's rail network linking north, south, east and west. The line between Broken Hill in NSW and Port Pirie was recognised as the busiest single-track railway in the world between 1911 and 1914. At the height of the railways, more than 100 trains passed through Peterborough daily, with this declining to eight trains in the mid-1990s and in 2002, the railways ceased operations in Peterborough (DC of Peterborough, 2020). Since the closure of the railways, Peterborough has experienced a decline in population and employment opportunities, impacting on the economic viability of the area.

Peterborough's historic role as a railway town and as the crossroad of the national railway network continues to be central to the identity and character of the town. Today, the town mainly functions as a destination for tourists and a service centre for surrounding agricultural uses. Peterborough has a range of community infrastructure servicing residents of the town and wider LGA, including a hospital, one primary school, one primary/middle school, a high school, and formal and informal sport and recreation facilities. The town also supports local businesses that serve the needs of residents and tourists, including hotels, accommodation (motels, caravan parks), cafes, retail stores and tourism facilities (e.g., Steamtown Heritage Rail Centre and the Peterborough Motorcycle and Antique Museum).

BURRA

The historic town of Burra is located approximately 100 km southwest of the ML and about 30-40 km from Bundey Substation and the terminus of the TL. The town is located on the Barrier Highway, within the Goyder LGA, and is located approximately 165 km by road, northeast of Adelaide. Burra had a population of 1,112 people at the 2021 Census (ABS, 2021).

The town of Burra was established in 1846 as a company settlement of Kooringa, following the discovery of copper ore in 1845. By 1850, the town of Burra had grown into Australia's largest inland settlement. Burra was recognised as the second largest producer of copper in the world by 1860 and was the largest mine in Australia for 15 years. Following the slowdown of copper production in the 1870s, Burra evolved into a service centre for agriculture, becoming a centre for sheep breeding (DEW, 2023).

Today, Burra continues to be a rural farming and pastoral centre for agricultural communities in the surrounding area. The town is also an important tourist destination within the Clare Valley Tourism region, drawing on the town's mining heritage. Burra was declared as a state heritage town in 1993 (RC of Goyder, 2022; Cegielski et al., 2001) and in 2017 the town was listed on the National Heritage list along with Moonta mines, as the Australian Cornish Mining Sites. Key tourism sites within the town include sites associated with the Burra Mine, the Burra Regional Art Gallery, the Redruth Gaol, and the Hampton Village Museum.

Since 2018, RC Goyder has been working on a nomination for the site to be listed as a World Heritage site (ARR news, 2022). In recent years, Burra has been a key service centre for the development of renewable energy resources in the wider Goyder LGA, accommodating workers of major renewables and transmission projects.

Burra supports a range of local businesses that service the needs of residents in the town and surrounding district, tourists, and workers, including hotels, accommodation, eateries, supermarket, service station, and other retail uses. The town is a focus of community infrastructure within the Goyder LGA and wider region, including the Burra Hospital, sporting clubs (e.g., sporting complex, golf club, tennis club) and informal recreation uses, combined primary and secondary school, and Burra showgrounds. Burra is also a hub for emergency services within the Mid-North region, including Burra CFS, CFS Burra Group headquarters, SA Ambulance station, State Emergency Services (SES) local headquarters and SA Police station.

3.11.2. Population profile

The areas around the Project Area are sparsely populated and mainly include people living on rural properties, such as pastoral stations and farms. Population and demographic information are available for a broader area than the Project Area, including people living in townships and villages away from the Project (e.g., Yongala, Yunta, Manna Hill) and on smaller farming properties surrounding Burra and Peterborough.

At the 2021 Census, there were a total of 1,374 people living in the area surrounding and including the Project Area. Based on data for the Australian Bureau of Statistics (ABS) defined 'suburbs and localities' immediately surrounding the project footprint (e.g., Nackara, Hardy, Parnaroo, Grampus, Mutooroo, Sturt Vale, Warnes, Burra Eastern Districts, Bundey) it is estimated that the total population of these areas is about 50 to 100 people (noting that information was not available from the ABS for some localities that had no people or very local populations). Consequently, population and demographic information for the Project region (primary) is for the towns of Yunta, Peterborough and Burra. Information on other aspects of the social value and community characteristics in those areas surrounding the project footprint is provided where relevant. The secondary region information is included for Lower North and Mid North areas that comprises communities in the wider region. People in these communities may interact with the Project and construction activities as they move about the region for work, education and leisure, and may also experience impacts, both positive and negative, due to construction related employment, and business spending.

3.11.2.1. First Nations people

At the 2021 Census, communities in the primary and secondary Study Areas had proportions of Indigenous people the same as or above the State average (refer Table 3-32). Peterborough had the highest proportion of Indigenous people in the primary Study Area with 108 people (7.2% of the town's population). Within the secondary study Area, there were 1,715 Indigenous people at the 2021 Census. The Mid-North had the highest proportion of Indigenous people in the secondary region, at 4.3%.

Table 3-32: First Nations people within Study Area

Study Area	Location	Indigenous		Non-Indigenous	Indigenous status not stated
		Number	Proportion		
Primary	Yunta SAL	4	6.6%	85.2%	8.2%
	Peterborough SAL	108	7.2%	80.0%	12.7%
	Burra SAL	27	2.4%	88.2%	9.4%
Secondary	Mid North SA3	1,163	4.3%	89.5%	6.2%
	Lower North SA3	552	2.4%	91.5%	6.0%
SA		42,562	2.4%	93.7%	3.9%

SOURCE: ABS CENSUS 2021

3.11.2.2. Population and age profile

Information on the population and age profile of communities in the primary and secondary Study Areas is presented in Table 3-33.

At the 2021 Census, the towns of Yunta, Peterborough and Burra had a combined population of 2,662 people, of which more than half were from Peterborough. The secondary region had a total population of approximately 49,864 people, with the Mid-North SA3 comprising about 55%.

Compared to SA, communities in the primary and secondary regions generally had older populations with higher median ages, lower proportions of children and higher proportions of older people aged 65 years and over. This is consistent with the trend experienced in many rural communities of young people moving away to pursue education and employment opportunities. Peterborough and Burra in particular, recorded median ages of 55 years and 54 years respectively, compared to 41 years for SA as a whole, and more than 30% of their populations aged 65 years or over. Implications of ageing populations are recognised as key issues by and for these LGAs.

Communities in the primary and secondary Study Areas generally had relatively even sex ratios (i.e., the number of males for every 100 females) at 99 or 100 (compared to 97 males/100 females in SA). At the 2021 Census there were 162 males for every 100 females in Yunta (ABS, 2021). This is likely due in part to the smaller population of this town and the predominance of rural industries in this area, which typically attract more males.

Table 3-33: Age profile within regions (2021)

Region	Location	Median age	0-14 years	15-64 years	65 years or over	Total population
Primary	Yunta SAL	52 years	5.0%	50.0%	26.7%	60
	Peterborough SAL	55 years	12.6%	55.6%	30.9%	1,490
	Burra SAL	54 years	15.9%	53.4%	32.1%	1,112
Secondary	Mid North SA3	47 years	16.9%	58.1%	25.0%	27,164
	Lower North SA3	49 years	16.9%	57.0%	26.1%	22,691
SA		41 years	17.0%	63.0%	20.0%	1,781,516

SOURCE: ABS CENSUS 2021

3.11.2.3. Household and family composition

There were 1,172 households in the towns of Yunta, Peterborough and Burra at the 2021 Census. As shown in Table 3-34, these towns had lower proportions of family households compared to SA, with the majority of family households comprising couple only families. The primary Study Area had proportions of lone person households above the SA average, which is likely to reflect the older age profile of these towns. About 57.4% of households in Yunta comprised group households, which reflect people living in shared accommodation on pastoral properties.

Compared to SA, the secondary Study Area also had higher proportions of lone person households and lower proportions of family households. About one third of family households comprised couple only families, with the Lower North SA3 having slightly higher proportions of this household type compared to the Mid-North SA3.

Table 3-34: Family and household composition

Family/ household type	Primary region			Secondary region		
	Yunta SAL	Peterborough SAL	Burra SAL	Mid-North SA3	Lower North SA4	SA
Family type						
Couple family with no children	5.6%	28.0%	33.8%	30.1%	34.0%	28.1%
Couple family with children	0.0%	9.6%	18.3%	21.0%	23.2%	27.9%
One parent family	0.0%	11.8%	6.8%	11.2%	8.8%	11.4%
Other family[1]	0.0%	1.6%	0.6%	1.0%	0.5%	1.1%
Household type						
Lone person household	37.0%	46.6%	39.8%	34.6%	31.5%	28.2%
Group households	57.4%	2.2%	0.6%	2.1%	2.0%	3.4%
Family households	25.9%	50.4%	60.4%	62.7%	65.7%	67.2%
Total households	**28**	**666**	**478**	**11,249**	**9,180**	**691,313**

SOURCE: ABS CENSUS 2021
OTHER FAMILY IS DEFINED AS A GROUP OF INDIVIDUALS RESIDING IN THE SAME HOUSEHOLD, WHO CANNOT BE CATEGORISED AS BELONGING TO A COUPLE OR A ONE PARENT FAMILY (E.G., TWO BROTHERS LIVING TOGETHER WITHOUT A SPOUSE, PARTNER, OR CHILD).

3.11.2.4. Cultural diversity

Table 3-35 summarises information on the diversity of communities in the primary and secondary regions. At the 2021 Census, the primary and secondary regions indicates a low level of cultural diversity with low proportions of people who were born overseas and who spoke a language other than English, and less than half the State averages.

Table 3-35: Overseas born and non-English speaking households within Study Area (2021)

Location	Born overseas	Non-English-speaking people	Speaks English not well or not at all
Yunta SAL	7.7%	5.1%	0.0%
Peterborough SAL	9.2%	2.1%	0.3%
Burra SAL	10.7%	3.8%	0.5%
Mid North SA3	7.6%	3.8%	0.4%
Lower North SA3	9.9%	3.0%	0.3%
SA	24.1%	18.0%	2.7%

SOURCE: ABS CENSUS 2021

3.11.3. Community values

This Section provides an overview of those values that communities hold as important for their wellbeing and quality of life, including intangible qualities such as sense of place, social networks and community cohesion and physical features, such as landscapes and social infrastructure.

3.11.3.1. Social capital and community cohesion

Social capital refers to the social resources that people draw on in pursuit of their livelihood objectives and includes peoples' networks, relationships of trust, reciprocity and exchanges that facilitate co-operation.

Community cohesion refers to the sense of harmony of a place and reflect the levels of acceptance and valuing of social diversity, sense of belonging, the accepted vision and image of a place, opportunities and access to services, and positive social relationships (Vanclay et. al., 2015).

Communities in the primary Study Area show strong levels of social capital and community cohesion, demonstrated by relatively high levels of volunteering and a range of community-based organisations and events that foster social connections and participation.

Observed community participation in volunteering includes community services, events, clubs, and tourism attractions in Yunta, Peterborough and Burra reliant on volunteer community members (e.g., Yunta District Hall Inc committee, emergency services, visitor information centres, sporting clubs, etc.).

Consultation in Peterborough reported a self-identified need for more community involvement and connection to maintain and then enhance the town's welcoming, friendly and resilient community attributes, which is a key source of pride for many residents. The Council's Strategic Plan identifies a reduction in volunteers and an aging population as a threat to the Peterborough LGA community.

3.11.3.2. Community character and amenity

Local character and amenity of the primary Study Area is primarily influenced by rural land uses, such as pastoral and agricultural use.

The local amenity and character of Yunta is dominated by the rural land uses, natural landscapes and a sense of remoteness that is present in the area surrounding the township.

Peterborough's character and identity is closely linked to its heritage as a major railway hub. The character of Peterborough has changed in recent decades as an influx of new residents have moved to the town for cheaper housing (than surrounding towns).

Burra's railway and mining heritage are linked to its local amenity and character, with heritage listings, rural uses and landscapes in the area surrounding the town.

3.11.3.3. Community safety

The level of crime of a place may affect individuals' sense of safety within the community and for some people, may lead them to withdraw or disengage from community life.

Peterborough's 'friendly and safe environment' is identified as a strength of their community and contributes to a continued safe lifestyle. It is a key driver for the LGA Strategic Plan and reflects responses received from DC of Peterborough elected members during project engagement programs. Existing community safety issues include concerns related to excessive alcohol and drug use in Peterborough, and theft and damage to public property (by Barrier Highway travellers) in Yunta.

Yunta and Peterborough reported a downward trend in crime between 2018-2023. An upward trend in crime in Burra was mainly attributed to property damage and environmental crime.

3.11.4. Economy and employment

3.11.4.1. Employment and income

All communities, except Yunta, have lower levels of labour force participation, below SA averages. Peterborough's low rates, with 35.7% of people aged 15 years and over who were working or actively looking for work, supports community feedback of multi-generational unemployment and lack of employment opportunities as current challenges for the Peterborough community. The key industries identified for the Peterborough and Burra areas are tourism and retail. This has likely resulted in the higher part-time and lower full-time employment rates to that of state, as these industries predominantly rely on a casual workforce, precluding significant full time employment opportunities. The reliance on a casual workforce in the tourism and retail sectors is likely the result of the seasonality of these industries in the area, with a higher influx of tourists, more employment resources are needed temporarily, which are unsustainable on a year-round basis. As such, to meet the resource needs of the local economy, a casualisation of the workforce has occurred as these industries have been developed in lieu of more traditional employment industries, which were likely more stable year-round.

Table 3-36: Employment status in Study Area, 2021

Location	Total labour force	Labour force participation rate (a)	Worked full time	Worked part time	Unemployment rate
Yunta SAL	39	66.7%	61.5%	28.2%	2.8%
Peterborough SAL	466	35.7%	38.8%	38.6%	13.1%
Burra SAL	454	48.9%	49.8%	38.8%	4.1%
Mid North SA3	11,725	52.0%	53.0%	34.8%	6.3%
Lower North SA3	10,251	54.3%	52.6%	36.3%	4.3%
SA	887,189	60.0%	54.1%	35.0%	5.4%

(A) THE NUMBER OF PERSONS IN THE LABOUR FORCE EXPRESSED AS A PERCENTAGE OF PERSONS AGED 15 YEARS AND OVER. SOURCE: ABS CENSUS 2021

The importance of agriculture and tourism industries to communities in the primary Study Area is reflected in the main industries of employment with agriculture, forestry, and fishing; retail trade; accommodation and food services within the top five industries of employment in Yunta, Peterborough and Burra.

Consultation indicates existing issues for the communities in Yunta and Burra include attracting and retaining skilled workers, and competition with the mining industry for workers for seasonal work such as sheep shearing.

Peterborough and Burra and the secondary region report higher than Australian average levels of mining employment. During consultation, it was identified that a small number of people in Peterborough currently work on a FIFO or DIDO arrangement to Olympic Dam mine in Roxby Downs and other local mines. SA Chamber of Mines and Energy reported in 2019/2020 that there were five people and 18 people who lived in the Peterborough and Goyder LGA's respectively, engaged in full time employment at SA mines. Mining was estimated to contribute $495,000 and $2.7 M in Peterborough LGA and Goyder LGA in 2019/20 through wages, salaries, and additional value (SACOME, 2022).

Compared to SA, communities in the primary and secondary regions had lower median weekly household incomes. Median personal incomes were also generally below the State average, except for Yunta which recorded a median income ($725 per week) very comparable to SA ($734 per week).

3.11.4.2. Business and industry

Data on businesses within the Study Area is available at a LGA level. There were 568 businesses in the Goyder LGA and 131 businesses in the Peterborough LGA as of 30 June 2022. Approximately 54.8% of businesses in the Goyder LGA and 48.9% of businesses in the Peterborough LGA were agriculture, forestry, and fishing businesses, which is reflective of the rural nature of these LGAs. Within the towns of Yunta, Peterborough and Burra, local businesses include those that cater for the needs of residents in the town and surrounding areas, rural industries, tourists, and travellers. They include:

- retail businesses, including supermarkets, post offices and newsagencies, rural supplies, and service stations
- hotels, cafes, restaurants, and takeaway food businesses (e.g., bakeries)
- accommodation providers, including hotels, motels, and caravan parks.

The key industries in the Study Area are agriculture, forestry and fishing, tourism (accommodation and food services) transport, postal and warehousing, retail and construction industries, as discussed below.

AGRICULTURE

A total of 32.1% of people in Yunta are employed in agriculture, fishing, and forestry industries, with these industries accounting for 9.6% and 16.6% of employment in Peterborough and Burra respectively.

Yunta district covers approximately 34,500 km^2 of natural pastoral land and includes 64 pastoral enterprises on land held under pastoral leases, perpetual leases, and freehold land. Key agricultural uses include pastoral grazing of sheep for wool and lamb production, with some cattle grazing also occurring in the north of the district.

Rural land in the Peterborough LGA is largely used for wheat growing and grazing (Regional Development Australia, 2023). The importance of agriculture industries was noted in feedback with stakeholders in Peterborough, with the abattoir identified as a key employer for residents, although it was also noted that the number of jobs had been in decline. The abattoir is currently the largest exporter of camel meat in the world and is also the only abattoir in Australia licensed for the export of horse meat to the European Union (Samex, 2023).

The Goyder LGA is located south of Goyder's line, meaning it is positioned on rich agricultural land for farming and pastoral activities. The region is known for its cereal crop production, wool production, and livestock production. The region has reportedly seen a reduction of labour hire as machinery and technologies have developed in the last decade (RC of Goyder, 2023).

TOURISM

The primary Study Area is covered by the Clare Valley and Flinders Ranges and Outback tourism regions of SA, and the towns of Burra and Peterborough are key destinations for visitors. At the 2021 Census, tourism related industries such as accommodation and food services employed about 10.1% and 9.4% of Burra and Peterborough's population aged 15 years and over respectively. This is compared to 6.6% of people employed in these industries in SA as a whole.

SOCIO-ECONOMIC DISADVANTAGE

The ABS produces socio-economic indexes for areas (SEIFA) that indicate relative levels of socio-economic advantage and disadvantage regarding peoples' access to material and social resources, and their ability to participate in the community. Figure 3-63 illustrates that the primary Study Area includes varying levels of socio-economic disadvantage. In Burra and surrounding areas, studies indicated moderate levels of socio-economic disadvantage, whereas Peterborough and localities near the Bundey Substation are shown as some of the most disadvantaged communities in SA.

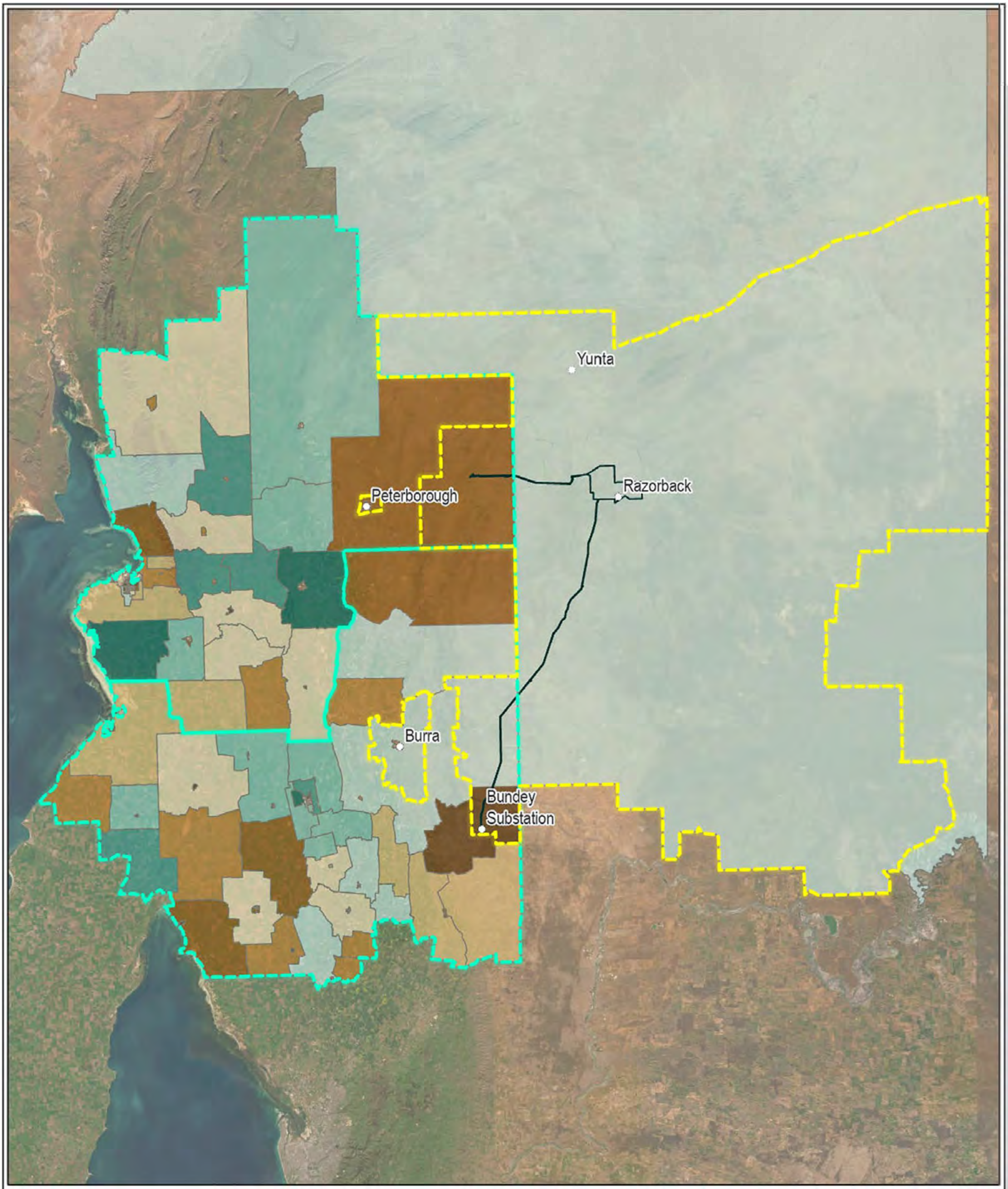
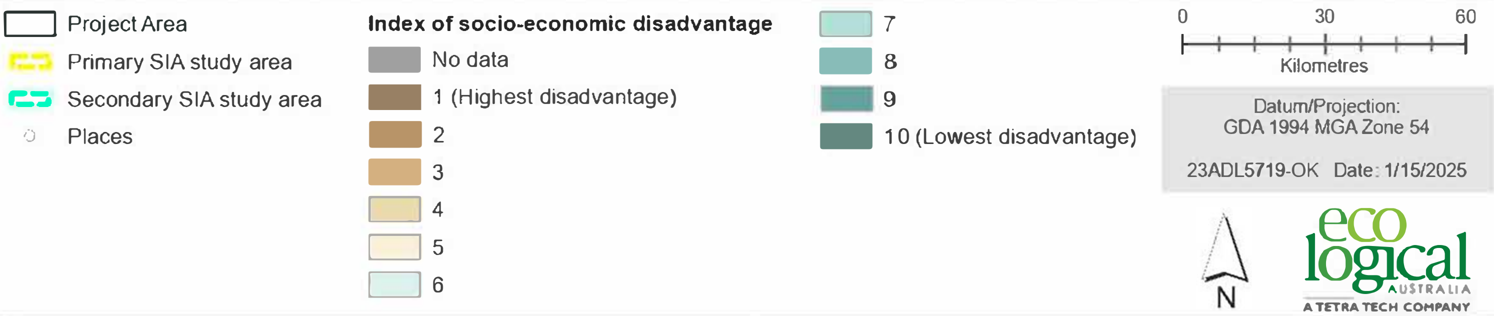


Figure 3-63: Index of socio-economic disadvantage, 2021



3.11.5. Proximity to infrastructure and housing

The proximity of the Project to residences is shown in Figure 3-64 and Table 3-37. Note in this instance the definition of 'primary residence' (where the owner occupies the property for most of the year) and 'secondary residence' (where the owner live part of the year, using it on weekend, holidays or on an intermittent basis) is relatively discretionary. Whereas the definition of whether a residence is permanently or occasionally occupied for exempt land purposes has a stricter definition based on legal precedence (refer Section 1.5).

The residences were selected using the homesteads and outstations layer of the Gazetteer dataset, augmented with site-specific knowledge of any additional residences proximal to the Project Area. MGT does not warrant that all residences have been identified within the wider study area (e.g. further than 5 km from Site boundary).

Table 3-37: Residences within 20 km of Project Area

ID	Name	Type	Status	Distance to Project Area (km)	ID	Name	Type	Status	Distance to Project Area (km)
<1 km					10	Homestead	Homestead	Unknown	12.281
6	Eurovale Outstation	Outstation	Occasionally occupied	0	50	Manunda	Homestead	Unknown	12.392
14	Tiverton Outstation	Outstation	Occasionally occupied	0	48	Grassville	Homestead	Unknown	12.518
22	Old Manunda	Homestead	Occasionally occupied	0.201	81	Wallowa Valley	Homestead	Unknown	12.828
2	Forshaw's	Homestead	Occasionally occupied	0.669	35	Salford	Homestead	Unknown	12.955
57	Kia-Ora	Homestead	Permanently occupied	0.915	11	Homestead	Homestead	Unknown	13.514
1-5 km					43	Bendigo	Homestead	Unknown	13.539
1	Pualco	Homestead	Occasionally occupied	1.326	75	Martin Hut	Building	Unknown	13.599
4	N Mosey	Homestead	Assumed permanently occupied	1.791	98	Glenbower	Homestead	Unknown	13.687
25	Woolamba	Homestead	Unknown	2.075	73	Thistlebeds	Homestead	Unknown	13.963
86	Braemar	Homestead	Permanently occupied	2.272	82	Worlds End	Homestead	Unknown	14.516
66	Hillgrange	Homestead	Permanently occupied	2.354	30	Kungara	Homestead	Unknown	14.583
97	Murkaby	Homestead	Permanently occupied	2.374	18	Valderemao	Homestead	Unknown	14.755
41	Stone Hut	Building	Unknown	2.797	53	Tiverton	Homestead	Permanently occupied	14.793
8	Private residence	Homestead	Permanently occupied	2.939	70	Pat Hut	Building	Unknown	14.793
20	Boolernunga Hut	Building	Unknown	2.950	29	Nettica	Homestead	Unknown	14.830
54	Glenora	Homestead	Permanently occupied	3.273	12	Homestead	Homestead	Unknown	14.904
9	KE4	Homestead	Unknown	3.605	68	Pepper Tree Cottage	Homestead	Unknown	14.925
21	Bullyaninnie	Homestead	Permanently occupied	3.738	24	Faraway Hill Outstation	Outstation	Permanently occupied	15.031
34	Eurovale	Homestead	Assumed permanently occupied	4.067	46	Boolee	Homestead	Unknown	150.36

ID	Name	Type	Status	Distance to Project Area (km)	ID	Name	Type	Status	Distance to Project Area (km)
91	Uratan Old Station	Homestead	Unknown	4.318	16	Lilydale	Homestead	Unknown	16.528
99	Old Oratan	Homestead	Unknown	4.318	93	Stud Holme	Homestead	Unknown	16.842
84	Oak Park	Homestead	Occasionally occupied	4.957	85	Pulpara Stone Hut	Building	Unknown	16.905
5-10 km					90	Oakleigh House	Homestead	Unknown	16.933
49	Chalk Cliffs	Homestead	Unknown	5.064	60	Onahill	Homestead	Unknown	17.139
55	Pitcairn	Homestead	Permanently occupied	5.278	100	Salt Well Hut	Building	Unknown	17.219
15	Jones Hut	Building	Unknown	6.873	59	Turowie Hut	Building	Unknown	17.318
87	Stoneleigh	Homestead	Assumed permanently occupied	6.997	101	Shamrock	Homestead	Unknown	17.617
7	Chalk Cliffs	Homestead	Unknown	7.071	74	Armonda	Homestead	Unknown	18.111
52	White Hill	Homestead	Assumed permanently occupied	7.095	40	The Oaks	Homestead	Unknown	18.230
5	Peechara Hills	Homestead	Assumed permanently occupied	8.384	36	The Plains	Homestead	Unknown	18.231
31	Woolgangi	Homestead	Unknown	8.470	32	Mallee Grove	Homestead	Unknown	18.415
3	Old Nackara School House	Homestead	Assumed permanently occupied	8.740	23	Rocky Springs	Homestead	Unknown	18.418
62	Mafeking Outstation	Outstation	Not occupied	8.741	61	Koomooloo	Homestead	Unknown	18.424
37	Gums Station	Homestead	Permanently occupied	9.324	102	West Outstation	Outstation	Unknown	18.461
10-20 km					96	Alderman Outstation	Outstation	Unknown	18.461
56	Blue Hills	Homestead	Unknown	10.047	33	Poonunda	Homestead	Unknown	18.484
42	Old Grampus	Homestead	Unknown	10.441	45	Paratoo	Homestead	Unknown	18.508
63	Drysdale	Homestead	Unknown	10.698	13	Erindale	Homestead	Unknown	18.702
27	Loch Winnoch	Homestead	Occasionally occupied	10.038	88	Erndale	Homestead	Unknown	18.702

ID	Name	Type	Status	Distance to Project Area (km)	ID	Name	Type	Status	Distance to Project Area (km)
28	Hog Back	Homestead	Unknown	10.731	47	Alexandrina Outstation	Outstation	Unknown	18.765
44	Spring Dam	Homestead	Unknown	10.826	83	Mongalata Station	Homestead	Unknown	18.950
67	Yeldominn	Homestead	Unknown	10.828	65	Pulpara	Homestead	Unknown	19.016
71	Seldominn	Homestead	Unknown	10.828	72	Fawlty Towers	Homestead	Unknown	19.215
39	Sunnyside	Homestead	Unknown	11.263	38	Emu Vale	Homestead	Unknown	19.236
78	Bundey Bore Station	Homestead	Permanently occupied	11.667	77	Caroona	Homestead	Unknown	19.259
76	Willara	Homestead	Unknown	11.687	26	Tilkilki	Homestead	Unknown	19.264
19	Arakcan	Homestead	Unknown	11.651	58	Stendal	Homestead	Unknown	19.331
51	Mallee Dale	Homestead	Unknown	11.910	95	The Olives	Homestead	Unknown	19.701
89	Wilda Park	Homestead	Unknown	12.079	69	White Well	Homestead	Unknown	19.786
80	Dandebong	Homestead	Unknown	12.271					

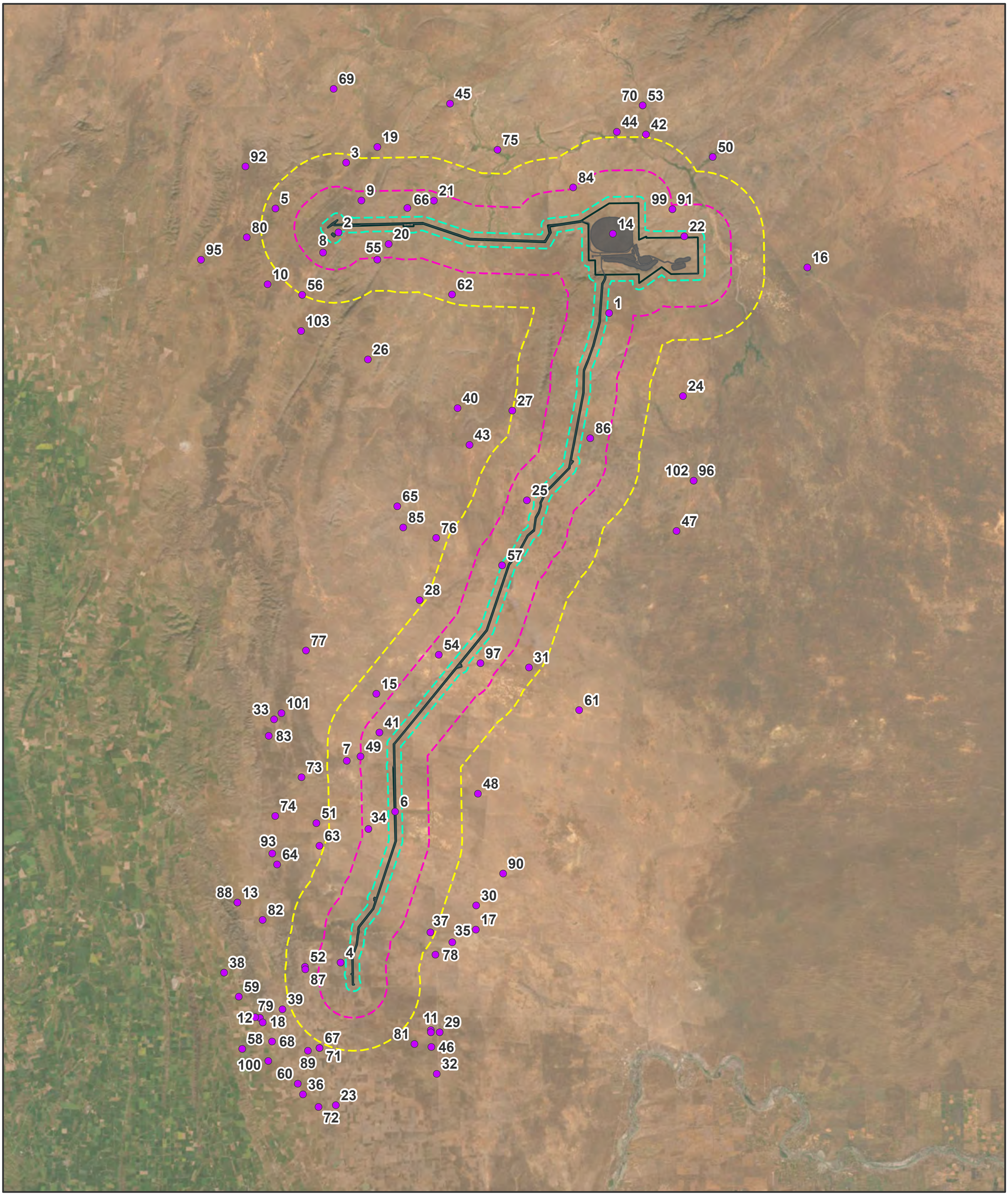


Figure 3-64: Residences in proximity to Project Area

Sensitive receptors

Project Area

Disturbance footprint

1km buffer

5km buffer

10km buffer

0 10 20

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 6/02/2025

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3.11.5.1. Infrastructure and housing

This Section describes the infrastructure and services that meet the needs and priorities of the local community.

SERVICES

Emergency services

Emergency services in the primary Study Area include SA Police, SA Ambulance Services (SAAS), Metropolitan Fire Service (MFS), CFS and SES. Police stations within the primary Study Area are located in Yunta, Peterborough and Burra, with additional police stations in nearby towns in the secondary Study Area including Hallett, Jamestown, Orroroo, Clare and Spalding.

The SIA Study Areas are within the CFS Region 4, which covers the Flinders, Mid-North, and Pastoral areas. A single MFS brigade is located at Peterborough and there are numerous volunteer-run CFS stations within the primary Study Area, including in Yunta, Peterborough, Yongala, Burra and Baldina, with stations also in surrounding towns in the secondary Study Area (CFS, 2023). Consultation for the SIA raised concerns about the implications for CFS volunteers of an ageing population. In particularly, it was noted that the Yunta CFS has eight volunteers that are over the age of 60 years.

SAAS ambulance stations are located in Yunta, Peterborough and Burra, as well as nearby towns such as Jamestown, Orroroo and Clare. Each of these stations are supported by volunteers, with additional crewed support based in Port Pirie. The Study Areas are serviced by the Royal Flying Doctors Service (RFDS) from bases in Adelaide and Port Augusta. The RFDS provide emergency aeromedical evacuation.

Hospitals

There are two hospitals in the primary Study Areas located at Peterborough (Peterborough Soldiers' Memorial Hospital) and Burra (Burra Hospital). The RFDS also provide first aid training programs and remote clinics at Yunta and emergency aeromedical evacuations from Peterborough, Jamestown and Orroroo.

Consultation for the SIA in Peterborough identified that access to GP services is limited, with some people waiting four to five weeks to see a doctor, and having to travel out of town for health services such as x-rays and minor surgery.

Education

Education facilities in the primary Study Area are located in Peterborough and Burra. These are summarised in Table 3-38.

Table 3-38: Education facilities in Peterborough and Burra

Education Facility	Government / Non-government	Education Level	Years
Peterborough High School	Government	Secondary	Years 7 – 12
Peterborough Primary School (including Yunta campus)	Government	Primary	Reception – Year 6
St Joseph's School	Non-government	Mixed	Reception – Year 9
Burra Community School	Government	Mixed	Reception – Year 12

Feedback from consultation within the school for the SIA indicated that attracting teachers was a challenge for the school, particularly due to wider shortages in some fields. Additionally, each school reported a decline in student enrolment.

Students in Yunta and surrounding pastoral stations are generally required to travel to school in Peterborough. There are no tertiary education facilities in the primary Study Area, with students looking to attend university or another tertiary education facility having to move away from the area. The closest tertiary education facilities are located in Port Pirie, Kadina, Port Augusta, and the Barossa Valley.

Sports and recreation facilities

The primary Study Area includes a range of local and district level sport and recreation facilities. These include:

- formal sporing facilities such as football ovals, netball and tennis courts, lawn bowls, and golf courses
- informal recreation facilities including parks, skate parks, swimming pool and playgrounds.

It was noted during engagement for the SIA that the declining population of some towns has required clubs to amalgamate with those in nearby towns (e.g., Jamestown Peterborough Football and Netball Club).

HOUSING

At the 2021 Census, Yunta, Peterborough and Burra had a combined total of 1,511 private dwellings, of which the majority (56.5% equating to 853 dwellings) were in Peterborough and 40.6% (614 dwellings) were in Burra. Dwelling occupancy rates in these towns were below the State average, which may be due to the use of some dwellings as short-term visitor accommodation (e.g., rentals through 'Airbnb' or similar).

Median housing costs in the primary and secondary Study Area were well below the State medians at the 2021 Census. Yunta and Peterborough recorded the lowest housing costs, with the Lower North SA3 recording the highest costs in the Study Areas.

A report into rental affordability SA (SACOSS, 2023) noted that the Yorke and the Mid-North region experienced the largest decrease in new rentals in SA, with less than half the properties available in June 2023 compared to June 2013. The report also recognises that while there are fewer rental properties in regional SA compared to Adelaide and that regional prices were lower, there are significant problems with rental affordability in regional areas. It was noted that the availability of rental housing was an issue for many regional areas, with this creating a barrier to attracting employment and development in these regions (SACOSS, 2023).

The availability of suitable rental housing was identified as a current issue in feedback from community and stakeholder consultation for this SIA. Comments were made that the availability of rental housing was tight, and a lack of availability of government or private rental housing was a constraint in attracting staff. It was also noted that Peterborough and Burra had both experienced increased rental prices, and that Peterborough has seen people who were born in the area returning in their retirement due to cheaper housing options. Feedback from consultation for the SIA also identified access to affordable and secure housing as a growing issue for lower income households, with some community service providers noting that the rate of people accessing services due to homelessness had doubled in the last 12 months.

Feedback from consultation for the SIA raised that house prices had increased in local towns. Information on residential sales is available from realestate.com at a postcode level. A review was undertaken of an online real estate sales website (realestate.com.au) for the following postcode areas of Burra (5417), Peterborough (5422), Orroroo (5431) and Jamestown (5491). Over the 12 months from October 2022, the median house sale price in Orroroo increased by 55.6% (refer to Table 3-39). This was followed by Peterborough, which saw a 25.8% increase in the median house sale price. Burra recorded a decline in the median house sale price between October 2022 and November 2023 (-5.3%), although the median sale price increased by 20.7% over the five years from October 2018. Peterborough and Jamestown also recorded an increase in the median sale price over the same 5-year period.

Table 3-39: Median house price changes

Postcode	Median sale price (Oct 18-Nov 19)	Median sale price (Oct 2022-Nov 2023)	Change 2018 - 2023	12-month growth (Oct 2022-Nov 2023)
5417 – Burra	$246,000	$297,000	20.7%	-5.3%
5422 – Peterborough	$75,500	$146,500	94.0%	25.8%
5431 – Orroroo	-	$280,000	-	55.6%
5491 – Jamestown	$200,000	$260,000	30.0%	18.2%

NOTE: (-) = DATA NOT AVAILABLE. SOURCE: REALESTATE.COM.AU

Social Housing

A report on rental affordability in regional SA (SACOSS, 2022) identifies that social housing has a critical role to play for people on low income due to the “chronic unaffordability of and lack of” rental housing in regional SA. The report also notes that social housing stock across SA has experienced a significant decline over the last two decades (SACOSS, 2022).

At the 2021 Census, there were 27 houses in Peterborough and 15 houses in Burra that were rented through a State or Territory housing authority (i.e., SA Housing Authority) or a community housing provider. State Government data on public housing indicates that as of 30 June 2021, there were:

- 25 public housing dwellings in the Peterborough LGA, a rate of 224 houses per 10,000 residential dwellings, with an occupancy rate of 100%.
- 15 public housing dwellings in the Goyder LGA, a rate of 59 houses per 10,000 residential dwellings, with an occupancy rate of 100%.

This was below the rate of public housing provision for SA as a whole, at 399 houses per 10,000 residential dwellings (SA Housing Trust, 2021).

INFRASTRUCTURE

Key infrastructure is shown on Figure 1-9 and discussed below.

Transport

The main transport infrastructure near the Project includes a network of roads that provide critical connections to townships and farming districts for business, recreation, and everyday living use. They include roads managed by the DIT, and those in Council ownership. Public transport services in rural SA are sparse, noting the very low population density and proximity between townships. Services operate in the form of private coachlines between larger townships. Refer to Section 3.12 and Figure 3-66 for an overview of traffic baseline information.

Communities in the primary and secondary Study Area are connected via air with regional airports (of varying size) located in towns such as Peterborough and Port Augusta. Although the infrastructure is established, it is not regularly serviced by an air carrier and are therefore used on an as needed basis. The Peterborough airstrip is owned and operated by the Peterborough DC. The 1,500 m-long airstrip is sealed, has lighting for night use and is available for use 24 hours a day. Consultation for the SIA noted that the airstrip is used by the RFDS for aeromedical evacuations. An aerodrome is also located at Yunta. The 900 m-airstrip has recently been upgraded and is used by the RFDS to provide the Yunta community with essential health services (Yunta SA, 2023a).

Utilities

Electricity in the primary Study Area is provided by ElectraNet and SA Power Networks. ElectraNet are responsible for the electricity transmission network that transports electricity from generators to SA Power Networks' substations. SA Power Networks are then responsible for the distribution network to the end customer (ElectraNet, 2023; SA Power Networks, 2023). Electricity supply in Yunta is provided through the remote area energy supply scheme and is supplied from a diesel generator managed by a private operator and is not connected to the State power grid.

Water supplies to Burra and Peterborough are supplied by the Morgan-Whyalla drinking water system, sourced from the River Murray. Yunta's water source is currently a tank, with water supplied from Broken Hill. SA Water is currently in the construction phase of delivering a new tank and chlorination system in 2023-2024. Domestic water supply at remote stations in the Study Area is generally sourced from harvested rainwater.

3.11.5.2. People's productive capacity

This Section describes the skills, knowledge, and experience that are important to effective participation in society and its economy. This includes health (both physical and mental wellbeing) as well as educational attainment, training, and skills.

HEALTH AND WELLBEING

Compared to SA, communities in the primary and secondary Study Area reported higher proportions of people with a long-term health condition at the 2021 Census (refer Figure 3-65). Mental health conditions (including depression or anxiety) were the second most common long-term health condition for Peterborough, Burra, Mid-North SA3 and Lower North SA3, with the proportion of people who self-reported as having this condition ranging from 11.0% to 13.7%, compared to an average of 9.8% in SA. The 2021 Census also showed a strong overlap between physical health and mental health illness, where people who reported having a mental illness were more likely to report having a long-term health condition (ABS, 2022; AIHW, 2023). As the Census relies on self-reporting, it is likely that the data for mental health is underestimated due to people not responding to this item or unaware they suffer from a long-term mental health condition (AIHW, 2023).

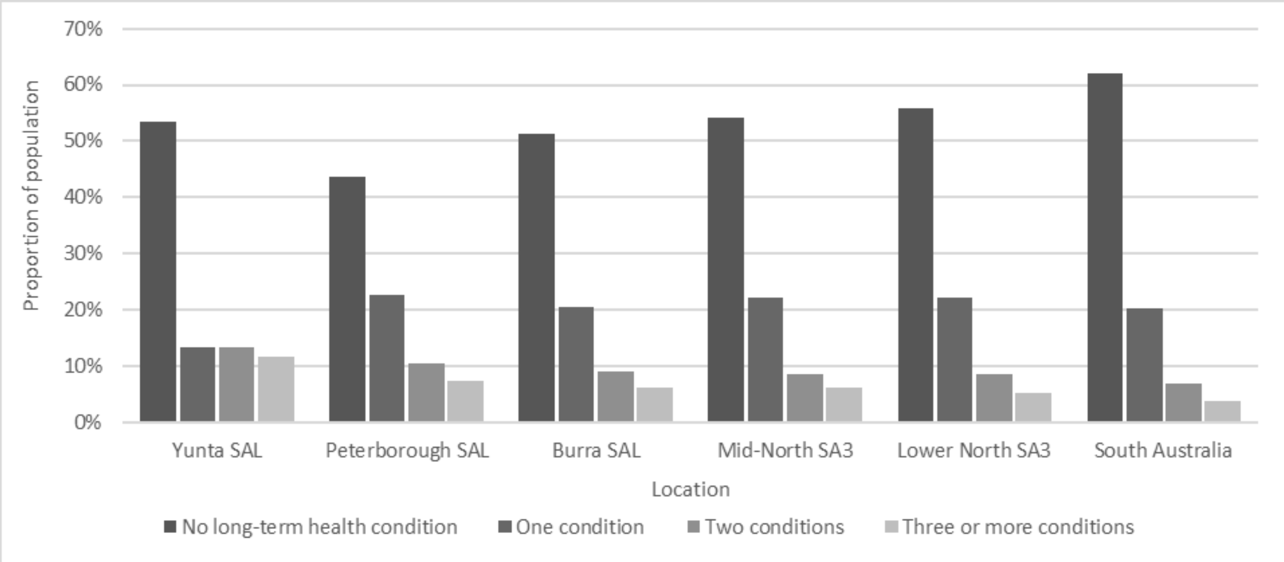

Figure 3-65: Proportion of population with health conditions within Study Area

EDUCATION ATTAINMENT

Compared to SA, communities in the primary and secondary Study Areas had lower proportions of people that had completed Year 12 and higher proportions of people who had completed Years 11 or below. Burra recorded the highest level of people who completed Year 12 in the primary Study Area (35.5%), while the Lower North SA3 recorded the highest levels in the secondary Study Areas (35.8%). These were both below the average for SA (at 48.4%).

With regard to non-school qualifications, communities in the primary Study Area generally had lower proportions of people with post-graduate, and graduate diploma or graduate certificate level qualifications, and higher proportions of people with advanced diploma or diploma and certificate level qualifications. However, it is not uncommon for young people to leave the area to seek post-school qualifications.

3.12. Traffic

An overview of the existing traffic network and the impacts to traffic from the Project are described within this Section. For a more detailed discussion on the assessment of traffic impacts please refer to Appendix C6 *Traffic Impact Assessment* (CIRQA, 2024).

Across rural SA, a network of roads provides critical connections to townships and farming districts for a combination of business, recreation, and everyday living use. The road network is used by a combination of light vehicles (LV), general heavy vehicles (HV), and restricted access vehicles (RAVs).

3.12.1. Road networks and general access vehicle routes

Rural SA comprises an array of roads varying in form and function. Roads are primarily separated between DIT and Council ownership, with larger traffic volumes and higher freight proportions typically occurring on DIT roads.

Council roads generally support the DIT road network by providing localised access to residential, commercial, and industrial properties (including farmland holdings). Such roads also connect DIT roads through the vast primary production areas located across rural SA. It is also noted that a proportion of the Study Area (generally to the north and east of the mine site) is located within Pastoral Unincorporated Areas (not within a designated Council/Local Government Area) and the responsibility for roads within such areas lies with DIT.

Primary access routes to the ML and TL use a matrix of DIT and Council roads, with differing road authorities for each road Section. Traffic associated with the construction of the TL will be distributed via a variety of access routes that will change as construction progresses.

Key access roads, along with relevant authority are listed in Table 3-40, with the key routes illustrated in Figure 3-66. For a detailed outline of each road, and road conditions, refer to Appendix C6.

Table 3-40: Routes and associated roads

Route	Roads
Razorback – Adelaide Access Route	Crocker Road [Peterborough Council] – is a low volume, rural access road Rucioch Road [Peterborough Council] – is a low volume, rural access road. Barrier Highway (including Copperhouse Road) [DIT] – forms part of the A32 route and generally comprises a single lane in each direction separated by a marked centre line. Horrocks Highway [DIT] – forms a major north-south regional route between Gawler and Quorn. Sturt Highway [DIT] – a key National Highway linking Adelaide and Sydney. Northern Expressway and Northern Connector [DIT] – these roads form a key non-stop transport corridor between Gawler and the North-South Motorway (Main South Road). North-South Motorway [DIT] – Main South Road is Adelaide's major north-south road transport corridor and is progressively being upgraded to form the North-South Motorway.
Razorback – Port Augusta/Whyalla Route	Crocker Road [Peterborough Council] – as above; Crocker Road [Peterborough Council] – is a low volume, rural access road Rucioch Road [Peterborough Council] – as above; Barrier Highway [DIT] – as above; Petersburg Road (including Main Street/West Terrace) [DIT] – links Barrier Highway to the township of Peterborough. R M Williams Way (including Second Street) [DIT] – R M Williams Way connects Clare to Spalding, Jamestown, Orroroo and Hawker.

Route	Roads
	Willowie Road (including Main Street) [DIT] – comprises a similar road cross-section and conditions to R M Williams Way, however, has gentle vertical undulations in the area west of Orroroo. Main North Road/Horrocks Highway [DIT] – the access route to/from Port Augusta/Whyalla includes a short section of the northern end of the Horrocks Highway (Main North Road). Horrocks Pass Road [DIT] – provides connection through the southern Flinders Ranges between Wilmington and the Augusta Highway. Augusta (Princes) Highway (including Victoria Parade) [DIT] – forms part of the National A1 Highway and provides the primary road link between Adelaide (via Port Wakefield Highway) and Port Augusta. Eyre Highway (for Whyalla) [DIT] – provides access between Port Augusta and central Eyre Peninsula (as well as the broader peninsula via other connecting roads such as the Lincoln Highway for movements to/from Whyalla). Lincoln Highway (for Whyalla) [DIT] – connects the Eyre Highway to Whyalla
Razorback – Yunta Route (option 1)	Crocker Road [Peterborough Council] – is a low volume, rural access road Rucioch Road [Peterborough Council] – is a low volume, rural access road. Barrier Highway (including Copperhouse Road) [DIT] – forms part of the A32 route and generally comprises a single lane in each direction separated by a marked centre line.
Razorback – Yunta Route (option 2)	Sturt Vale Road [DIT] – is a low volume, rural access road. It comprises an unsealed two-way carriageway with a formation width of generally in the order of 7.5 m to 8.5 m Barrier Highway (including Copperhouse Road) [DIT] – forms part of the A32 route and generally comprises a single lane in each direction separated by a marked centre line.

3.12.2. Aerodrome road access

In addition to the broader road network (Table 3-40), access movements will also be distributed to/from the Peterborough Aerodrome via roads within and surrounding the township of Peterborough. They key Aerodrome access routes are listed below and shown in Figure 3-67.

- Barrier Highway [DIT] – as above.
- Petersburg Road (including Main Street/West Terrace) [DIT] – as above.
- Silver Street [DIT] – is a state-maintained road within the township of Peterborough.
- Queen Street [DIT] – provides a continuation of Silver Street (to its east).
- Cleary Road [DIT] – provides a continuation of Queen Street (and Silver Street) and functions as a regional (low-volume) access road.
- Booborowie Road [Peterborough Council] – a low volume regional access road comprises a single, two-way carriageway.

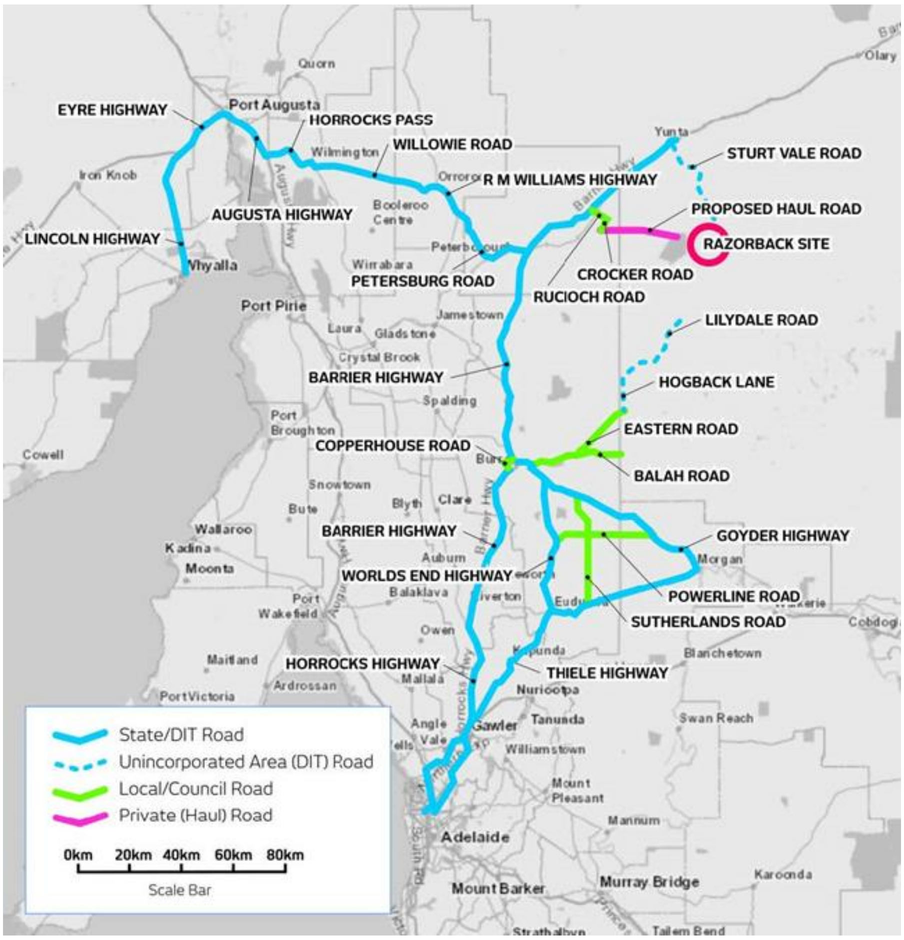

Figure 3-66: Key access routes associated with the Project

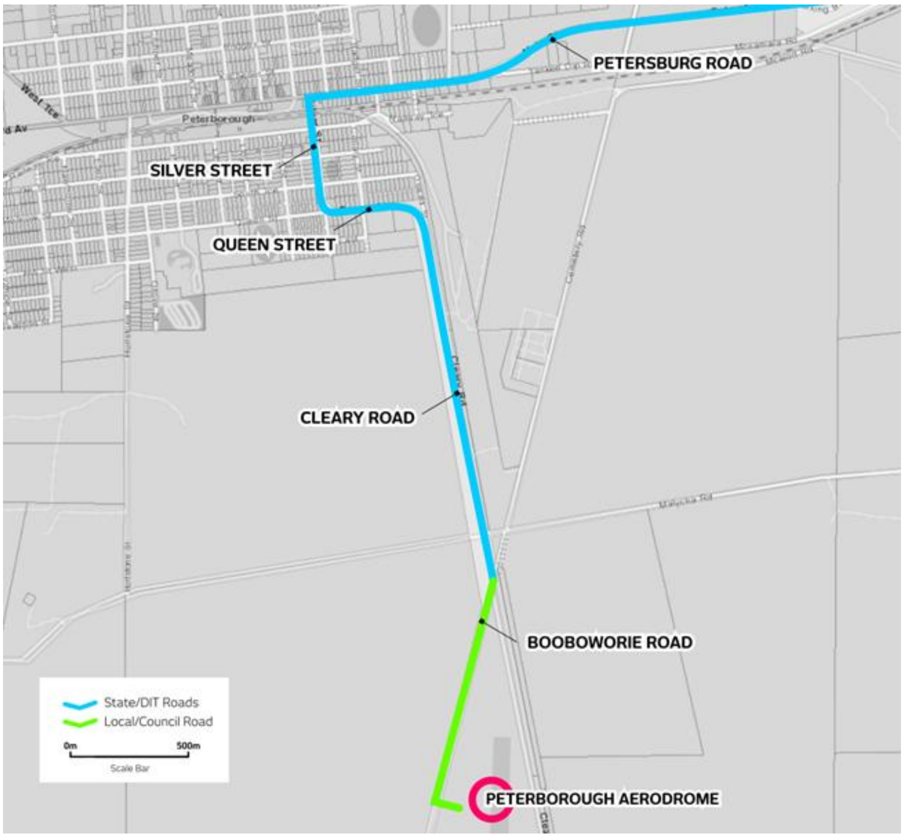

Figure 3-67: Access routes to and from Peterborough Aerodrome

3.12.3. Existing traffic volumes

Traffic data has been obtained for roads forming the DIT Road Network across rural SA. Council roads within the Study Area are typically not monitored, nor do they form part of DIT's traffic survey program. Accordingly, existing traffic volumes on Council roads are unavailable (albeit would generally be very low).

Data obtained from DIT includes Annual Average Daily Traffic (AADT) volumes and associated commercial vehicle (CV) percentages, as well as the year in which the data was collected. Lane and shoulder width information has been obtained from available aerial imagery. Table 3-41 illustrates the data obtained for key roads for the Project. Note, roads beyond the southern end of Horrocks Highway towards Adelaide have been excluded given they accommodate significant traffic volumes and have high road capacities well above any traffic generation associated with the subject project.

Table 3-41: Available traffic data for key roads within the Study Area

Road	AADT Volume (Yr rec.)	CV%	Lane width	Shoulder width	Control/ ownership
Barrier Hwy (Yunta to Petersburg Rd)	600 (2022)	38.5%	≈ 3.3 m	≈ 1.1 m (S) ≈5.0 m (U)	DIT
Petersburg Rd (Barrier Hwy to Petersburg Rd)	250 (2018)	34.0%	≈ 3.2 m	≈ 1.5 m (S) ≈ 3.1 m (U)	DIT
Petersburg Rd (Peterborough to R M Williams Way)	750 (2018)	18.5%	≈ 2.6 m	≈ 3.0 m (U)	DIT
R M Williams Way (Petersburg Rd to Orroroo)	460 (2018)	24.0%	≈ 3.1 m	≈ 1.5 m (U)	DIT
Willowie Rd (Orroroo to Wilmington)	220 (2018)	22.5%	≈ 3.2 m	≈ 1.2 m (S) ≈ 2.2 m (U)	DIT
Horrocks Pass Rd (Wilmington to Augusta Hwy)	800 (2023)	15.0%	≈ 3.6 m	≈ 3.0 m(U)	DIT
Augusta Hwy (Horrocks Pass Rd to Port Augusta)	4,700 (2022)	25.5%	≈ 3.7 m	≈ 1.0 m (S) ≈ 3.2 m (U)	DIT
Eyre Hwy (Port Augusta to Lincoln Hwy.)	2,800 (2019)	27.0%	≈ 3.6 m	≈ 1.5 m (S) ≈ 1.5 m (U)	DIT
Lincoln Hwy (Eyre Hwy to Whyalla)	2,200 (2022)	20.5%	≈ 3.5 m	≈ 0.7 m (S) ≈ 2.3 m (U)	DIT
Cleary Rd (Peterborough to Booboworie Rd)	270 (2015)	15.0%	≈ 3.0 m	≈ 1.8 m (U)	DIT
Barrier Hwy (Petersburg Rd to Terowie)	430 (2018)	39.5%	≈ 3.3 m	≈ 0.9 m (S) ≈ 1.2 m (U)	DIT
Barrier Hwy (Terowie to Hallet)	650 (2022)	27.5%	≈ 3.3 m	≈ 1.0 m (S) ≈ 1.6 m (U)	DIT
Barrier Hwy (Hallet to Burra)	850 (2019)	24.5%	≈ 3.3 m	≈ 1.0 m (S) ≈ 1.6 m (U)	DIT
Barrier Hwy (Burra to Horrocks Hwy)	1,000 (2022)	23.0%	≈ 3.4 m	≈ 0.8 m (S) ≈ 2.3 m (U)	DIT

Road	AADT Volume (Yr rec.)	CV%	Lane width	Shoulder width	Control/ ownership
Horrocks Hwy (Barrier Hwy to Theile Hwy)	3,300 (2019)	11.0%	≈ 3.5 m	≈ 1.5 m (S) ≈ 1.3 m (U)	DIT
Thiele Hwy (Roseworthy to Kapunda)	5,000 (2022)	11.0%	≈ 3.3 m	≈1.2 m (S) ≈ 1.5 m (U)	DIT
Thiele Hwy (Kapunda to Eudunda)	1,400 (2022)	11.5%	≈ 3.1 m	≈ 1.5 m (U)	DIT
Thiele Hwy (Eudunda to Morgan)	330 (2022)	19.5%	≈ 3.2 m	≈ 3.3 m (U)	DIT
Worlds End Hwy (Eudunda to Goyder Hwy)	550 (2019)	15.5%	≈ 3 m	≈ 2.7 m (U)	DIT
Goyder Hwy (Worlds End Hwy to Morgan)	550 (2022)	29.0%	≈ 3 m	≈ 4.3 m (U)	DIT

(U) = UNSEALED, (S) = SEALED

3.12.4. Restricted access vehicle route

DIT and the National Heavy Vehicle Regulator (NHVR) are responsible for the gazettal of roads to allow vehicle access for vehicles greater than 19.0 m in length (i.e., longer than a Semi Trailer). Road Trains up to 36.5 m in length, operating at Higher Mass Limits (HML), are currently permitted to utilise roads linking townships within the Study Area.

It is noted, however, that 36.5 m road trains travelling between the site and Port Augusta/Whyalla (if proposed for site access) would need to travel via Port Pirie (as there is no direct connection between Willowie Road and Augusta Highway), unless a permit was granted (refer Figure 3-68). The direct route between Willowie Road and Augusta Highway (i.e., Horrocks Pass) is, however, gazetted for 26 m B-Doubles.

If required for site access (or OTL construction), restricted access vehicles longer than 36.5 m or those with over-size or over-mass (OSOM) conditions would require issuance of an NHVR permit. Such requirements can be assessed as the construction methodology is refined and associated traffic control measures (such as pilot vehicles) identified at such time to ensure impacts on the road network and its users are minimised.

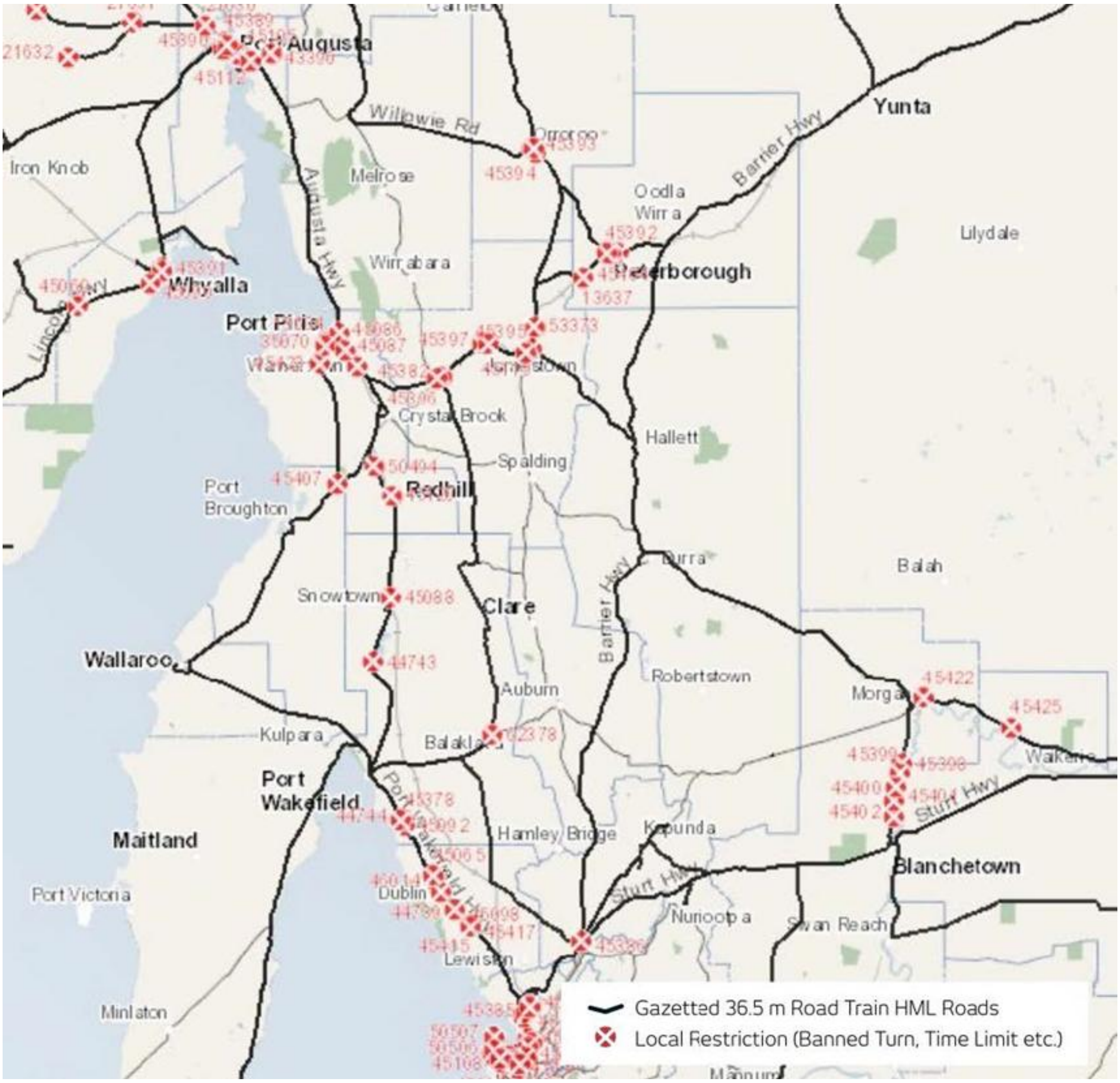

Figure 3-68: Existing 36.5 m Road Train (HML) network within the study area locality (Source: DIT RAVnet 2023)

3.13. Visual amenity

3.13.1. Local and regional visual amenity values

The scenic and aesthetic values associated with the region relate to areas of relatively undisturbed vegetated plains where low-input grazing activities occur, with intermittent low ranges and hills of local or landscape-scale. Of note within the region are the Olary, Pualco and Levi Ranges, while isolated features, such as Oratan Rock, are important local landmarks.

The Study Area is generally characterised by the east-west trending Pualco Range that separates flat to low undulating plains to the north and south. Razorback Ridge and Iron Peak are extensions of the Pualco Range, with overall elevation declining from a peak of 560 m AHD immediately west of the Site to as low as 185 m AHD at Manunda Creek to the east of the Site (see Figure 3-69).

Figure 3-69: Cross-section of regional elevation (west to east)

The Razorback Ridge ridgeline sits to the east of the much-taller Pualco Ranges; it is a prominent feature within its immediate landscape, particularly when viewed laterally where it forms an isolated figure against the vast plains of the Murray Basin to the south (see Plate 3-7).

Plate 3-7: Razorback Ridge from Iron Peak, looking east with Levi Range and Boiekevie Hill in the far distance

Iron Peak, another key landform within the Site, is lower in elevation than Razorback Ridge; however, its prominence is again notable given its local elevation and profile, with outcropping resistant ironstone bands running across the crest of Iron Peak and folding eastward (see Plate 3-8).

Plate 3-8: Iron Peak

3.13.2. Potential visual receptors

Whilst the area is sparsely inhabited, mostly by pastoralists, Razorback Ridge and Iron Peak, as the most prominent landforms within the Site, may be enjoyed by local residents or occasional travellers that have permission to access the private property on which these features are located.

Selected residences proximate to Project footprints are shown in Figure 3-64 and listed in Table 3-37.

It is assumed that Project activities may only be directly visible at selected residences:

- Old Manunda homestead (occasionally occupied) – initial mining operations at Iron Peak
- Pualco homestead - mining operations at Razorback Ridge, predominantly associated with initial mining operations
- Hillgrange and Bullyaninnie homesteads, Private residence – HR operations
- Eurovale Outstation (occasionally occupied)
- Various residences along the TL.

Other Project infrastructure or activities may also be visible from discrete locations on private pastoral property.

Publicly-accessible locations that may provide suitable vantage to view the Site and associated mining activities are limited. The southern façade of Razorback Ridge is visible along the Lilydale Road approximately 20 km south, and it is anticipated that some mining-related activities may be visible from the Oak Park Road to the north (principally the northern embankment of the TSF). As discussed in Section 1.6, Pualco Range Conservation Park (Pualco Range CP) is not open to visitors and hence there are no visual amenity impacts to consider in relation to the CP.

As discussed in Section 3.16.1, the Ngadjuri people maintain a strong connection to the land and water in the region, and as such, the visual amenity of the landscape is of high cultural value. Pastoralists also have strong connections to the land through and a rich and varied history in the development of agriculture in the region, and therefore highly value the visual amenity of the landscape.

3.14. Air quality

An overview of air quality is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B1 *Air Quality Baseline Assessment* (Lathwida, 2022) and Appendix C1 *Air Quality Impact Assessment* (Katestone, 2024).

3.14.1. Site specific climate modelling

The existing ambient air quality in the Project Area is typical of an arid environment, where evaporation greatly exceeds rainfall across all months, with hot summers and cool winters, in addition to dust storms and wildfires potentially occurring within the area, impacting surrounding air quality.

As part of the Air Quality technical studies, site-specific meteorological data has been generated by coupling the prognostic model “The Air Pollution Model” (TAPM) (version 4.0.5) with the diagnostic meteorological model CALMET (version 6.5.0). The coupled TAPM/CALMET modelling system was developed to enable high resolution modelling capabilities for regulatory and environmental assessments. The modelling system incorporates synoptic, mesoscale and local atmospheric conditions, detailed topographic and land use categorisation schemes to simulate synoptic and regional scale meteorology for input into pollutant dispersion models.

The meteorological modelling included selection of a representative year, TAPM modelling and validation, and CALMET modelling. This modelled climate was then compared with observational data to validate the model. Detailed methodology can be found within Appendix C1 *Air Quality Impact Assessment* (Katestone, 2024).

3.14.1.1. Wind speed and direction

The annual distribution of winds predicted by TAPM/CALMET for 2021 for the Study Area is presented in Figure 3-70. Winds across the Study Area are predominantly light to moderate (up to around 5 m/s) and from the north-northwest through to south. Winds from the east are less frequent. There are also a small number of higher speed winds from the northwest.

The seasonal breakdown of winds shows strong directionality between seasons. Summer shows almost entirely southerly winds, while winter shows a predominance of northeasterly winds. Spring and Autumn show more evenly distributed winds with, however, a slight dominance in southwesterlies (refer Figure 3-71).

The diurnal breakdown of winds shows that the strongest winds occur between 6 am to 6 pm during daylight hours, decreasing in the evenings. Winds from the western quadrants (from 180° to 360°) are dominant throughout the day (refer Figure 3-72).

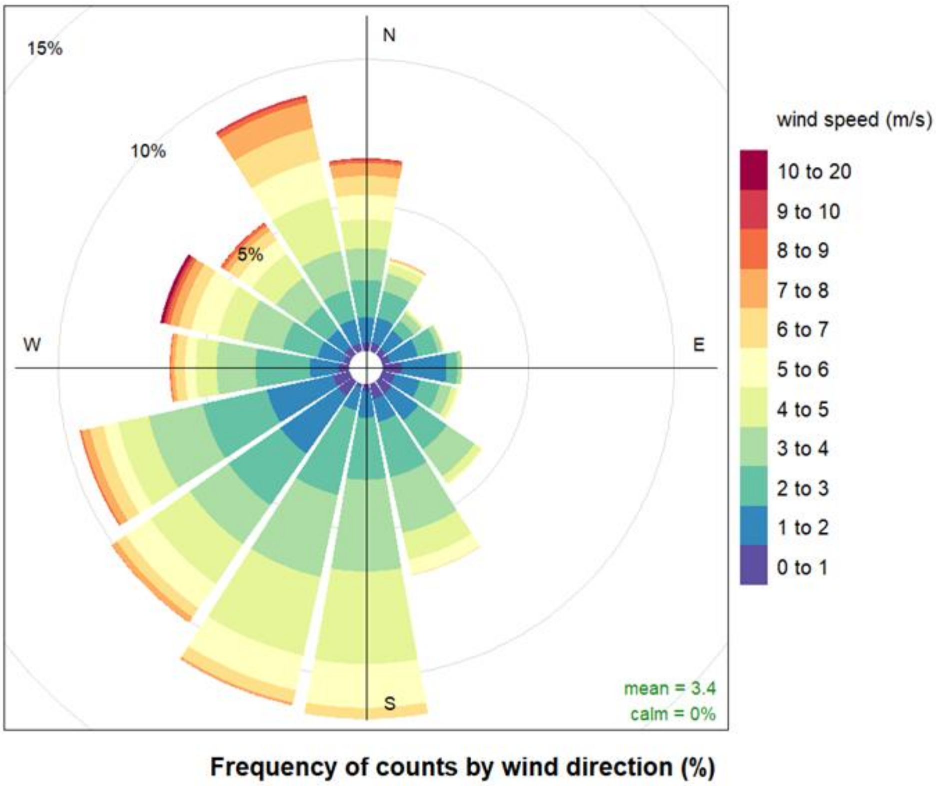

Figure 3-70: Annual distribution of winds predicted by TAPM / CALMET (Source: Katestone, 2024)

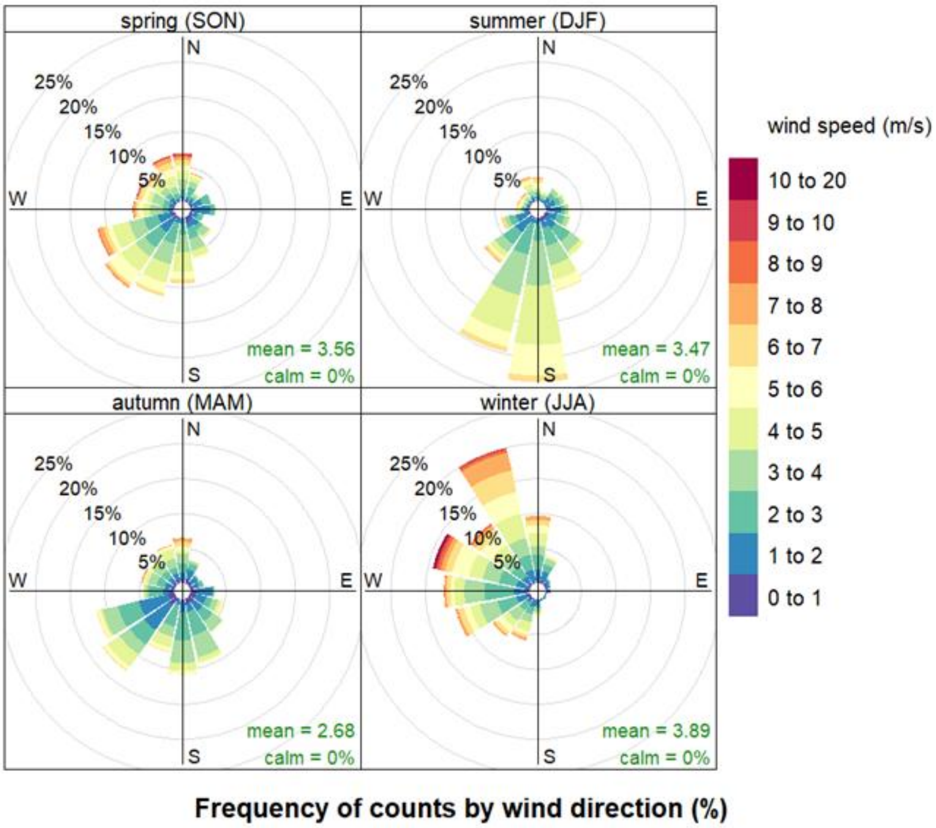

Figure 3-71: Seasonal distribution of winds predicted by TAPM / CALMET (Source: Katestone, 2024)

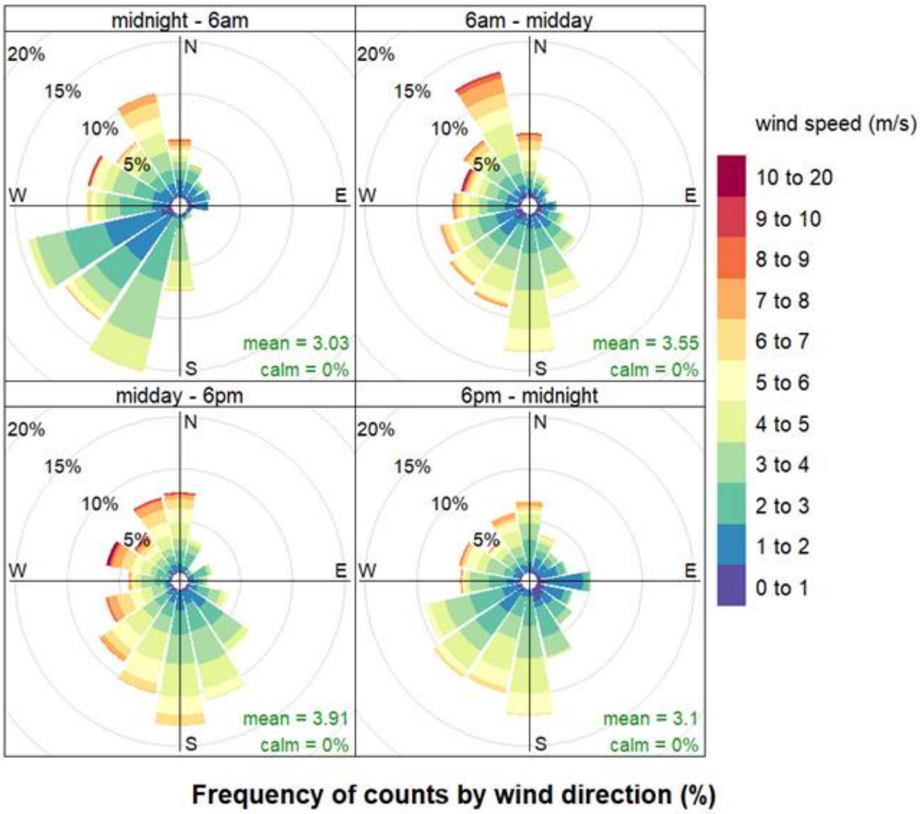

Figure 3-72: Diurnal distribution of winds predicted by TAPN/CALMET (Source: Katestone, 2024)

3.14.2. Sensitive receptors

The location of residences in proximity to the Project Area is discussed in Section 3.11.5.

There are also two primary ecologically sensitive areas near to the mine site including Pualco Range CP immediately to the west of the Site and the MNES MBC of the MDDB TEC area within the Site near to the Iron Peak pit activities.

3.14.3. Baseline air quality

The closest township to the Site, Yunta, is located 37 km to the north and there are no significant (in emission terms) commercial enterprises in that area, with emissions are being confined to vehicle traffic and expected fuel tank vent emissions.

There is a lack of human emissions sources within proximity to the Project Area, with no industrial activities (with the exception of minor emissions from the proponent's occasional exploration activities such as drilling, stockpiling, vehicle movements and unpaved roads) in the vicinity of the Project.

Local pastoral activities, including associated road travel are the main source of local anthropogenic emissions with minor combustion product emissions from vehicle and stationary energy, all of which are considered negligible. Additionally, traffic along roads along the HR and TL will also be a source of anthropogenic emissions, albeit on a small scale.

The only pollutants likely to have concentrations or deposition rates greater than zero in the Project Area are the ones related to particulate matter. All other baseline pollutant concentrations can be assumed to be not present due to a lack of emissions sources. A summary of the estimated air quality at the Project Site is shown in Table 3-42.

Table 3-42: Estimated air quality at the Project Site (Katestone 2024)

Pollutant	Value	Averaging period	Units
Total Suspended Particulate (TSP)	27	Annual average	µg/m³
PM_{10}	24	24-hour average	µg/m³
	16	Annual average	µg/m³
$PM_{2.5}$	8.1	24-hour average	µg/m³
	4	Annual average	µg/m³
Dust Deposition Rate	65.6	Monthly	mg/m²/day

3.14.4. Odour

The baseline odour environment in the Razorback Project Area is free from anthropogenic odour sources with the exception of localised odours associated with livestock around core pastoral activities (e.g., stockyards and dams). The Project Area is considered to have clean and generally odour-free baseline air quality. Existing Exploration Licence activities include some operations that have the potential to emit odorous material, specifically the management of wastewater and exhaust emissions from on-site diesel electricity generation, however these result in only occasional and localised odours, which due to the absence of sensitive receptors within close proximity, do not cause nuisance.

3.15. Noise

An overview of existing noise environment is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B9 *Existing Noise Baseline Assessment* (Sonus, 2022) and Appendix C7 *Noise and Vibration Assessment* (Resonate, 2024).

An independent review and baseline noise assessment survey was undertaken for the Project by Sonus in 2022 which consolidated the results of the noise assessment undertaken by Parsons Brinkerhoff in 2012, and updated by Resonate in 2023. As part of the Sonus noise assessment, continuous noise measurements were conducted for eight days and nights at four pastoral homesteads, to determine the existing noise environment, whilst Resonate undertook noise measurements at an additional three locations in 2023 (refer Table 3-43 and Figure 3-73). The noise monitoring locations were selected to measure noise data which would best indicate noise levels at sensitive receptors within the vicinity of the Site, HR and TL.

Table 3-43: Project noise monitoring locations (Sonus 2022 and Resonate 2023)

Year	Location Name	Latitude	Longitude
2022	S1 Forshaw	333214 m E	6358392 m S
	S2 Hillgrange	343652 m E	6362005 m S
	S3 Old Manunda	385542 m E	6357640 m S
	S4 Dry Dam Homestead (Tiverton Outstation)	374931 m E	6358075 m S
2023	NL1 Crocker Road, Hardy	330753 m E	6355524 m S
	NL2 Kia Ora Station, Warnes	358017 m E	6307835 m S
	NL3 Eurovale Outstation	341806 m E	6271021 m S

The baseline noise monitoring results showed existing noise levels are low due to the remoteness of the area, with no existing developments nearby. The current acoustic environment is dominated by natural sounds (i.e., wind in nearby trees, birds, and insects, and noise from distant traffic), with no significant noise outputs. Background noise levels of less than 20 dB(A) were recorded at times at all locations, with higher noise levels recorded during periods of higher wind, early morning (as typical from birds) and during the evening (when insects were likely present).

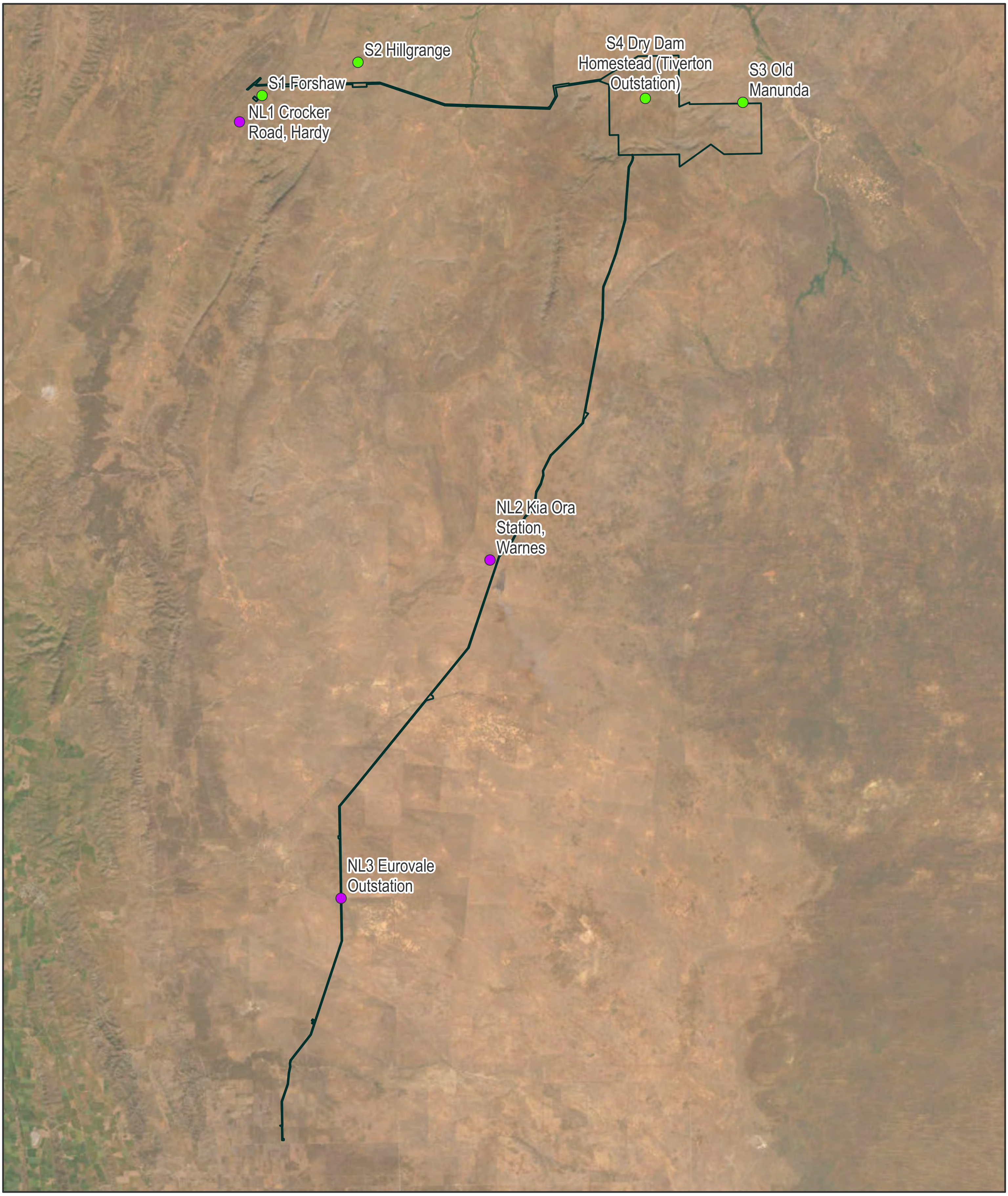

Figure 3-73: Noise monitoring locations

Project Area

Noise monitoring

2022 location

2023 location

0 10 20

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 18/12/2024

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3.16. Heritage (Aboriginal, European, geological)

An overview of heritage (Aboriginal, European and geological heritage) is described within this Section. For a more detailed discussion on baseline information please refer to Appendix C5 *Cultural Heritage Impact Assessment* (Linking Futures, 2024).

3.16.1. Aboriginal heritage

As discussed in Section 1.4.1, the Site, HR and northern section of the TL are situated within the Ngadjuri Nation #2 Native Title area (refer Figure 1-4) with Native Title rights held on behalf of the Ngadjuri Peoples by the Ngadjuri Nation Aboriginal Corporation (reference: SAD84/2022 (SC2011/002) Ngadjuri Nation #2 Determination - Determination Orders: p7-8).

The southern end of the TL is within the lands of the First People of the River Murray and Mallee Region, which is currently subject to Claim (reference: SC2019/001).

3.16.1.1. SA Register of Aboriginal Sites and Objects

The Central Archive, including the Register of Aboriginal Sites and Objects, is maintained by the SA Attorney-General's Department. The Central Archive contains confidential and non-confidential information regarding previously recorded Aboriginal heritage sites in SA and is a mechanism that identifies Aboriginal sites in an area prior to any development. A search of the Register in August 2024 returned several Aboriginal Heritage Sites within and proximal to the Project Area (refer to Appendix C5). It should be noted that the Register of Aboriginal Sites and Objects only includes those items and areas identified and recorded; it should not be inferred that heritage items and areas do not exist in other locations.

3.16.1.2. Ngadjuri Project engagement

A detailed account of engagement between MGT and Ngadjuri Nation, including key concerns and outcomes, is provided in Chapter 5.

3.16.1.3. Ngadjuri cultural heritage surveys

Contemporary survey activities have been completed to develop a cultural heritage baseline for the Razorback Project and/or to enable ground-disturbing activities for project development activities (i.e., resource/stratigraphic drilling).

MGT, with support from Ngadjuri Nation Aboriginal Corporation and Ngadjuri heritage teams, has completed approximately 3,500 ha of cultural heritage characterisation within the Project Area for the abovementioned purposes (refer Figure 3-74).

Phase 1 survey programs were initiated to support targeted exploration programs at Razorback and other surrounding prospects, and include:

1. Phase 2 Royal Resources Ngadjuri Aboriginal Cultural Heritage Survey: Access Clearance Survey at Razorback Project within EL4267 and EL3997. For Royal Resources Pty Ltd (ACHM, 2011).
2. Archaeological Assessment Clearance Survey, EL3927, EL3997 & EL4276 Razorback Region – SA Drill Lines and Access Roads. A report to Royal Resources Pty Ltd (Ironbark Heritage & Environment (IHE), 2012a).
3. Archaeological Assessment Heritage Clearance Survey Razorback Ridge Razorback Region – SA Drill Lines and Access Roads. A report to Royal Resources Pty (IHE, 2012b).
4. Archaeological Assessment Heritage Clearance Survey Razorback Ridge Razorback Region – SA Drill Lines and Access Roads. A report to Royal Resources Pty Ltd (IHE, 2012c).

Since 2021, Phase 2 program has included six independent heritage surveys performed across the Project Area to inform Project baseline information:

1. Ngadjuri Access Clearance Survey Report, Stage 1, Razorback Hill, SA. Confidential Report to the Ngadjuri Nation Aboriginal Corporation and Magnetite Mines Ltd (Bishop H. et al, 2022a).
2. Ngadjuri Access Clearance Survey Report, Stage 2, Razorback Hill Tailings Area, SA. Confidential Report to the Ngadjuri Nation Aboriginal Corporation and Magnetite Mines Ltd (Bishop H. et al, 2022b).
3. Ngadjuri Access Clearance Survey Men's Confidential Ethnographic Report, Magnetite Mines, Razorback Iron Ore Project, SA. Confidential Report to the Ngadjuri Nation Aboriginal Corporation and Magnetite Mines Ltd (SANTS, 2023).
4. Cultural Heritage Report, Magnetite Mines, Cultural Heritage Assessment, Drill Locations, Iron Peak, SA. Prepared for Magnetite Mines (Blackwood Heritage Consulting, 2021a).
5. Ngadjuri Access Clearance Survey Report, Iron Peak North, SA. Confidential Report to the Ngadjuri Nation Aboriginal Corporation and Magnetite Mines Pty Ltd (Liebelt, B. and Wimmer, M. 2022).
6. Cultural Heritage Report, Magnetite Mines, Cultural Heritage Assessment, Water Bore Locations, Braemar, SA. Prepared for Magnetite Mines (Blackwood Heritage Consulting, 2021b).

The above surveys have recorded archaeological and ethnographical data which is missing or incomplete from formal government records. The information provided by consultants and the Ngadjuri Traditional Owners has enabled a comprehensive platform upon which to consider the tangible and intangible heritage which may be directly or indirectly impacted by the Project.

Known Aboriginal heritage sites across the Project Area include:

- artefact scatters and isolated artefacts
- campsites and hearths
- rockholes and engravings
- rocky outcrops
- culturally modified trees

Sites that may have been used as burial sites have been identified during survey, however no direct evidence of burial sites has been recorded within the Project Area.

Intangible heritage values have also been recorded within the Project Area. Such ethnographic sites may be interconnected with significant regional landforms. The recording of dreaming stories/ song lines has provided a detailed understanding of the interconnectedness and three-dimensional understanding of the impacts to landforms, and understanding of concepts of place and space for Traditional Owners and community.

MGT acknowledges that cultural heritage information captured during the baseline heritage surveys remains the intellectual property of the Ngadjuri Nation, that certain information is confidential in nature and the right to publish this information is determined by NNAC according to lore and custom. As such, detailed information on the results of the surveys is not available in the public version of this document. Residual baseline characterisation of the Project Area will be completed with Ngadjuri heritage advisors prior to commencement of the Project. Further, southern sections of the TL will be assessed with representatives of the First Peoples of the Murray and Mallee #2 claimant group.

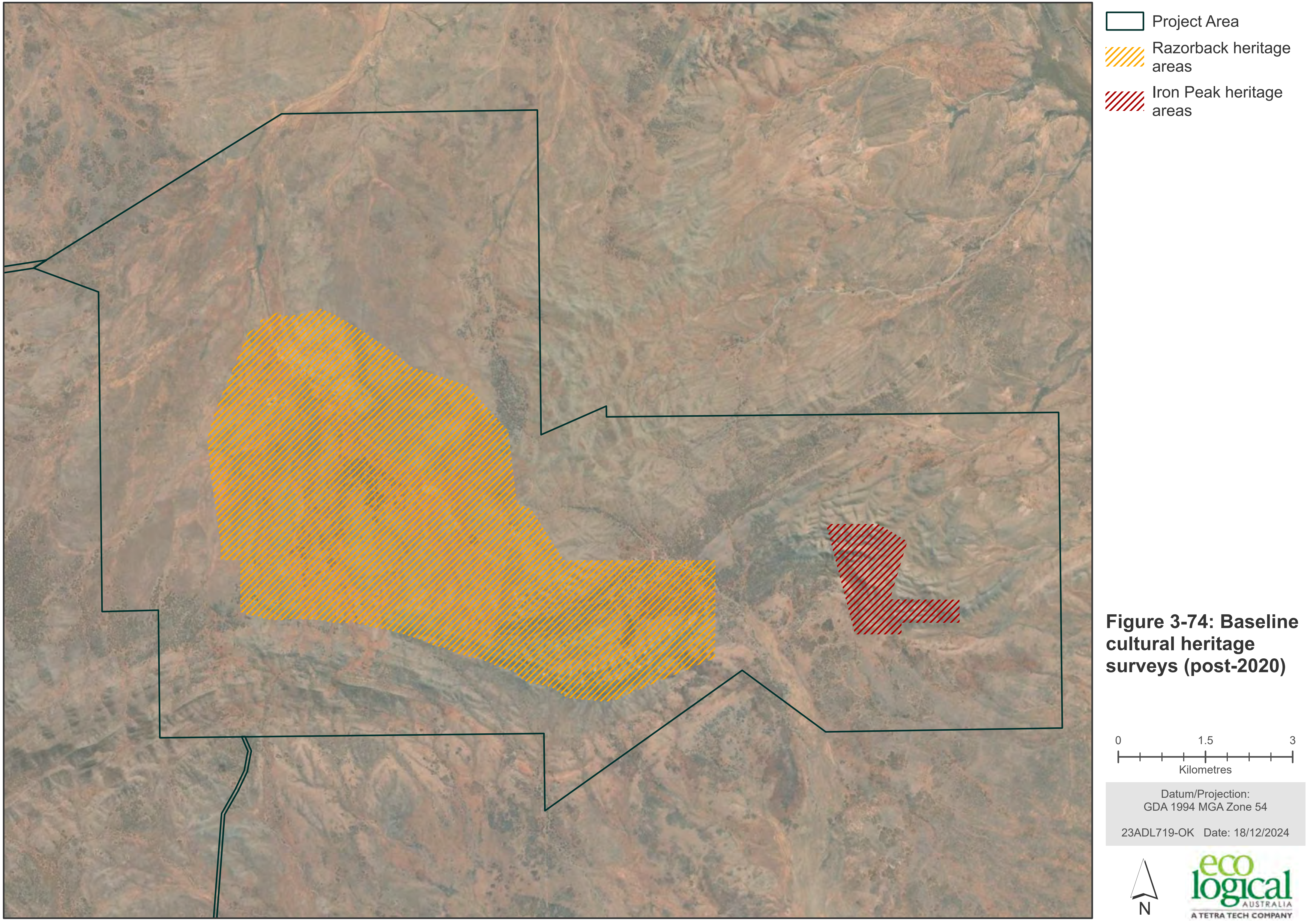

Figure 3-74: Baseline cultural heritage surveys (post-2020)

3.16.2. European heritage

The first settlements around the Project area occurred in the mid / late 19th century with the discovery of copper near Burra, and gold around Yunta. Alternatively, Peterborough was home for agricultural and pastoral activities. For more detailed information, refer to Section 3.11.1. However, the Project area has largely remained untouched and unexplored, until recently, when it began to be used for pastoral activities.

No European heritage surveys have been carried out within the Project area. Searches were undertaken using the following heritage databases for European heritage:

- UNESCO World Heritage List – for World Heritage Places
- the Australian Heritage Database – for World Heritage Places, National Heritage Places and Commonwealth Heritage Places
- the SA Heritage Places Database – for places of State and Local heritage significance
- the Register of the National Estate.

The above databases do not indicate any heritage places and items within the Razorback Project area that are protected under the *Heritage Places Act 1993* or the *Planning and Development Infrastructure Act 2016* (PDI Act), as shown in Figure 3-75.

The heritage listed sites in proximity to the Site are outlined in the table below. It is highly unlikely that any of these places will be directly affected by the Project as they are located well outside the Project Area.

Table 3-44: heritage listed sites

Heritage listed site	Description
Waukaringa Ruins	Approximately 73 km away from the Site
Mannahill Railway Station	Approximately 63 km away from the Site. Mannahill railway station is the heritage listed site nearest to the Site
Burra	Located approximately 30-40 km away from the end of the TL, Burra is declared as a state heritage town in 1993, with seventy places and one object on the Australian Heritage Register. Additionally, the Australian Cornish mine Sites: Burra and Moonta, were added to the National Heritage List in 2017 (DCCEEW, 2024). Burra retains many mid-nineteenth century buildings and structures from its days as one of the world's great copper producers.
Railway heritage at Peterborough	The Peterborough railway line was built in 1887 from Port Pirie to Broken Hill, approximately 85 km west of the Site. This railway held an immense economic significance for Port Pirie and SA, earning a place on the State heritage list.
Several homesteads on the west side of the TL	Several homesteads are linked to early constructions dating back to the 1850s

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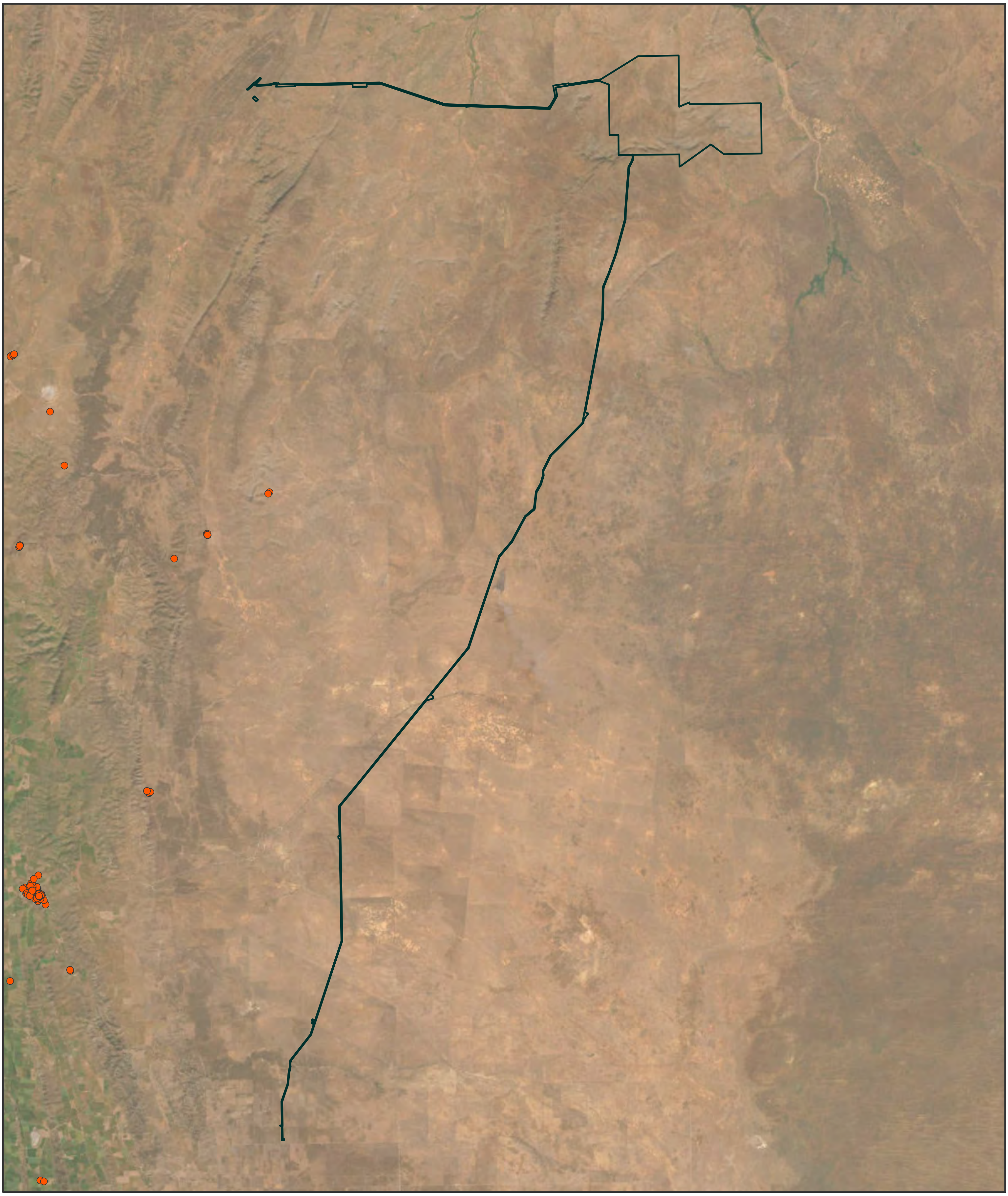

Figure 3-75: Historical heritage places

Project Area

Heritage survey places

0 10 20

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 19/12/2024

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3.16.3. Geological heritage

Geological heritage sites are features considered to be of such geological or physiographic significance that are worthy of preservation.

Razorback Ridge comprises a section through the thickest development of the Braemar Iron formation, and is considered a geological monument under the GSA (and as recognised by DEM). Razorback Ridge is considered as having one or more geological features and/or processes that are not shown elsewhere or with such clarity. Unlike living systems, geological monuments are not reproducible. A geological monument:

- provides illustration of geological features and processes that aid in the teaching of science at all educational levels and that are used for research references,
- preserve geological features that are representative, rare, or unique to science and
- preserve geological features that are of aesthetic, educational or recreational value to the general public.

The status of “geological monument” conferred on any site by the GSA does not give to that site any automatic protection. Legal protection can only come from a variety of laws which may be applicable to the particular place, or as provided by the State, National or International Heritage Registers. However, it has been outlined by the GSA that any future mining should take into account the need to retain important geological exposures in rehabilitation (GSA, 1981).

Investigations reveal that Razorback Ridge is not registered on the SA Heritage Places Database or the Australian Heritage Database.

As Razorback Ridge is outside of reserves created under the NPW Act, is not on the State or National heritage registers and is not identified in any known council development documents, it has no legal protection in addition to the provisions of the Mining Act, which are limited to the effects of exploration and mining operations.

3.17. Pre-existing site contamination and previous disturbance

3.17.1. Pastoral activities

Pre-existing site disturbances on and surrounding the proposed Project Area are primarily associated with low-intensity rangeland grazing and associated pastoral activities, including sheep and cattle, as well as grazing by feral animals such as goats. Pastoral-related infrastructure in the Project Area includes fencing, tracks, dams, sheds, water bores, pipelines, tanks, troughs and stockyards. A homestead sits within the Project footprint.

Feral goat populations are high in the region and are managed through mustering and trapping. It is noted that goat trapping has become a key source of revenue for some of the pastoralists. Grazing by stock and feral herbivores has resulted in disturbance and a reduction in the ecological value of the Project Area, as discussed in Section 3.8.4.

No known sites of contamination exist in the Project Area. A search of the Environment Protection Agency SA’s Site Contamination Index (including the Government of SA’s Location SA Map Viewer) did not reveal any previously listed contamination in the area.

There is very low potential for existing soil or groundwater contamination within the Project Area; however, given the historical land use, potential latent contamination sources could include historic or current sheep dips, and historic waste disposal pits.

3.17.2. Exploration and resource assessment activities

3.17.2.1. Exploration by SA Mines Department

The SA Mines Department constructed an adit and horizontal shaft into the northern face of Razorback Ridge in 1962. Located on Ti Tree Station, the horizontal shaft extends for approximately 130 m southwards and was completed to enable assessment of the magnetite resource (refer Figure 3-76 and Figure 3-77). A large spoil pile, extending more than 50 m northwards from the adit (and 12 m wide and up to 5 m in height), and access track were left unrehabilitated (refer Plate 3-9). The adit will be mined as part of Project activities.

No contamination arising from this activity has currently been identified.

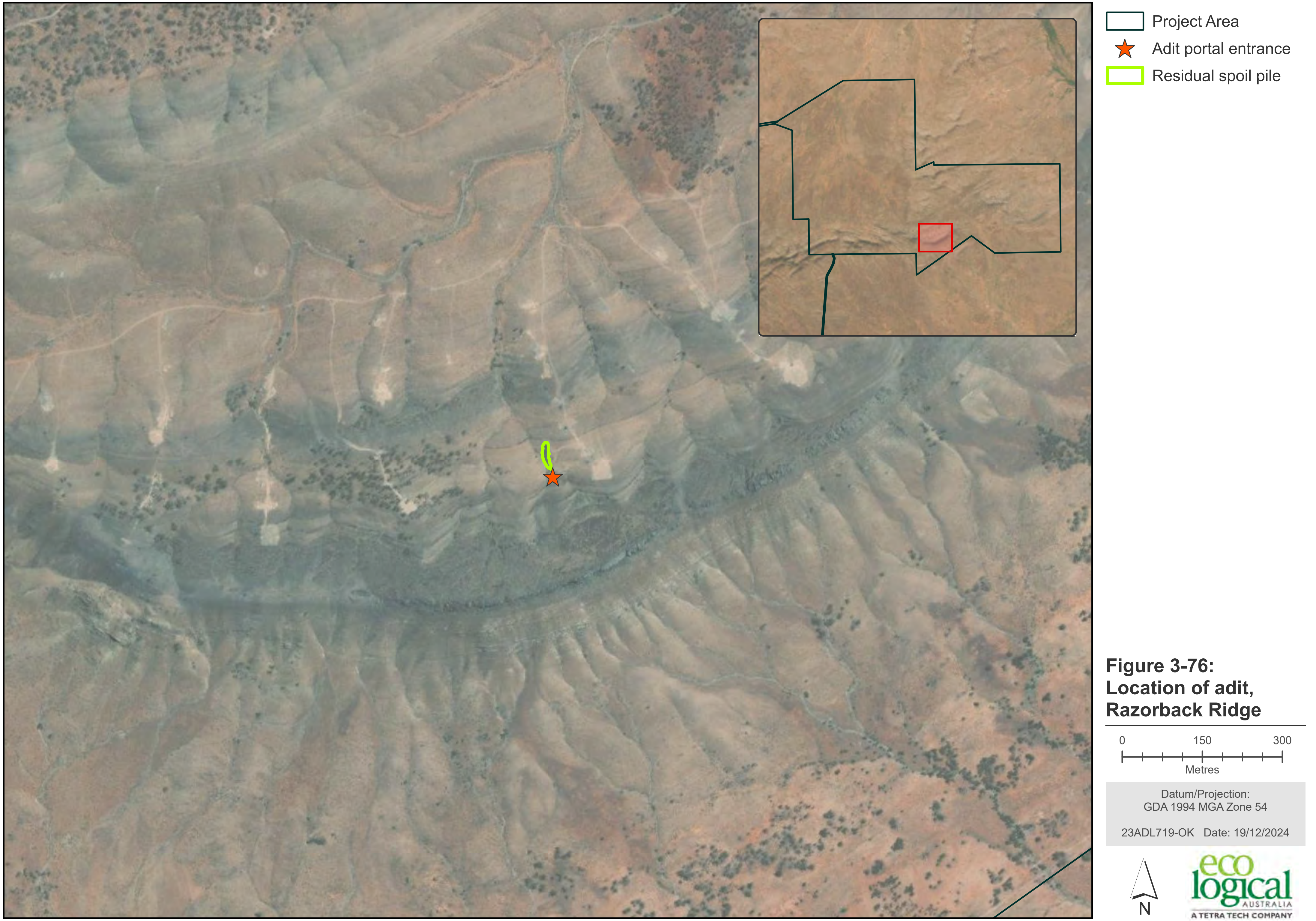

Figure 3-76: Location of adit, Razorback Ridge

Plate 3-9: Adit and residual stockpile, Razorback

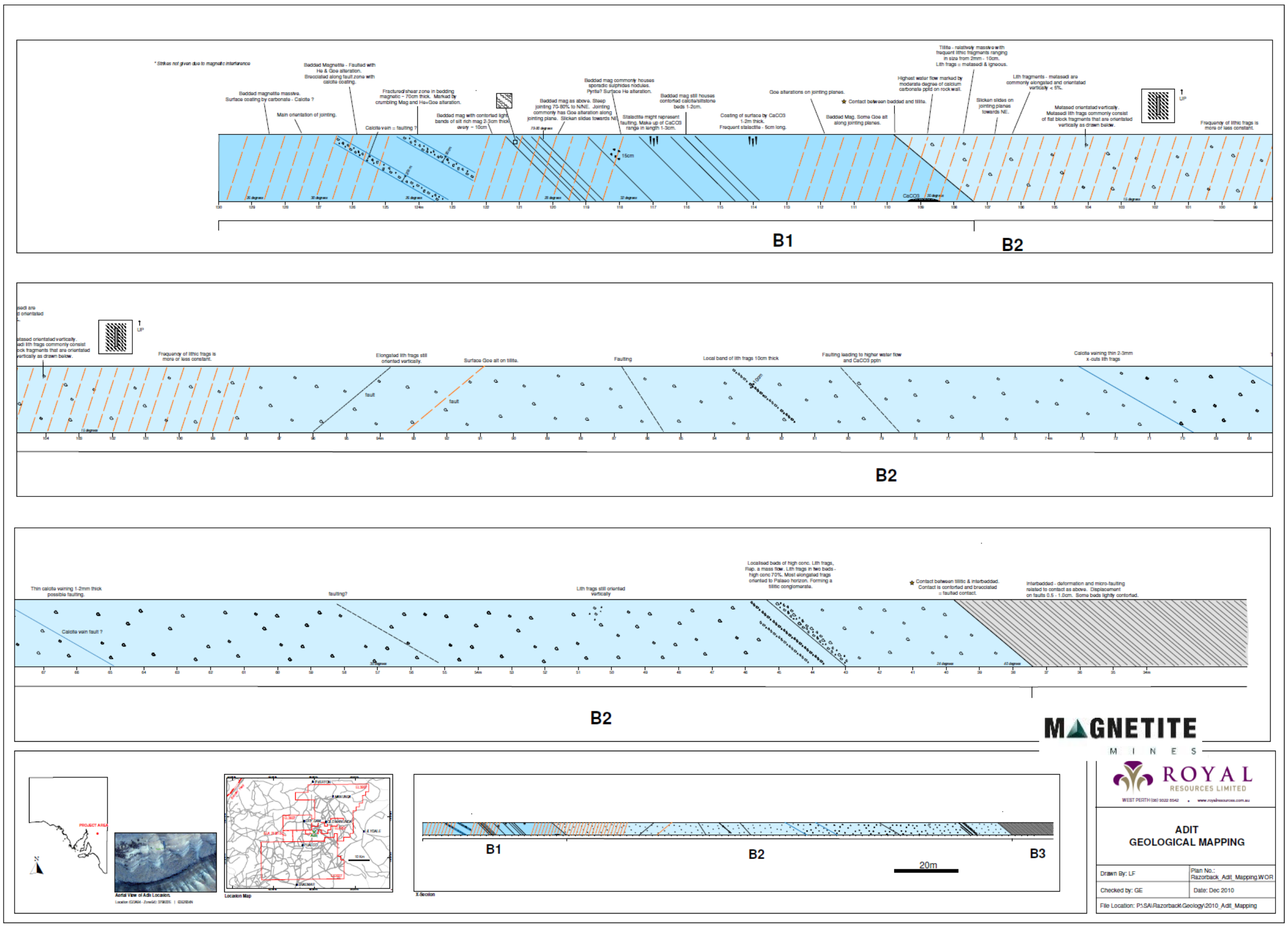

Figure 3-77: Geological map of adit/horizontal shaft, Razorback

3.17.2.2. Exploration by Magnetite Mines

During MGT's tenure, approved exploration programs (refer to Appendix A2 *Exploration drill holes records*) have resulted in 278 sites of disturbance (refer Figure 3-78). Rehabilitation of these sites has been undertaken in accordance with M33 - Statement of environmental objectives and environmental guidelines for mineral exploration activities in SA. Relevant sites are subject to ongoing monitoring.

No known sites of contamination exist in the Project Area as a result of MGT's exploration activities. Any minor hydrocarbon spills that have occurred throughout MGT's tenure have been reported using the incident reporting system. Any affected soils were removed from site and disposed of at a registered waste handling facility to mitigate the potential for any continuing contamination concerns.

The Project Area has also been exposed to limited additional disturbance associated with the exploration activities (e.g., tracks, drilling activities, exploration camp facilities). There are no known or identified potential sources of contamination and resulting from the limited exploration activities undertaken to date.

MGT currently maintains a temporary exploration camp at Razorback to support exploration and interim activities. The camp is permitted under the Mining Act.

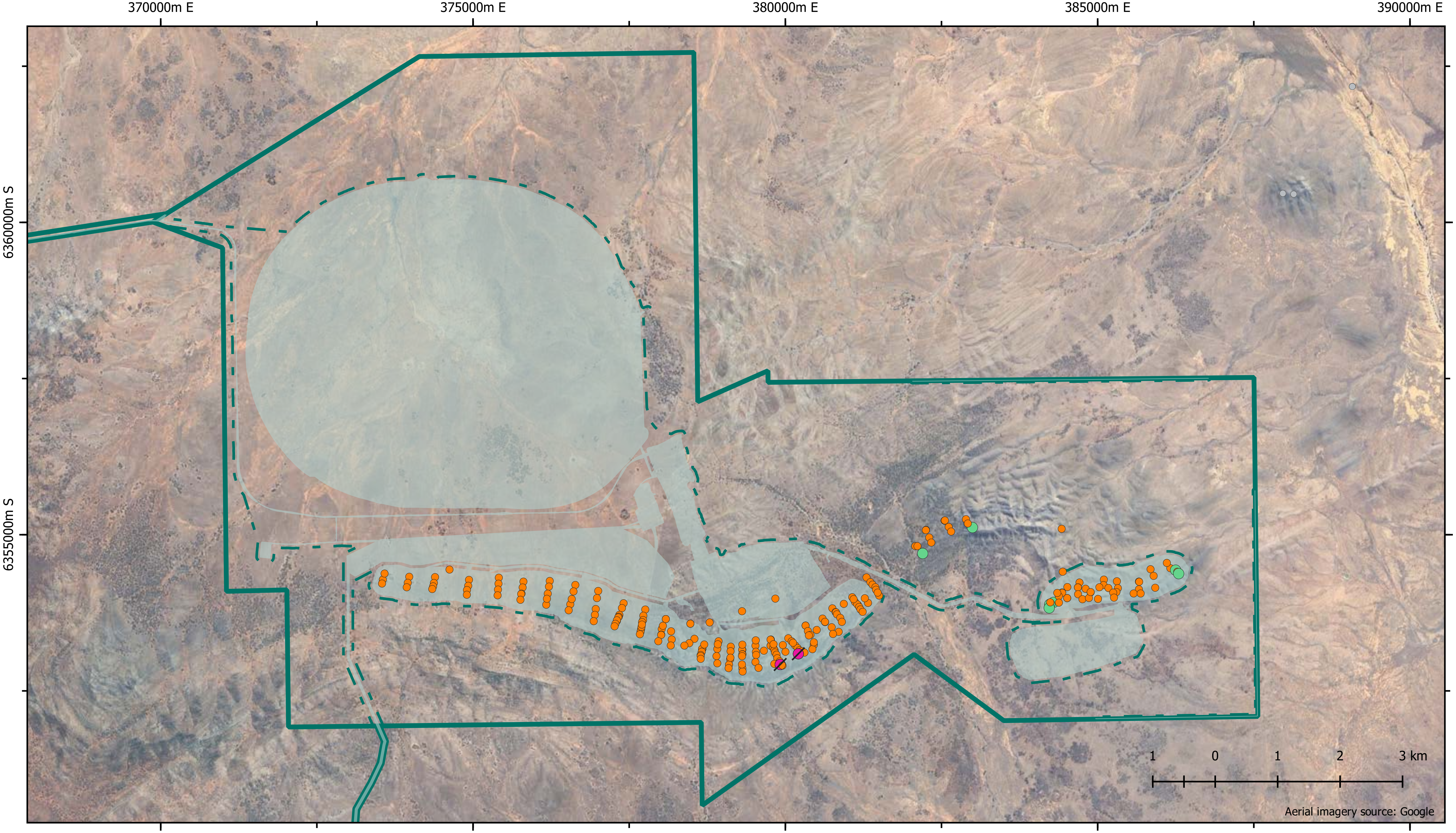

Figure 3-78: Location of drilling activities undertaken with the Site by MGT and others

Project Area
Conceptual Footprint
Disturbance Footprint

Activities in Project Area
- Mintech Resources Pty Ltd
- SA Department of Mines and Energy
- MGT
- Holes with geostratigraphy

Other regional exploration
- Mineral drillholes
- Drillholes with geostratigraphy

GDA 1994 MGA Zone 54 | 1:85,000 @ A4
Author: A Kane | Date: 14/01/2025
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Chapter 4

Description of the proposed operations

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

Chapter 4 presents a detailed description of the Razorback Iron Ore Project operations, including all phases of proposed activities such as construction, commissioning, operations, rehabilitation and closure. Information is included on all elements including mining method and extent of workings, and extent and method for mine waste management.

This Chapter includes a detail of the options analysis and associated multi-criteria analysis for key aspects of the Project such as the tailings storage facility, transport options, HR and TL locations.

Any design and operational measures for controlling and managing the environmental impacts such as option selection to reduce potential impacts on receptors and eliminate or reduce a hazard are included in Chapter 4, whilst a detailed impact assessment is shown in Chapter 7 of this document.

4. Description of the proposed operations

4.1. Summary of operations

The Project is centred on the greenfield development of the Razorback and Iron Peak deposits. With a target production of 5 Mtpa of dry, high-grade iron concentrate for the international steel market, the concentrate is particularly suitable for direct reduced iron-electric arc furnace (DRI-EAF) steel production and an essential input into the production of 'green steel'.

The high-grade iron ore concentrate will include a range of product grades, typically greater than 65% Fe and including Direct Reduction Pellet Feed (DRPF)-grade concentrate of >68.5% Fe and <25% silicon dioxide (SiO_2) + aluminium oxide (Al_2O_3). MGT will have the flexibility to produce concentrate grades within this range to meet changing market and customer demands.

The deposits will be mined as open cut pits, with ore extracted through conventional drill and blast and truck and shovel methods, providing an average annual process plant ore feed rate of 35 Mtpa, varying as a function of ore body grade variability and stripping ratios.

A progressive mining and pit development sequence will commence at Iron Peak for the initial mining period (Mining Years 1–12), given its higher in-situ iron ore and mass recovery grades that provide early project value. Mining will move to the Razorback pit (Mining Years 12–38 on current design), with potential for mining up to Year 56 (subject to further approvals) with appropriate tailings storage increases within the current footprint.

Waste rock, which includes overburden and low-grade ore that falls below the magnetite cut-off minimum grade, will be placed primarily within permanent waste rock dumps (WRDs), and also used in construction, geotechnical and rehabilitation applications.

Ore will be processed using established (conventional) technologies and processes inclusive of:

- two stages of crushing
- two stages of grinding and magnetic separation
- reverse flotation
- final fine grinding and cleaner magnetic separation scavenger circuit, with tailings and ore concentrate as the primary outputs.

Tailings will be disposed to a single LOM Central Thickened Discharge (CTD) TSF. Coarse sand tailings material will be used to construct perimeter and internal TSF embankments with fines material, and surplus coarse material, deposited within the TSF impoundment area.

Concentrate will be transported via a dedicated site access and haulage road to the Hillgrange RS for rail loading and transport via the Broken Hill to Port Pirie railway line initially to the Port of Whyalla for export to end markets. MGT previously has announced (MGT, 2023d) a port services MoU was signed with Whyalla Ports Pty Ltd, owner of the Port of Whyalla, that contemplated receival (via rail) and storage of magnetite concentrates, materials handling, transhipment and ship loading via self-discharging barges at the port.

Other export facility options are also available (i.e. Port of Adelaide, Port of Port Pirie), and will be considered across LOM subject to service capacity of all port options. A MoU with Flinders Ports was also signed (MGT, 2023e) to consider alternative port options, inclusive of existing port facilities (which are accessible via existing rail connections) or greenfield developments.

The principal Project elements within the ML are presented in Figure 4-1, while the broader Project layout is shown in Figure 4-2.

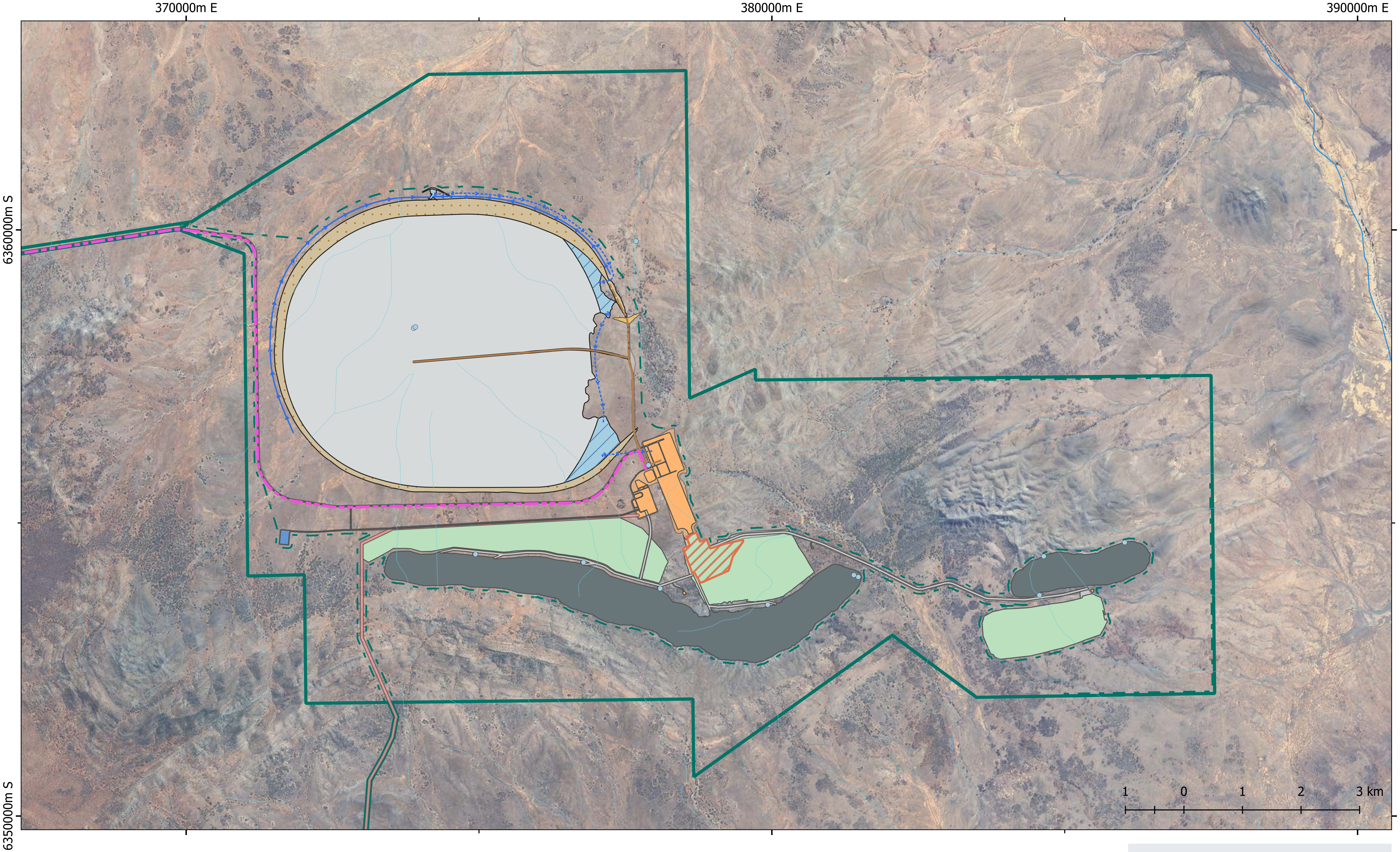

Figure 4-1: Proposed Mining Lease and principal project elements

Project Area
Conceptual Footprint

Watercourses
Major
Minor

Water supply
Groundwater bore site (ind.)
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Accommodation camp

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile

Ultimate TSF infrastructure
TSF Toe drain (with flow direction)
TSF Decant pipelines (with flow direction)
TSF Tailings slurry pipeline
TSF Coarse sand pipeline
TSF Spigot access pier/road
TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond
TSF Tailings beach extent
TSF Spillway
TSF Embankment

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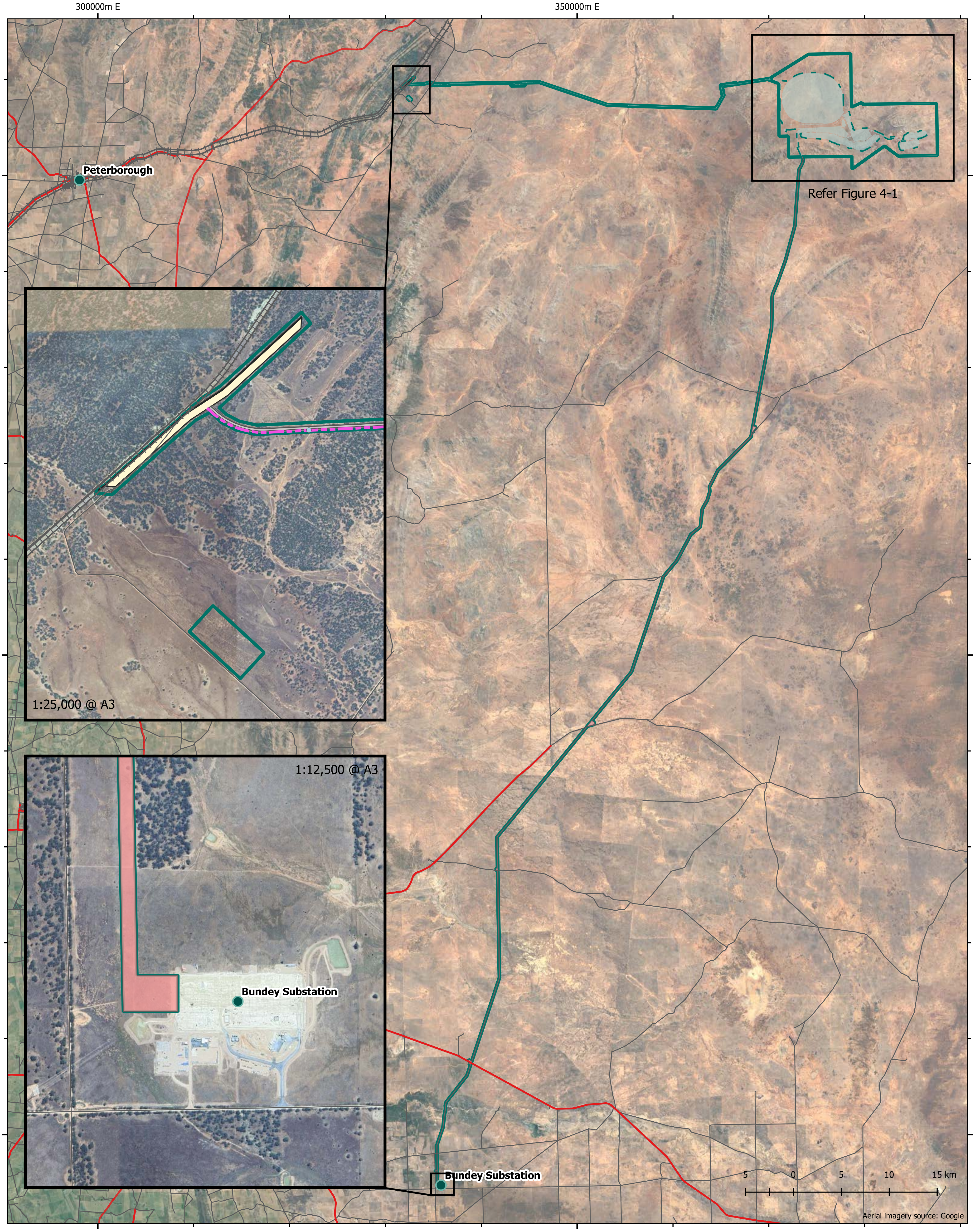

Figure 4-2: Project layout including activities within proposed MPLs

Project Area
Disturbance Footprint
Conceptual Footprint
Localities

Existing railways
Existing roads
Main
Local

Primary facilities
Transmission line corridor
Rail siding
Siding corridor
Siding hardstand
Siding batters

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4.2. Consideration of options

4.2.1. Mining, processing and mine wastes

Relevant options considered for mining, processing, mine waste management, and supporting infrastructure are provided below.

4.2.1.1. Mining

Several mining production scenarios have been considered for the Project as part of iterative production scale and mining methodology assessments. All assessed options considered the use of open pit mining methodologies owing to the bulk nature of the deposit and the high productivity (mining rate) required to meet the target high-grade iron concentrate production rate.

Open-pit mining methodologies investigated included:

- in-pit sizing and conveying (IPSC)
- selective mining techniques
- conventional drill-blast and truck-shovel (base case).

These options have significantly different outcomes in terms of material handling and sequencing of waste material produced from the ore deposit, and hence cost.

IPSC considered the use of a mobile or semi-mobile crusher in-pit, in conjunction with a mobile conveyor system. This option was ultimately discounted owing to the unfavourable pit geometries (depth and pit wall angles) and high capital costs associated with this technology.

The selective mining option considered more targeted, low-heave blasting techniques to limit material mixing during blasting and the selective targeting of high-grade stratigraphic units and high-grade strata bound mineralisation to improve ore grade presenting to the processing plant. By increasing mining selectivity through increased cut-off grades, lower bench heights or smaller mining widths, better grades are theoretically achieved though at the expense of increased non-preferential lower-grade ore and waste material sent to stockpile. This option was ultimately discounted given the future cost to re-handle this material.

Conventional ‘truck and shovel’ mining was ultimately selected based on a ‘bulk mining’ strategy targeting a lower but consistent ore cut-off grade and providing lower cost of production by minimising material re-handle and improving operational efficiency. This option is also favourable given the nature of the ore bodies and optimised pit geometries which suit a conventional truck and shovel mining fleet and provide reduced ore haulage distances from pit the run-of-mine (ROM) even as pit shells expand spatially and with depth. Further, the mining fleet is easily scalable with changes in mining production. Detail on the mining method is provided in Section 4.5.

Underground mining was not considered given the at-surface, outcropping nature of the deposits and overall depth of ore – with both scenarios rendering underground mining methodologies unsuitable.

4.2.1.2. Processing

Various standard magnetite beneficiation processes were considered as part of early scoping, pre-feasibility and value engineering and optimisation studies, informed by extensive mineralogical and geo-metallurgical test-work programs. The type and combination of equipment and beneficiation methods considered included:

- high pressure grinding roll (HPGR)
- vertical roller mill (VRM)
- semi-autogenous grinding (SAG)
- ball milling
- low intensity magnetic separation, including dry- and wet-magnetic separation options, and
- various types of flotation cells and regimes.

The combination of beneficiation methods and equipment types resulted in several potential processing flowsheets, which were assessed in terms of technical, infrastructure requirements, environmental considerations and cost.

A conventional flowsheet involving grinding and wet magnetic separation was ultimately chosen due to technically suitability / maturity and economic performance. Key rationale is provided below.

- Two-stage grinding with HPGR-Ball mill was selected as the most technically robust and economically favourable grinding solution.
- Dry magnetic separation was rejected in favour of wet magnetic separation due to the low amenability of this ore to coarse cobbing, and immature technology for fine magnetic separation.
- Conventional flotation cells and reverse silicate flotation was chosen over novel flotation cells and direct flotation due to technical performance and robustness.
- Additional hematite beneficiation was considered and tested, but due to the fine-grained nature of the hematite within the orebody, was found to be unprofitable.

4.2.1.3. Tailings

Several tailings deposition / placement methodologies and numerous potential TSF locations have been assessed to-date as part of previous pre-feasibility and optimisation studies.

These prior studies evaluated a range of different annual ore concentrate production scenarios (between 2.5 – 10 Mtpa concentrate production), and potential process plant and infrastructure configurations, meaning that the associated TSF and tailings options differed markedly in terms of their required storage capacity, location and means of construction and operation. Notwithstanding, the assessment of each option considered the following common but key criteria, in no particular order:

- design – spatial footprint, use of topography, storage efficiency, ability to stage and scale
- safety – geotechnical risk and hazard to community
- design – storage efficiencies, water recovery and costs.
- economics – operating efficiency, potential for staged development and future expansion
- water – potential impacts to surface waters and groundwater
- ecology – potential impacts to listed species and / or TECs
- social – impacts to landowners, land accessibility and cultural heritage.

An overview of the various iterations of the TSF and tailings options is provided below. In-pit disposal of tailings is also discussed in Section 4.2.1.4.

Noting that this MLP is based on a 5 Mtpa production setting, the enclosed MCA (Appendix E) has only evaluated the 5 Mtpa tailings options.

9.3 MTPA PRODUCTION TSF (2010-2013 INITIAL PRE-FEASIBILITY STUDY (PFS))

The initial design for the 'South-West TSF' included a 6-cell TSF (solar drying dam configuration) located to the south of the mining operation, based on a processing plant location south of the Iron Peak and Razorback deposits (refer Figure 4-3). The Project, in 2010 to 2013, was initially designed for a 6.2 Mtpa production setting, with a flow sheet optimised for hematite recovery. Subsequently, the PFS scope was expanded to consider a 9.3 Mtpa production setting to take advantage of economies of scale.

The South-West TSF assumed conventional wet tailings deposition, with design incorporating a 40 m-high embankment, footprint area of 2,860 ha and a capacity of 850 Mt for a 25-year LOM. The TSF was designed to operate at a solids concentration of 66% by weight.

This TSF option was ultimately not carried forward due to a change to 5 Mtpa concentrate production setting during PFS optimisation studies in 2022 / 2023, though the following key issues also applied:

- spatial footprint overlapped with a Commonwealth-listed Mallee Bird TEC
- high civil construction costs of construction (~ $615 M)
- lack of site-won embankment construction materials – requirement for material import for construction
- large footprint, complex design and distance from mining operations increasing operational costs and
- additional stakeholder impact and requirement to purchase additional land outside of target mining area.

2.5 MTPA PRODUCTION TSF (2021 PFS)

A second PFS completed in 2021, for a 2.5 Mtpa production setting, considered two potential TSF locations located broadly south-east of the Razorback and Iron Peak deposits (refer Figure 4-3). The two options were presented by:

- Hatch Engineering ('South-East TSF - Hatch')
- PSM Engineering ('South-East TSF - PSM').

Both options assumed conventional wet tailings disposal, with embankment construction using the coarse sand tailings material and fine tailings disposal into the established impoundment area.

Operational differences among proposed TSF strategies included discharge points, water recovery methods, and embankment construction techniques, each with associated capital and operating costs.

Neither option was ultimately carried forward due to a change to 5 Mtpa concentrate production setting during PFS optimisation studies in 2022 / 2023, though the following key issues also applied:

- High operating costs:
  - distance from mining operations increasing operational costs
  - requirement for multiple downstream embankment lifts to accommodate tailings during the LOM under the PSM option
  - engineering complexity.
- Environmental:
  - Hatch option overlapped with a Commonwealth-listed Mallee Bird TEC
  - proximity to major ephemeral drainage line.
- Other:
  - additional stakeholder impact and requirement to purchase additional land outside of target mining area.

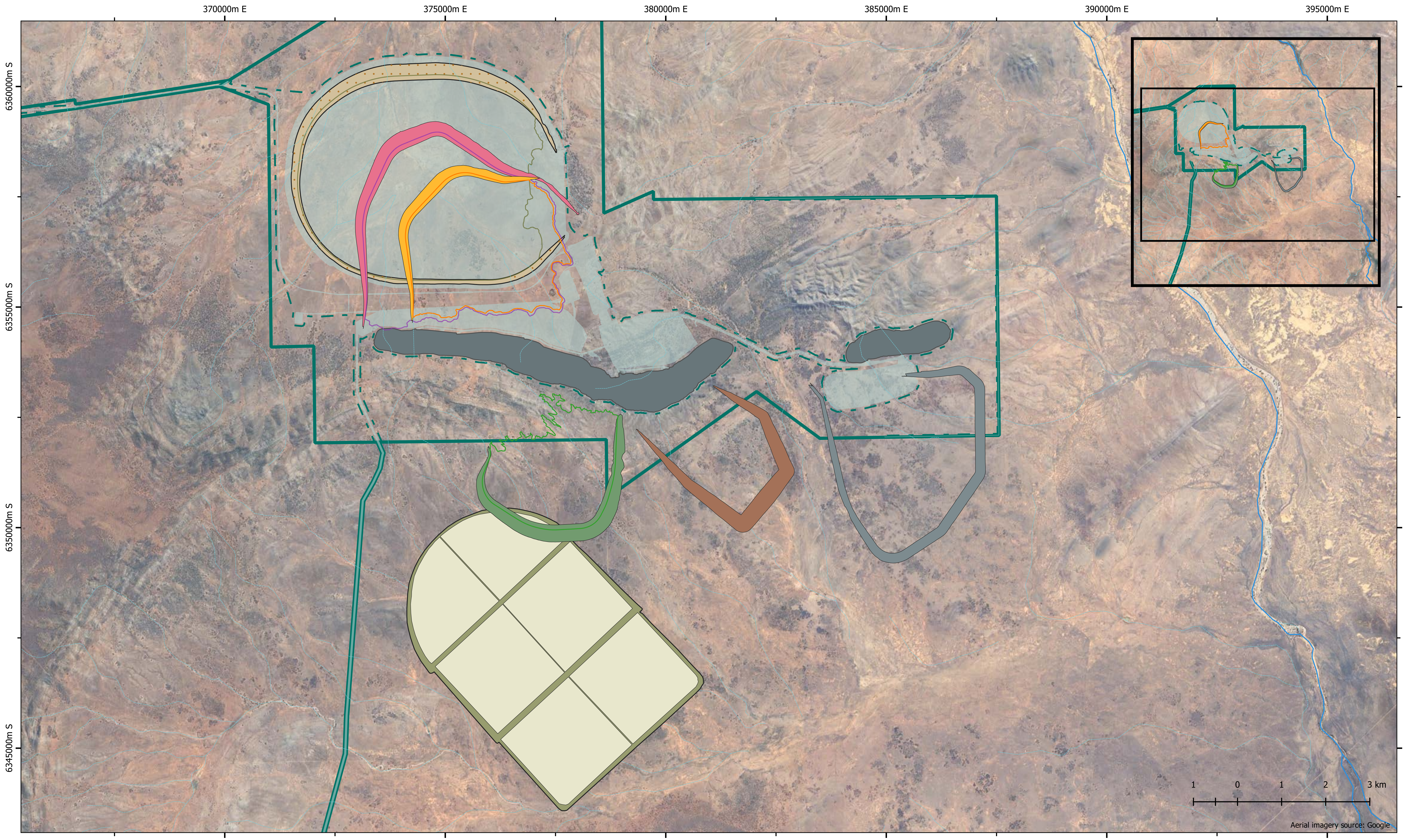

Figure 4-3: Location of assessed TSF options, 2013-2022 study programs

Project Area
Disturbance Footprint
Conceptual Footprint
Watercourses
Major
Minor

Mine and stockpile infrastructure
Mine pit
Ultimate TSF infrastructure
TSF Embankment

2022 'Go-forward' DFS (2.5 Mtpa) TSF design (Hatch)
TSF Embankment
TSF Tailings beach extent

2022 Preliminary DFS (2.5 Mtpa) TSF options (Hatch)
North-East concept TSF Embankment
North-East concept TSF Tailings beach extent
South-East concept TSF Embankment
South-East concept TSF Tailings beach extent

2021 PFS TSF options
South-East TSF - Hatch
South-East TSF - PSM
2013 PFS 9.3 Mtpa TSF
TSF Embankment
TSF Cells

GDA 1994 MGA Zone 54 | 1:80,000 @ A3
Author: A Kane | Date: 31/01/2025
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DRY-STACKED TAILINGS SOLUTIONS (2021 PFS)

Dry-stacked tailings represent an advanced method of tailings management that involves the dewatering of tailings to produce a solid, stackable material. This method is favoured for its environmental and safety advantages, including advanced water recovery, decrease of geotechnical hazard, and smaller environmental footprint when compared to conventional TSFs; however, the economic and technical feasibility of dry-stacked tailings is highly dependent on site-specific factors, including ore characteristics, plant throughput, and water recovery requirements.

The low mass recovery nature of the Project's deposits results in a particularly high tailings-to-product ratio (6-7:1). Given the anticipated ore processing rates, this means that for every tonne of iron ore concentrate produced, a volume of 5-6 t of fine-grained tailings must be managed. Achieving the necessary moisture content for dry stacking presents a significant challenge due to the ultra-fine particle size distribution, which negatively impacts the efficiency of mechanical dewatering processes such as filtration.

Filtration, required for dry stack tailings, is highly energy-intensive, incurs megawatt-scale power consumption and ongoing maintenance of critical components like filter cloths and high-pressure pumps, adding to operational costs. Additionally, dry stacking necessitates specialised material handling and compaction equipment, increasing complexity, workforce requirements and the need for dust suppression to mitigate wind erosion. These factors compound the financial and technical burden, making dry-stacked tailings significantly the least efficient and most expensive than most other alternative methods (i.e., conventional wet tailings, and thickened tailings). Given the low mass recovery of the Razorback and Iron Peak deposits, the additional costs of a large filtration plant would substantially impact project economics, potentially rendering the operation unprofitable and threatening its overall financial viability.

While dry-stacked tailings offer clear safety and environmental advantages, the combination of high tailings throughput, fine particle size, filtration plant costs and excessive energy demand makes this solution technically-challenging and economically-prohibitive for the Project. The current CTD TSF represents an excellent balance of low initial capital costs, improved water recovery over traditional conventional wet tailings dams and reduced geotechnical risk owing to embankment design that utilised processing waste streams (classified sands), while maintaining financial and technical viability.

5 MTPA PRODUCTION TSF (2022 PFS)

In 2022 a third PFS was undertaken based on a 5 Mtpa ore concentrate production setting, which is the basis of this MLP.

The change to a 5 Mtpa production setting included siting of the process plant precinct and ROM pad to the northern side of the Razorback deposit to reduce ex-pit ore haulage distances and leverage associated production and cost efficiencies. In parallel, tailings geotechnical characterisation studies identified the ability to use the coarse fraction of the tailings to construct the tailings embankment, providing the ability to decouple the TSF from the pit locations, greater flexibility in potential TSF site selection and reduced capital construction cost.

Three 5 Mtpa TSF options were identified in the 2022 PFS, on the northern side of the deposits, two located in the same general area immediately north of the new processing plant location but with different tailings deposition methods, and another located further to the north-east (Table 4-1 and Figure 4-4).

Table 4-1: Razorback Project – Assessed TSF options and design basis

Option	Design and Operating Basis
Option 1A – ‘North-West TSF’	• 5 Mtpa concentrate production • embankment construction using coarse sand tailings material • conventional wet tailings deposition – spigot/ outfall discharge from embankment(s) into the impoundment area
Option 1B – ‘North-West CTD TSF’	• 5 Mtpa concentrate production • embankment construction using coarse sand tailings material • CTD tailings method for increased consolidation of deposited fine tailings and water shedding and recovery
Option 1C – ‘North-East TSF’	• 5 Mtpa concentrate production • embankment construction using coarse sand tailings material • conventional wet tailings deposition – spigot / outfall discharge from embankment(s) into the impoundment area

A detailed multi-MCA comparing the three 5 Mtpa TSF options is presented in Appendix E. Options were compared against fourteen (14) representative criteria spanning economic, technical, environmental and social aspects and applying the rank sum normalised weighting methodology. The assessment criteria and scoring framework were adapted from the QLD Department of Transport and Main Roads (TMR) ‘Smarter Solutions – Multi-Criteria Analysis Tool – User Guide’ (TMR, 2019) and Guidelines for the assessment of alternatives for mine waste disposal (Environment Canada, 2024).

Option 1C (‘North-East TSF’) was discounted given primarily due to greater distance from the processing plant relative to the other options (higher operating cost and greater supporting infrastructure footprint [and resultant impact]). The valley fill construction method was also likely to involve greater geotechnical complexity and cost, less potential for expansion, and environmental constraints (land clearing, proximity to Manunda Creek and increased rehabilitation complexity and risk).

Options 1A and 1B consider a similar location and footprint, with their differentiation and suitability primarily related to the method of tailings disposal (conventional wet tailings versus CTD, respectively). Compared to conventional wet tailings which involves tailings disposal from the perimeter embankment, CTD involves tailings discharge from a single spigot in the centre of the impoundment area, which is raised gradually over the life of the TSF to accommodate increases in elevation. This creates a conical tailings beach radiating outwards toward the downstream containment embankments, improving drainage and decant water recoveries and providing improved consolidation of deposited tailings and reduced seepage compared to conventional wet disposal.

Per the MCA (Appendix E), Option 1B (‘North-West CTD TSF’) has been selected for the Project. Key advantages over Option 1A are as follows:

- Lower operating cost, primarily associated with reduced water losses and improved water recoveries (reduced make-up process water costs) compared with conventional wet tailings.
- Greater ability to stage the construction of the embankment and impoundment area in line with mine development, providing operational and production flexibility aligned with market economic conditions and potential mine expansion.
- Lower potential for seepage losses to and adverse impacts on groundwater and surface waters given lower relative moisture content in CTD tailings compared with conventional wet tailings deposition.

- CTD tailings deposition method provides improved consolidation of fines materials, reducing potential for future landform subsidence or differential settlement and earlier opportunity for progressive rehabilitation and staged closure (increased amortisation of closure costs during operations phase).
- Following the above point, CTD tailings deposition method is likely to allow reinstatement and return of the original (pre-mining) landform sooner in the overall project life cycle, with less potential for final landform erosional and geotechnical instability.

Detail on the CTD TSF facility and disposal methodology is provided in Section 4.7.2.

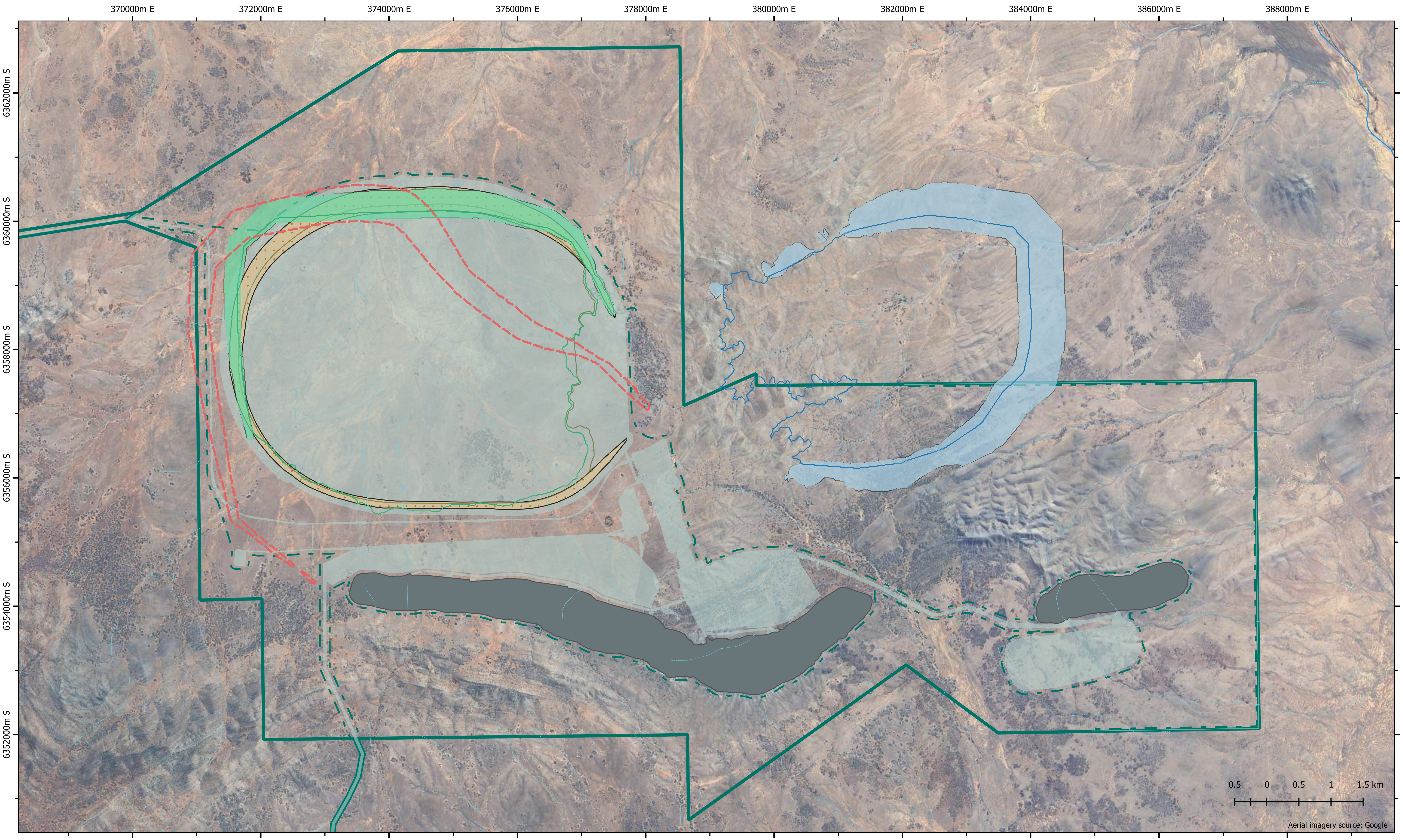

Figure 4-4: 5 Mtpa TSF options - 2022 PFS and Optimisation Studies, with proposed ultimate TSF extent

Project Area
Disturbance Footprint
Conceptual Footprint
Watercourses
Major
Minor

Mine and stockpile infrastructure
Mine pit
Ultimate TSF infrastructure
TSF Embankment

North-East Conventional Wet TSF option
NE Wet TSF Embankment
NE Wet TSF Tailings beach extent

North-West TSF options
NW CTD and Wet Conventional TSF Embankment (unoptimised)
NW CTD and West Conventional TSF Tailings beach extent
Early concept alternative Wet TSF Embankment

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4.2.1.4. In-pit backfill (tailings and / or waste rock)

In-pit backfill of tailings and waste rock material refers to the practice of depositing tailings generated from mineral processing and unmineralised (below grade cut-off) waste rock material into mined-out pit voids as a means of storage and disposal. This waste disposal method is often considered for its potential to reduce the surface footprint of TSFs and WRDs, improve land rehabilitation outcomes, and mitigate long-term environmental risks associated with tailings impoundments; however, its feasibility is highly dependent on site-specific geological, operational, and economic factors.

In-pit backfilling of tailings and waste rock is not been included as part of the Project's waste management strategy due to the risk of resource sterilisation. The defined mineral resource extends across multiple deposits (Razorback and Iron Peak), and placing tailings / waste rock within pit voids will likely preclude future access to economic magnetite ore. The mineral resource deposit has been constrained based on drilling data which presently limits the deposit to 300 m depth from surface. As such, the deposit's mineralisation is open at both depth and strike, with backfill disposal potentially limiting resource recovery under current and future economic assumptions. Given the strategic importance of maintaining flexibility for ongoing and future mining operations, preserving the integrity of potential ore sources is a priority. The dynamic nature of the Project's mine plan necessitates that in-pit disposal be assessed against long-term production viability and resource utilisation strategies.

There may be an opportunity for in-pit disposal of waste rock and, potentially, tailings material following further evaluation of the Iron Peak and Razorback deposits. In the latter years of the currently-defined mining schedule, there may be an opportunity to utilise the mining pits at Iron Peak to facilitate potential tailings and waste rock co-disposal in the completed pit void, to substitute for new or additional tailings and waste rock storage capacities. Should mine planning and economic assessments determine that portions of Iron Peak are not viable for future extraction, these areas could be considered for waste storage, subject to geotechnical and hydrogeological assessments. This approach would contribute to optimised waste management while minimising expansion of the Project's land disturbance profile. Any such strategy would require rigorous assessment of geochemical stability, long-term landform integrity, and potential impacts to future resource development.

4.2.2. Other infrastructure

Relevant options considered for selected infrastructure developments are provided below.

4.2.2.1. Rail siding and haul road

The movement of iron ore concentrates to port has considered four principal options:

- road transport direct to port, via private HR and the public road network
- rail transport direct to port, via a private rail spur between the ML and the existing ARTC-controlled rail line, then use of the existing ARTC-controlled rail line
- a combination of road and rail transport, with the use of a private HR between the ML and the existing ARTC-controlled rail line
- slurry pipeline direct to port.

A PFS-level Project options analysis determined that road transport between the ML and port was significantly constrained due to the low-efficiency nature of the option, associated public safety and nuisance impacts, and lower environmental performance (i.e., increased emissions). This option was discounted accordingly. Further, the significant capital cost profiles for rail-only and slurry transport options each had a material impact on the Project's economic performance, with optimisation studies determining that such concentrate transport options are principally feasible for larger production profiles of 10 Mtpa and above.

The adoption of a slurry pipeline would also lock Project exports to a single port option, reducing future competitive pricing opportunities.

Accordingly, the road and rail option, as described in Section 4.8, was selected as the preferred concentrate transport solution. Key benefits of this option include:

- road to rail haulage provides additional flexibility in logistics and materials re-handling, particularly for future expansion options
- operational costs and lower capital cost profile
- optimised use of existing infrastructure (ARTC siding, ARTC rail capacities) and new infrastructure (HR is also site access road), including lower land disturbance rates
- lower operating risk profile.

RAIL SIDING OPTIONS

Three RS and network connection options were identified in a logistics and infrastructure study completed by Bis Industries (2021) which considered siding locations immediately north and west of the Project Area for a provisional 2 Mtpa production profile project. Other options to the east were not considered as it would proportionally increase both road and rail and haulage distances. The RS options are presented in Figure 4-5 and are listed below:

- Yunta Siding
- Paratoo
- Hillgrange Siding.

All three sites were assessed via field inspection and desktop analysis, with key parameters including:

- general topography of the surrounding area
- any features of interest (e.g. flood ways, road crossings)
- availability of existing rail infrastructure for use by Razorback
- proximity to port of export
- suitability of typical rail head layouts
- proximity to public and private areas (e.g. townships, highway, homesteads)
- (indirectly) the proximity to Razorback by road.

MGT has deemed that the assessment completed by Bis Industries remains valid for the proposed 5 Mtpa Project as only haul truck and train movement frequencies scale with the increased production profile; siding infrastructure and materials handling activities generally remain consistent. A summary of the preliminary assessment outcomes from the Bis Industries study are included in Table 4-2.

Table 4-2: Preliminary rail siding options description and assessment summary

Option	Option description	Description and summary assessment
1	Yunta Siding	Located adjacent Yunta township at the 196 marker of the Crystal Brook-Broken Hill line; situated approximately 41 km north-northwest of the Site with an existing passing loop located on the north side of the main rail line (opposite side to the Project Area). Also directly adjacent to various public and private town infrastructure and is less than 50 m from the Barrier Highway. Key assessment outcomes: • The area to the south of the rail line is generally flat and is unlikely to be flood-affected. • Proximity to Yunta and Barrier Highway provides for the best access for support vehicles, inbound supply and staff housing associated with those activities at the RS and for the haulage of product from the mine. • Existing Yunta siding is located on the north side of the Crystal Brook-Broken Hill line; use of this infrastructure would require haul trucks to cross the Barrier Highway twice for each cycle and may require infrastructure or dedicated resources to facilitate safe truck crossing. • Yunta is the farthest siding location option from the port of export and, while being the closest in straight-line distance from Site, is the farthest via identified potential haul corridors. • The location is effectively within the township of Yunta, very close to public and private infrastructure (including a hotel, police station, primary school and two service stations) and adjacent the Barrier Highway; a higher level of disturbance (principally amenity factors) would be expected from siding activities in this location (i.e., from train loading, product storage, trucking). Overall, Bis Industries determined the Yunta Siding option to be the least-favourable option.
2	Paratoo	Located at the 169 marker on the Crystal Brook-Broken Hill railway line and approximately 44 km north-west of the Site. There is no existing rail loop at this location; the line is approximately 700 m from the Barrier Highway. Paratoo Road crosses the rail line approximately 1.5 km to the northeast of the Paratoo site. Key assessment outcomes: • Paratoo is the closest siding option to the Site (by road) and the second closest to the port of export. • The area to the south of the rail line is generally flat and provides good options for RS layout and construction. • Evidence of nearby drainage systems may require the siding and stockpile area to have specific flood protection controls. • There is no existing loop or other relevant in-situ infrastructure at this location. • The siding location is highly visible from the Barrier Highway.

Option	Option description	Description and summary assessment
3	Hillgrange Siding	Located at the 146 marker of the Crystal Brook-Broken Hill line and approximately 45 km west of the Site. An existing passing loop located on the south side of the main rail line on same side as the Project Area. This location is not proximate to other significant public or private infrastructure and is located approximately 6 km from the Barrier Highway. Key assessment outcomes: • Hillgrange is the closest siding option to the port of export and second closest to the Site (by road). • The area is generally flat. • The location is not visible from any main road or highway and is generally removed from public interaction. • The existing siding infrastructure at Hillgrange is not specifically usable but a goods loop may provide a network connection option. • The location has a floodway passing through or adjacent to it, facilitated by existing drainage infrastructure; the location, design and construction of the siding and stockpile infrastructure will need to address this.

HAUL ROAD OPTIONS

In parallel to the RS assessment, Bis Industries (2021) also assessed indicative HR alignments between the Site and each of the RS location options. A total of five alignments were considered in the Bis Industries assessment (two to Yunta, two to Paratoo, one to Hillgrange), and primarily by desktop analysis owing to temporary site access constraints. Key parameters considered in this initial assessment included:

- topographic information, including vertical and horizontal alignment of the identified routes
- any other topographic features (i.e., flood ways, road crossings)
- existing roads that are amenable to product haulage use (subject to upgrade to suit road trains)
- overall haulage distance
- proximity to public and private areas (i.e., townships, highways, homesteads).

MGT extended this assessment to a total of 8 HR options following initial stakeholder engagement, with three additional routes to Hillgrange identified. Bis Industries also provided provisional capital and operational cost profiles for each original rail and road option configuration, which has been adopted as the basis of financial performance assessments of all options (subject to loading of other cost factors).

A summary of the preliminary assessment outcomes of all Bis Industries and MGT HR options is included in Table 4-3 and are presented in Figure 4-5.

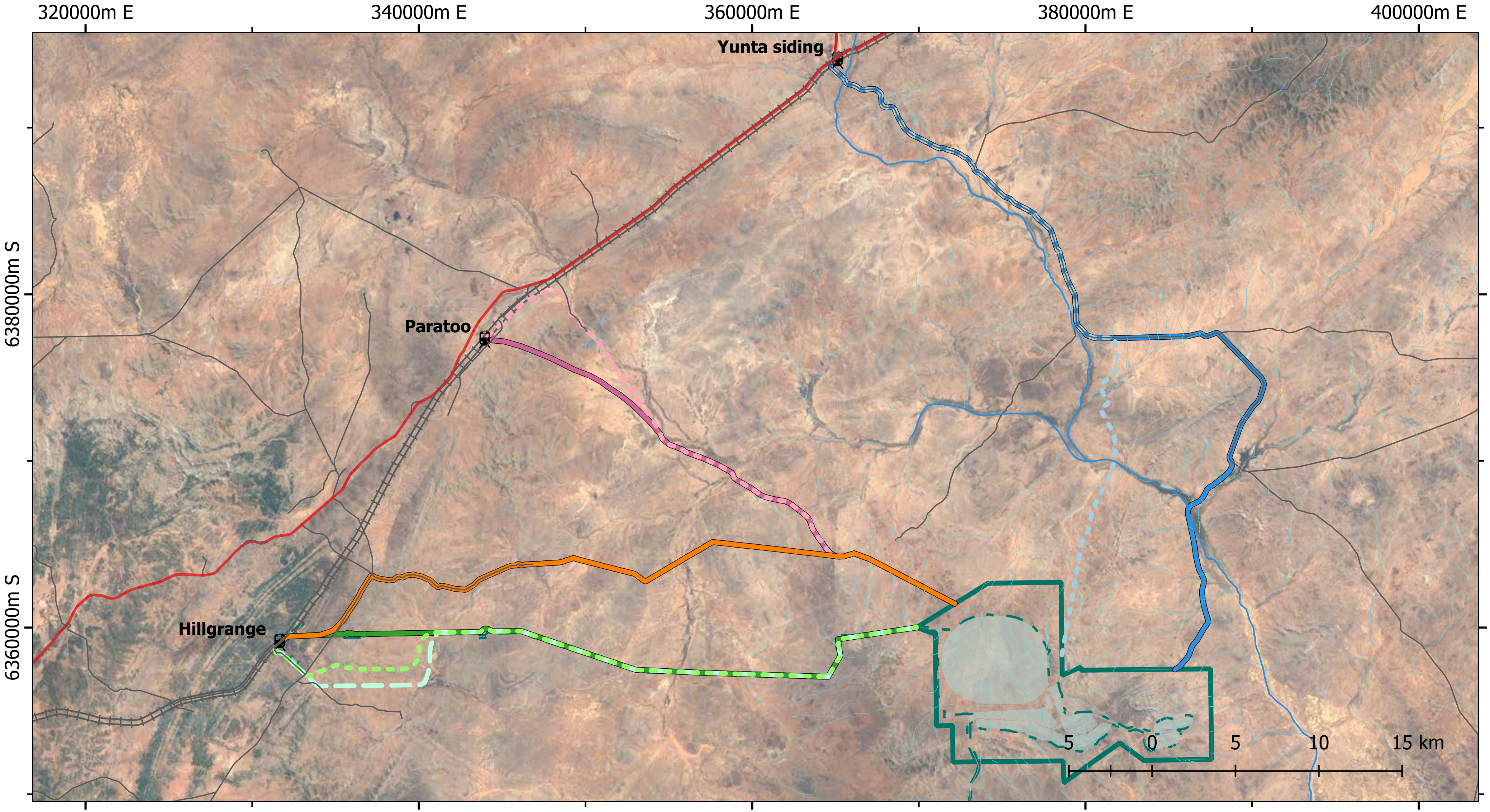

Figure 4-5: Rail siding and haul road option assessment

Project Area
Disturbance Footprint
Conceptual Footprint

Watercourses
Major
Minor

Existing roads
Main
Local

Existing railways
Siding options

Haul road options
Hillgrange South A
Hillgrange South B
Hillgrange South C

Paratoo A
Paratoo B
Yunta A
Yunta B

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Table 4-3: Preliminary haul road alignment options description and assessment summary

Option	Option description	Description and summary assessment
1A	Yunta A (to / from Yunta Siding)	Route length of approximately 52 km; uses approximately 25 km of the Sturt Vale Road (DIT) with the balance being a combination of existing unsealed station tracks and new roads. Significant upgrades to the Sturt Vale Road and station tracks would be required but would be a moderate cost saving compared to all new roads. This route has the most-pronounced changes in elevation; as a result, a HR following existing topography would result in the lowest average haul truck speed or, alternatively, extensive cut and fill construction to achieve better gradients increase the overall construction costs markedly. This option, along with the alternative Yunta B route, have been assessed to be the most susceptible routes to flooding and the impacts of heavy rain. A large section in the middle of the route crosses a series of watercourses, including several regional-scale drainage features. This alignment will traverse within ~50 m of an occupied homestead
1B	Yunta B (to / from Yunta Siding)	This route shares similar characteristics with the Yunta A option, including proximity to a remote residence; at 61.3 km, it is 20% longer than the Yunta A option. While this route avoids some of the flood-prone areas associated with Yunta A, the relatively challenging terrain, longest HR length and connection to the least favourable siding, the Yunta B option is considered unviable in comparison to the other options under consideration.
2A	Paratoo A (to / from Paratoo)	This route is 46 km in length – one of the shortest of the assessed options. The alignment takes advantage of an existing public road (requires ~8 km of upgrading) through the Paratoo Gap to cross the Paratoo Range immediately south of the siding location. The alignment also passes a homestead in this approximate area. The alignment continues in a southeast direction through to the Site, further upgrading existing unsealed station tracks or requiring new road construction. It is the equal flattest route (along with Hillgrange options) and reduces per unit road construction and maintenance costs. The route travels across drainage systems that appear less susceptible to flooding than Yunta options but more susceptible than routes to Hillgrange options. It is anticipated that expansive culverting will be required to reduce the holding of water along the track given its flanking position to a prominent drainage feature.
2B	Paratoo B (to / from Paratoo)	This route shares similar positioning and characteristics to the Paratoo B route but is approximately 2.5 km shorter at 43.7 km length. This is the shortest route of all options. This route follows the Paratoo A alignment for all but the last 12 km, where the road deviates westward with a new road over the Paratoo Range (instead of via the Paratoo Gap and Paratoo Road). The alternative alignment avoids the residence but potentially results in increased land disturbance in areas of steeper terrain.

Option	Option description	Description and summary assessment
3	Hillgrange North (to / from Hillgrange Siding)	This alignment is 56.4 km long, and targets the use of station tracks and the existing Bullyaninnie Road (public road). The eastern section of this route requires the construction of new roads. It is the equal flattest route, long with the other Hillgrange and Paratoo routes. The route is assessed as the least susceptible to flooding (equal with Hillgrange South options) and, correspondingly, the lowest cost in terms of road construction cost per kilometre. The alignment favourably connects to the closest RS to port. Notably, the alignment runs within~100 m of two residences and requires consistent use of a major local road under the care and control of DC Peterborough (Crocker Road) and poses an increased public access and safety risk.
4A	Hillgrange South A (to / from Hillgrange Siding)	An alternative alignment to the Hillgrange North option identified following landowner engagement; seeks to follow property boundaries (to reduce impact to landowner operations) when feasible and to maximise the separation distances from local residences from ~100 m to no less than 1.8 km. Alignment is approximately 49.8 km in length and is positioned along property boundaries for all but two Sections – one approaching the RS west of Crocker Road and one within the vicinity of Sawers Road. This alignment is the least susceptible to flooding with only three main drainage channel crossings higher in the Manunda Creek catchment. The alignment deviates around the Pualco Range CP.
4B	Hillgrange South B (to / from Hillgrange Siding)	Similar to the Hillgrange South A option, the western extent of this alignment seeks to assess an alternative southern entry option into Hillgrange Siding using the existing public Hillgrange Road (DC Peterborough asset). This option is 52.9 km in length, and significantly increases the transit through properties (as opposed to Hillgrange South A and C options that have aimed to avoid alignments through paddocks).
4C	Hillgrange South C (to / from Hillgrange Siding)	Very similar route to the Hillgrange South A option, with a southerly deviation of the HR alignment within the vicinity of Sawers Road; deviation aims to reduce disturbance to the landowner by following property boundaries at all times. This is the longest HR option to Hillgrange at 55.5 km, and shares similar flood-prone characteristics as the Hillgrange South A option.

HAUL AND RAIL MCA

A detailed multi-MCA comparing the eight HR and RS combinations is presented in Appendix E. Options were compared against fourteen representative criteria spanning economic, technical, environmental and social aspects and applying the rank sum normalised weighting methodology (as adapted from the TMR MCA Tool).

As per the MCA (Appendix E), Hillgrange Siding with corresponding haulage route 'Hillgrange South A' option has been selected for the Project. Key advantages of this option include:

- closest RS to port, likely providing reduced rail haulage costs
- remote location of Hillgrange Siding, no adjacent sensitive receptors and willing landowner
- suitable siding location, with appropriate gradients and low-moderate flood and water management risks
- the third shortest HR route (after Paratoo A and B options) at 49.8 km
- equal flattest route, with lowest anticipated road construction cost on a per kilometre basis (partially offset by longer road distance when compared to Paratoo options)

- equal lowest perceived susceptibility of HR to flooding events and corresponding lowest risk of product haulage delays
- HR conforms to property boundaries to the greatest extent, minimising impact to stock management activities of existing pastoralists
- equal largest separation distances of HR from residences, noting the proximity of Yunta A, Yunta B, Paratoo A and Hillgrange North options to occupied premises
- favourable operating costs, compared to other siding and HR options.

HILLGRANGE RS MCA

MGT completed a further, local options assessment to determine the optimal siding placement and orientation to reduce cut and fill requirements, and to examine physical environmental and stakeholder impacts. Three RS configurations were considered for the Hillgrange location:

- Option 1 (Southern Rail Spur): required significant imported fill material, a longer construction period, and additional signalling infrastructure.
- Option 2 (Northern Rail Spur): reduced imported fill but required extensive vegetation clearing and culvert extensions near the ARTC mainline.
- Option 3 (modified Northern Rail Spur): reduced earthworks, minimised private land impact, and simplified construction requirements.

Option 3 was selected as the final configuration based on the final, local MCA with the outcome reflecting material benefits across constructability, environmental impact, and land access factors.

4.2.2.2. Primary accommodation camp

Two primary (on site) accommodation camp locations (Figure 4-6) were considered for the project, consisting of:

- Option 1, located north-east of the footprint area of the TSF.
- Option 2, located south-west of the footprint area of the TSF.

The Option 1 location was the initial concept, identified due to amenable (flat) topography, distance from mining and processing operations, and co-location with an early concept site airstrip that was tentatively proposed north of the TSF. The intended co-location of the accommodation camp with the conceptual airstrip became the principal determinant of camp location given the limited suitable locations for the airstrip; as such, the accommodation camp site was proposed at the southern end of a generally north-south orientated sealed airstrip. The accommodation camp was to be accessed by a separate light vehicle road from the western side of the ML, with a second road providing access between the accommodation camp and the process plant.

The proposed airstrip was ultimately discounted due to engineering complexity and capital cost and removed from the proposed Project scope. With the airstrip not carried forward, the Option 1 location was no longer considered as a preferred accommodation site. Further, this location was also rejected based on:

- the potential, albeit very low, risk of a geotechnical failure of the TSF and downstream inundation event and associated hazard to the camp facility
- the extent of ground disturbance associated with camp access roads and concurrent power / water infrastructure corridors.

Due to the limitations with Option 1, the Option 2 location was identified as an alternative. This location has:

- preferentially positioning on the western side of the ML (i.e., no access through active operational areas to attend the accommodation camp)
- suitable flat topography
- sufficient distance / separation from active mining and processing areas
- improved accessibility to / from the site access and HR and processing plant complex
- no TSF breach / inundation risk
- distance from watercourses and low flood-risk
- less ground disturbance (inclusive of required access roads and infrastructure corridors).

The repositioning of the accommodation camp to the Option 2 site resulted in a reduction of ~60% land disturbance and consolidated all direct impacts to the predominant VA1 (*M. sedifolia*) vegetation community.

On this basis, Option 2 was selected for the Project.

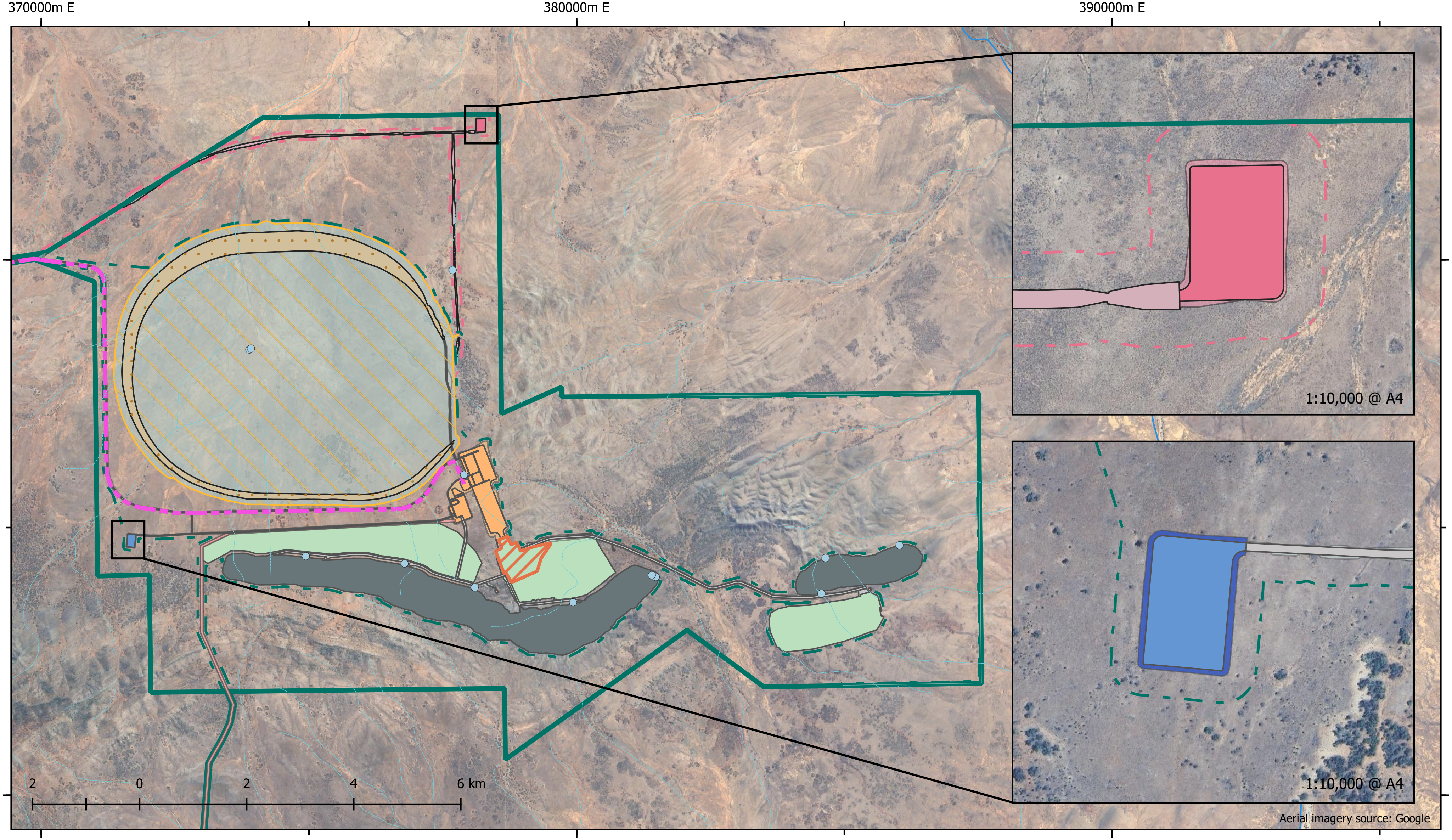

Figure 4-6: Accommodation camp location options

Project Area
Disturbance Footprint
Conceptual Footprint

Watercourses
Major
Minor

Water supply
Groundwater bore site (ind.)
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile

Ultimate TSF infrastructure
TSF Embankment
TSF Domain

Accommodation camp
Accommodation camp
Accommodation camp batters

Alternative camp location
Alt. accommodation camp
Alt. accommodation camp batters
Alt. accommodation camp roads
Alt. accomodation camp buffer

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4.2.2.3. Transmission line

Assessment of grid-connected power supply options for the Project have been considered within the context of both network/grid connection and TL alignment; these factors are discussed below. MGT has maintained a strategy to connect to the SA sector of the national electricity market (NEM) to leverage the increasing renewable energy penetration and resulting low-carbon factors uniquely available in the State.

CONNECTION OPTIONS

A range of grid connection options were initially evaluated for the Project, informed by a connection options assessment with ElectraNet (ElectraNet, 2021) and additional supply assessments undertaken by GHD (GHD, 2021). These options were associated with the original planned 2.5 Mtpa production setting and an indicative 40-megawatt (MW) project power demand. Eight (8) grid connection options comprising a mix of 11 kilovolt (kV), 66kV, 132 kV, 275 kV supply options were initially evaluated against a range of criteria including Project power demand (load), connection point availability, and reliability and cost of supply (Table 4-4 and Figure 4-7). Under the 2.5 Mtpa production scenario, a 132 kV connection to the Robertstown Substation was initially identified as the preferred option.

Table 4-4: Razorback Project – Initial grid connection options assessment (2.5 Mtpa production setting)

Option	Supply Point and Connection	Assessment
1	Belalie Substation – 275 kV connection, ElectraNet supply	Exceeded mine demand requirements, high supply cost – not considered further.
2	Belalie Substation – 132 kV connection, ElectraNet supply	Exceeded mine demand requirements, high supply cost – not considered further.
3	North West Bend Substation (near Morgan) – 132 kV connection, ElectraNet supply	Interruptible supply (lower reliability), high supply cost – not considered further.
4	Robertstown Substation – 132 kV connection, ElectraNet supply	Interruptible supply, lowest supply cost – shortlisted as supply option.
5	SA Power Networks (SAPN) supply – 11 kV connection at Terowie	Significant grid upgrade required – not considered further.
6	SAPN supply – 11 kV connection at Peterborough	Significant grid upgrade required – not considered further.
7	SAPN supply – 20 MVA connection at North West Bend (near Morgan) and 66 kV line.	Lower capital cost, but subject to load supply constraints – not considered further.
8	SAPN supply – 20 MVA connection at North West Bend (near Morgan) and 66 kV line.	Lower capital cost, significant line losses, supply option not available from SAPN – not considered further.

An updated grid connection options assessment was completed in October 2023 to reflect an increased power demand of 150 MW corresponding with the change to a 5 Mtpa production setting, and improved understanding of power demand requirements following concentrate processing testing and optimisation studies. An updated connection options assessment (ElectraNet, 2023) considered 275 kV supply only, and evaluated new connection options potentially available. This included Project EnergyConnect (SA to New South Wales Interconnector), a project that had been recently committed to with a new 330/275 kV substation at Bundey, 15 km northeast of Robertstown.

The updated study considered two (2) options:

- Option 1: 275 kV connection to the new Bundey Substation.
- Option 2: establish a new switching station connecting to the potential future high-capacity North Expansion – Northern TL between Bundey and Cultana.

Option 2, though potentially favourable in terms of the connecting TL (point of connection to the Project), was dependent on the Razorback Project being deemed an 'actionable project' under the Australian Energy Market Operator (AEMO) Integrated System Plan (ISP) and future completion of construction of the Mid North Expansion – Northern TL. This carried significant uncertainty given project timelines and was therefore discounted.

Option 1 was selected given the pending completion of the Project EnergyConnect interconnector and Bundey Substation, availability of bays at the substation for connection of the Project's TL, alignment with Project development timelines, and supported by the assessment of the corresponding line alignment feasibility. Consistent with Option 1, Project grid connection will comprise a proposed 275 kV single-circuit 126 km TL between the Bundey Substation and the Project Site that terminates at a substation located within the NPI compound.

LINE ALIGNMENT OPTIONS

In concert with the connection option assessments, MGT has assessed potential TL alignments for two probable corridors:

1. a corridor between the ML and Robertstown / Bundey (formed by a minimum of all land parcels located within or partially withing a 10 km-wide zone)
2. an alternative corridor between the ML and Belalie Substation (formed by all land parcels located within or partially within a 2 km-wide zone).

Each of these corridors, as defined by the relevant land parcels, is presented in Figure 4-7.

Belalie

Consideration of the Belalie option utilised a desktop review method only, and identified three material issues – land use / tenure, conservation matters and constructability.

Owing to the reliable regional rainfall and arable soils conditions ('Goyder's Line'), cereal (wheat, barley, etc.), canola, lentil and bean production are prevalent in the Mid North agricultural district, as is some sheep grazing on open pastures. The Mid North district is a highly productive region, with agricultural land values approximately 40% higher than state averages. Approximately 20% of the corridor (or some 40 km^2) is suitable for high value applications, with this being concentrated in the western end of the survey area from the Belalie Substation through to Sheoak Hills southeast of Whyte Yarcowie. In addition to the predominant agricultural land use, some small parcels of land are used for residential, environmental (i.e., remnant vegetation, not under a conservation covenant), and renewable energy generation purposes.

The balance of the corridor is largely dedicated to pastoral and environmental / conservation land uses. Pastoral activities are likely to span from near Whyte Yarcowie through to the Project Area. Significant stands of remnant vegetation are within the survey area and are unavoidable owing to their general north-south alignment following major regional topographical features. These significant belts of remnant vegetation mainly occur on the flanks of ranges, including the eastern shelf abutting the Waupunyah Plain, the Wonna Range, the Brown Hill Range and the Levi / Pualco Range to the east.

Two gazetted conservation areas, the Pandappa and Pualco Range CP located within the survey area are unavoidable within this corridor alignment. A search of State and PMST records indicated a higher probability for protected species to be located within the corridor. The steep, rugged terrain experienced at numerous locations within the alignment increases constructability risks, particularly geotechnical and construction access risks and suggests increased capital costs for modified footing designs.

Robertstown/Bundey

Consideration of the Robertstown / Bundey option utilised a desktop review and stakeholder-led methods, and identified three material issues – available access to land, a recorded TEC, and constructability.

The majority of the corridor is flat, open grassland (chenopod) that is amenable to pastoral applications. Further description of vegetation units representative of the area is included in Section 3.8. Sheep grazing is the predominant land use, with some potential for cropping in the area around Robertstown and Bundey in years with favourable rainfall conditions.

MGT engaged with over 30 landowners within the Robertstown / Bundey corridor to assess their interest in accommodating the development of a TL within their properties. This stakeholder-led process identified a number of potential alignments, with the majority of landowners viewing a TL as a compatible concurrent land use with their grazing or cropping activities. A number of landowners proximate to the Robertstown substation noted committed options to renewable energy project proponents that limited the ability to position a TL through that land; as such, rerouting and alternative construction types were considered to identify a technically feasible alignment option. Compared to Robertstown, an alignment to Bundey substation was far simpler with limited overlap with proposed renewable energy generation projects.

Field investigations confirmed that one TEC under the EPBC Act (MBC of the MDDB TEC) is present within Sections of the Robertstown / Bundey corridor (refer to Section 3.8.6.1 for description of the TEC). Constructability of a TL between the Site and Robertstown / Bundey was deemed to be better than the Belalie option given the predominance of the flat plains of the Murray Basin, although a short section of the TL would need to cross the Pualco Range south of the Razorback mine pit. No conservation parks or reserves were recorded in the corridor.

Summary

The Robertstown / Bundey TL alignment demonstrated superior land access and constructability profiles and, together with a preferred grid connection location at Bundey, was deemed to be the preferable option for power supply.

The final alignment of the TL was subsequently identified through further engagement with landowners, and is presented in Figure 4-2.

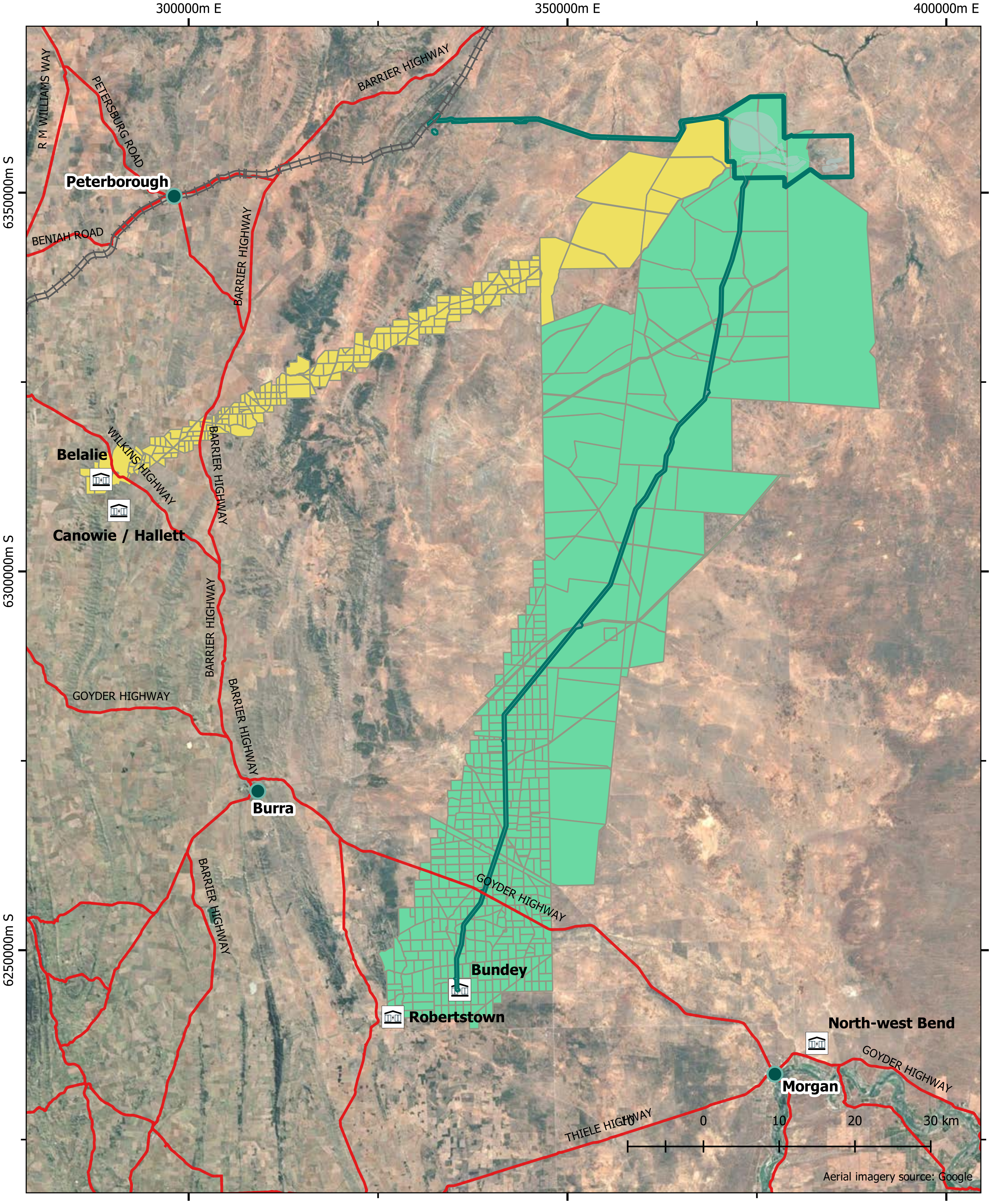

Figure 4-7: Grid connection and transmission line options

Project Area
Disturbance Footprint
Localities
Existing railways

Existing roads
Main

Grid connections (substations)

Assessed transmission options (by land parcel)
Belalie corridor
Robertstown / Bundey corridor

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4.3. Reserves, products and market

4.3.1. Ore reserves and mineral resources

Ore Reserves and Resource Estimate have been calculated by the following Competent Persons under the JORC Code:

- Geological and Exploration Data: Trevor Thomas of Magnetite Mines Limited.
- Mineral Resource Estimates: Lynn Widenbar of Widenbar Associates Pty Ltd.
- Ore Reserves: James Stoddard of AMC Mining Consultants.

4.3.1.1. Mineral resource estimate

The current Mineral Resource Estimate as of June 2025, prepared in accordance with the JORC Code is summarised in Table 4-5.

The resource has been classified in the Indicated and Inferred categories in accordance with the JORC Code. Classification is based on a combination of drill hole spacing and kriging output parameters (including number of sample and holes used in estimation, average distance to samples, kriging variance, etc.).

Table 4-5: Razorback Iron Ore Project – Resource Estimate

Razorback Iron Ore Project – Resource Estimate (Razorback and Iron Peak combined) *								
Classification	Tonnes (Mt)	Mass recovery (eDTR%)	Fe %	SiO_2 %	Al_2O_3 %	P %	LOI %	Magnetite %
Indicated	1,973	15.01	18.75	48.59	8.19	0.18	5.55	14.04
Inferred	1,864	15.09	17.02	49.28	8.38	0.18	5.63	14.46
Total	**3,837**	**15.05**	**17.40.06**	**48.92**	**8.28**	**0.18**	**5.59**	**14.23**

* RESULTS PRESENTED AT 8% EDTR CUT-OFF
SOURCE: MAGNETITE MINES, 2025 (ASX RELEASE - 30 JUNE 2025)

4.3.1.2. Ore reserves estimate

The current Ore Reserves estimate for the Project is summarised in Table 4-6. The Ore Reserves are classified as Probable Ore Reserves in accordance with the JORC Code and guidelines and are based on the Indicated Mineral Resource Estimate (Section 4.3.1.1).

Table 4-6: Razorback Iron Ore Project – Ore Reserves estimate at June 2023

Probable Ore Reserves*	Tonnes (Mt)	eDTR %	Fe %	Magnetite %
Weathered	149	12.9	17.9	10.7
Primary	1,828	14.8	17.5	13.9
Total	**1,977**	**14.6**	**17.5**	**13.7**

* ORE RESERVES ARE A SUBSET OF MINERAL RESOURCES AND ARE QUOTED AT AN 8% EDTR (MASS RECOVERY) CUT-OFF GRADE
SOURCE: MGT, 2023C (ASX RELEASE - 9 JUNE 2023)

The Ore Reserves are developed from mining schedules with an estimated tonnage and grade which, in the opinion of the Competent Person, form the basis of a technically and economically viable project, after taking account of material relevant Modifying Factors.

4.3.1.3. Resource sterilisation

At Iron Peak, the WRD is located on the southern side of the ridge. As the Braemar Iron Formation dips towards the north with the Pualco tillite in the footwall, there is no risk of magnetite mineralisation sterilisation regardless of pit depth.

The Razorback WRD is located on the north side of the proposed Razorback pit. This limits the minable depth, and the mineralisation is open at depth; however, on the western end of the deposit the stratigraphy steepens to 70° resulting in an escalation of stripping ratio and as such, the impact of mineralisation sterilisation is considered minimal.

The current mine plan for the combined ROM pad and eastern Razorback WRD partially cover approximately 2 km strike length of magnetite mineralisation hosted in Unit G, which has been delineated by surface mapping, limited drilling and airborne magnetic susceptibility survey. At the time the mine scheduling was undertaken this mineralisation was not sufficiently defined to be included in the mine plan, however it is expected that after mining has commenced at Iron Peak resource drilling at Razorback will define this resource and inform a change to the spatial extent of this WRD. DEM would be notified of any proposed revision to the Project via the appropriate change mechanism.

Based on field observations and regional geophysics, the risk of magnetite mineralisation in the plant, non-process infrastructure (NPI), accommodation camp and tailings storage facility are considered low. The HR and TL corridors do cross known areas of mineralisation; however, these are relatively inexpensive to relocate in the event of future mine expansion so would not be considered as potential sterilisation of resource.

A representation of the proposed mine development footprint relative to magnetite mineralisation, represented by total magnetic intensity (TMI) imagery, is shown in Figure 4-8.

In terms of other commodities, scattered copper and gold occurrences have been mapped in the area surrounding the proposed ML throughout the early 20th century. None have been identified by MGT or previous tenement holders in the proposed disturbance area and the nearby occurrences are of low significance; therefore, the risk of sterilisation for these commodities is considered inherently low.

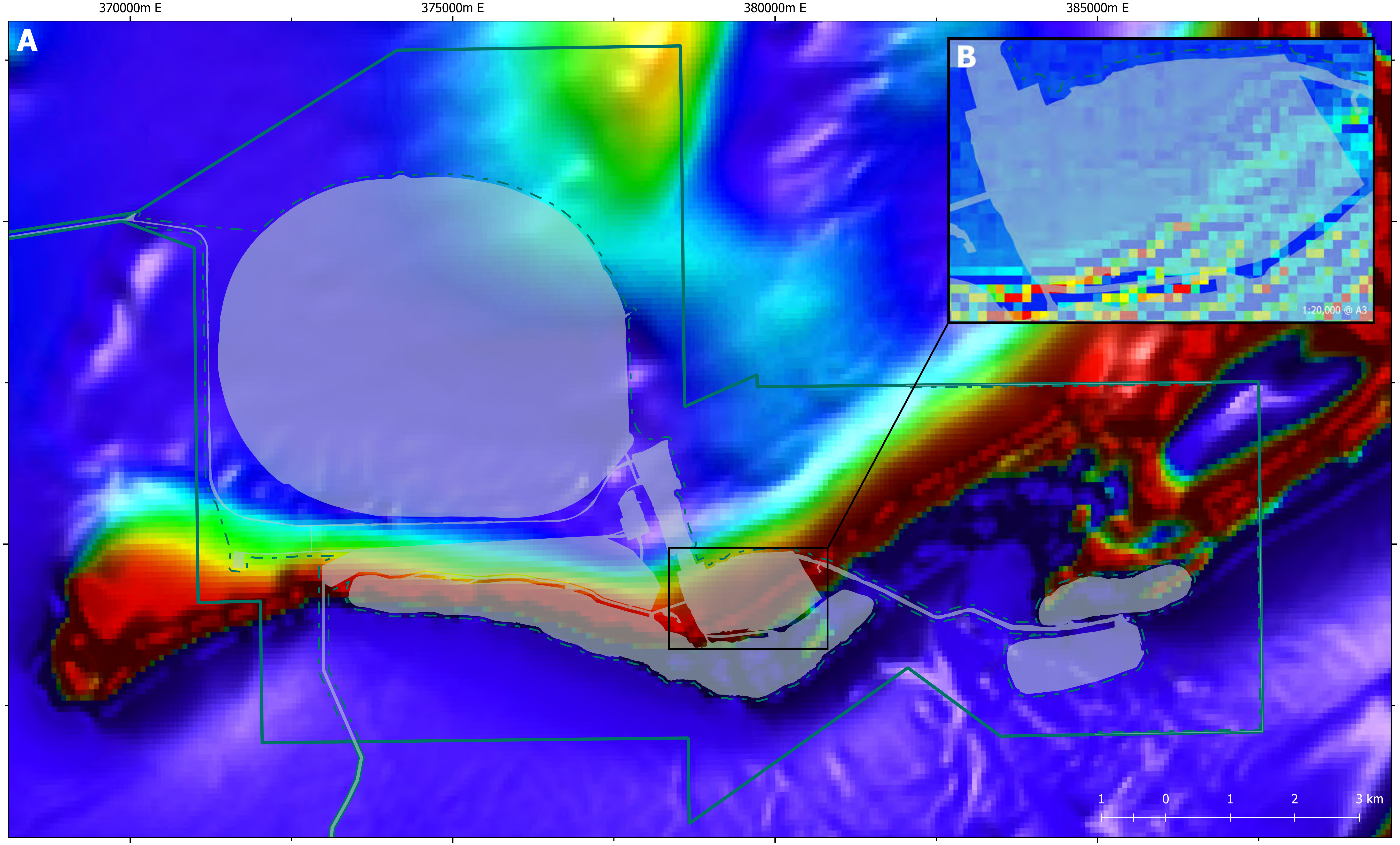

Figure 4-8: Magnetic modelling - Statewide TMI (A) and MGT 38-metre Depth Slice Magnetic Inversion Model (B)

Project Area
Disturbance Footprint
Conceptual Footprint

TMI - Total Magnetic Intensity (A)
Dimensionless
5869.3
-760.6

38m DS Magnetic Inversion value (B)
Dimensionless
20,000 x 10^-6
0

GDA 1994 MGA Zone 54 | 1:55,000 @ A3
Author: A Kane | Date: 28/01/2025
Razorback MLP/Referral

N

MAGNETITE
MINES

4.3.2. Production rates and products

4.3.2.1. Target commodities

Mining aims to deliver an average of 35 Mtpa of magnetite iron ore to produce 5 Mtpa of dry, high-grade iron concentrates that will include a range of product grades, typically greater than 65% Fe and including DRPF grade concentrate of >68.5% Fe and <25% SiO_2 + Al_2O_3.

4.3.2.2. End market

Approximately 70% of global steel production relies on coal, directly contributing around 8% of global carbon emissions. Coal and iron ore are often transported to steelmaking centres where iron and steel are produced in integrated plants comprising blast furnaces and basic oxygen furnaces (BF-BOF) – and with an associated large carbon footprint. The remaining 30% of steel is produced using electric arc furnaces (EAF) which are reliant on natural gas, steel scrap and various forms of metallic iron as raw materials, with a lower comparative carbon footprint.

In response to regulatory, consumer and investor pressure, most major steel producers have made commitments to reduce their carbon emissions, generally targeting a 30% reduction by 2030, and carbon-neutrality by 2050 (Figure 4-9).

The transition to low-emission ('green') steelmaking will replace coal with hydrogen for the conversion of iron ore to iron, fundamentally changing the supply chain. Green iron will be produced where hydrogen is available, then transported to low carbon market-facing steel mills to produce a range of steel products. Global EAF-route steelmaking is forecast to rise more than 50% by 2050, representing a growth of approximately 500 Mt of lower CO_2 emitting route. Supporting this, an exponential increase in the demand for DR pellet feed is anticipated by 2050 (refer Figure 4-10).

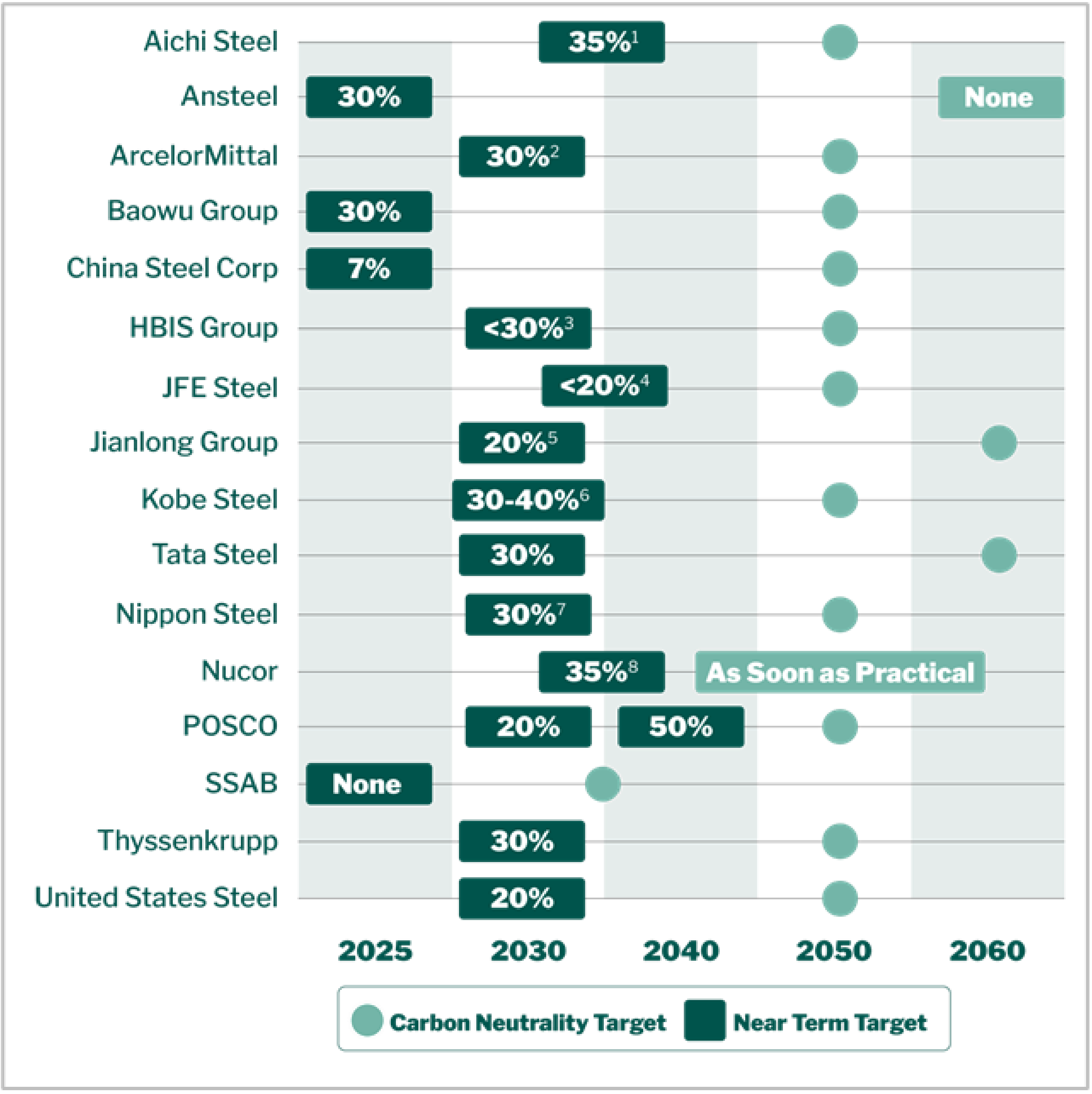

Figure 4-9: Major steel producer carbon reduction targets (company reports)

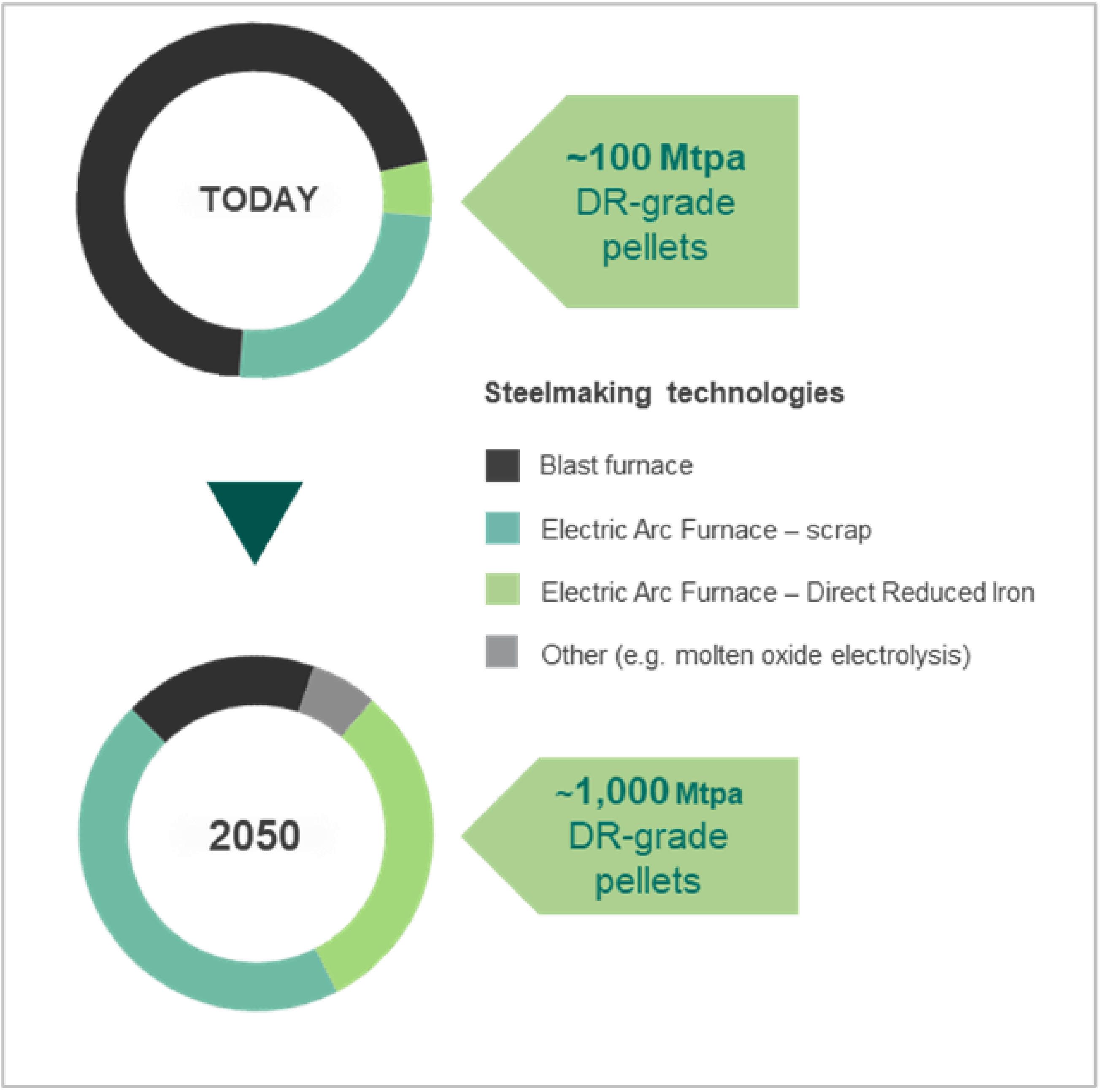

Figure 4-10: Forecasted demand for DR-grade pellet feed in 2050 (Bloomberg)

Transitional measure using high-grade iron ore as blast furnace feedstock can yield emissions savings as ores with fewer deleterious elements produce less slag and require less coke for processing than lower-grade ores. The Project's high-grade, low-impurity iron concentrate feedstock is particularly suitable for DRI-EAF steel production, which is heavily grade- and purity-dependent. reliant on high-grade, low-impurity iron ore feedstock. Eastern Asia and Middle East countries are likely to be leaders in the further adoption of DRI-EAF steel production.

The Project's targeted concentrate specification, produced in laboratory conditions, is estimated to reduce blast furnace carbon emissions by 0.3 Mt (post-agglomeration) relative to standard-specification 62% Fe iron ore (Dazmin Consulting, 2023). MGT will also have the flexibility to produce variable concentrate grades to meet changing market and customer demands.

4.3.2.3. Other commodities

No other commodities available for economic extraction have been identified within the Site.

Hematite mineralisation occurs co-incident with magnetite mineralisation, and metallurgical test-work has investigated the recovery of hematite as either a blend or standalone concentrate product. Due to the very fine nature of the hematite mineralisation (5–10 microns (μm)), processing infrastructure would need to include ultrafine grinding techniques to liberate the hematite, which is beyond the limitations of contemporary processing equipment and therefore not economically viable at this stage. The production of a hematite concentrate may be achievable with improvement in hematite recovery processes and its underlying economic feasibility.

4.3.2.4. Annual production

The Project will produce 5 Mtpa of dry, high-grade iron concentrate. A detailed annual LOM schedule of associated material movements inclusive of extraction volumes (waste rock and ore) and ore processed is provided in Table 4-11 and discussed in Section 4.5.3.

4.3.2.5. Extractive minerals

MGT is not planning the removal or sale of extractive minerals, as defined in Section 6 of the Mining Act, from the Project Area.

All non-target materials excavated within proposed tenement areas during construction and operations (i.e., rock, gravels, sands, clays and soils) will remain within the tenement areas and will occur as an effect of construction, mining and rehabilitation activities only. They are not intended as a saleable commodity.

4.4. Exploration activities

4.4.1. Resource and geotechnical exploration

Proposed exploration activities within the Site during the life-of-project will include low impact (early exploration) activities, resource drilling, exploration drilling and costeans / bulk sampling. Geotechnical assessments may also be required and will use similar processes to those described for previous exploration and resource drilling programs.

Low impact activities will include geological mapping, soil and rock chip sampling, and ground and airborne geophysics surveys. Geophysics surveys will principally include magnetic susceptibility surveys and downhole magnetic susceptibility, gamma, specific gravity and acoustic televiewer surveys in conjunction with drilling activities.

Exploration and resource drilling activities will be undertaken for purposes of further defining the Iron Peak, Razorback and other potential resources within the ML area (see Figure 3-20) and to obtain material for metallurgical test work. Resource drilling is likely to include RC, diamond (DD), air core sonic and other similar techniques. The excavation of costeans is also a possible option to obtain larger volumes of ore for test work programs.

Where possible, activities will be undertaken using areas of pre-existing disturbance, including station tracks and old drill pads. Where this is not possible, new pads are accessed by a light vehicle driving off-road to the proposed collar location, and track construction minimised unless a risk of vehicle or drill rig rollover risk exists.

Drill and costean sites will be chosen as to minimise disturbance where possible, and in all cases first approved in accordance with operating requirements. Sites will be prepared by pushing shrubs to one end of the pad and excavating sumps (where required) using an appropriately sized front-end loader or excavator, with topsoils scraped / stripped and stockpiled. Where tracks will be required in undisturbed areas, vegetation will be track- or wheel-rolled and scarified on completion.

Disturbed areas will be rehabilitated and include the backfilling of sumps (if applicable) and reinstatement of soils, scarification and reinstatement of woody debris, and removal and disposal of waste.

Typical exploration equipment will include a light truck or track-mounted drill rig (RC /DD / combination), a support truck, 4,000 litre (L) fuel truck, 10,000 L water truck, front end loader (FEL), 5 t excavator and approximately 3–6 light vehicles. Costeans will require a larger excavator and a bulk materials rigid or heavy vehicle. Multiples of this equipment may be used in the case of concurrent exploration programs.

4.4.2. Exploration rehabilitation

The Project Area has 365 recorded sites of disturbance from previous drill pads, water bores, geotechnical test pits and other exploration activities, of which 357 have been rehabilitated as per Environmental Guidelines ISM33. Additionally, approximately 22 km of exploration access tracks have also been rehabilitated, following DEM guidelines, and earthen bund requirements stipulated by the landholder to prevent erosion.

As at the time of this MLP submission there are eight remaining un-rehabilitated exploration sites comprising five monitoring bore and two production bore sites that currently used for baseline environmental monitoring, and one further site will be rehabilitated with support from cultural heritage advisors. Rehabilitation works generally require:

- capping and burial of residual well casing (as relevant)
- removal or burial of any residual drill cuttings / spoil
- contouring and shallow ripping of the pad (and any relevant access track)
- installation of whoa-boys on access tracks with higher gradients
- installation of windrows or other barrier to deter vehicle access along access tracks (as may be relevant)
- ongoing monitoring and evaluation of rehabilitation performance.

In addition to the MGT exploration sites noted above, a 134 m long adit was excavated by the SA Department of Mines in 1962 into the Razorback deposit for the purpose of collecting metallurgical samples. The adit portal, along with a 52 m long, 10.7 m wide and 4 m high spoil pile and access tracks installed by the SA Department of Mines were left in-situ and remain un-rehabilitated.

4.5. Mining activities

4.5.1. Proposed mining operation

4.5.1.1. Mining method overview

The deposits will be mined as open cut pits, with ore extracted through conventional drill and blast and truck and shovel methods. As the deposits outcrop above surface, mining below ground level and the formation of pits will not occur immediately in the mining sequence, commencing only when outcropped material has been depleted.

The pit development sequence will commence at Iron Peak (Years 1–12) given its higher grade (mass recovery), lower strip ratios and high-quality concentrate grade (in Fe%). The strip ratio in the first five years at Iron Peak is 0.17 (waste to ore), indicating effectively nil pre-stripping with low initial mining costs and early project value. Mining and extraction within Iron Peak will advance in four stages, initially focussed on areas with low strip ratio. The Iron Peak Ore Reserve is currently estimated at 590 Mt rock for a total of 362 Mt ore, at an average 16.8% mass recovery (eDTR) and pit life of approximately 12 years, and representing material classified as Indicated (JORC, 2012).

Mining will then move to the Razorback pit, with mining to occur from Years 12–38 on current design (and as per the limit of tailings storage within current project configuration), though with potential for mining up to Year 56 with appropriate tailings storage increases within the current footprint (and subject to additional approvals). Further, the full spatial extent of the 56-year mining operation has been considered within this application to provide flexibility for the mining plan to access all Ore Reserves; this is deemed prudent as mine plans may be optimised to meet contemporary concentrate specifications and corresponding ore feeds, or in response to advances in material handling solutions across the life of the Project.

Pre-stripping of vegetation, soils and overburden will commence at Razorback towards end of mining at Iron Peak to facilitate a smooth transition between pits in the mining sequence.

Mining and extraction within Razorback Deposit will take place in up to fourteen stages, starting in Year 12 and occurring over three primary pit areas (Central, East and Consolidated) to Year 56 (based on the full mine plan). Pit design follows an initial pit at the East pit closely followed by a spatially separate Central pit which merge as pit expansion advances forming the consolidated pit. The Razorback Ore Reserve currently measures at 2,258 Mt rock for a total of 1,615 Mt ore at an average of 14.2% mass recovery (eDTR) for a total available pit life of 44 years and representing material classified as Indicated (JORC, 2012).

Combined, the mining schedule for the Project generates a LOM strip ratio of 0.42 (waste to ore).

4.5.1.2. Drill and blast

Drill and blast operations will be required as the deposits consist of competent and generally massive rock, with a uniaxial compressive strength (UCS) ranging from 75–175 Megapascals (MPa). This is generally considered 'medium hardness iron ore' though with 'high to very high strength' in terms of the powder factor (the amount of explosive required to fragment a given volume or quantity of rock) (Table 4-7).

To achieve an appropriate level of rock fragmentation, and to optimise the blasting / comminution trade off, relatively high powder factors will be required to cause material movement and heave.

Table 4-7: Rock hardness and strength

Razorback deposits UCS (Mpa)	World iron ores hardness [1]		Rock strength and powder factor [2]		
	Rock / ore type	UCS (MPa)	Rock strength	UCS (MPa)	Powder Factor (kg/m³)
75–175	Friable hardness iron ore	20–35	Very low strength	1–5	0.15–0.25
	Medium hardness iron ore	110–200	Low strength	5–25	0.25–0.35
	Hard iron ore	200–500	Medium strength	25–30	0.4–0.5
	Penryn Granite	132	High strength	50–100	0.7–0.8
	Cliffe Hill Diorite	275	Very high strength	100–250	n.d.
	Nuneaton Quartzite	139	Extremely high strength	>250	n.d.

1. ADAPTED FROM O'CONNOR ET AL. (2000)
2. ADAPTED FROM CHOUDHARY AND SONUS (2013)

Information on the explosive types to be used, blasting method and storage is provided in Section 4.5.5.

Information on the plant and equipment required for blasting operations is provided in Section 4.5.6.

4.5.1.3. Materials handling

Land within the proposed disturbance footprint will be cleared of vegetation with woody debris, with subsoils and topsoils stripped and separately stockpiled for future re-use in site rehabilitation. Clearing and stripping activities will be undertaken incrementally, in line with the mining schedule, to minimise the point-in-time area of cleared ground ('open' area) requiring management and control (e.g., management of surface water and wind erosion of soils).

Broken material within the pit generated from drill and blast operations will include waste rock (overburden and low-grade ore that falls below the magnetite cut-off minimum grade) and ore. These materials will be handled through conventional 'truck and shovel' operations (nominally 400 t excavators and 193 t dump trucks), with waste rock removed from the pit and placed into WRDs. The waste rock will be placed through paddock dumping to provide an efficient and stable disposal method that maximises closure outcomes.

The WRD facility will be expanded laterally and vertically via bench lifts; dozers will move the paddock-dumped material and contour according to the operating geotechnical design and continuing dump truck access. On conclusion of mining operations, the WRDs will be re-shaped and retained as post-mining WRDs.

Ore will be removed from pit ('truck and shovel' operations as per waste rock handling description) and placed into short-term ore stockpiles on the ROM pad, and then re-handled to the fixed gyratory crusher, for crushing and processing (most likely with a loader). The temporary stockpiling of ore material will be limited, only occurring when ore extraction exceeds direct tip capacities of the processing plant. Longer-term ore stockpiles develop adjacent to the ROM pad and within the eastern Razorback WRD when the annual volume of mined ore exceeds the annual volume of ore processed, and depleted when the opposite applies. Interim dust management controls are to be considered for longer-term ore stockpiles subject to the susceptibility of the material.

Ore processing will produce both tailings and ore concentrate (product) as the primary outputs. Tailings will be disposed to the TSF, with coarse sand tailings used to construct perimeter and internal TSF embankments and fines material deposited within the TSF impoundment area. Concentrate, once approved for shipment, will be transported by road to the Hillgrange RS for rail transfer loading to the Port of Whyalla (or alternative) for export to markets.

4.5.2. Open pit workings

4.5.2.1. Pit design parameters, operating parameters and final dimensions

Key wall design and operating parameters are as listed in Table 4-8 and Table 4-9, respectively. AMC Mining consultants reviewed geological and geotechnical data sets and incorporated the outcomes in mine wall design with respect to geohazard assessment (refer 3.5.8). Further work during definitive feasibility studies will assess geotechnical outcomes via additional drilling programs.

Pit operating parameters allow for sufficient space and optimal haulage for cost-effective mining operations. Pits will have a series of ramps running up the wall which include nodes that allow haul trucks to travel east towards the central ROM pad and crusher while climbing out of the pit, optimising haulage efficiency. Proposed ramp widths will accommodate haul trucks ranging from 180 t to 230 t payload capacity (e.g. CAT789 or CAT793 or equivalents), with allowance for safe operating width (nominally 3.5 times the truck operating width).

A minimum mining width of 70 m is proposed, which accommodates the nominal 30–35 m turning circle of the proposed trucks as well as sufficient width for efficient blasting operations.

Table 4-8: Wall design parameters

Design parameters	Criteria	
	Foot wall	Hanging wall
Batter slope angle (BSA) (degrees)	70°	75°
Berm width (m)	8.5 m	8.5 m
Batter slope height (m)	20 m	20 m
Inter-ramp angle (IRA) (degrees)	52°	55°

Table 4-9: Operating parameters

Operating parameters	Criteria
Ramp width (m)	30 m
Ramp gradient (%)	10%
Minimum mining width (m)	70–100 m

The final pit extent for Iron Peak is approximately 2,500 m long (east-west), and 600 m wide (north-south), with a final pit depth of approximately 320 m. The final pit extent for Razorback is approximately 8,000 m long (east-west), and 900 m wide (north-south), with a final pit depth of approximately 310 m.

Final pit plans, including the staged development sequence, are provided in Section 4.5.8. Cross-sections are provided in Section 4.10.5.1

4.5.2.2. Underground workings

Not applicable – no underground mining operations are considered in the current mining methodology.

4.5.3. **Material *movements***

Summary material movements for waste rock and ore extraction, ore processed and concentrate production for both the 38-year and 56-year LOM scenarios are summarised in Table 4-10 and represented in Figure 4-11 and Figure 4-12. Corresponding annual movements are detailed in Table 4-11, and include the proposed 38-year LOM and full 56-year LOM quantity schedules.

Table 4-10: Summary LOM material movements

	Material extracted (Mt)		Ore direct tip (ROM ore) (Mt)	Annual ore to stockpile (Mt)	Ore reclaimed from stockpile (Mt)	Ore stockpile running balance (Mt)	Ore processed (Mt)	Concentrate (Mt)
	Waste rock	Ore						
38 Year LOM (Basis for MLP)								
Annual Average	15	35	32	3	3	7	35	5
Total	**555**	**1,329**	**1,231**	**98**	**98**	**192**	**1,329**	**190**
56 Year LOM (Potential Future Mining Continuation and would be subject to further approvals)								
Annual Average	15	35	33	2	2	5	35	5
Total	**865**	**1,970**	**1,838**	**133**	**133**	**196**	**1,970**	**280**

The progressive mining and pit development sequence will commence at Iron Peak (Years 1–12) and then move to Razorback (Mining Years 12–38, with potential for mining to Year 56 (subject to further approvals)). Further detail on this mining and staged pit development sequence is provided in Section 4.5.8.

Table 4-11: Material movements by year and area

Mine Year	Material extracted (Mt)		Strip ratio (W:O)	Ore direct tip [1] (Mt)	Annual ore to stockpile (Mt)	Ore reclaimed from stockpile (Mt)	Ore stockpile running balance (Mt)	Ore processed (Mt)	Head grade (eDTR%)	Concentrate (Mt)	Total material extracted by area (Mt)				
												Razorback			
	Waste rock	Ore									Iron Peak	West	Central	East	Eastern Ext.
1	25.85	34.81	0.7	33.00	1.82	1.74	*0.08*	34.73	14.8	5.0	60.7	-	-	-	-
2	31.51	33.77	0.9	32.08	1.69	1.69	*0.08*	33.77	15.3	5.0	65.3	-	-	-	-
3	27.31	35.58	0.8	30.81	4.78	1.62	*3.24*	32.43	15.9	5.0	62.9	-	-	-	-
4	28.04	31.16	0.9	29.60	1.56	1.84	*2.96*	31.44	16.4	5.0	59.2	-	-	-	-
5	37.94	30.27	1.3	28.76	1.51	2.14	*2.33*	30.90	16.7	5.0	68.2	-	-	-	-
6	18.80	32.58	0.6	30.95	1.63	1.63	*2.33*	32.58	15.8	5.0	51.4	-	-	-	-
7	5.19	30.29	0.2	28.77	1.51	1.51	*2.33*	30.29	17	5.0	35.5	-	-	-	-
8	23.62	30.48	0.8	28.96	1.52	1.52	*2.33*	30.48	16.9	5.0	54.1	-	-	-	-
9	21.65	31.89	0.7	29.56	2.32	1.56	*3.10*	31.12	16.6	5.0	53.5	-	-	-	-
10	4.36	27.41	0.2	26.04	1.37	1.37	*3.10*	27.41	18.8	5.0	31.8	-	-	-	-
11	2.71	26.14	0.1	24.02	2.11	1.26	*3.95*	25.29	20.4	5.0	28.8	-	-	-	-
12	3.08	31.50	0.1	24.47	7.02	1.29	*9.68*	25.76	20	5.0	18.7	-	-	15.9	-
13	2.07	38.23	0.1	34.91	3.32	1.84	*11.17*	36.75	14	5.0	-	-	-	40.3	-
14	14.82	31.30	0.5	29.73	1.56	8.11	*4.62*	37.85	13.6	5.0	-	-	46.1	-	-
15	2.39	35.12	0.1	33.36	1.76	1.76	*4.62*	35.12	14.7	5.0	-	-	8.6	28.9	-
16	5.35	32.52	0.2	30.89	1.63	6.24	-	37.14	13.9	5.0	-	-	37.0	0.9	-
17	10.31	36.70	0.3	34.86	1.83	1.83	-	36.70	14	5.0	-	-	27.6	19.4	-
18	4.68	36.37	0.1	34.55	1.82	1.82	-	36.37	14.2	5.0	-	-	29.6	11.5	-
19	12.23	38.50	0.3	36.10	2.40	1.90	*0.50*	38.00	13.6	5.0	-	-	50.7	-	-
20	9.62	53.00	0.2	36.10	16.90	1.90	*15.50*	38.00	13.6	5.0	-	-	8.0	54.6	-

Mine Year	Material extracted (Mt)		Strip ratio (W:O)	Ore direct tip [1] (Mt)	Annual ore to stockpile (Mt)	Ore reclaimed from stockpile (Mt)	Ore stockpile running balance (Mt)	Ore processed (Mt)	Head grade (eDTR%)	Concentrate (Mt)	Total material extracted by area (Mt)				
	Waste rock	Ore									Iron Peak	Razorback			
												West	Central	East	Eastern Ext.
21	2.42	39.26	0.1	36.10	3.16	1.90	*16.76*	38.00	13.6	5.0	-	-	22.6	19.1	-
22	0.86	35.79	0	34.00	1.79	4.00	*14.55*	38.00	13.6	5.0	-	-	18.4	18.2	-
23	1.13	40.32	0	36.10	4.22	1.90	*16.87*	38.00	13.6	5.0	-	-	5.4	36.0	-
24	1.05	37.08	0	35.22	1.85	2.78	*15.95*	38.00	13.6	5.0	-	-	2.9	35.2	-
25	4.20	35.38	0.1	33.61	1.77	4.39	*13.33*	38.00	13.6	5.0	-	-	8.5	31.1	-
26	4.59	33.93	0.1	32.23	1.70	5.77	*9.26*	38.00	13.6	5.0	-	-	4.8	33.7	-
27	16.10	39.53	0.4	35.25	4.28	1.86	*11.68*	37.11	13.9	5.0	-	-	44.9	10.8	-
28	3.31	34.94	0.1	33.20	1.75	4.70	*8.73*	37.90	13.6	5.0	-	-	37.2	1.1	-
29	31.98	34.87	0.9	33.13	1.74	4.87	*5.60*	38.00	13.6	5.0	-	-	58.1	8.7	-
30	34.18	34.68	1	32.94	1.73	2.88	*4.45*	35.82	14.4	5.0	-	-	67.6	1.3	-
31	23.77	33.71	0.7	32.03	1.69	3.70	*2.44*	35.72	14.4	5.0	-	-	51.7	5.7	-
32	19.10	34.05	0.6	32.35	1.70	4.15	-	36.50	14.1	5.0	-	-	46.4	6.7	-
33	8.87	35.08	0.3	33.33	1.75	1.75	-	35.08	14.7	5.0	-	-	37.1	6.9	-
34	2.87	34.60	0.1	32.87	1.73	1.73	-	34.60	14.9	5.0	-	-	37.5	-	-
35	31.91	38.00	0.8	36.10	1.90	1.90	-	38.00	13.6	5.0	-	-	27.3	42.6	-
36	31.56	37.10	0.9	35.25	1.86	1.86	-	37.10	13.9	5.0	-	-	46.7	21.9	-
37	18.37	37.81	0.5	35.92	1.89	1.89	-	37.81	13.6	5.0	-	-	18.0	38.2	-
38	27.52	35.54	0.8	33.76	1.78	1.78	-	35.54	14.5	5.0	-	-	35.5	27.6	-
MLP LOM	555.32	1329.29	0.4	1230.91	98.3	98.3	-	1329.31	14.3	190	590.1	-	778.2	516.3	
39	23.48	34.68	0.7	32.71	1.97	1.72	*0.25*	34.43	15	5.0	-	-	20.9	37.3	-

Mine Year	Material extracted (Mt)		Strip ratio (W:O)	Ore direct tip [1] (Mt)	Annual ore to stockpile (Mt)	Ore reclaimed from stockpile (Mt)	Ore stockpile running balance (Mt)	Ore processed (Mt)	Head grade (eDTR%)	Concentrate (Mt)	Total material extracted by area (Mt)				
												Razorback			
	Waste rock	Ore									Iron Peak	West	Central	East	Eastern Ext.
40	32.42	37.58	0.9	35.40	2.18	1.86	*0.57*	37.26	13.8	5.0	-	-	56.5	2.1	11.4
41	13.98	33.95	0.4	32.26	1.70	2.05	*0.21*	34.31	15	5.0	-	-	45.1	-	2.9
42	6.68	33.56	0.2	31.80	1.76	1.67	*0.30*	33.47	15.4	5.0	-	-	40.2	-	-
43	5.36	34.08	0.2	32.33	1.75	1.70	*0.35*	34.03	15.1	5.0	-	-	34.6	-	4.8
44	3.49	33.72	0.1	31.65	2.08	1.67	*0.76*	33.31	15.5	5.0	-	-	37.2	-	-
45	1.38	32.88	0	31.23	1.64	2.15	*0.25*	33.39	15.4	5.0	-	-	34.3	-	-
46	12.85	37.70	0.3	35.81	1.88	2.13	-	37.94	13.6	5.0	-	-	14.9	-	35.6
47	6.77	38.56	0.2	35.88	2.68	1.89	*0.79*	37.76	13.6	5.0	-	-	12.1	-	33.2
48	21.35	36.20	0.6	34.39	1.81	2.60	-	36.99	13.9	5.0	-	26.8	11.8	-	19.0
49	21.91	37.62	0.6	35.74	1.88	1.88	-	37.62	13.7	5.0	-	31.4	0.5	-	27.7
50	15.03	35.46	0.4	33.69	1.77	1.77	-	35.46	14.5	5.0	-	21.5	7.9	0.2	20.8
51	30.80	34.69	0.9	32.96	1.73	1.73	-	34.69	14.9	5.0	-	52.0	1.4	-	12.1
52	34.80	35.20	1	33.44	1.76	1.76	-	35.20	14.6	5.0	-	45.5	1.7	-	22.8
53	31.02	34.25	0.9	32.54	1.71	1.71	-	34.25	15.1	5.0	-	54.4	-	-	10.8
54	27.07	35.90	0.8	34.11	1.80	1.80	-	35.90	14.4	5.0	-	35.6	-	-	27.4
55	13.46	38.64	0.3	36.10	2.54	1.90	*0.64*	38.00	13.6	5.0	-	11.8	-	-	40.3
56	7.36	36.40	0.2	34.58	1.82	2.46	-	37.04	13.9	5.0	-	11.2	0.1	-	32.4
Full LOM	864.53	1970.36	0.4	1837.53	132.8	132.8	-	1970.36	14.2	280		290.2	1097.4	555.9	301.2

1. ORE TIPPED DIRECTLY TO THE PROCESSING PLANT PRIMARY GYRATORY CRUSHER

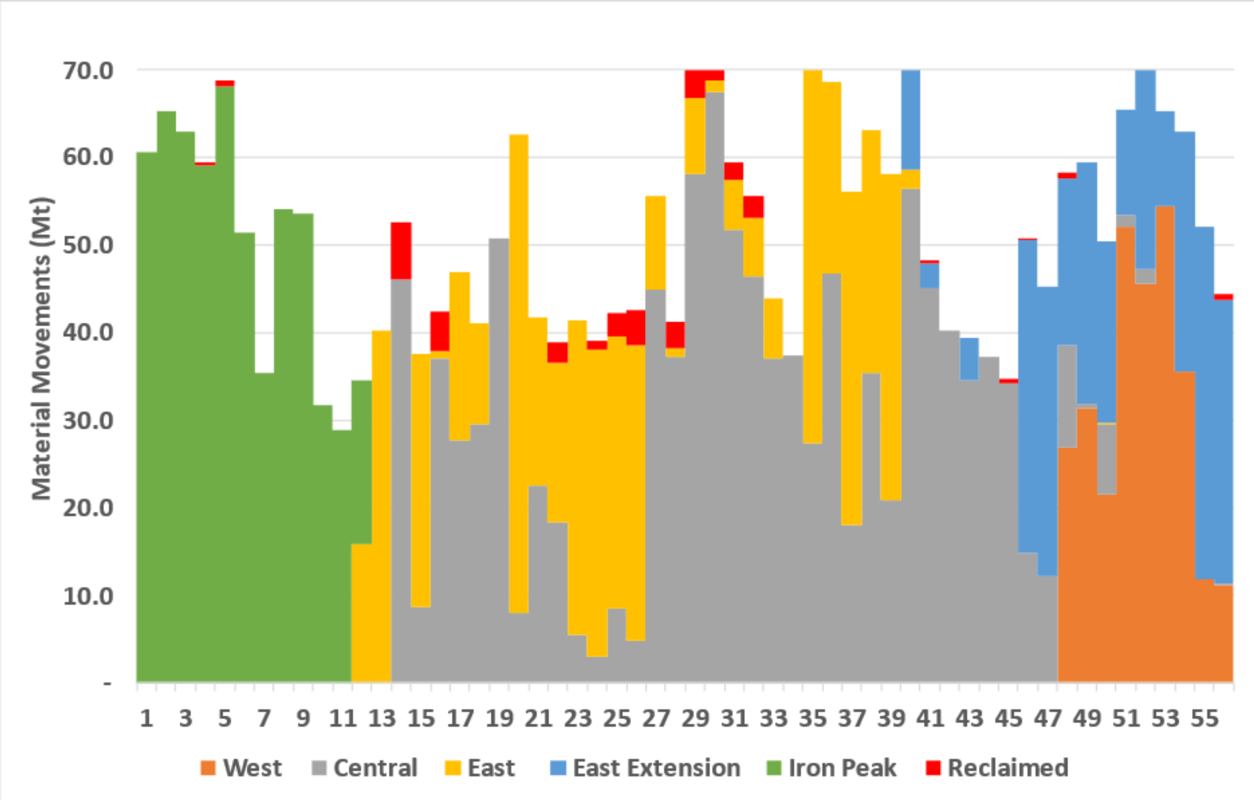

Figure 4-11: Material movements by pit designation

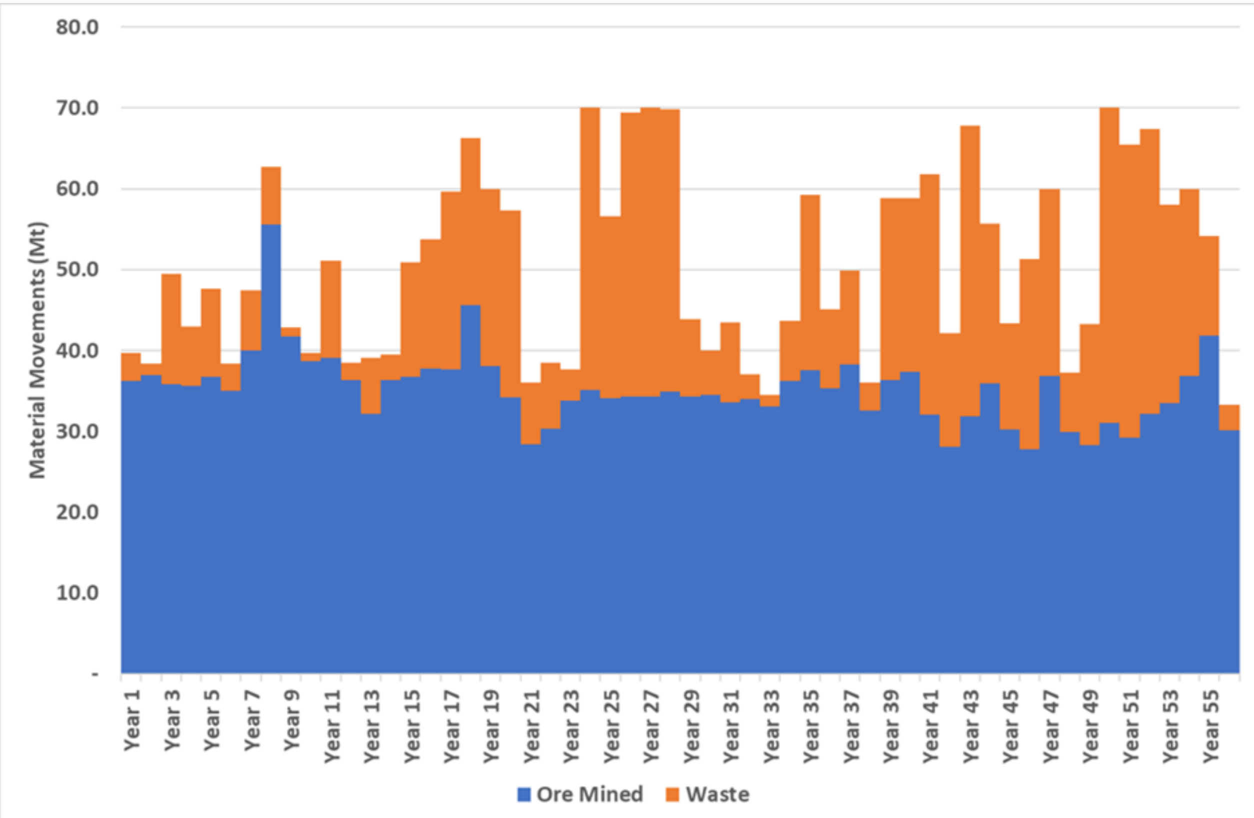

Figure 4-12: Material movements – ore and waste rock

4.5.4. Stockpiles

4.5.4.1. Cleared vegetation

Woody debris and light organic matter generated during land clearing will be separated and preserved for re-use in rehabilitation. Coarse woody debris (e.g. large branches and tree trunks) will be placed in timber stockpiles according to its origin and original vegetation association. Whilst grasses and small shrubs will be cleared as part topsoil stripping and retained within the soil stockpiles (refer Section 4.5.4.2). This enables retention of organic matter and existing seed bank within the stockpiled soils, providing opportunity for interim revegetation of stockpiles allowing for vegetation stabilisation, nutrient cycling and maintenance of long-term soil function until such time that stockpiled soils are re-used in rehabilitation (Section 4.5.10).

Detailed stockpile plans will be developed as part of Construction Environmental Management Plans (CEMPs) and with final detailed site layouts; however, MGT anticipates a degree of co-location of vegetation stockpiles with soil stockpiles to simplify management and reduce rehandling distances during rehabilitation.

4.5.4.2. Subsoil and topsoil

In general, all subsoils and topsoils coinciding with the disturbance footprint in the ML and HR / RS areas will be stripped and stockpiled. Within the TL corridor, soil stripping and stockpiling will principally be focussed on locations where material ground disturbance will occur (e.g., TL tower pads, temporary laydown areas, accommodation camp locations and areas of poor ground conditions requiring track improvements). While much of the TL alignment will use existing access tracks and fence line tracks, some new access tracks will be required. The preparation of new access tracks within the TL MPL may require the stripping of topsoils in certain areas, with the material to be temporarily stockpiled as windrows to enable ready access in for rehabilitation activities. Once construction is complete, many of these areas subject to temporary activities will be rehabilitated.

The depth of material to be stripped and stockpiled will vary according to the depth of soil resource present, with soils ranging from very shallow to shallow (0.25–0.5 m deep) on upper slopes and ridges, moderately deep (to 1 m) on lower rises, and deep (>1 m) deep within alluvial fans, flats and drainage depressions.

The method of stockpile placement will depend on the mining equipment used which may include single-pass excavation and stockpile placement using carry graders, windrow stockpiling using graders or dozers, truck and shovel (excavation, truck loading and paddock dumping), or a combination of these.

Subsoils and topsoils will be stripped and stockpiled separately to prevent mixing and reduction in topsoil quality. Soils will be stockpiled according to soil type and origin, with the latter considerate of the original soil landscape and vegetation association. Subsoil and topsoil stockpile heights will be limited to 4 m and 2 m, respectively, with lower topsoil stockpile heights to reduce in-situ compaction and maintain water/air exchange and soil function. Given the inert nature of the soil, stockpiles will be subject to normal water infiltration and soil / water processes; no leachate concerns are evident.

Stockpiles will be stabilised through application of water and / or commercial dust suppressants. Native seed may also be applied to topsoil stockpiles to encourage long-term vegetation-based stabilisation. If required, supplementary erosion and sediment control measures such as silt fences, v-drains and sediment basins will be used to minimise sediment runoff and soil loss.

Indicative primary soil stockpile locations for mining and associated activities are shown in Figure 4-13. Detailed stockpile plans will be developed further once detailed designs and site layouts are prescribed.

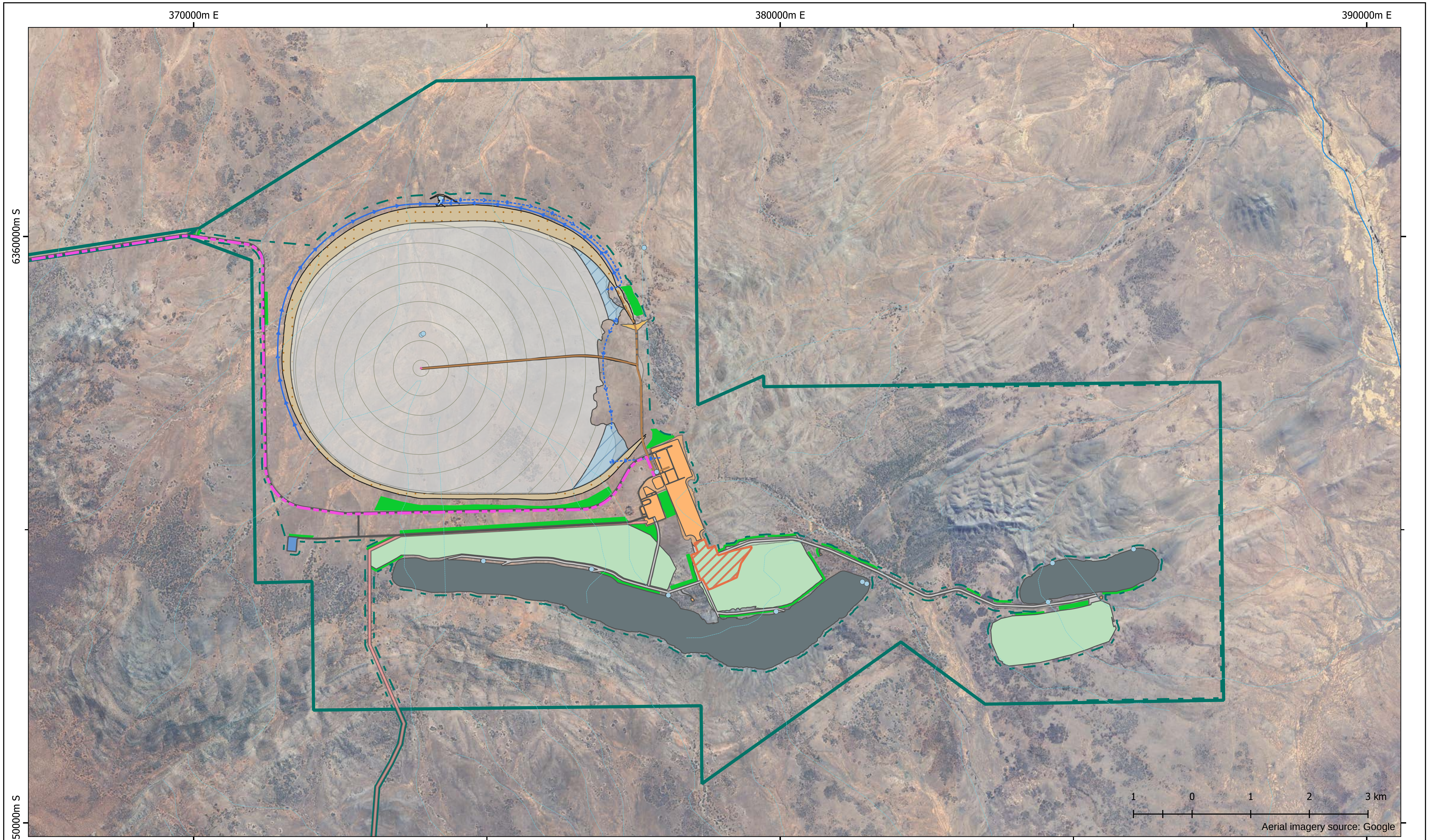

Figure 4-13: Proposed Mining Lease indicative vegetation and soil stockpile areas

Project Area
Conceptual Footprint

Watercourses
Major
Minor

Water supply
Groundwater bore site (ind.)
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Accommodation camp

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile
Vegetation/soil stockpile areas

Ultimate TSF infrastructure
TSF Toe drain (with flow direction)
TSF Decant pipelines (with flow direction)
TSF Tailings slurry pipeline
TSF Coarse sand pipeline
TSF Spigot location
TSF Spigot access pier/road

TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond
TSF Mounding profile
TSF Tailings beach extent
TSF Spillway
TSF Embankment

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4.5.4.3. Ore

Excess ore that cannot be directly crushed and processed will be placed into temporary ore stockpiles on the ROM pad near the primary crusher and re-handled into the crusher for processing when necessary to maintain target process plant feed rate. Further information on ore handling management is included in Section 4.5.1.3.

Temporary and longer-term ore stockpile locations are shown in Figure 4-14.

As ore stockpiles will primarily consist of competent bulk rock generated from drill and blast operations, the tipped ore will rest at a stable angle of repose with no or minimal need for stabilisation, which would be limited to as-required dust suppression using water carts.

The maximum height of long-term ore storage stockpiles are expected to be approximately 6 m based on the average ore stockpile volumes across the first 20 years of mining operations. Mining years 20-27 generally have ore stockpile balances in excess of 10 Mt (compared to an average of 3.6 Mt across the first 20 years), which will result in higher maximum stockpile heights within the designated long-term ore stockpile area to accommodation the temporarily-increased volumes.

Given the predominant inert nature of the ore, stockpiles will be subject to normal water infiltration processes; no leachate concerns are evident. The ore stockpiles will be free draining, with any water (and associated sediment) runoff directed to sediment drains and basins around the perimeter of the ROM pad and stockpile area. It is noted that the long-term ore stockpile area is contained within the Razorback Central WRD that will form as an effective hardstand under the ore stockpiles.

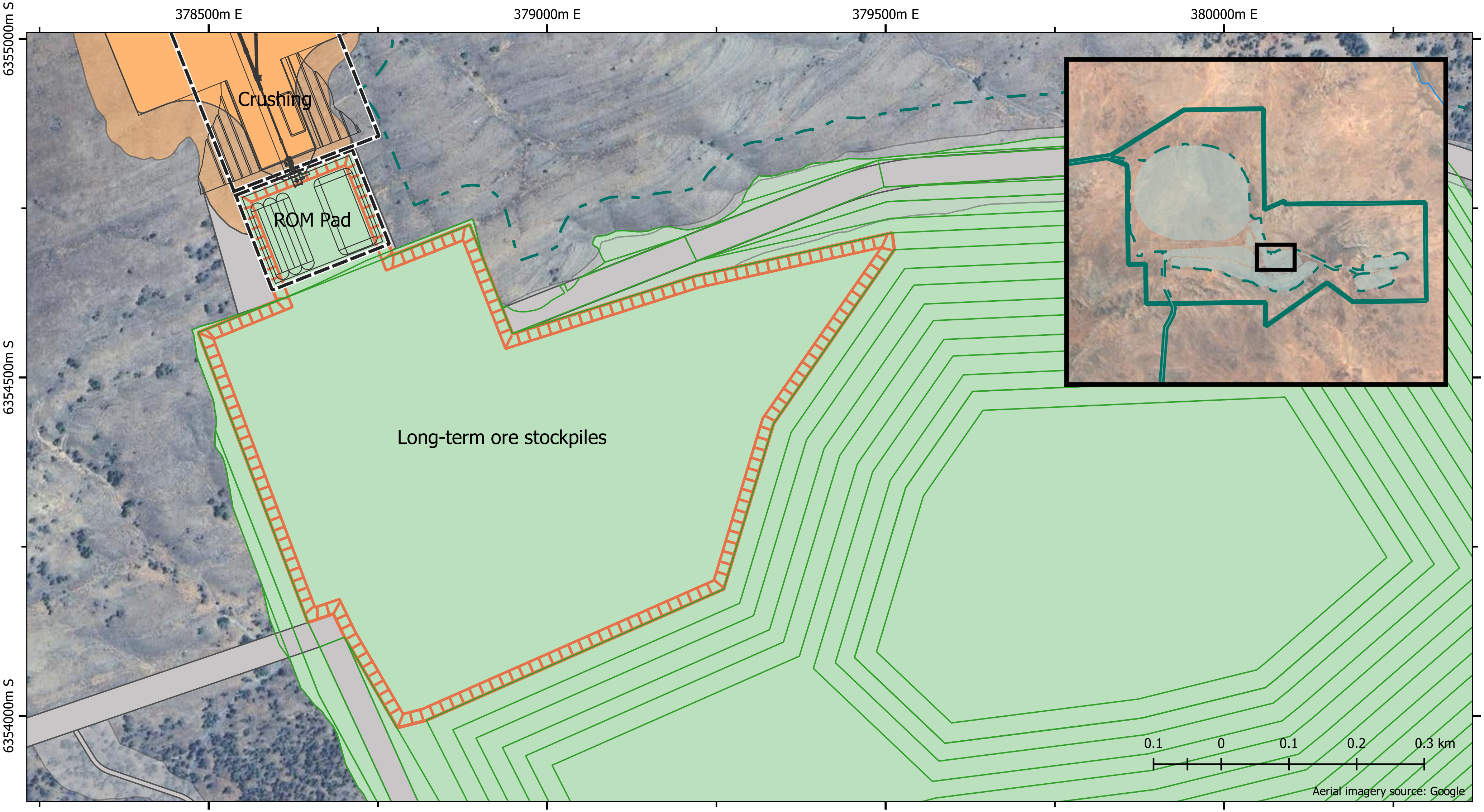

Figure 4-14: Short-term and long-term ore stockpiling, ML

Project Area
Conceptual Footprint

Roads
Haul, access and other roads
Road batters

Primary facilities
Key facility compounds
Key facility batters
Process plant layout
Process plant layout

Mine and stockpile infrastructure
ROM operations area
Waste rock stockpile
Waste rock stockpile profile

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4.5.4.4. Concentrate (product)

Concentrate from the processing plant is produced as a filter cake which is conveyed by the concentrate stacker to the concentrate stockpile pad.

The concentrate stacker will allow for radial stockpiling for up to three stockpiles. The concentrate produced during each shift will have a separate stockpile to allow for confirmation of concentrate grade and compliance with the transportable moisture limit (TML) (≤8.4% moisture). Concentrate is released for shipment and loading into triple road trains once the concentrate grade and TML is confirmed.

The concentrate stockpile pad and radial stockpiling design are shown in Figure 4-15. Maximum stockpile heights are assumed to be 21 m, assuming an angle of repose of 40 degrees, which is generally considered at the higher end of the acceptable range for materials at approximately 40 micron grain size.

If required, surplus concentrate may be re-handled to long-term stockpiles on the outer edges of the concentrate stockpile pad.

Stockpiled concentrate will have inherently low moisture content though will be allowed to free drain, with any sediment runoff directed to drains around the concentrate stockpile pad with water returned to the process water circuit. Water infiltration and movement within concentrate stockpiles is not considered a material issue given the active and continued consumption and replenishment of the stockpiles

If required, concentrate stockpiles will be stabilised through application of water and / or commercial dust suppressants to limit wind erosion and dust emissions while maintaining relevant product and product transport standards.

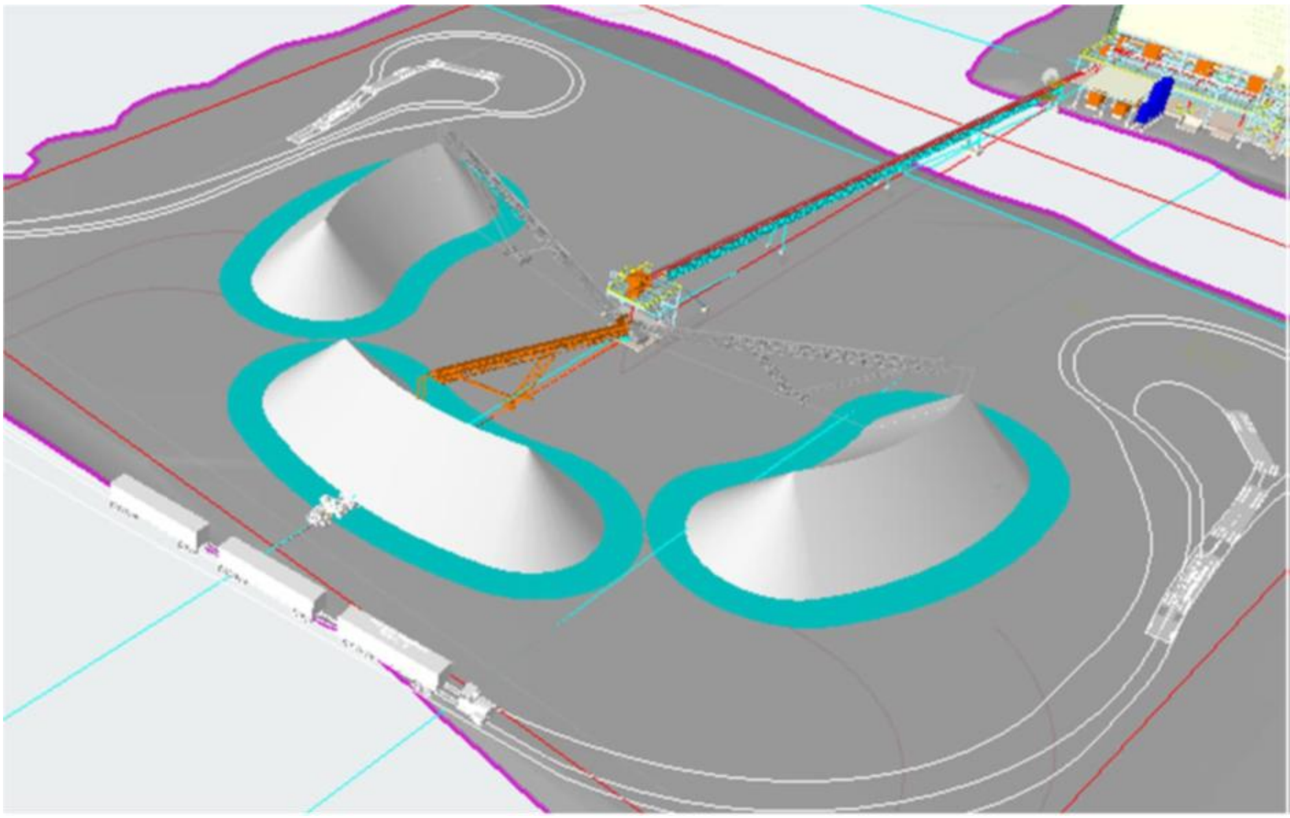

Figure 4-15: Radial concentrate stockpile concept visualisation

4.5.5. Use of explosives

4.5.5.1. Explosive types, blast frequency and blast sizes

Explosives likely to be used for blasting operations include ammonium nitrate / fuel oil (ANFO), and in circumstances where groundwater is encountered, Heavy ANFO (mix with emulsion).

An Explosives and Blasting Management Plan, developed in accordance with Australian Standard AS 2187.2:2006 (*Explosives—Storage and use; Part 2: Use of explosives*) and other relevant best-practice guidelines, will be implemented to define the protocols for safe explosives storage, handling and use. The core objectives of the Explosives and Blasting Management Plan will be to:

- ensure there are no risks to mine personnel, members of the public, and mine and public infrastructure and
- mitigate health and amenity impacts to sensitive receptors associated with noise, vibration and dust in conjunction with related environmental management plans.

The Explosives and Blasting Management Plan will include and address, at a minimum:

- a site plan for the magazine including access roads
- distances to potential receptors
- inventory management and control, including chain-of-custody spanning material procurement, delivery to the Site, storage and requisition for use)
- roles and responsibilities, including requirements for authorised (licensed) persons;
- protocols around unauthorised magazine facility access, material take, theft and unexplained loss and investigation; and
- administrative matters, including licensing and training requirements.

Further, the Explosives and Blasting Management Plan will address protocols for safe blasting including but not necessarily limited to:

- blast planning and design with input from mine engineering, geotechnical, safety and blast specialists
- community and site notices for planned blast events (minimum 24-hour notice period)
- designation and implementation of exclusion ('no go') zones
- development of blast plans for each planned blast event
- closure of pit / void access points and posting of 'blast guards' to prevent access
- pre-blasting inspection to confirm full evacuation of blast exclusion zones and authority to initiate the blast event
- nomination of a blast controller (person with Blaster's Licence)
- emergency preparedness
- post-blasting inspection to confirm a safe and effective blast (and any deviation) and
- clearance to resume normal truck and shovel operations.

The preparation, assembly, charging or firing of explosives will be managed by qualified and experienced personnel or contractors who hold an Explosives Licence (Blaster's Licence) issued by SafeWorkSA under the *Explosives Regulations 2011* (SA).

An indicative blasting schedule is provided in Table 4-12. On average, blasting will occur every two to three days for each of the active pits.

Table 4-12: Indicative blasting frequency

Mine Year	Blasts per year (#)	Holes drilled per blasting (#)	Area per blast (m^2)
1	143	350	15,000
2	154	350	15,000
3	148	350	15,000
4	139	350	15,000
5	161	350	15,000
6	121	350	15,000
7	84	350	15000
8	127	350	15,000
9	126	350	15,000
10	75	350	15,000
11	68	350	15,000
12	81	350	15,000
13	95	350	15,000
14	109	350	15,000
15	88	350	15,000
16	89	350	15,000
17	111	350	15,000
18	97	350	15,000
19	119	350	15,000
20	148	350	15,000
21	98	350	15,000
22	86	350	15,000
23	98	350	15,000
24	90	350	15,000
25	93	350	15,000
26	91	350	15,000
27	131	350	15,000
28	90	350	15,000
29	157	350	15,000
30	162	350	15,000
31	135	350	15,000
32	125	350	15,000
33	104	350	15,000
34	88	350	15,000
35	165	350	15,000
36	162	350	15,000
37	132	350	15,000

Mine Year	Blasts per year (#)	Holes drilled per blasting (#)	Area per blast (m^2)
38	149	350	15,000
39	137	350	15,000
40	165	350	15,000
41	113	350	15,000
42	95	350	15,000
43	93	350	15,000
44	88	350	15,000
45	81	350	15,000
46	119	350	15,000
47	107	350	15,000
48	136	350	15,000
49	140	350	15,000
50	119	350	15,000
51	154	350	15,000
52	165	350	15,000
53	154	350	15,000
54	148	350	15,000
55	123	350	15,000
56	103	350	15,000

Average blasting sizes (material volume moved) will be approximately 150,000 bulk cubic metres (BCM), equivalent to approximately 417,000 t (Table 4-13). The nominal blasthole diameter size will be 165 mm.

Table 4-13: Indicative blasting pattern and size

Blasting pattern		Blasting size	
Average depth	10 m	Blasthole size (nominal)	165 mm
Average length	150 m	Blast size	150,000 BCM 417,000 t
Average width	100 m	Presplit size	150 Holes

4.5.5.2. Magazine location and design

The magazine will consist of shipping-container type storage on a compacted hardstand pad. The nominated magazine location (Figure 4-16) is selected to provide suitable separation distance between active mine working areas and the separate ANFO storages (Section 4.5.5.3).

The magazine will be designed in accordance with Australian standard AS 2187.1 (*Explosives – Storage, transport and use – Storage*), which provides critical guidance on facility design, siting, security, and inventory management. Consistent with AS 2187.1, magazine design and operation will include but not necessarily be limited to:

- Earthing, lightning and spark protection controls and use of intrinsically safe electrical equipment and components per relevant Australian and New Zealand Standards (e.g. *AS/NZS 1768: Lightning protection and AS/NZS 3000: Electrical installations* ('Australian/New Zealand Wiring Rules')).
- Security and access controls including secure magazine compound perimeter fencing and locked magazine access.
- Provision of emergency control, suppression and containment systems and equipment.

Licences for the Storage of Explosives (Premises) ('Explosives Storage Licences') issued by SafeWorkSA under the *Explosives Regulations 2011* (SA) will be required. Licensing will apply both for the magazine, personnel accessing the magazine (e.g., personnel with a valid Blaster's Licence) and MGT accountable persons.

Protocols regarding the access, use and maintenance of the magazine will be defined within the Explosives and Blasting Management Plan with procedures for explosives-related emergency events defined in the Site Emergency Management Plan.

4.5.5.3. ANFO storage location and design

Two separate ANFO storage facilities will be established during life-of-mine to support blasting operations at Iron Peak and Razorback. The location of these facilities (Figure 4-16) provides adequate separation distances from the magazine and other key facilities.

Each ANFO storage facility will consist of a compacted hardstand pad hosting silos for the storage of ANFO emulsion (180,000 kg total volume) and separate shed for the storage of dry ANFO bulk-bags (120,000 kg total volume).

As with the magazine, the ANFO facilities will be designed and managed in accordance with Australian standard AS 2187.1 (*Explosives –Storage, transport and use – Storage*), explosives licensing and the Explosives and Blasting Management Plan.

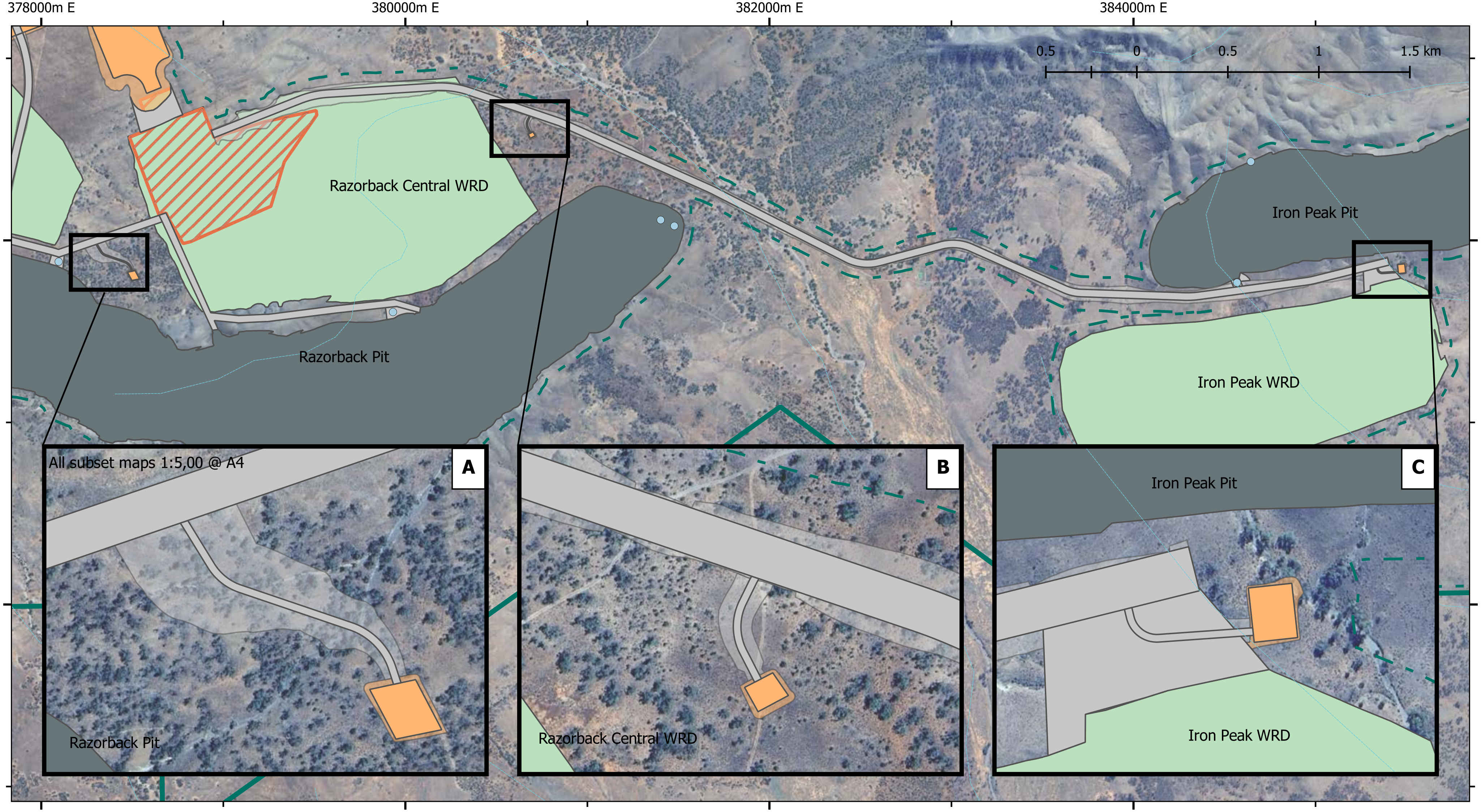

Figure 4-16: Magazine and ANFO storage locations

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4.5.6. Mining equipment

An indicative list of mobile plant and equipment to be used during the life of Project is provided in Table 4-14, including equipment size / capacity, noise emission levels (dB(A)) and average point-in-time fleet numbers.

No fixed mining infrastructure is proposed to be used.

Mobile plant and equipment will be used for construction, mining operations and closure for the following applications:

- Earthmoving and materials handling:
  - soil stripping and stockpiling
  - primary mining (on-site waste rock and ore excavation haulage)
  - WRD construction
  - final landform construction and reinstatement.
- Drilling, including:
  - ore definition drilling
  - drill and blast programs
  - water bore drilling.
- Mining support:
  - mobile service and refuelling
  - road watering and dust suppression.
- Infrastructure and fixed processing plant construction and decommissioning.
- Ore concentrate handling and loading.
- General freight, warehousing and maintenance activities.
- Personnel transport.

Mining equipment operational noise and vibration emissions from mining the equipment encompass, but are not restricted to:

- engine operation
- operational alarms and warning systems, such as tramming or reversing alarms
- loading noise in truck bodies
- track noise stemming from tramming tracked equipment and
- hammer noise generated by drilling rigs.

Table 4-14: Indicative mining equipment and application

Equipment	Capacity / payload	Average fleet (n)	Emissions				Use by Project phase		
			Noise dB(A)		Air (exhaust)	Potential ignition sources	Construction	Mining	Rehabilitation
			Inside cabin	Outside cabin					
CAT 6040FS (Face Shovel)	400 t	4	75	120	Diesel combustion (Exhaust composition by volume as per Table 4-15)	Diesel combustion		●	
Cat 789F (Haul Truck)	193 t	25	76	121				●	
CAT 777G (Haul Truck)	89 t	2	73	112			●	●	●
CAT 992 (Large Wheel Loader)	25 t	2	70	116			●	●	●
CAT 6015B (Excavator)	16 t	1	71	114			●	●	●
Kubota U55-4 (Small Excavator)	5 t	2	78	73			●	●	●
CAT 777G WC (Watercart)	76,000 L	3	73	112			●	●	●
CAT D9T (Track Dozer)	-	1	76	114			●	●	●
CAT D10T (Track Dozer)	-	4	74	111			●	●	●
CAT 16M (Grader)	-	3	72	108			●	●	●
CAT 637 Carry Grader (Scraper)	37 t	3	72 *	116			●		●
EPIROC Viper 271 (Primary Drill)	-	5	<80	124 *				●	
EPIROC D65 (Secondary Drill)	-	3	<79	124				●	
CAT Hydraulic Hammer	-	1	73	112			●	●	●
CAT 854K (Wheel Dozer)	-	1	71	87			●	●	●
CAT Service Truck (Support Truck)	-	1	73	112			●	●	●
CAT 980K (Front End Loader)	3 t	3	72	112			●	●	●
PANTHER Series II Float (Low Loader)	360 t	1	76 *	120 *			●	●	●
FRANNA (Articulated Mobile Crane)	16 t	3	75 *	110 *			●	●	●
TOYOTA 22-Seater Bus	-	15	75	110 *			●	●	●
Light Vehicles (4WD)	-	25	75 *	110 *			●	●	●
Commercial Truck	-	2	75 *	110 *			●	●	●

Equipment	Capacity / payload	Average fleet (n)	Emissions				Use by Project phase		
			Noise dB(A)		Air (exhaust)	Potential ignition sources	Construction	Mining	Rehabilitation
			Inside cabin	Outside cabin					
Forklift	1.5 t	3	93	93			●	●	●
Site Ambulance (Emergency Vehicle)	-	1	75 *	110 *			●	●	●
Site Fire Truck (Emergency Vehicle)	5,000 L	1	75 *	110 *			●	●	●
Diesel Generators (~10 kVA)	-	10	-	120 *			●	●	●
ALLIGHT (Lighting tower)	-	16	-	<70			●	●	●

* APPROXIMATE VALUE (MANUFACTURER AND EQUIPMENT SPECIFICATION NOT AVAILABLE, OR EQUIPMENT MAKE/MODEL NOT YET KNOWN)

Potential ignition sources include diesel combustion and hot engine and exhaust systems.

Indicative diesel exhaust gas composition and emissions are provided in Table 4-15. Actual emissions will be variable according to the equipment type and use (rate of fuel consumption).

Table 4-15: Indicative diesel exhaust gas composition and emissions

Indicative diesel exhaust gas composition		
Component	**Typical concentration range**	
Nitrogen oxides (NOx)	50 – 2,000	ppm-vol 2
Sulphur oxides (SOx)	30 – 90	ppm-vol
Carbon monoxide (CO)	10 – 500	ppm-vol
Total Hydrocarbons (as Methane)	20 – 500	ppm-vol
Volatile Organic Compounds (as Methane)	20 – 100	ppm-vol
Particulate Matter (PM)	0.02 – 0.2	g/m3

1. % VOLUME (CONCENTRATION PERCENTAGE, VOLUME BASIS)
2. PPM-VOL (CONCENTRATION IN PARTS PER MILLION, VOLUME BASIS)
SOURCES: CIMAC (2008), GRENIER (2015), ECOPOINT INC. (2020), SHETE (2021)

4.5.7. Mine dewatering

Groundwater elevation and depth to groundwater in the vicinity of the deposits is highly variable, ranging between 225–300 m relative to the Australian Height Datum (mAHD) and between 2–89 m bgl (ELA, 2024).

Generally, the water table at Iron Peak is expected to be encountered at approximately 100 m below the natural surface, and approximately 2 years after mining commences. The water table at Razorback is expected to be encountered at approximately 60 m below natural surface, and approximately 1 year after mining commences at that deposit.

In fractured rock, as applies to the deposits and future pits, groundwater yields are variable and generally very low, ranging between <0.1 and 7 litres per second (L/s) with a median of 0.5 L/s, with higher yields associated with interconnected fractures (ELA, 2024).

Due to the variable occurrence of interconnected porosity, and irregularity in the size and connectivity of fractures within the aquifer, point-in-time and cumulative pit inflows are difficult to accurately predict and will change over time as the pit is deepened and more rock face is exposed. Consistent with this, groundwater modelling predictions (CDM Smith, 2024) estimate that groundwater inflows (at full development), based on a 5th to 95th percentile range, will be between 1,570 – 3,960 kilolitres per day (KL/day) (averaging 2,765 KL/day), equating to 573 – 1,445 ML/year. It is noted that this percentile range is for groundwater inflows into both the Iron Peak and Razorback pits at full development. Assuming a 25 / 75 split of inflows (based on 2-dimension pit extents), this equates to 382-990 KL/day at Iron Peak and 1,178-2,970 KL/day at Razorback. In-pit flows will be managed by a combination of in-pit sumps and evaporation.

Surface water inputs to the pits will be primarily through direct rainfall; however, the net effect on in-pit water volumes will typically be negligible given that average rainfall is lower than average potential PET, with material rainfall contributions limited to large episodic rainfall events. Further, rainfall-derived runoff and inflow will be largely prevented by pit crest perimeter safety bunds and cut-off drains.

In-pit water management infrastructure during the active mining phase will consist of groundwater inflow collection sumps, pumps and standpipes with the water used for in-pit and ex-pit dust suppression and road watering. Based on simultaneously operating three (3) 76,00 L water carts (Section 4.5.6), approximately 6– 18 water cart loads per day will be required to manage the 1,570 – 3,960 KL/day of groundwater inflow, plus / minus any rainfall contributions and evaporative losses. An in-pit dust suppression spray system is also considered to manage groundwater inflows while simultaneously reducing the number of water cart movements within the pit and improving dust management outcomes.

In the event of significant or unexpected surface or groundwater inflows, contingency measures may include but will not necessarily be limited to a combination of the following:

- temporary cessation of mining, awaiting improved weather conditions
- use of evaporation cannons
- pumping of water to the ex-pit process water dam and TSF.

A representative operations phase site water balance, including mine dewatering inflows and outflows, is provided in Section 4.6.2.1.

Key water inputs and outputs that will remain in the post-closure phase are limited to passive water fluxes within the mined-out pits (groundwater and rainfall inputs forming pit lakes, less evaporation) and the TSF final landform (residual entrained water and seepage, evaporation and rainfall fluxes).

4.5.8. Sequence of mining and rehabilitation operations

4.5.8.1. Mining sequence

The Iron Peak and Razorback deposits cover a combined strike length of approximately 13 km.

The progressive mining and pit development sequence will commence at Iron Peak (Years 1–12) and progress in four stages, initially focussed on areas with low strip ratio. Iron Peak has two starter pits in the east and west of the deposit (Pit Stages 1 and 2); Stage 3 consolidates the initial two stages, and the final stage (Stage 4) pushes out to the north-east pit limit (refer Figure 4-17 – Figure 4-20).

On completion of mining at Iron Peak, mining and extraction will move to Razorback, which will be developed in 14 stages, starting in Year 12 and occurring over 3 primary pit areas (Central, East and Consolidated) based on mining up to Year 56. Mining will commence initially in the Central pit, closely followed by a separate East pit which merge as pit expansion advances, forming the Consolidated pit (refer Figure 4-21–Figure 4-34)

Mine pit development at Year 38 is coincident to Razorback Consolidated – Stage 10 which is the timeframe and extent of mining covered by this application. Information for proposed Mining Years 39-56 is included for future reference

The mining stages provide ample working areas for efficient operations and none of the stages are required to be mined at excessive vertical advance rates.

Extraction volumes and sequencing of the Iron Peak and Razorback deposits are summarised in Table 4-16, with residual volumes for the full 56-year mine plan included in Table 4-17.

Table 4-16: Pit staged development sequence and maximum material volumes – to Year 38

	Waste rock (Mt)	Ore (Mt)	Total material extracted (Mt)	Strip ratio (W:O)	eDTR (%)	Iron (%)	Magnetite (%)
Iron Peak							
Iron Peak – Stage 1	84	88	172	1.0	17.3	18.2	14.4
Iron Peak – Stage 2	31	82	113	0.4	15.4	16.7	12.5
Iron Peak – Stage 3	48	100	148	0.5	15.8	16.6	13.3
Iron Peak – Stage 4	65	92	157	0.7	18.7	17.4	15.8
Iron Peak Totals	**228**	**362**	**590**	**0.6**	**16.8**	**17.2**	**14.0**
Razorback							
Razorback Central – Stage 1	28	162	190	0.2	14.6	15.8	13.4
Razorback Central – Stage 2	14	61	75	0.2	13.6	16.6	12.8
Razorback Central – Stage 3	24	76	100	0.3	13.7	15.8	13.4
Razorback Central – Stage 4	58	19	77	3.1	14.1	15.7	12.9
Razorback Central – Stage 5	39	66	105	0.6	14.6	15.7	13.4
Razorback Central – Stage 6	12	128	140	0.1	15.0	16.2	14.1
Razorback East – Stage 7	5	82	87	0.1	14.3	22.2	14.3
Razorback East – Stage 8	28	243	271	0.1	13.2	18.7	13.0
Razorback Consolidated – Stage 9	Consolidation of Central and East - quantities captured in Stages 7 and 8						
Razorback Consolidated – Stage 10	211	403	614	0.5	14.7	17.2	14.2
Interim (MLP LOM) Razorback Totals	**391**	**1,078**	**1,469**	**0.4**			
COMBINED TOTALS (MLP LOM)	**619**	**1,440**	**2,059**	**0.4**			

Table 4-17: Pit staged development sequence and minimum material volumes – Years 39-56 (subject to further approvals)

	Waste rock (Mt)	Ore (Mt)	Total material extracted (Mt)	Strip ratio (W:O)	eDTR (%)	Iron (%)	Magnetite (%)
Razorback							
Razorback Consolidated – Stage 10	Residual volumes from Stage 10 not mined within the first 38 years will apply						
Razorback Consolidated – Stage 11	66	67	133	1.0	14.9	15.6	13.9
Razorback Consolidated – Stage 12	82	76	158	1.1	15.8	14.9	15.0
Razorback Consolidated – Stage 13	31	148	179	0.2	13.0	20.2	12.7
Razorback Consolidated – Stage 14	47	83	130	0.6	12.6	21.7	11.9
Razorback Totals (all stages)	**645**	**1,615**	**2,258**	**0.4**	**14.2**	**17.6**	**13.6**
COMBINED TOTALS	**873**	**1,977**	**2,849**	**0.4**	**14.6**	**17.5**	**13.7**

Pit design and development sequence (Iron Peak – Stages 1–2)

Iron Peak is developed as four stages commencing with two lower strip ratio ore starter pits in the west and east (Stages 1 and 2).

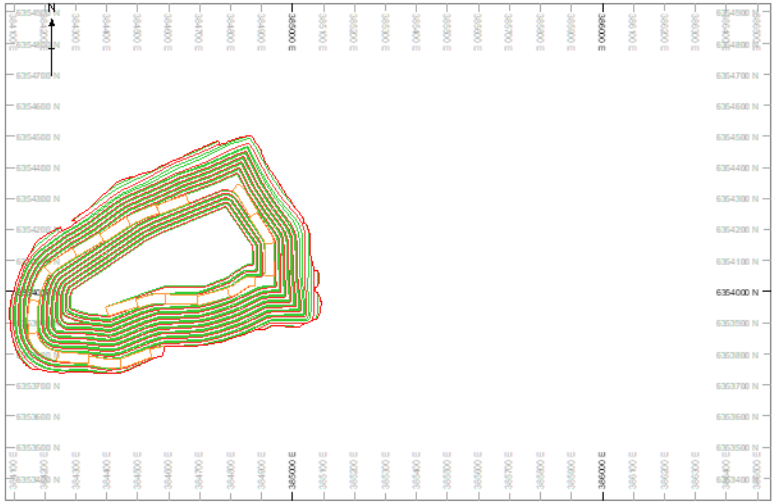

Figure 4-17: Design – Iron Peak – Stage 1

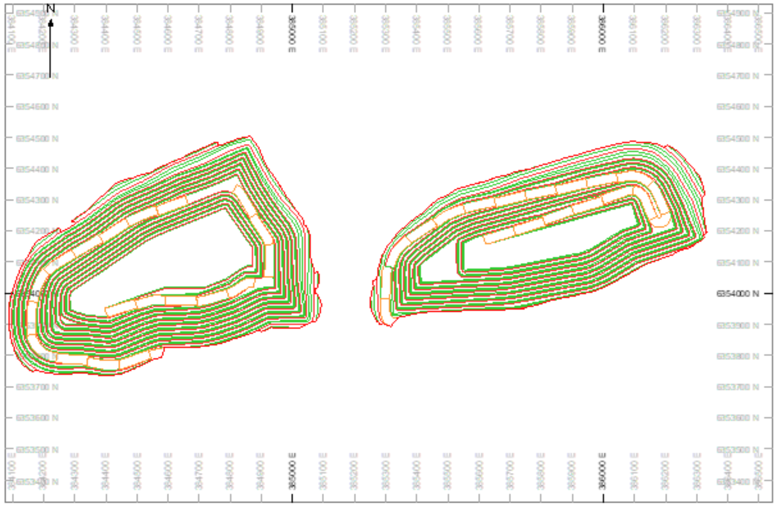

Figure 4-18: Design – Iron Peak – Stage 2

Pit design and development sequence (Iron Peak – Stages 3–4)

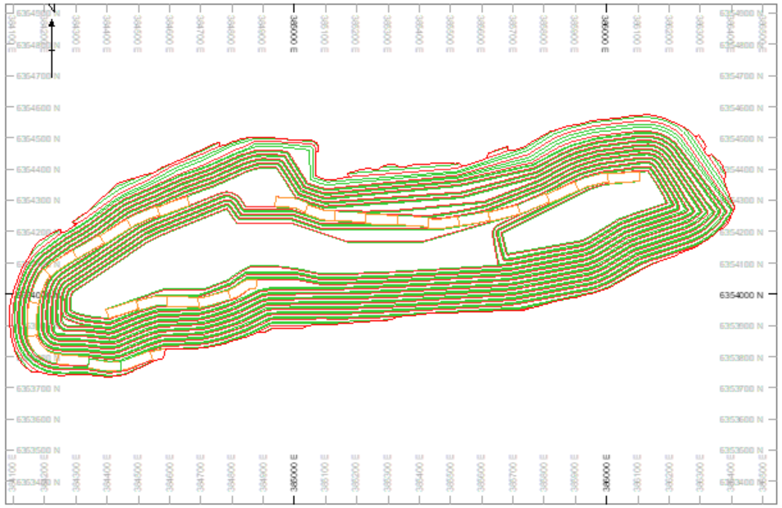

Figure 4-19: Design – Iron Peak – Stage 3

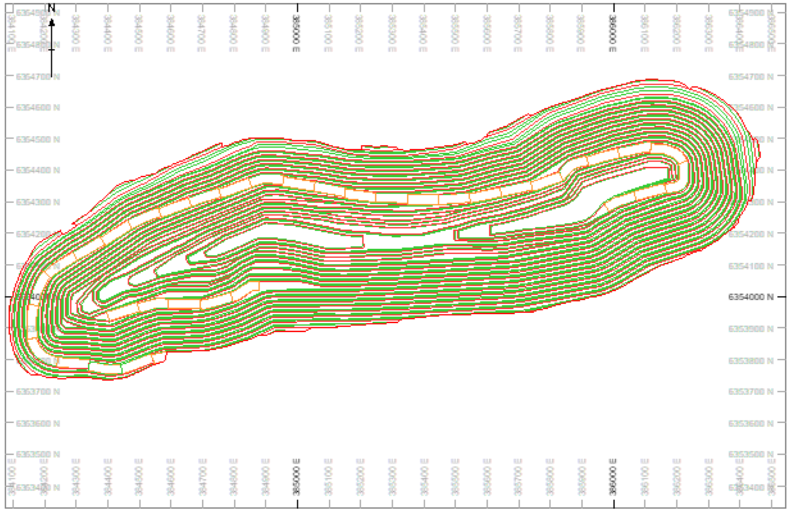

Figure 4-20: Design – Iron Peak – Stage 4

Stages 3 and 4 joins the first two pits and includes a final push to the northern pit limit and deepening to the final pit floor.

The final pit geometry at the end of Stage 4 represents the final void shape and geometry at closure (refer Section 4.10.5.1).

Pit design and development sequence (Razorback Central – Stages 1–2)

The initial two stages at Razorback focus on a very low strip ratio area, with separate starting pits both with independent ramps exiting the pit at the closest point to the crusher.

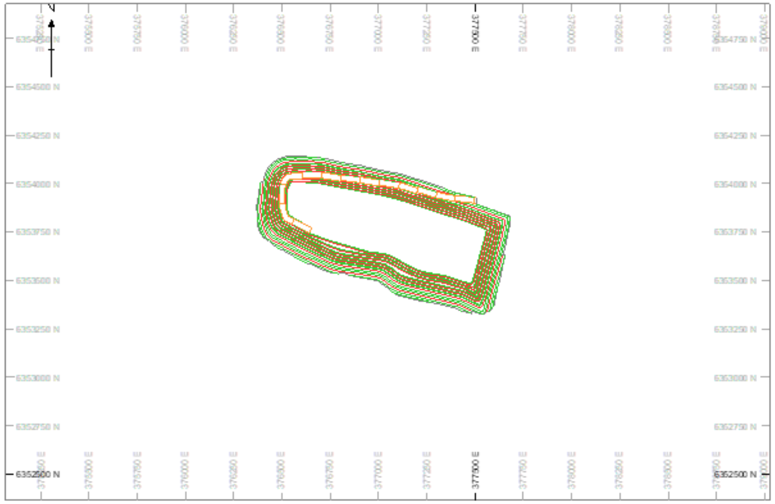

Figure 4-21: Design – Razorback Central – Stage 1

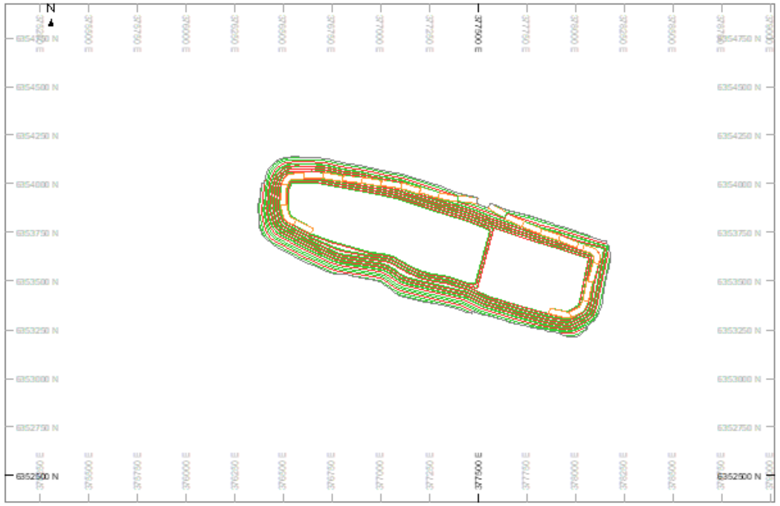

Figure 4-22: Design – Razorback Central – Stage 2

Pit design and development Sequence (Razorback Central – Stages 3–4)

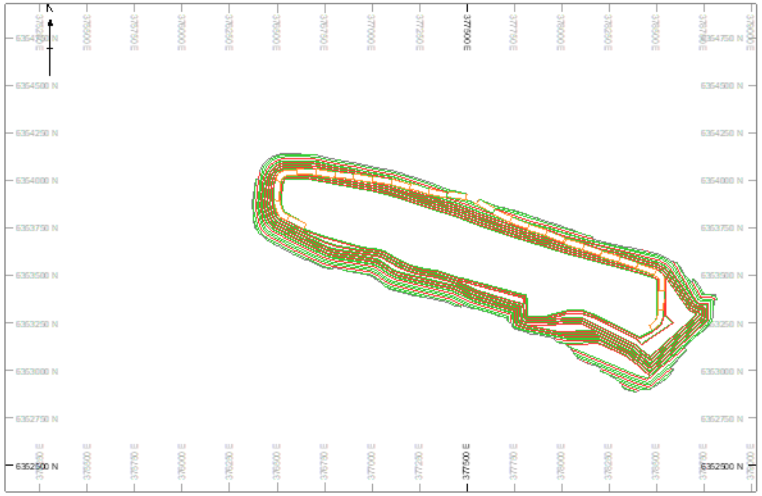

Figure 4-23: Design – Razorback Central – Stage 3

Stage 3 removes the internal wall separating the Stage 1 and 2 starting pits, merging the two, and then extends the Stage 2 starter pit to the East.

The upper four benches will require temporary ramps to access which will be addressed in more detailed operational planning.

Figure 4-24: Design – Razorback Central – Stage 4

Stage 4 is a high strip ratio stage, removing waste deferred from the initial three stages and takes the wall of the central area out to the ultimate pit limit.

Pit design and development sequence (Razorback Central – Stages 3–4)

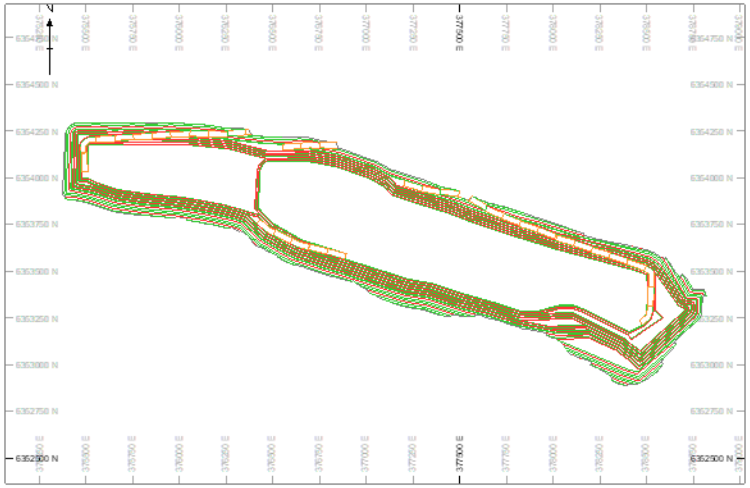

Figure 4-25: Design – Razorback Central – Stage 5

Stage 5 extends the pit the pit west, again with an independent ramp which climbs to the east taking the trucks toward the crusher as they climb from the pit, minimising haul distances.

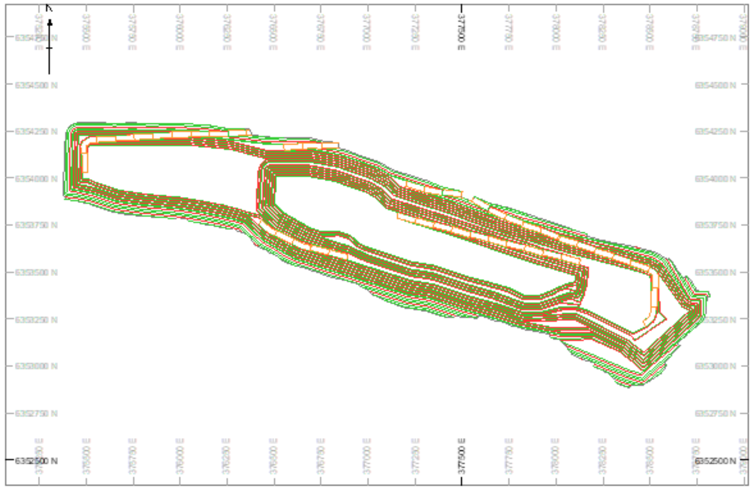

Figure 4-26: Design – Razorback Central – Stage 6

Stage 6 deepens the central Section of the pit utilising the existing ramp from Stage 3.

Pit design and development sequence (Razorback East – Stages 7–8)

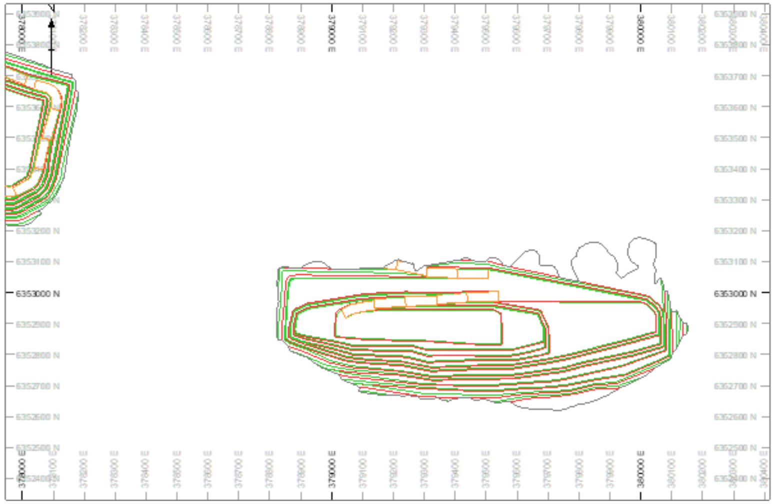

Figure 4-27: Design – Razorback East – Stage 7

Razorback East Stage 7 focusses on very low strip ratio ore which can be mined at the start of the mine life. The south wall of the stage pushes to the final pit wall position.

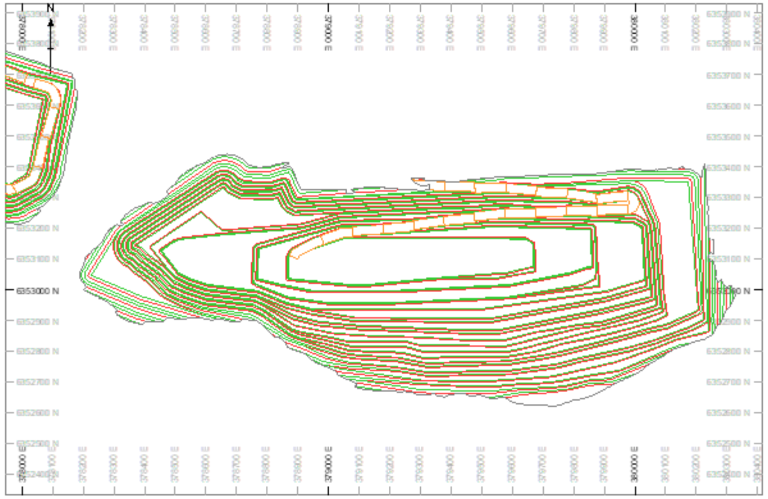

Figure 4-28: Design – Razorback East – Stage 8

Stage 8 pushes out the north wall and deepens the pit. This stage also accesses very low (0.1) strip ratio ore and provides sufficient plant feed for 8 years of concentrate production.

Pit design and development sequence (Razorback Consolidated– Stages 9–10)

Figure 4-29: Design – Razorback Consolidated – Stage 9

Stage 9 is a consolidation of Central Stage 6 and East Stage 2.

The material in this stage has been accounted for in the two previous stages, with the material included in both stages being assigned in East Stage quantities and for scheduling.

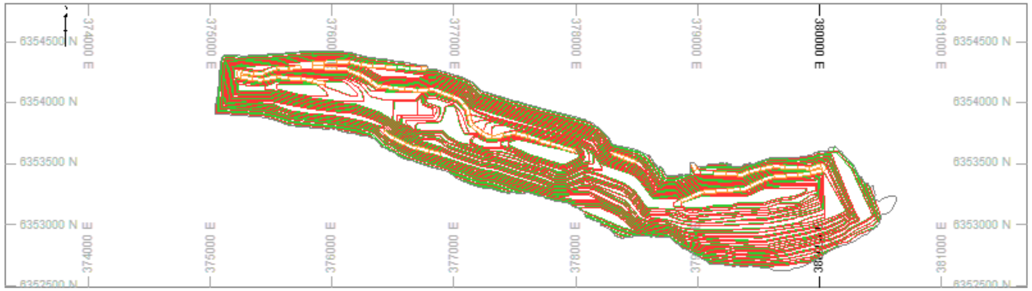

Figure 4-30: Design – Razorback Consolidated – Stage 10

Stage 10 is a large stage, deepening the central area and extending it further west. Stage 10 also pushes out the east end of the deposit into the Eastern Extension.

Based on the proposed 38-year mine life, mining would not proceed further than Stage 10 without additional tailings storage capacity.

Pit design and development sequence (Razorback Consolidated– Stages 11–12)

Figure 4-31: Design – Razorback Consolidated – Stage 11

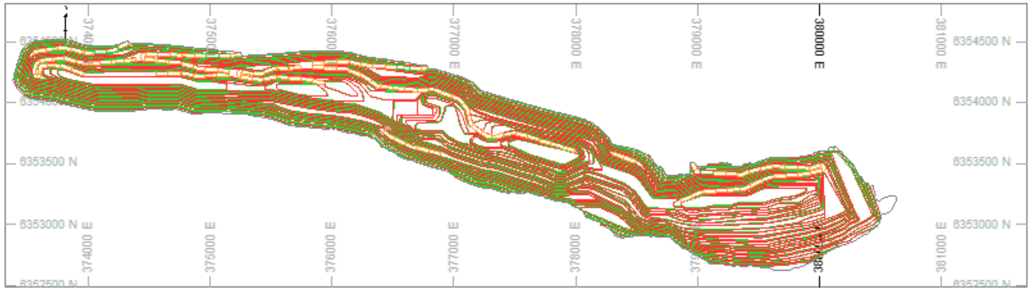

Figure 4-32: Design – Razorback Consolidated – Stage 12

Stages 11 and 12 push the pit to its western limit.

Pit design and development sequence (Razorback Consolidated– Stages 13–14)

Figure 4-33: Design – Razorback Consolidated – Stage 13

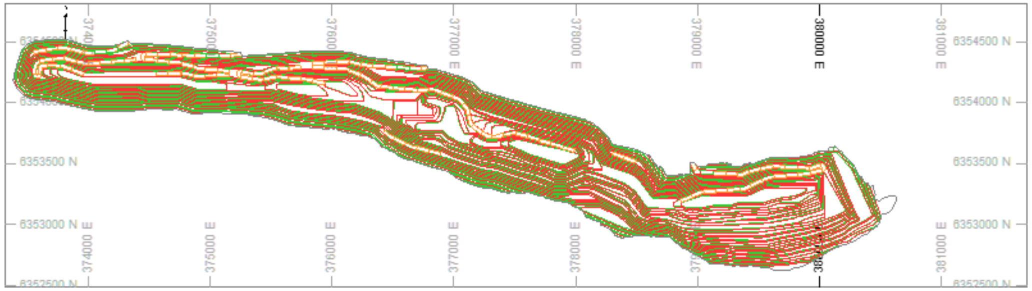

Figure 4-34: Design – Razorback Consolidated – Stage 14

Finally Stage 13 and 14 push the pit out completing mining the Eastern Extension.

The final pit geometry at the end of Stage 14 represents the final void geometry at closure (refer Section 4.10.5.1).

4.5.8.2. Staged rehabilitation

The likely sequence for site rehabilitation is outlined below and shown in Figure 4-35.

This represents the logical sequence of closure and rehabilitation of the Project's disturbance areas, as well as proposed progressive closure and rehabilitation of WRDs and the TSF, based on the 38-year operating model with approximate allowance of 10-12 years for rehabilitation / closure.

Table 4-18: Site rehabilitation sequence

Area	Year
TL construction compounds	Years 1 – 4
Hillgrange Construction Laydown Area	Years 2 – 4
Iron Peak WRD	Years 4 – 9 (preliminary rehabilitation trials) Years 12 – 24 (active closure)
Iron Peak Pit (including ANFO site)	Years 12 – 14
Iron Peak HR	Years 24 – 26
Razorback Pit	Years 38 – 41
Razorback Central WRD	Years 38 – 48
Razorback WRD	Years 30 – 48 (active closure)
TSF	Years 34 – 46 (staged closure) *Cell 1 – Years 34 – 40* *Cell 2 – Years 36 – 42* *Cell 3 – Years 37 – 44* *Cell 4 – Years 38 – 46*
Process Plant Area	Years 38 – 42
Magazine and Razorback ANFO site	Years 38 – 42
NPI Area	Years 38 – 40 (principal decommissioning) Years 47 – 48 (final decommissioning and closure)
Hillgrange RS	Years 38 – 40
Accommodation Camp	Years 38 – 42
Other Infrastructure (ML fencing, gates, etc.)	Years 48 – 50
TL	Years 38 – 40
Site Access / HR	Years 47 – 50

Detail on rehabilitation strategies for mining facilities, processing infrastructure and areas, and supporting infrastructure and areas is provided in the following Sections.

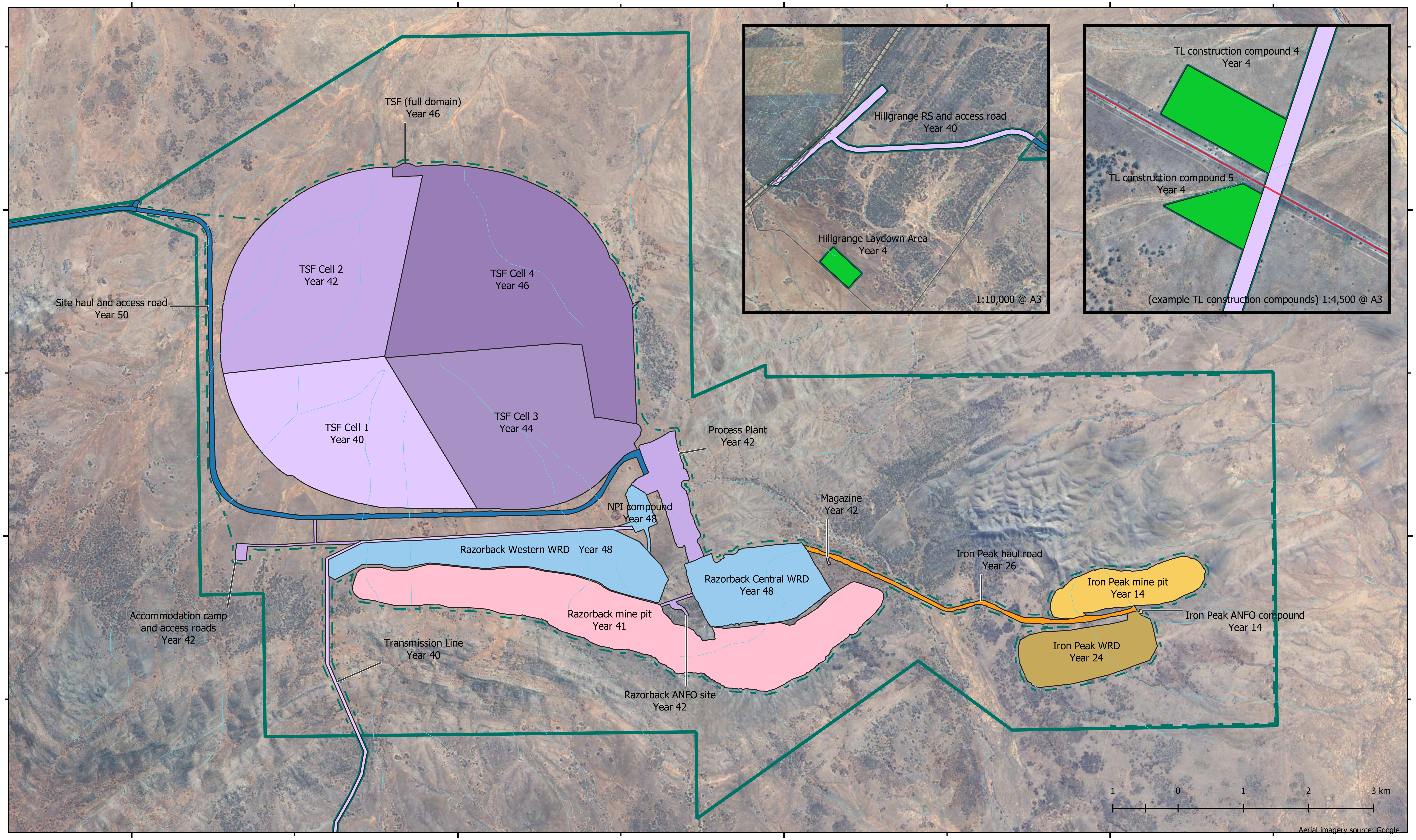

Figure 4-35: Conceptual site rehabilitation sequence

Project Area
Conceptual Footprint
Watercourses
Major
Minor

Rehabilitation completion sequence, by 'mining' year
Year 4
Year 14
Year 24
Year 26
Year 40
Year 41
Year 42
Year 44
Year 46
Year 48
Year 50

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4.5.9. Hours of operation

The project will operate on a continuous 365-day, 24/7 basis except for periods of processing plant downtime and maintenance.

4.5.10. Rehabilitation strategies and timing

General strategies for the rehabilitation and closure of mining features and facilities are outlined in Table 4-19.

Detailed rehabilitation strategies will be documented within the Rehabilitation Management Plan (RMP) and Mine Closure Plan (MCP). Strategies will evolve and adapt over time as the project-specific rehabilitation knowledge base is improved through rehabilitation trials, research and monitoring.

Table 4-19: Mining and associated features – general rehabilitation and closure strategy

Feature	General strategy
Pits	• Pits will be left as open voids (no backfilling of pits with waste rock is proposed given this is not economically viable and would result in the sterilisation of un-mined ore that exists both laterally and vertically beyond the proposed pit shells). • All mobile surface mining equipment will be removed from the mine areas and demobilised from the Site (no fixed mining plant is proposed for use). • Pit dewatering infrastructure (e.g., pumps, pipelines and standpipes) removed. • Pits assessed and signed-off as geotechnically stable. • Pit crest abandonment safety bunds (minimum 2 m height and 5 m width), exclusion fencing and warning signage installed. Abandonment bunds will be installed progressively as part of the mine plan development along the deposits and positioned beyond the pit crest zone of geotechnical instability. Where abandonment bunding cannot be installed, for example due to inaccessible terrain, safety fencing will be used. • Pit lakes will form gradually over time, with the pits acting as terminal groundwater sinks. No rehabilitation intervention is proposed given that adverse impacts on receptors or groundwater beneficial uses is unlikely (see below for further detail on closure pit lake levels and quality).
Explosives magazine	• Un-used detonators (if applicable) made safe and removed from site. • Former storage facilities (e.g., sheds, containers) removed from site. • Earthen blast protection embankments removed, re-spread on surface and the area re-shaped to final landform. • Deep ripping to alleviate compaction (if required). • Reinstatement and contour ripping of subsoil and topsoil (or suitable alternative growth media). • Native seed application.
Haul roads, pipeline corridors and laydown areas	• All ancillary mining consumables and equipment (e.g., pipes, pumps, portable plant, shipping containers and other items) removed from site (e.g., for sale or re-use). • HR surface water drainage infrastructure (e.g., pipes and culvert) removed. • Wastes removed for disposal, recycling or re-use. • Areas re-shaped to final landform and deep ripped to alleviate compaction, if required. • Subsoil and topsoil (or suitable alternative growth media) reinstated and ripped into underlying surface. • Native seed application.

Industrial and commercial wastes generated will be managed as per Section 4.7.

Potential site contamination will be identified through contaminated sites assessments to determine the type, nature and extent of extent of any contamination and appropriate remediation actions. Validation assessments will be undertaken to confirm the effectiveness of the remediation actions.

Pit lakes are expected to form within the Iron Peak and Razorback voids post-mining. Pit lake water balance modelling was undertaken by CDM Smith (2024), for a 150-year model prediction period to assess the difference in net inflows (rainfall, runoff, groundwater seepage) and outflows (evaporation). Pit water levels will rise until inflows are balanced by evaporation, with the final water levels below the surrounding water table elevation and forming a permanent groundwater discharge feature. The predicted final pit water levels are approximately 40 m above the final pit floor at Iron Peak and approximately 93 m above the final pit floor in Razorback, in both cases significantly lower than the spill elevations (250 mAHD for Iron Peak and 290 mAHD for Razorback) with no long-term overflow risk. Salinity levels are expected to increase over time due to native groundwater salinity and evapo-concentration, though with no adverse impacts on receptors or groundwater beneficial uses.

As noted in Section 4.10.5.1, at the end of mining the voids will be as assessed and signed-off as geotechnically stable and crest bunding, fencing and controls implemented to restrict access by members of the public.

Indicative timing for rehabilitation and closure of mining features and facilities is presented in Section 4.5.8.2 (Figure 4-35).

The Iron Peak pit will be closed first following completion of mining in Year 12. Principal closure works will take approximately 2 years, with a further 10 years to finalise the likely closure program for the Iron Peak WRD years, after which works within the eastern portion of the ML will cease.

The Razorback pit will be closed on completion of mining in either Year 38, or otherwise in Year 56 subject to additional statutory approval. Pit closure works will take approximately 3 years, while closure works for the Razorback WRDs and TSF will take a further 10 and 8 years, respectively.

4.6. Crushing, grinding, processing and product transport

This Section contains information on the process plant design and operation only; for information on supporting non-process infrastructure, please refer to Section 4.8.5.

4.6.1. Crushing, grinding and processing plant

Ore will be processed using established (conventional) technologies and processes inclusive of two stages of crushing, and two stages of grinding and magnetic separation, followed by reverse flotation and a final fine grinding and cleaner magnetic separation scavenger circuit, with tailings and ore concentrate as the primary outputs.

The layout of the combined crushing, grinding and processing plant, and location relative to the broader site, is shown in Figure 4-37.

The key components and stages of the combined crushing, grinding and processing plant are listed below with the corresponding summary process flowsheet provided in Figure 4-36.

- crushing and grinding plant:
  - ore handling and crushing
  - primary grinding and classification (HPGR / ball mill)
- processing plant:
  - rougher magnetic separation
  - secondary grinding and secondary magnetic separation
  - rougher flotation
  - fine grinding and cleaning (magnetic) circuit
  - concentrate thickening and filtration

- tailings sand circuit and thickening.

Detail on the crushing and grinding plant components, and processing plant components, are provided in Sections 4.6.1.1 and 4.6.1.2 respectively.

The combined plant will be designed to treat a nominal 35 Mtpa of ROM (direct tip) ore, producing 5 Mtpa of concentrate (dry) and generating approximately 26 Mtpa of tailings (Table 4-20).

Table 4-20: Estimated material flows into and out of the processing plant

Material flows (dry basis)	Average yearly rate (t/yr)
ROM ore	35,000,000
Coarse sand tailings	5,811,000
Fine tailings	24,289,000
Concentrate	5,000,000

The high-grade iron ore concentrate will include a range of product grades, typically greater than 65% Fe and including DRPF grade concentrate of >68.5% Fe and <2.5% SiO_2 + Al_2O_3. MGT will have the flexibility to produce concentrate grades within this range to meet changing market and customer demands.

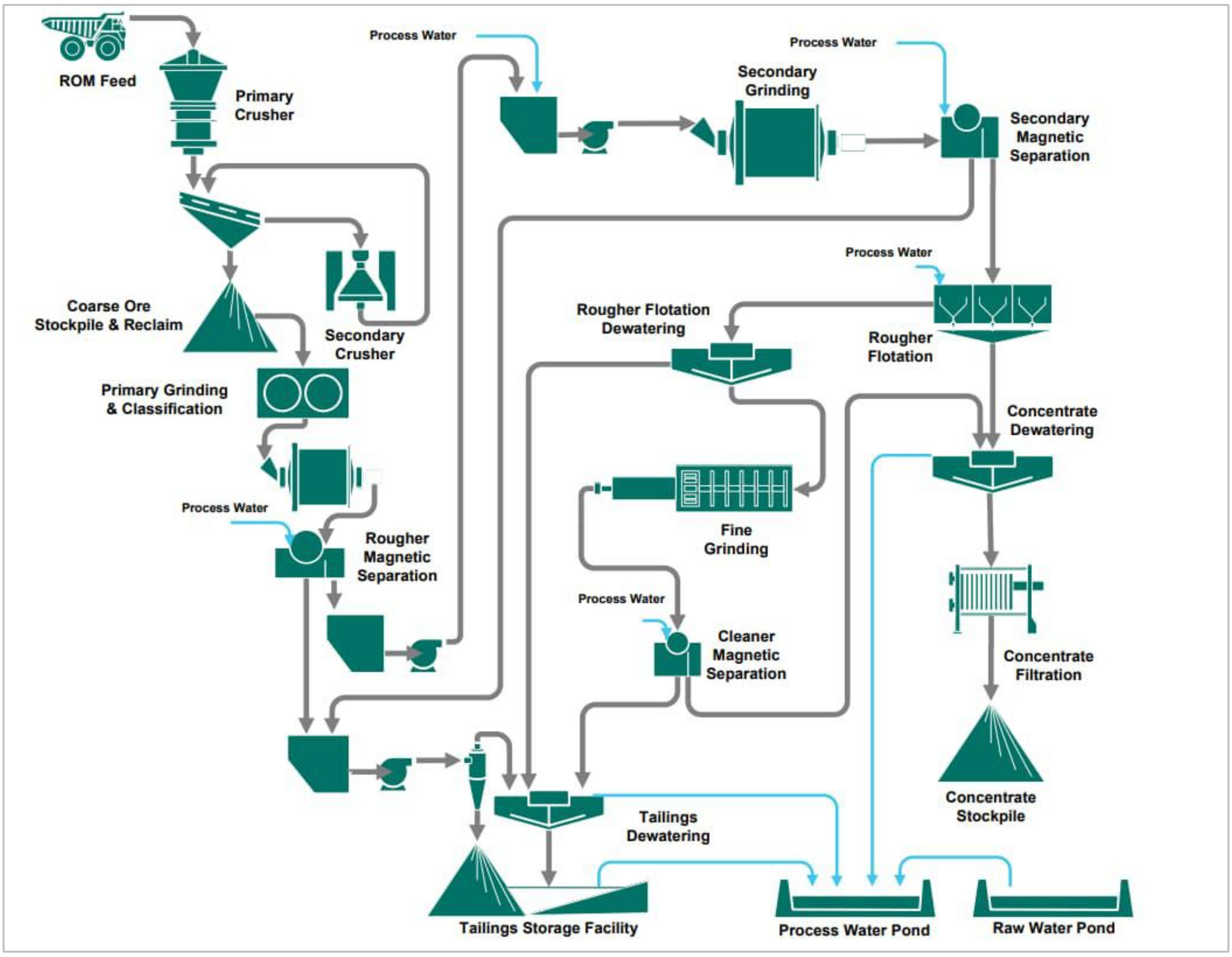

Figure 4-36: High-level process flowsheet

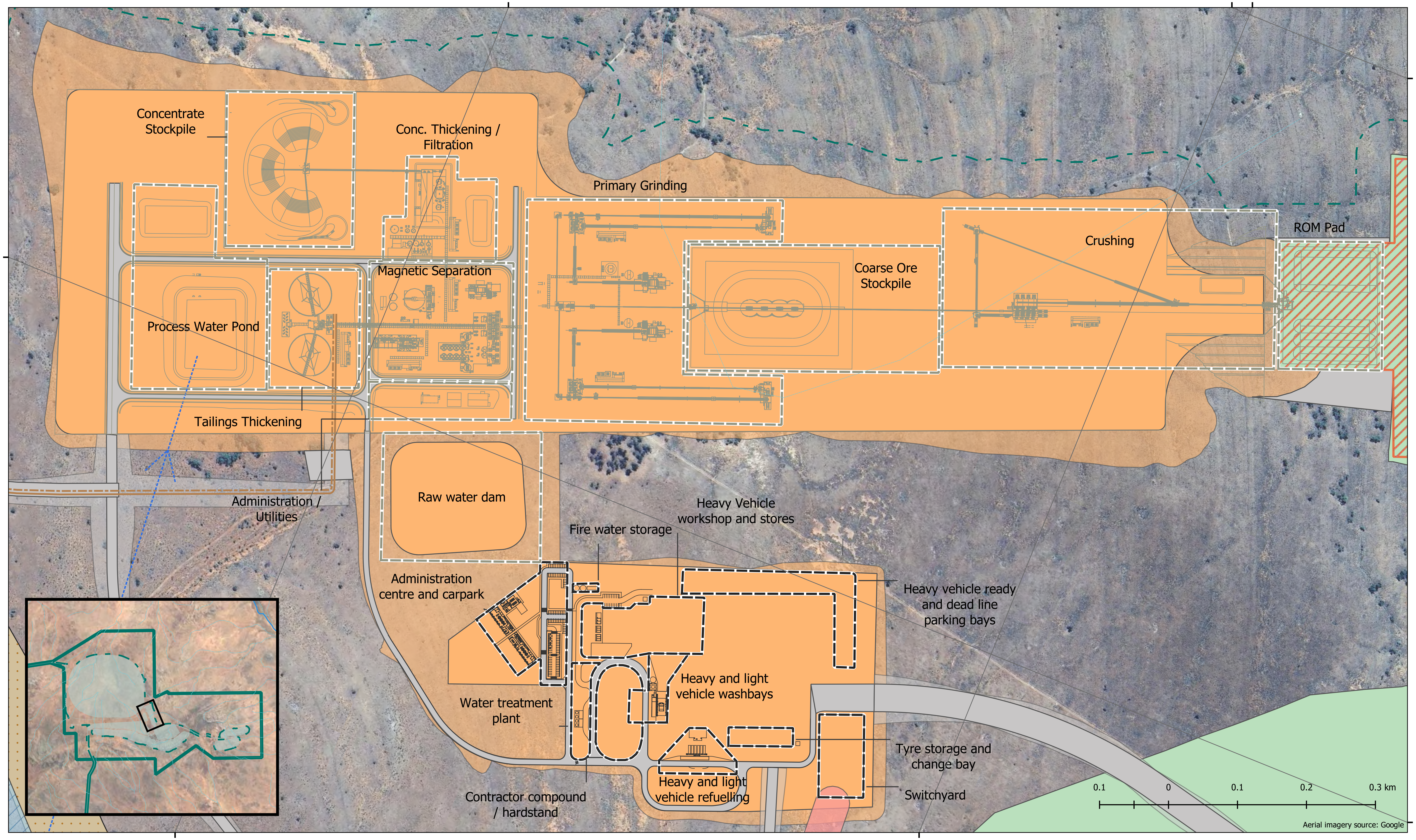

Figure 4-37: Process plant and non-process infrastructure layout

Project Area
Conceptual Footprint

Watercourses
Minor

Roads
Haul, access and other roads
Road batters

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Process plant areas
Process plant layout

NPI areas
NPI layout

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile

Ultimate TSF infrastructure
TSF Decant pipelines (with flow direction)
TSF Tailings slurry pipeline
TSF Coarse sand pipeline
TSF Decant pond

TSF mounding profile
TSF Tailings beach extent
TSF Embankment

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ENGINEERING DEVELOPLMENT

The engineering development for the process plant involved a multi-disciplinary approach including process, mechanical, civil, structural, electrical, instrumentation and control engineering functions. All detailed design will be in accordance with relevant regulations, codes, industry standards and good design practice. Table 4-21 describes the basis of engineering development used by key disciplines in the engineering process.

Table 4-21: Engineering development

Engineering development	Description
Process	The process plant design was developed from process flowsheets through an iterative process involving metallurgical test work, technical assessment, flowsheet development, safety assessment and cost estimation. The process plant is designed according to good design practices for efficient and safe construction, operation and maintenance while considering cost effective CAPEX. These same principles will continue in detailed design incorporating further design reviews, HAZOPS, CHAZOPs, fire hazard assessment and functional safety management plans. All detailed design will be in accordance with relevant regulations, codes, industry standards and good design practice.
Mechanical	Mechanical equipment sizing and selection was completed based on process flow diagrams and mass balances to inform the designs. 3D modelling has been utilised for effective plant layout and to inform civil, structural, piping, electrical, instrumentation and earthwork requirements. All detailed design will be in accordance with relevant regulations, codes, industry standards and good design practice.
Civil and structural	Civil design considered the geotechnical elements of the area, pad and footing design, drainage to low points of existing ground and minimisation of earthworks as informed by the 3D modelling. The majority of the process plant is an open-air plant, with only the concentrate filtration building and process control rooms as buildings. Structural steel, platework, access and protective coatings have been informed by the 3D modelling, mechanical equipment details and process requirements. No specific lining systems within the process plant area are proposed. All detailed design will be in accordance with relevant regulations, codes, industry standards and good design practice.
Electrical, instrumentation and control	Electrical design considered the mechanical loads, substation and reticulation to process infrastructure, camp and NPI for efficient and safe construction, operation and maintenance while considering cost-effective CAPEX. The process control system is engineered connecting field instrumentation, substations and equipment to a distributed control system (DCS) to enable efficient operation, control, and functional safety.

The identification of major process equipment summarised in Table 4-22 from the process and mechanical engineering design informed the civil, structural, electrical, instrumentation and control requirements.

Table 4-22: Indicative major equipment type, quantity and size

Major equipment	Type	Qty	Size	Unit
Primary Crusher	Gyratory Crusher	1	1.2	MW
Secondary Crusher	Cone Crusher	4	0.95	MW
Primary Grinding	HPGR	2	6.5	MW
Primary Grinding	Overflow Ball Mill	2	20	MW
Rougher Magnetic Separators	LIMS	12	1.2 x 4	m
Secondary Grinding	Ball Mill or Stirred Mill	1	12.5	MW
Secondary Magnetic Separators	LIMS	6	1.2 x 4	m
Rougher Flotation	Conventional Cell	8	300	m^3
Tertiary Grinding	Stirred Mill	3	4	MW
Tertiary LIMS	LIMS	6	1.2 x 4	m
Concentrate Thickening	High-Rate Thickener	1	28	m diameter

Major equipment	Type	Qty	Size	Unit
Concentrate Filtration	Ceramic Disk Filter or Pressure Filter	6	144	m^2
Tailings Classification	Hydrocyclone	2	N/A	Clusters
Tailings Thickening	High-Rate Thickener	1	61	m diameter

4.6.1.1. Crushing and grinding plant

ORE HANDLING AND CRUSHING

The crushing and grinding plant will be located on the ROM pad (dimensions approximately 170 x 145 m) and consist of a two-stage (primary and secondary) crushing circuit.

The primary crusher plant will comprise a dump pocket feeding a fixed gyratory crusher (Figure 4-38). The dump pocket, arranged in a wingwall configuration with a reinforced earthen wall, is fed by ore received directly from the pit or from ROM pad ore stockpiles. The gyratory crusher is operated in open circuit, crushing ore to a nominal size of 80% (P80) passing 158 mm.

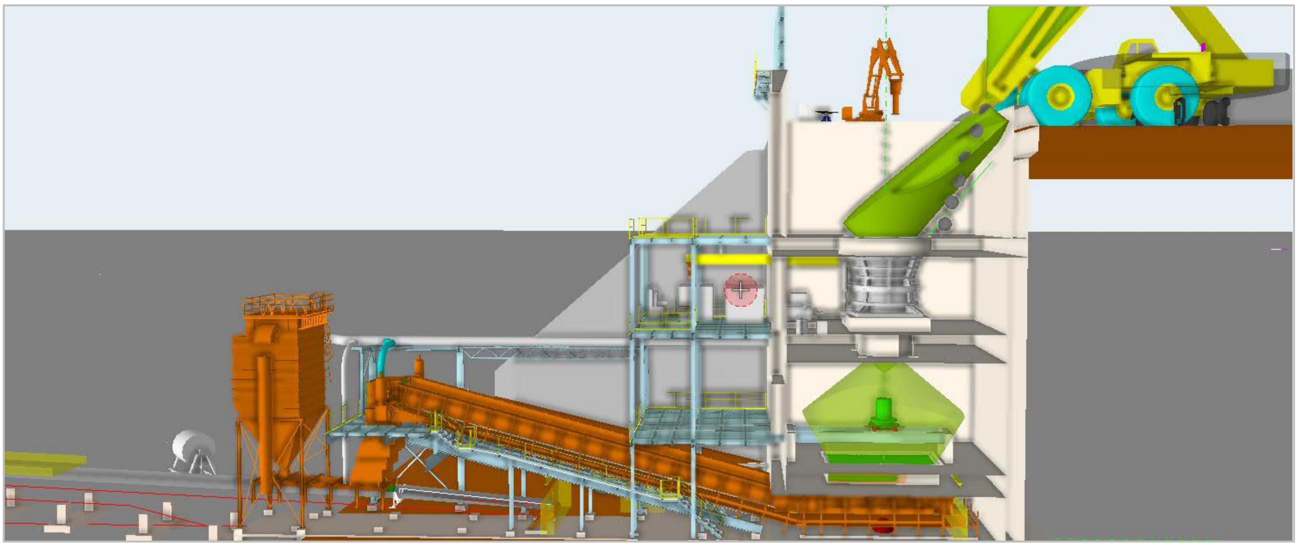

Figure 4-38: Primary crushing concept visualisation

Primary crushed ore is conveyed to dry vibrating screens and secondary cone crushers operating in closed circuit. Screened undersize material (nominal size of 80% (P80) passing 26 mm) is transferred via conveyors and radially stacked into a coarse ore stockpile (COS), with any screened oversize material returned to the secondary cone crushers for re-crushing. Crushed ore from the COS is reclaimed by underground apron feeders and transferred by conveyor to the primary grinding circuit.

PRIMARY GRINDING AND CLASSIFICATION

The primary grinding circuit consists of two parallel HPGR / ball mill modules, each operating in closed circuit with vibrating screens and cyclone classification (Figure 4-39). Crushed ore that is reclaimed from the COS is split evenly between the two circuits using a splitter bin and fed to each module.

Within each module, crushed ore is initially fed to HPGR dry screens, with screened undersize transferred by conveyor to the ball mill circuit, and screened oversize transferred to the HPGR. The HPGR product is returned by conveyor to the HPGR dry screens, forming a closed crushing circuit with a target product with a nominal P80 of 4 mm passing through to the ball mill circuit.

The crushed ore from the HPGR circuit is transferred by conveyor to the ball mill discharge hopper where it is mixed with water and the ball mill discharge. The resulting slurry is pumped to a cyclone cluster for classification, with the overflow reporting to the primary magnetic separation circuit. The underflow from the cyclone cluster reports to the ball mill feed hopper and transferred to the ball mill for grinding. Additional steel grinding media is added to the circuit as required. The discharge from the ball mill passes through a scats screen to remove damaged grinding media (mill scats) to a scats bunker, before passing through to the cyclone cluster to close the grinding loop. Process water is added at various locations to control slurry solids density. The targeted product size from the milling circuit will be altered to optimise the efficiency of the process plant, with an expected nominal size of 80% (P80) passing 140 µm.

The wet processing equipment will be contained within a bunded are with sumps to allow pumping of spillage or rainwater into the appropriate place within the circuit.

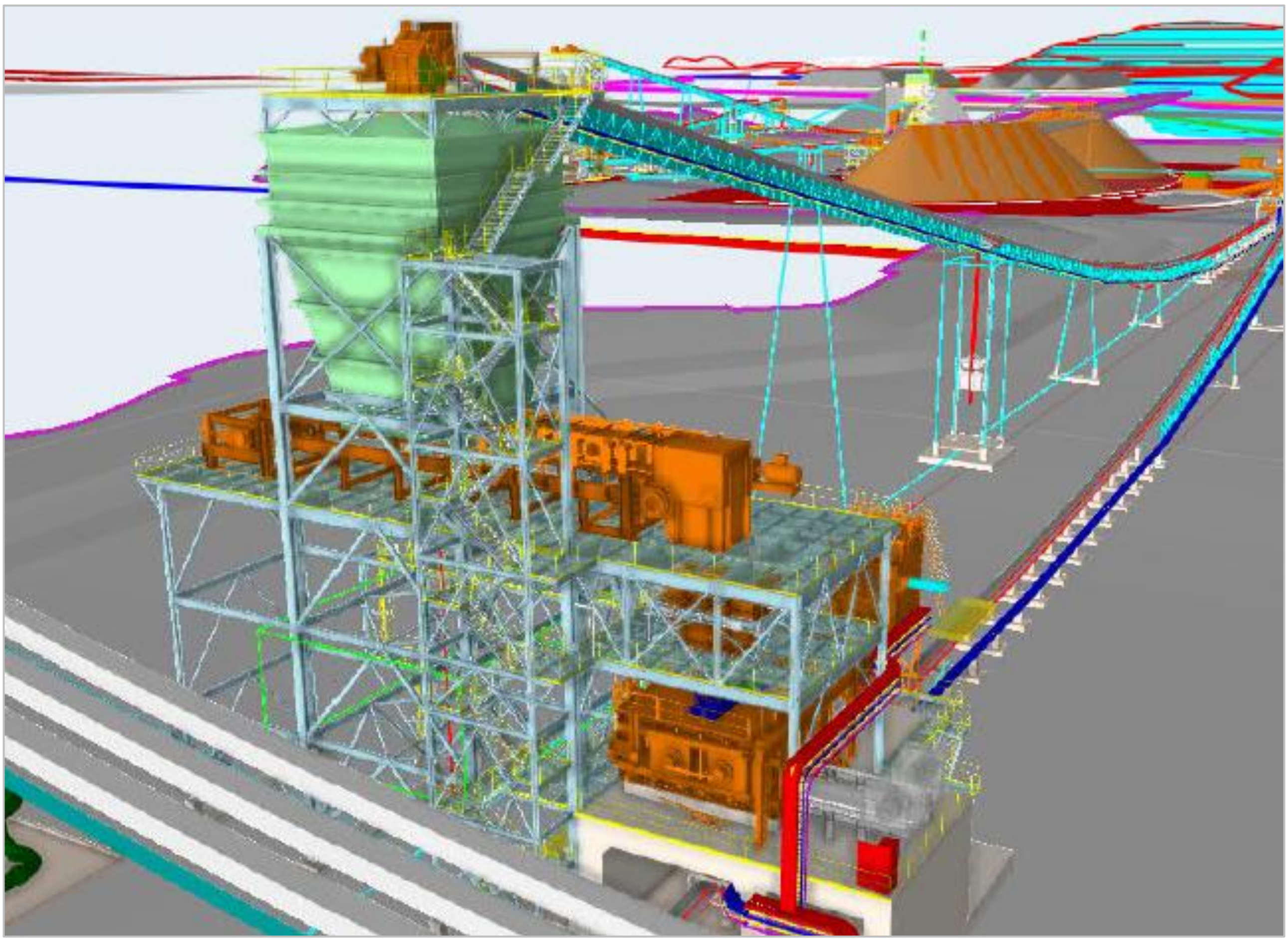

Figure 4-39: Primary HPGR concept visualisation

4.6.1.2. Processing plant

ROUGHER MAGNETIC SEPARATION

The rougher magnetic separation circuit consists of two parallel modules. Within each module, the overflow product from the upstream primary grinding circuit is combined with process water in the rougher magnetic separator feed tank to control slurry solids density. The slurry is then pumped and distributed to an array of LIMS (low intensity magnetic separator)-type rougher magnetic separator drums.

The magnetic separators concentrate the magnetic fraction of the ore which flows under gravity to a magnetic collection hopper, with the magnetic concentrate then pumped to the secondary grinding circuit.

The non-magnetic material flows under gravity to a tailings collection hopper to be pumped to the tailings classification circuit.

The rougher magnetic separation equipment (Figure 4-40) will be contained within a bunded area with sumps to allow pumping of water and sediment spillage back into the appropriate point within the circuit.

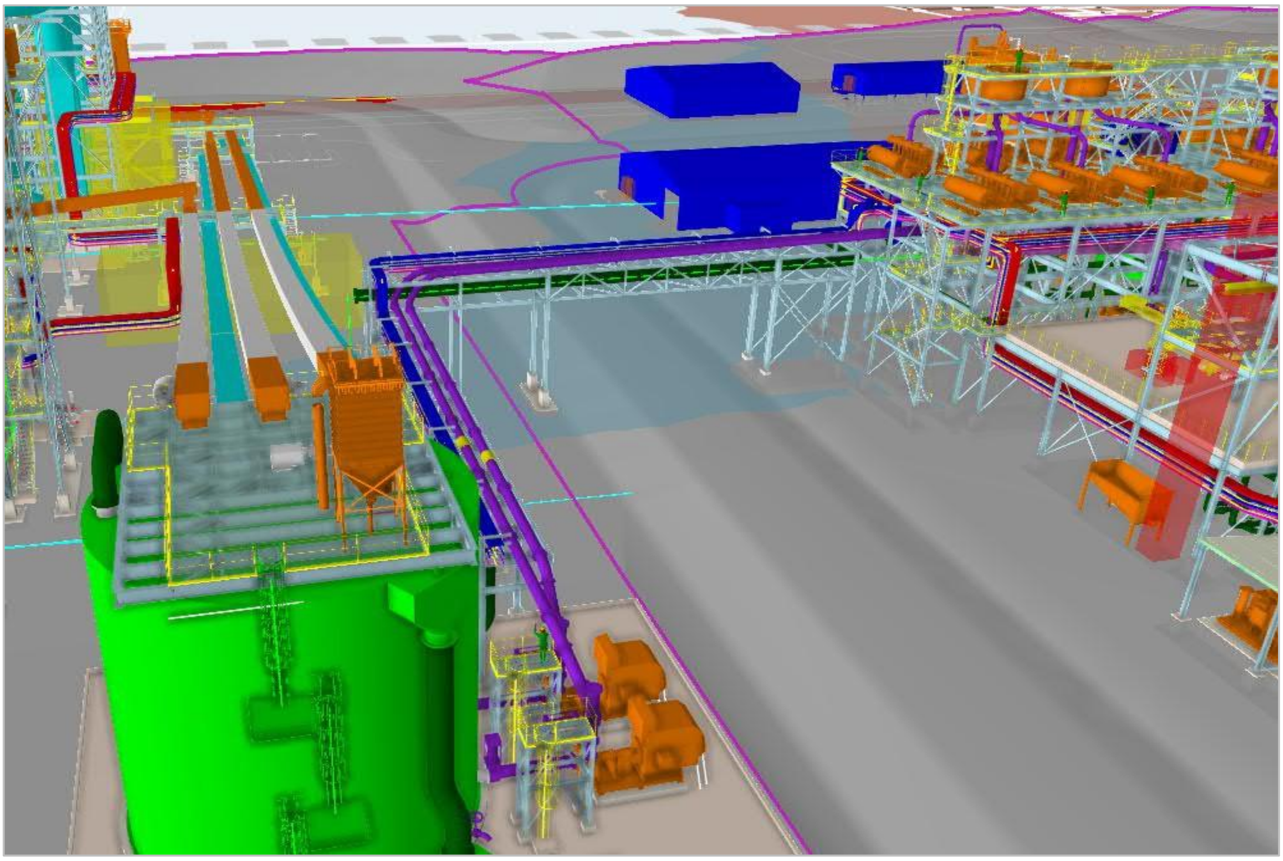

Figure 4-40: Rougher magnetic feed tank and magnetic separation module concept visualisation

SECONDARY GRINDING CIRCUIT AND SECONDARY MAGNETIC SEPARATION

The secondary grinding and secondary magnetic separation circuit consists of a grinding mill circuit with classification followed by magnetic separation (Figure 4-41).

The upstream rougher magnetic concentrate is pumped to the secondary grinding mill circuit. The slurry will be pumped to a classification step utilising either high efficiency wet screens or cyclone clusters. The undersize material from the classification is pumped to the secondary magnetic separators, while oversize material is pumped to the secondary grinding mills which will consist of ball mills or stirred tower mills. The discharge of the grinding mills is returned to the classification step to create a closed milling circuit.

Process water will be added at various locations for slurry solids density control.

The targeted product size from the milling circuit will be altered to optimise the efficiency of the process plant in accordance with the ore variability, with an expected nominal size of 80% (P80) passing 35–45 µm.

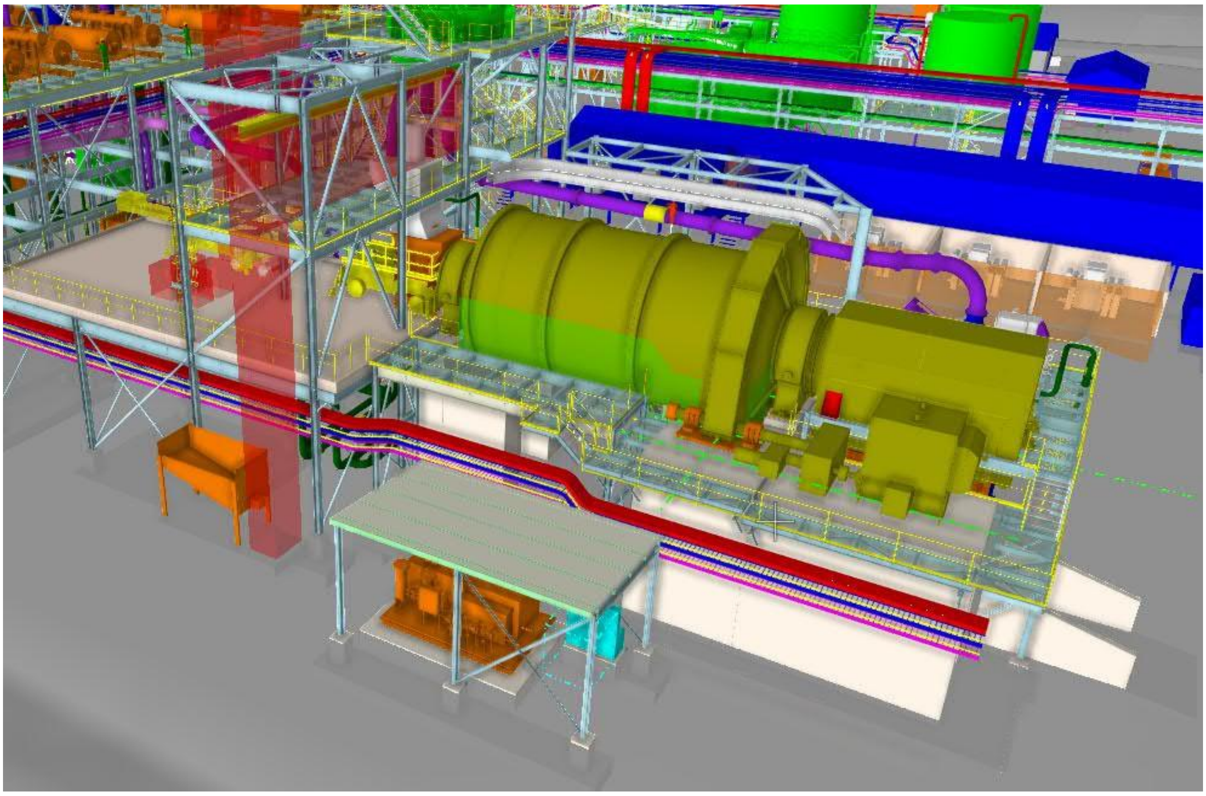

Figure 4-41: Secondary grinding concept visualisation

Undersize slurry from the secondary grinding circuit is pumped and distributed evenly to the LIMS-type secondary magnetic separators. The magnetic concentrate flows under gravity through a demagnetising coil to remove any remanent-induced magnetism, and then to the rougher flotation circuit. The non-magnetic tailings flow under gravity to a combined magnetic separation tailings hopper. The tailings slurry is then pumped to the tailings classification circuit. Process water is added at various locations for slurry solids density control.

The secondary grinding and magnetic separation equipment will be contained within a bunded area with sumps to allow pumping of spillage back into the appropriate place within the circuit.

ROUGHER FLOTATION

The rougher flotation process is a reverse flotation process by which iron-rich concentrate is separated from silica-rich gangue utilising flotation cells and reagent conditioning. Iron-rich particles remain hydrophilic and sink into a collection hopper, while silica-rich tailings are floated as the particles are rendered hydrophobic through the addition of a collector reagent.

Magnetic concentrate slurry from the upstream secondary magnetic separators is pumped to the first flotation conditioning tank. A pH regulator and depressant reagents are added to the slurry to maintain pH at the desired range (typically pH 8.5–10.5) and prevent iron oxide flotation. In the second conditioning tank, flotation collector reagents are added to adhere to the silicate particles and promote hydrophobicity with frothing agents added as necessary to aid in bubble formation. The slurry from the second conditioning tank is then pumped to banks of rougher flotation cells where slurry subsequently flows under gravity controlled by dart valves through to each flotation cell, where air is injected into the cells by an air blower.

The iron rich underflow slurry is collected in a hopper and pumped through a magnetising coil prior to feeding the concentrate thickener. The flotation froth containing silicates and composite material is collected in a hopper and pumped to dewatering hydro-cyclones or hydro-separators. Process water will be added at various locations for slurry solids density control.

The collector reagent will predominantly adhere to the silica-rich float particles, with some remaining in the process water and passing through to the fine grinding step and ultimately into tailings. Most of the depressant will remain adhered to the iron particles and pass into the final concentrate (product), with residual depressant carried through water to the tailings. The flotation reagent recipe will be adjusted over time for process plant efficiency based on the specific ore feed.

The rougher flotation equipment (Figure 4-42) will be contained within a bunded area with sumps to allow pumping of spillage back into the appropriate place within the circuit.

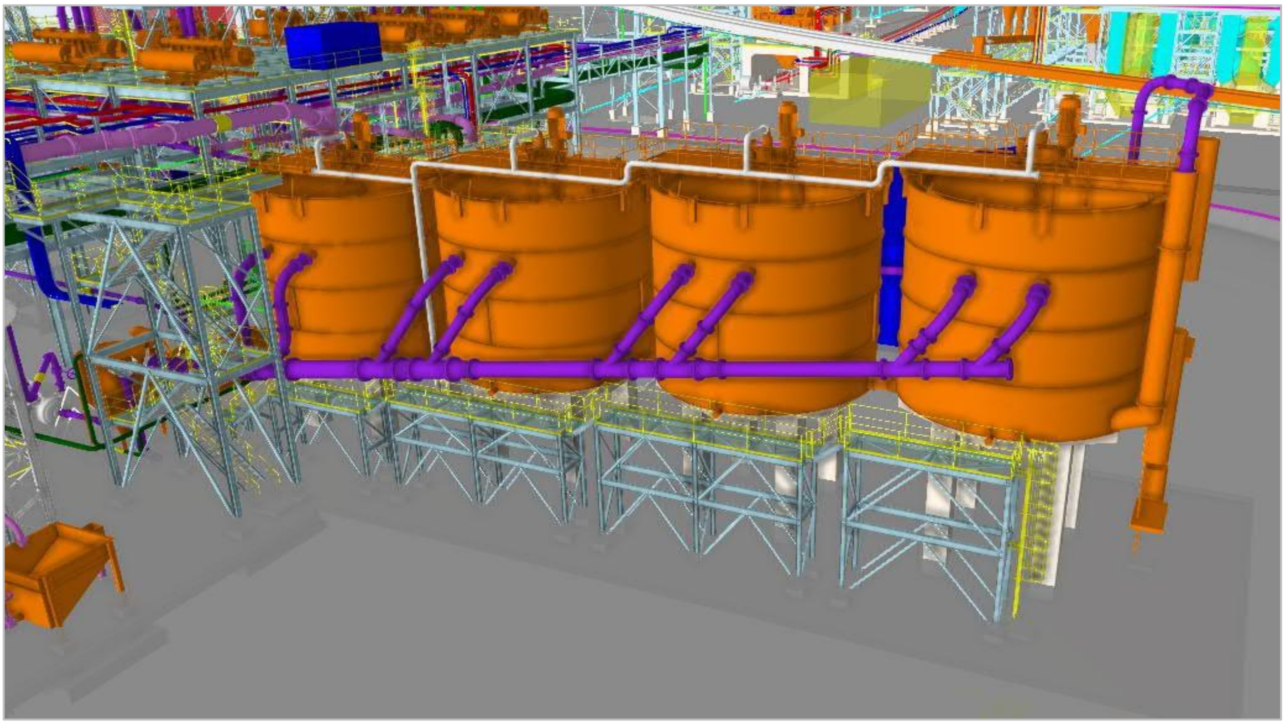

Figure 4-42: Rougher flotation conceptual visualisation

FINE GRINDING AND CLEANER MAGNETIC SEPARATION

The fine grinding and cleaner magnetic separation area consists of a dewatering process followed by fine grinding in a horizontal or vertical stirred mill, and magnetic separation.

The upstream silica-rich floats slurry is pumped to dewatering units, either hydro-cyclones or hydro-separators. The underflow slurry is pumped to the fine grinding mill feed hopper, while the overflow reports to the tailings thickener.

The underflow slurry is pumped from the grinding mill feed hopper to feed several fine grinding mills. The fine grinding mills operate in open circuit with mill discharge slurry pumped to the cleaner magnetic separators. The targeted product size from the mill will be altered to optimise the efficiency of the process plant in accordance with the ore, with an expected nominal size of 80% (P80) passing 15 µm.

The mill discharge slurry is pumped and distributed evenly to the LIMS-type cleaner magnetic separators which produce magnetic concentrate and non-magnetic tails. The magnetic concentrate flows under gravity to the concentrate thickener, while the non-magnetic tailings flow under gravity to a hopper before being pumped to the tailings thickener. Process water is added at various locations for slurry solids density control.

The fine grinding and cleaner magnetic separation area equipment (Figure 4-43) will be located within a bunded area with sumps to allow pumping of spillage back into the appropriate place within the circuit.

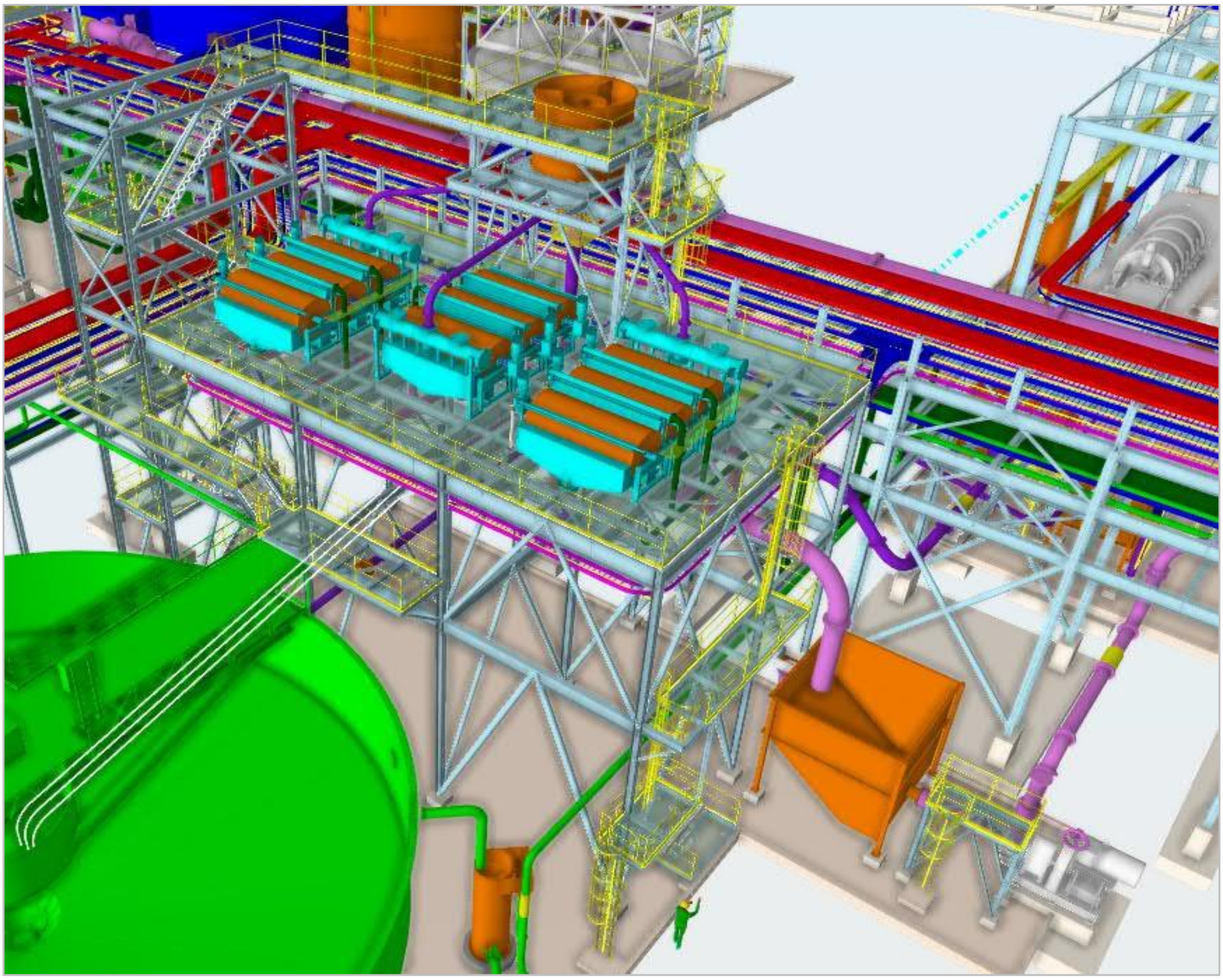

Figure 4-43: Cleaner magnetic separation concept visualisation

CONCENTRATE THICKENING AND FILTRATION

The concentrate thickening and filtration plant area consists of a concentrate thickener and filters to dewater the concentrate to within TML.

The iron-rich underflow slurry from flotation is pumped through a demagnetising coil and into the concentrate thickener, while the magnetic concentrate from the cleaner magnetic separators flows by gravity. Flocculant is added into the concentrate thickener to assist the settling of solids, which will ultimately remain in the concentrate (product), with minor amounts recirculating in process water. The concentrate thickener underflow is pumped to the concentrate filter feed tank, while the overflow is pumped back to and recycled through the process water pond.

Concentrate is filtered using ceramic disk filters to the target moisture percentage (TML of ≤8.4%), and then conveyed to the radial stacker, pending concentrate grade confirmation and loading and transport to the Hillgrange RS. Filtrate from the concentrate filters is collected and recirculated back to the concentrate thickener.

The equipment within the concentrate thickening and filtration area will be contained within a bunded area with sumps for pumping spillage or rainwater into the appropriate place within the circuit.

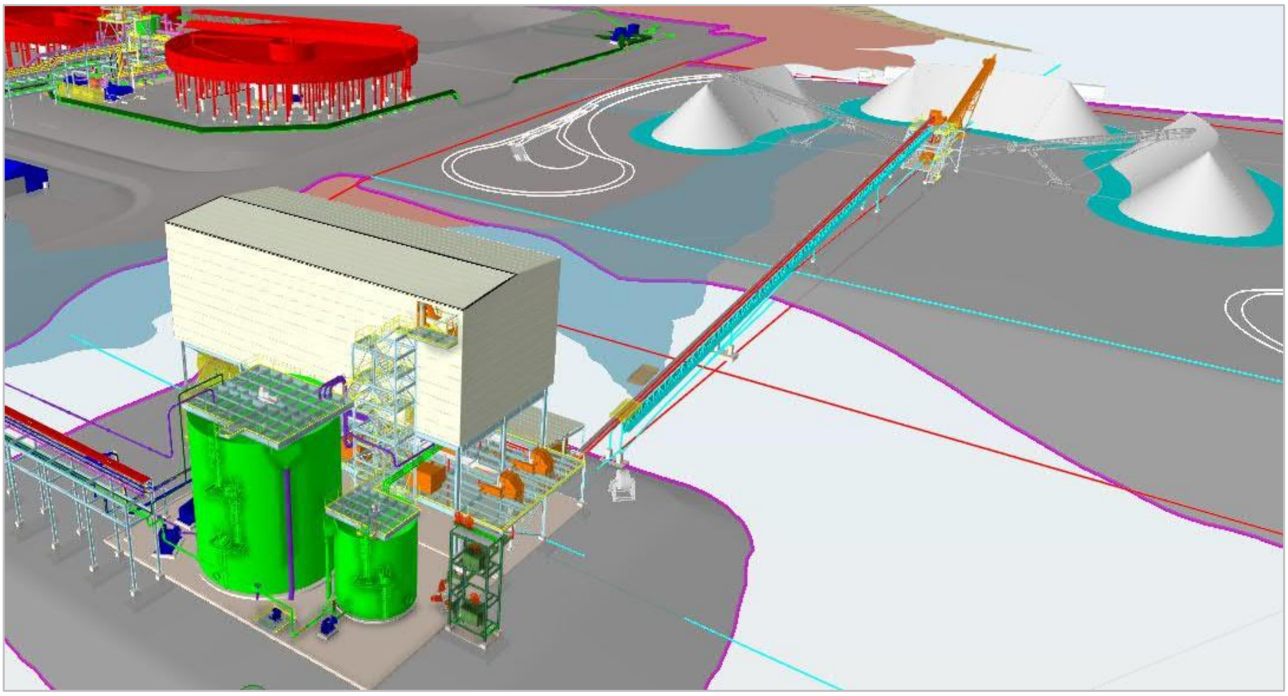

Figure 4-44: Concentrate filtration and radial stockpile concept visualisation

TAILINGS SAND CIRCUIT AND THICKENING

Non-magnetic tailings are received at the tailings treatment area for size classification in the tailings classification circuit and thickener before being sent to the TSF.

The combined tailings from the rougher and secondary magnetic separator facilities contains the coarse sand tailings fractions. This stream is pumped to a cyclone cluster in the tailings thickening area to separate the stream into an underflow sand component (predominantly ≥75 µm) and cyclone overflow. The sand component will be pumped to the TSF for embankment wall construction and progressive lifts and used in the construction of TSF 'cells' towards TSF end of life to enable staged closure and progressive rehabilitation (refer Section 4.7.2).

Cyclone overflow is combined with overflow from the dewatering unit in the fine grinding plant area and the cleaner magnetic tails and transferred into a high-rate thickener. While the project configuration is for one thickener, an area allowance has been made for a second thickener, if required. Flocculant is added to the thickener to aid in settling of fine solids. The underflow from the tailings thickeners is pumped to the TSF central discharge point at an estimated 55–65% solids. Most flocculant will remain with the solids and deport to tailings, with residual flocculant to circulate within the process water. The overflow from the tailings thickener will report to the process water pond.

The tailings sand circuit and thickening equipment (Figure 4-45) will be contained within a bunded area with sumps for pumping spillage or rainwater to the appropriate place within the circuit.

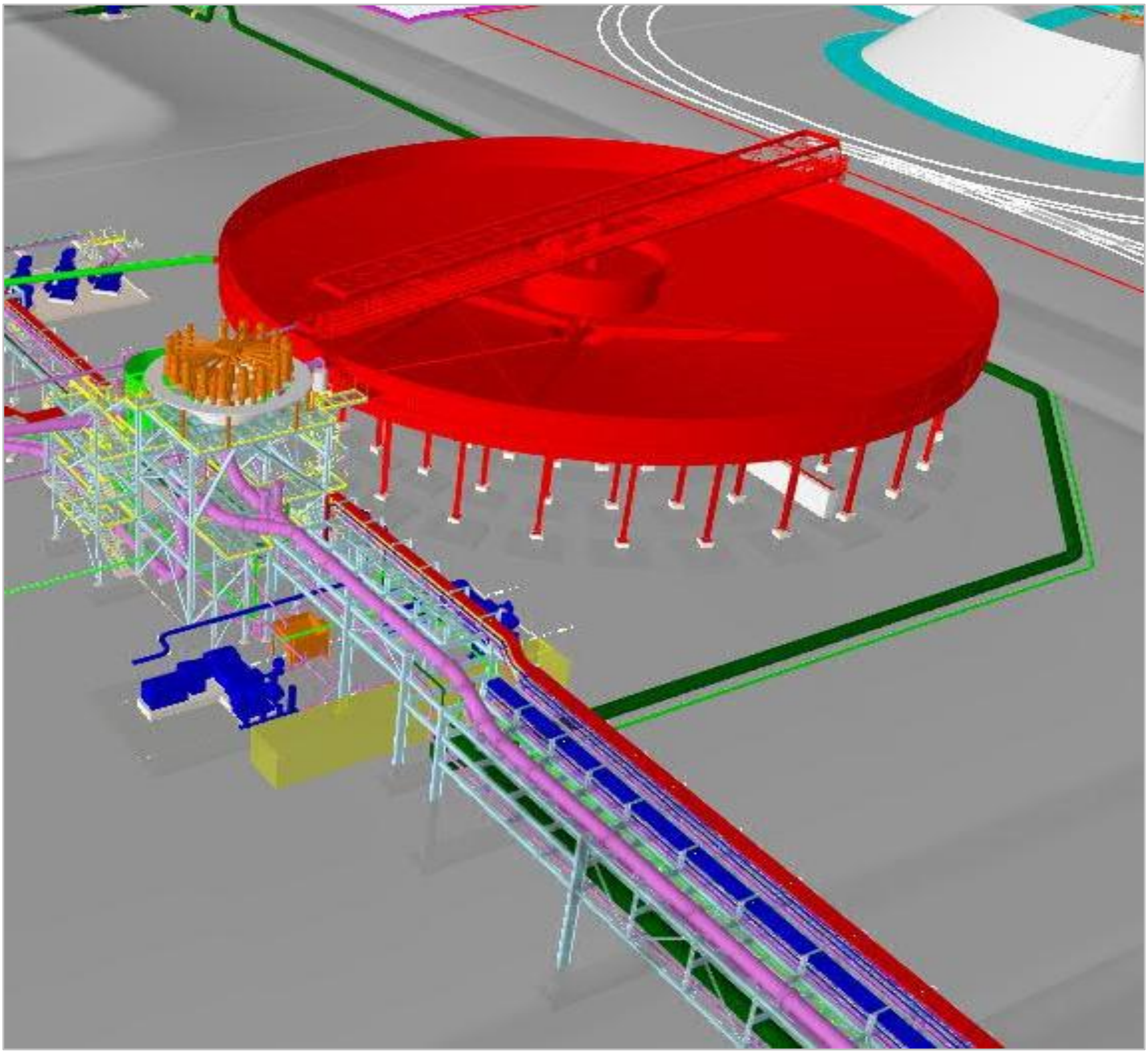

Figure 4-45: Tailings thickening concept visualisation

BENEFICIATION CHEMICALS

Several reagents (e.g. frothers, collectors, pH adjusters, depressants and flocculant) are required to facilitate the production of concentrate and separation of non-target materials (gangue and tailings).

Estimated annual consumption volumes by reagent type is provided in Table 4-23.

Table 4-23: Process reagents and estimated consumptions and storage volumes

Chemical / substance	Example product	Packing group	Unit dosage rate (g/t) [1]of float feed [2]of thickener solids feed	Estimated annual consumption (t/yr)	On-site storage volumes (m^3)
pH adjuster (alkali)	Sodium hydroxide (50% aqueous solution)	Group II and Group III	200[1]	1,379	72
Collector	Flotigam 2835-2 Or similar ether-amine collector Flotinor 5530 or similar amido-amine collector	Group II	300[1]	2,068	90

Chemical / substance	Example product	Packing group	Unit dosage rate (g/t) [1]of float feed [2]of thickener solids feed	Estimated annual consumption (t/yr)	On-site storage volumes (m^3)
Depressant	Gemgel S90	Non-Dangerous Goods	250[1]	1,379	50
Flocculant	Magnafloc155 or similar flocculant	Non-Dangerous Goods	30 (tailings)[2] 2.5 (concentrate)[2]	1,040	50
Frother	Methyl Isobutyl Carbinol (MIBC)	Group III	40[1]	276	18

Information on the fate of reagents, summarised from previous Sections and based on the expected behaviour within the process, is provided in Table 4-24.

Table 4-24: Fate of process reagents

Chemical / substance	Fate
pH adjuster (alkali)	Retained in the process water
Collector	Adheres to silica-rich float particles (gangue minerals) which are discharged with the fine tailings stream to the TSF. Minimal quantities may be re-circulated back in the process water circuit via tailings decant return water.
Frother	Adheres to silica-rich float particles which are discharged to tailings. Residual concentrations may pass through to final concentrate (product).
Depressant	Adheres to iron particles, which pass through to final concentrate (product). Residual concentrations may adhere to gangue minerals and pass through to tailings, with potential for re-circulation back to the process water circuit via tailings decant return water, though likely in trace quantities.
Flocculant	Flocculant fate depends on where it is added within the process: • Flocculant added into the concentrate thickener will pass through to final concentrate (product). • Flocculant added into the tailings thickener will pass through to tailings. Residual flocculant will re-circulate within the process water circuit until consumed.

Liquid reagents will be delivered to site and stored in dedicated storage tanks within a reagent unloading and storage area. The reagents will be pumped into dedicated reagent mixing and storage tanks for raw water addition prior to being dosed to the plant.

Dry flocculant and depressant will be delivered to site and added by a debagging station and screw feeders to dedicated reagent mixing and storage tanks for raw water addition prior to being dosed to the plant.

Reagents will be stored in accordance with relevant EPA Bunding Guidelines, Australian Standards, the Australian Dangerous Good Code and the material Safety Data Sheets (SDS).

4.6.1.3. Potential emissions sources

Potential processing dust emissions sources include dry conveyors, hoppers, coarse ore stockpile, dump bins, transfer points, crushers, screens, vibrating screens, located within the ore handling and secondary crushing areas and dry reagent handling. Potential dust emissions within the ore handling area are likely to be of the same composition as the ROM ore as shown in Table 4-15. Potential dust emissions from the reagent handling area will be the same compositionally as the dry reagents (starch depressant and flocculants).

At the primary grinding stage (Section 4.6.1.1) process water is added to the ROM material. From this stage, the material will be processed wet with limited potential for dust emissions. Tailings waste is transported and deposited wet to the TSF, while the final concentrate (product) is stacked damp at approximately 8% moisture with low inherent potential for dust emissions, and short residence time in stockpile before being loaded and transported to the Hillgrange RS.

Hoppers, crushers, conveyors, screens and dump bins will use standard methods of dust mitigation including water sprays, coverings, encapsulations, and extraction where appropriate. The reagent storage area will be designed to prevent the emission of dry reagents including use of water misters, dust extraction systems and enclosed hoppers.

Potential noise emissions include vehicles, crushers, conveyors, hoppers, dump bins, transfer points, vibrating screens, pumps, mills, motors, magnetic separation units, cyclones, agitators, air blowers, process air, instrument air within all processing areas. Maintenance activities will have various sources of noise emissions.

Potential ignition sources include:

- The storage, use and handling of flammable processing reagents (e.g., MIBC) and reagents that are potentially combustible when suspended in air as dust (e.g., GemGel powder and Magnafloc).
- Unplanned, loss of control events such as electrical fires from faulty or damaged equipment, the loss of fire control during maintenance activities such as welding and grinding, and diesel combustion from mobile equipment.

The storage of flammable and combustible materials will be in accordance with relevant Australian Standards, the Australian Dangerous Good Code and the material SDS, with provision of fire suppression systems and emergency response equipment. Potential ignition events from plant and equipment will be mitigated through scheduled inspection and maintenance regimes, with maintenance-related fire risk managed through hot works permitting and fire watch procedures.

Ore, tailings, ancillary processing wastes and final concentrate are not considered flammable.

4.6.1.4. Heap leach

Not applicable – no heap leach processing and mineral recovery will be undertaken.

4.6.2. Process water management

4.6.2.1. Water balance

Raw water is required on-site for the support of operations including mining, non-process infrastructure, process plant accommodation and amenities. Most of this water is used within the processing plant for the beneficiation of the magnetite concentrate. Water is recycled extensively (principally through the processing plant and capture of decant water from the TSF for processing use), with key water loss points being tailings entrainment, seepage and evaporation. Water is also lost as residual moisture in the final concentrate product and the use of water for dust suppression.

Key water balance inputs and outputs are summarised in Table 4-25 and represented in Figure 4-46, and demonstrate a net balance.

Given that surface water flows will generally be minimal and limited to large episodic rainfall events that are difficult to predict, these cannot be reliably considered and are not included within the site water balance presented here. MGT can reduce the production/importation of raw water to enable efficient use of any large surface flows contained within the TFS or other part of the ML and maintain the modelled balance of water inputs and outputs.

Table 4-25: Site water balance – key inputs and outputs

Water inputs	Annual estimated flows (GL/yr)
Raw water supply	11
Groundwater extraction and inflows	1
Total inputs	**12**
Water outputs	**Annual estimated flows (GL/yr)**
Concentrate product	0.4
Tailings entrainment	5.1
Tailings evaporation and seepage	5.1
Effluent wastewater evaporation and irrigation	0.05
Mine pits (dust suppression and evaporation)	1.0
Other (general system losses, purges)	0.35
Total outputs	**12**

The principal wastewater stream is the process water that deports to (and is reclaimed from) the TSF; the potential composition of this water will reflect added process reagents (refer Table 4-23), with the fate of the process water reagents presented in Table 4-24.

4.6.2.2. Water holding ponds

Information on key process water holding ponds including dimensions, construction method, freeboard and chemistry of stored water is provided in Table 4-26. Ponds associated with the TSF have also been included.

The freeboard level in metres for water holding ponds will nominally between 0.5–1.0 m based on the specific geotechnical requirements of each pond.

Table 4-26: Water holding ponds – indicative design details

Water pond description	Dimensions	Approximate capacity	Design and construction	Freeboard (m)	Anticipated chemical composition
Water holding ponds – NPI area					
Raw (treated) water dam	180 m x 80 m x 6.0 m	80 ML	Clay-lined	0.5 – 1.0 m	Raw Water / Fresh Water
Water holding ponds – Process Plant area					
Process water dam	150 m x 65 m x 4.5 m	35 ML	HDPE-lined	0.5 – 1.0 m	Process Water pH 10
Settlement pond (allocation in thickener/filtration plant)	60 m x 20 m x 3.0 m	3.2 ML	HDPE-lined	To be defined	Process Water pH 10
TSF					
Reclaim pond	175 m x 120 m x 2.0 m	25 ML	HDPE / LLDPE or GCLx liner	To be defined	Assumed equivalent to

Water pond description	Dimensions	Approximate capacity	Design and construction	Freeboard (m)	Anticipated chemical composition
Decant ponds	Variable; at Year 38: North: 1,540 m x 285 m South: 1,320 m x 490 m	Variable	HDPE / LLDPE or GCLx liner	Refer TSF Section	Process Water pH 10

For further information on the decant and reclaim ponds associated with the TSF, refer to Section 4.7.2.3.

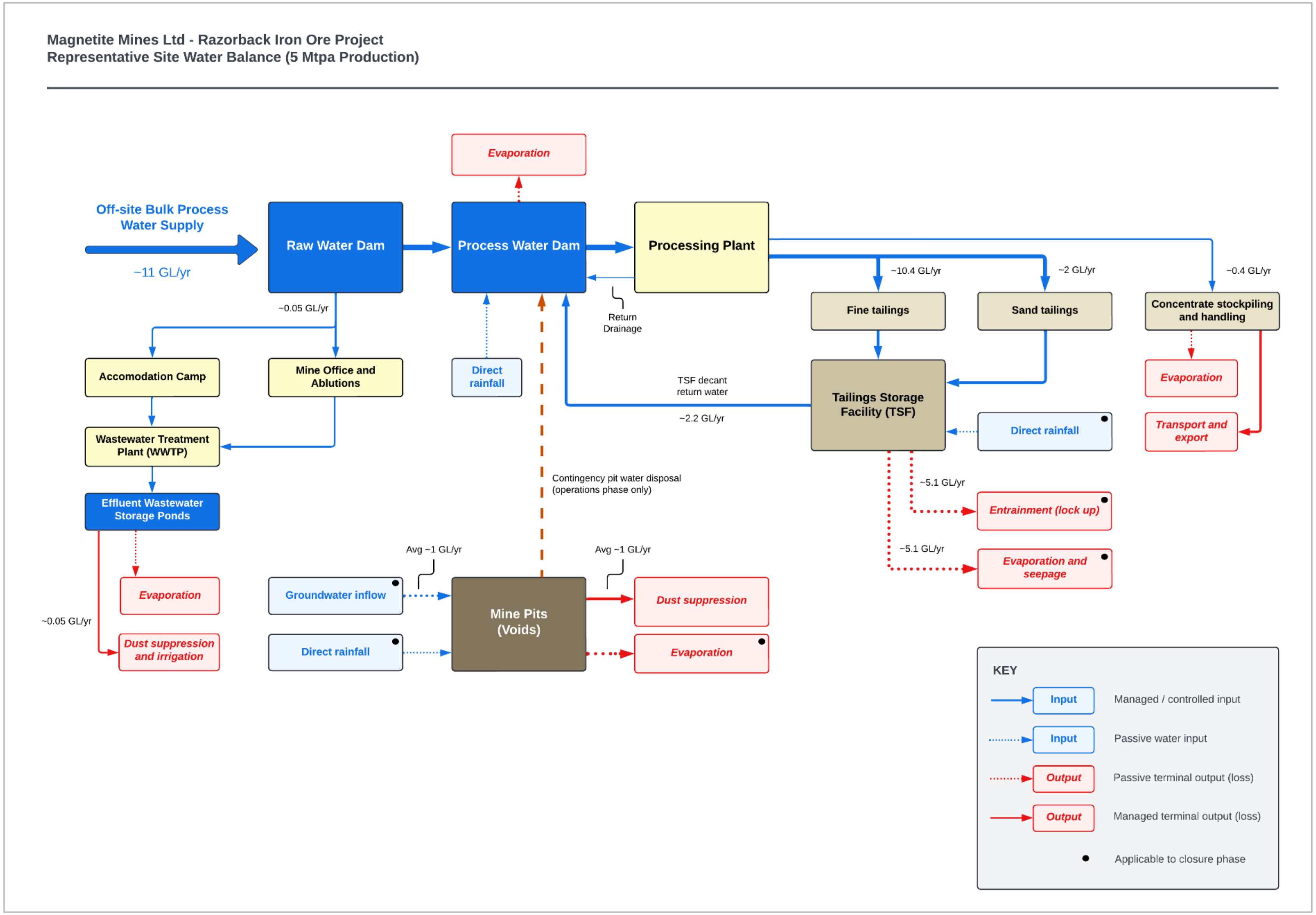

Figure 4-46: Representative process water balance flow diagram

4.6.3. Process plant construction

The construction of the process plant is the main works to be undertaken on Site and will commence once key access, accommodation and other enabling facilities have been commissioned.

The general construction methodology for the process plant will consist of:

- survey of work area
- clear and grub of pad area, including the temporary stockpiling and management of felled vegetation, topsoils and subsoils
- main earthworks, including cut, fills and installation of structural materials, with grading and compacting to required levels
- installation of drainage and sediment control infrastructure
- concrete works, structural, mechanical and piping, electrical and instrumentation and site services installation
- placement and installation of prefabricated buildings and vendor plant packages
- installation of site utilities including water, power and communications equipment, as required.

Construction verification, commissioning (wet and dry), performance testing and production ramp up will follow. Once relevant capacities have been achieved and defects/faults resolved, the rehabilitation of temporary disturbance areas and the removal of wastes will occur.

To support commissioning (wet commissioning and performance testing) of the process plant, ore will be supplied at a defined rate and tailings facilities will be commissioned concurrently.

Indicative mobile construction fleet requirements for the process plant package are discussed in Section 4.6.4.1.

4.6.4. Mobile equipment

The crushing, grinding and processing of ore will be through the fixed processing plant.

Mobile equipment used as part of crushing, griding and processing activities will generally include large wheel loaders, excavators and miscellaneous plant (e.g. forklifts and other). The type and nature of emissions to air, and potential ignition sources from such equipment is consistent with that for the mining equipment fleet (refer Section 4.5.6).

The off-site transport of concentrate (product) will be undertaken using triple road trains (A-triples) with an average payload of 230 t. The A-triples will tip concentrate at the Hillgrange RS into linear stockpiles, with large wheel loaders (e.g. CAT 992, or equivalent) used to load the receiving freight trains.

The residence time of the stockpile will be of short duration, with train cycles approximately every 21 hours as per ARTC modelling, with a loading rate of 2,250 t/hr, sufficient to load a 12,000 t payload freight train in the six-hour loading window mandated by ARTC. Based on loading eight (8) freight trains per week on a continuous 24/7 basis, a fleet of approximately eleven (11) A-triples will operate between the site and RS, including allowance for planned and unplanned A-triple maintenance. Ten (10) A-triples will be in operation 20 hours a day, with six (6) cycles per vehicle per day, totalling 60 truck cycles per day.

A-triples will be powered by prime movers with a gross power output of around 700–750 horsepower (e.g. Volvo FH16, Scania R730 or equivalent units).

An indicative list of mobile equipment specific to off-site concentrate transport and HR/RS operations, is provided in Table 4-27.

Table 4-27: Indicative mobile equipment – HR and RS operations

Equipment	Capacity/ payload	Average fleet (n)	Emissions			
			Noise dB(A)		Air (exhaust)	Potential ignition sources
			Inside cabin	Outside cabin		
Road Trains (A-triples)	230 t	11	65–70[1]	75–80[1]	Diesel combustion	Diesel combustion
CAT 992 (Large Wheel Loader)	25 t	2	70	116		
Forklift	1.5 t	3	93	93		
Diesel Generators (~10 kVA)	-	3	-	120[2]		
ALLIGHT (Lighting tower)	-	4	-	<70		

[1]. BASED ON SCANIA R730 PRIME MOVER
[2]. APPROXIMATE VALUE (MANUFACTURER AND EQUIPMENT SPECIFICATION NOT AVAILABLE, OR EQUIPMENT MAKE/MODEL NOT YET KNOWN)

Loaded freight trains will travel 315 km to the Port of Whyalla for off-loading via bottom discharge rail cars. The concentrate will then be loaded onto transhipping vessels using Port-side conveyor infrastructure, and then loaded onto cape-size vessels for transport to international end markets. The Port of Whyalla has existing capacity to serve this initial arrangement.

4.6.4.1. Construction equipment

A range of plant and equipment is required to support the construction phase, with the final equipment and plant type and numbers to be identified by the construction contractor, once awarded. Table 4-28 identifies expected equipment types for the construction phases, with indicative numbers of units provided for active work fronts.

Crane sizes have bene assumed based on comparable; however, specific requirements will be confirmed once equipment size, weight and site reach constraints are fully assessed by the construction contractor.

Table 4-28: Indicative mobile equipment – process plant construction

Construction sub-phase	Equipment type	Indicative number of units
Site establishment	Trucks	14
	Water Carts	2
	25-30 t excavators	1
	Scrapers	4
	Cranes	2
	Dozers	2
	Lights Vehicles	10
	Ancillary Equipment	20
Main earthworks	25-30 t excavators	1
	40 t dump truck	20
	compactors	2
	Water Carts	3
	Bulldozers	3
	Graders	2
	Vibratory Compactors	2

Construction sub-phase	Equipment type	Indicative number of units
Support works	Compound Excavators	1
	Maintenance LV's	2
	Lube Truck	1
	Fuel Truck	2
	HR Water carts	3
	HR graders	2
	Ancillary Trucks	3
	Forklifts/Loaders	4
	Low Loader	1
	Franna	2
	Large Mobile Crane	1
Plant, buildings and structures	750-ton crane	1
	250-ton crane	1
	100-ton crane	1
	Franna Cranes	2
	Piling Rig	2
	Low Loader	1
	Light Vehicles	5
	Ancillary vehicles	3

4.6.5. Conveyors and pipelines

Not applicable – no conveyors or pipelines will be used for transporting material between the Site and off-site facilities or point of sale.

4.6.6. Hours of operation

As per Section 4.5.9, the project will operate on a continuous 365-day, 24/7 basis.

Within this, primary and secondary crushing plant will be designed for a minimum availability of 6,570 hours per annum (75% availability) while the remainder of the processing plant will be designed for a minimum availability of 8,000 hours per annum (91.3% availability). At all times, including night shift and when plant is not available for operation, maintenance activities may be undertaken. Periods of extended shutdowns for maintenance work will occur (known as a plant 'turnaround') where extensive maintenance will be performed across all shifts.

4.6.7. Rehabilitation strategies and timing

General strategies for the rehabilitation and closure of crushing, griding and processing infrastructure and associated disturbance areas are outlined in Table 4-29.

Detailed rehabilitation strategies will be documented within the RMP and MCP. Strategies will evolve and adapt over time as the project-specific rehabilitation knowledge base is improved through rehabilitation trials, research and monitoring.

Table 4-29: Crushing, griding and processing infrastructure – general rehabilitation and closure strategy

Infrastructure / area	General strategy
Process plant structures	• Services disconnected. • Infrastructure to be decommissioned and either removed from site or demolished, unless retained (by agreement) to support the post-mining land use. • Any residual ore or concentrate scalped and disposed to WRDs or TSF. • Concrete broken-up and crushed for on-site beneficial re-use. • Wastes removed for disposal, recycling or re-use.
Fuel and hazardous materials storages	• Services disconnected. • Surplus fuels and chemicals removed and disposed off-site per EPA requirements. • Structures demolished or removed from site (e.g. for sale or re-use). • Concrete pads and bunds broken, crushed and disposed off-site as potentially-contaminated material. • Former storage sites subject to soil sampling and testing to determine presence or absence of any site contamination. If contaminated, remedial plan implemented.
Water holding ponds	• Residual stored water pumped out and used for dust suppression or disposed on site (e.g. within pits or TSF). • Sediments removed and disposed on-site (within pits or TSF). • Liner removed and disposed off-site. • Associated infrastructure (e.g. pumps, pipes, telemetry systems) decommissioned and removed. • Embankments / walls removed and former pond area backfilled. • Area re-shaped to final landform and deep ripped to alleviate compaction, if required. • Subsoil and topsoil (or suitable alternative growth media) reinstated and ripped into underlying surface. • Native seed applied.
Drains, bunds and launders	• Pipework removed and disposed off-site. • Sediments collected and disposed to TSF. • Concrete broken-up and crushed for on-site beneficial re-use.

Infrastructure / area	General strategy
Access roads, pipeline corridors and laydown areas	• All ancillary mining consumables and equipment (e.g. pipes, pumps, portable plant, shipping containers and other items) removed from site (e.g. for sale or re-use). • Access road surface water drainage infrastructure (e.g. pipes and culvert) removed. • Wastes removed for disposal, recycling or re-use. • Areas re-shaped to final landform and deep ripped to alleviate compaction, if required. • Subsoil and topsoil (or suitable alternative growth media) reinstated and ripped into underlying surface. • Native seed applied.
Former process plant area and access roads	• Area re-shaped to final landform and deep ripped to alleviate compaction, if required. • Subsoil and topsoil (or suitable alternative growth media) reinstated and ripped into underlying surface. • Native seed applied.

Industrial and commercial wastes generated will be managed as per Section 4.7.

Indicative timing for rehabilitation and closure of crushing, grinding and processing infrastructure and associated areas is as provided in Section 4.5.8.2 (Figure 4-35).

4.7. Wastes

4.7.1. Waste rock dumps

4.7.1.1. Waste rock volumes

WRDs will consist of extracted hard-rock overburden and low-grade ore that falls below the magnetite cut-off minimum grade.

Annual and LOM waste rock volumes reporting to the Iron Peak and Razorback WRDs, associated with the Ore Reserves and Mineral Resources estimates are provided in Section 4.5.3 (Table 4-10 and Table 4-11).

Some waste rock will also be used in construction, geotechnical and rehabilitation applications though specific associated volumes cannot be quantified at this time.

4.7.1.2. Waste rock characterisation

Waste rock will be generated through drill and blast operations with a nominal blasthole diameter size of 165 mm. Based on drill and blast modelling (Orica, 2022) the particle size distribution (PSD) of generated waste rock will consist primarily of large fragments, with 80% greater than the target blast size 400 mm (Table 4-30). Given the proportion of larger fragments, and inherent hardness and strength, the disposed waste rock is expected to have low erodibility and low susceptibility to weathering and leaching of metals.

Table 4-30: Waste rock modelled particle size distribution (165 mm blasthole size) (Orica, 2022)

% Passing	Passing size (mm)
20%	37 – 51
50%	150 – 165
80%	400
99.9%	1,280

Regarding geochemistry, a preliminary assessment of ARD potential was undertaken by Parsons Brinckerhoff (2013) involving laboratory analysis of RC drill hole reject material (cuttings), with samples representative of ores and overburden both spatially and at depth. Of the thirteen samples assessed – including material from the footwall, hanging wall and low and high-grade magnetite ores – results indicated the lithological units comprising the Braemer Iron Formation offer negligible potential for ARD with samples classified as either ACM or NAF. It is therefore highly unlikely that substantive quantities of PAF waste rock will be generated. Future works include a program of kinetic testing of waste rock to provide specific demonstration of the potential risk of this waste stream.

4.7.1.3. Location, design and construction

WRD construction will follow conventional method involving paddock dumping via haul trucks, with staged lifts (nominally 20 m lifts) achieved through the installation of access ramps and tip head dumping for ground-up construction. Excavators and dozers will be used to push, shape and compact deposited rock.

The location of and concept design of the final WRDs is presented in Figure 4-47. The conceptual lateral and vertical development sequence for the Iron Peak and Razorback West WRDs are provided in Figure 4-48 and Figure 4-48, respectively. Representative cross-sections for operations and closure phases are generally identical at drawing scale, as a result, a single set of cross-sections is included in Section 4.10 (Completion), Figures for the Iron Peak WRD are included in Figure 4-81 and Figure 4-82, while those for Razorback West WRD are included in Figure 4-83 and Figure 4-84. Refer to Section 4.7.6.1 for information on specific rehabilitation strategies, including the moderate re-shaping proposals for WRDs.

WRD (stockpile) heights have been assessed based on maximum landform elevations and average existing ground elevations, noting:

- Maximum elevation of approximately 360 m AHD above an estimated average existing ground elevation of 260 m AHD and lowest estimated elevation of 252 m AHD at the Iron Peak WRD site.
- Maximum elevation of 470 m AHD above an estimated average existing ground elevation of 350 m AHD and lowest estimated elevation of 340 m AHD at the Razorback West WRD site (based on the full 56-year mine plan).

It is noted, however, that the 38-year mine plan will likely result in a lower final height of the Razorback West WRD of approximately 415 m AHD

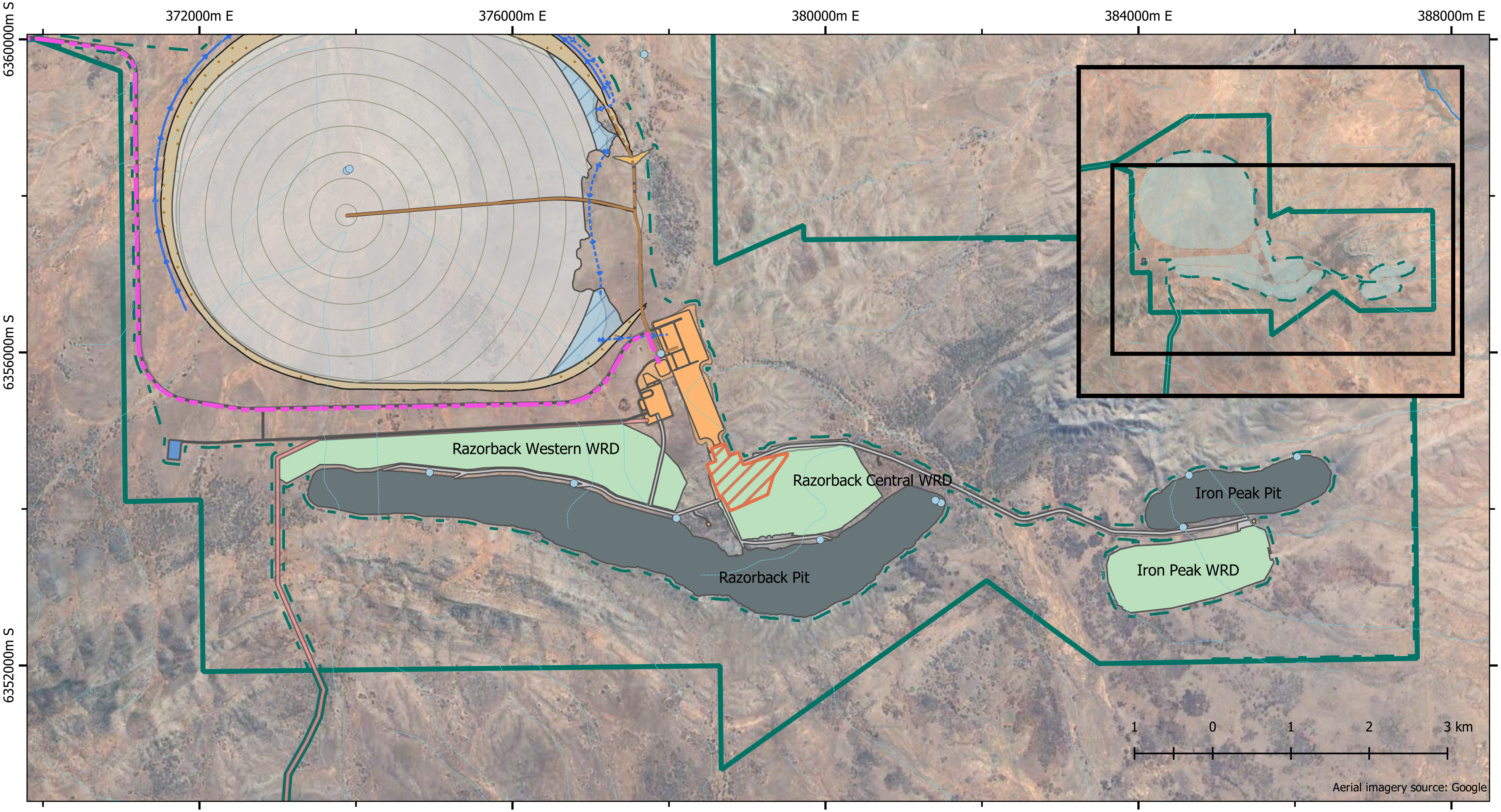

Figure 4-47: Waste rock stockpile locations

Project Area
Conceptual Footprint
Watercourses
Minor
Water supply
Groundwater bore site (ind.)
Coastal raw water line
Coastal raw water line

Roads
Haul, access and other roads
Road batters
Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Accommodation camp

Mine and stockpile infrastructure
ROM operations area
Waste rock stockpile
Mine pit
Ultimate TSF infrastructure
TSF Toe drain (with flow direction)
TSF Decant pipelines (with flow direction)
TSF Tailings slurry pipeline

TSF Coarse sand pipeline
TSF Spigot access pier/road
TSF Decant pond
TSF mounding profile
TSF Tailings beach extent
TSF Spillway
TSF Embankment

GDA 1994 MGA Zone 54 | 1:70,000 @ A4
Author: A Kane | Date: 31/01/2025
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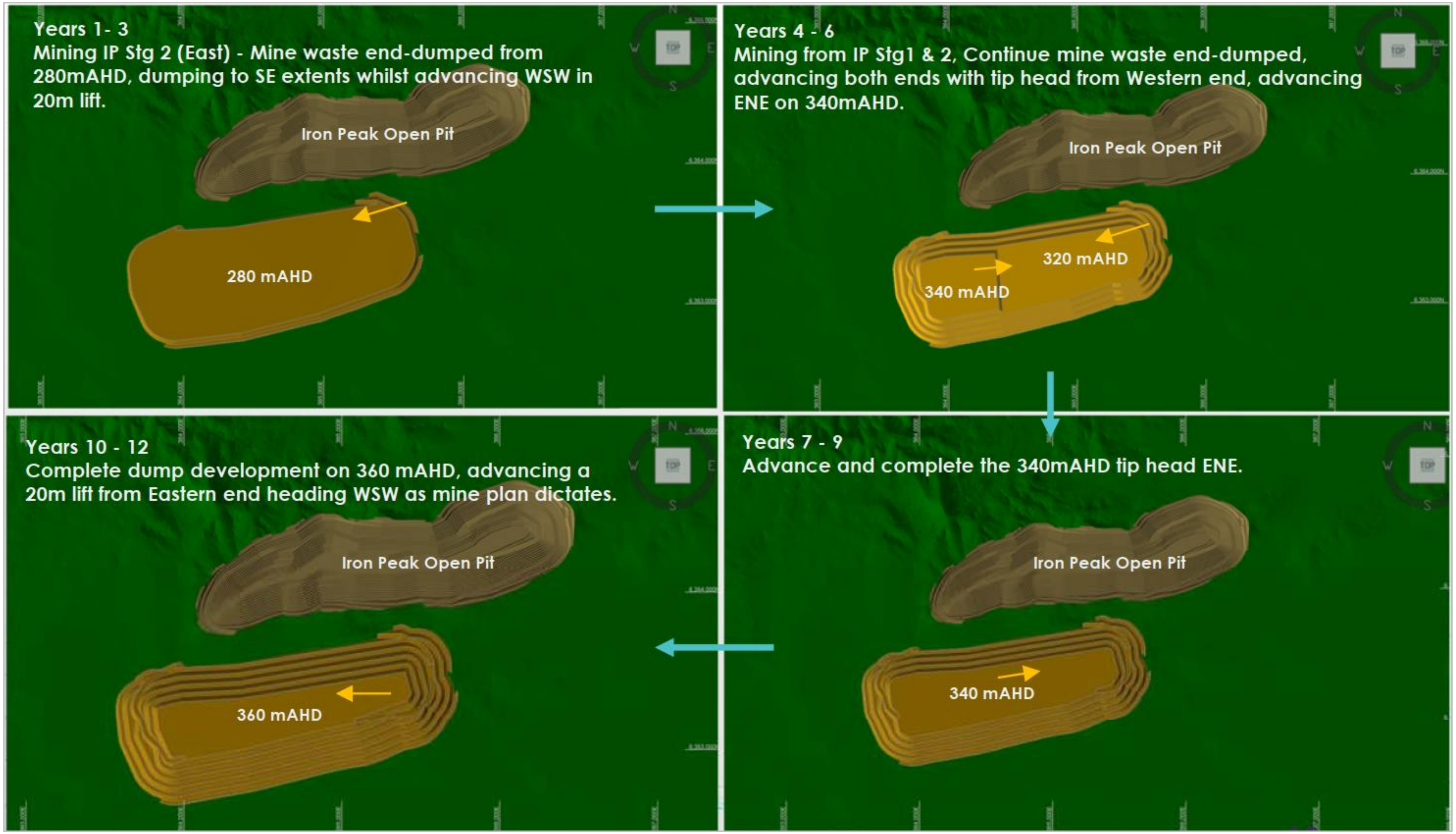

Figure 4-48: Iron Peak WRD conceptual development sequence

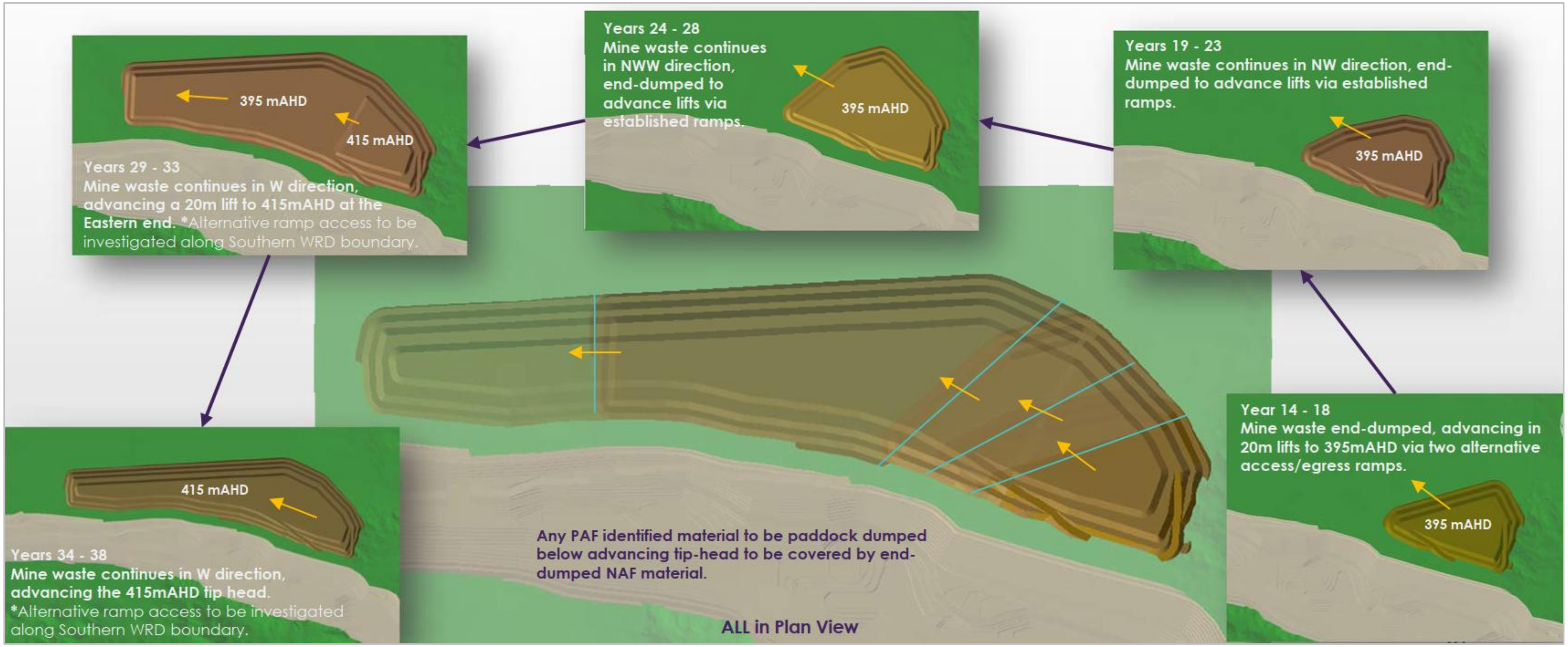

Figure 4-49: Razorback WRD conceptual development sequence

DRAINAGE AND EROSION CONTROL

WRD drainage and erosion control will be achieved through the installation of berms, installed with each successive vertical lift, to promote rainfall infiltration and capture of sediment runoff. WRD perimeter toe drainage (e.g. V-drains, sediment basins) will provide secondary control of any sediment runoff and capture of any WRD seepage. It is expected that rates of erosion, sediment runoff and WRD seepage will generally be low given the arid climate.

Water and / or commercial dust suppressants will be used as required to limit wind erosion and dust.

PAF WASTE ROCK MANAGEMENT

As discussed in Section 3.5.4, it is highly unlikely that substantive quantities of PAF waste rock will be generated; however, if this does occur, PAF waste rock will be managed using PAF rock ‘cells’ following the concepts shown in Figure 4-50 (Pearce et al., 2016) and Figure 4-51 (Earth Systems and Okane, 2020) where PAF rock is dumped in an alternating arrangement with NAF material (centrally and at depth within the overall waste rock dump), and between compacted layers of NAF material, as the WRD is constructed. The compacted NAF layers and surrounding NAF material limit air and water ingress, and thus potential for oxidation and ARD, and provide ANC. Equally, this method reduces reliance on and/or need for a WRD final cover that limits air and water infiltration, which would also inhibit native vegetation rehabilitation.

The interval height of successive waste rock dump lifts may also be reduced to 10 m to increase the number of intermediate compacted barrier layers within the landform for PAF management purposes.

This method is considered appropriate in the prevailing semi-arid and low rainfall environment and can be readily implemented as PAF rock is detected or anticipated in the forward mine plan, with the exact sequence of material placement and the barrier layer configuration adaptable depending on when and how potential PAF waste rock is encountered.

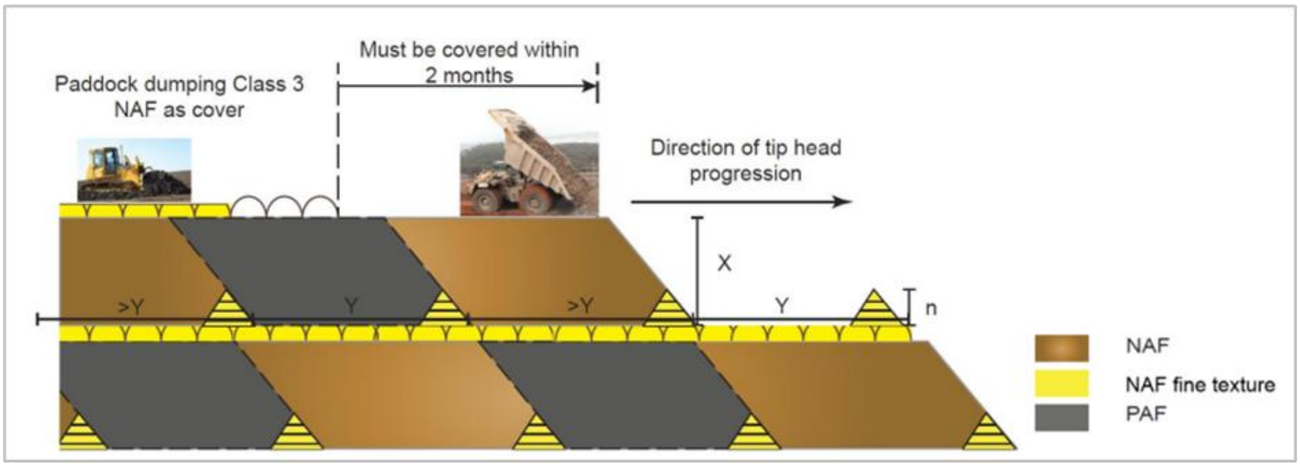

Figure 4-50: Concept waste rock dump PAF disposal method (Pearce et al. 2016)

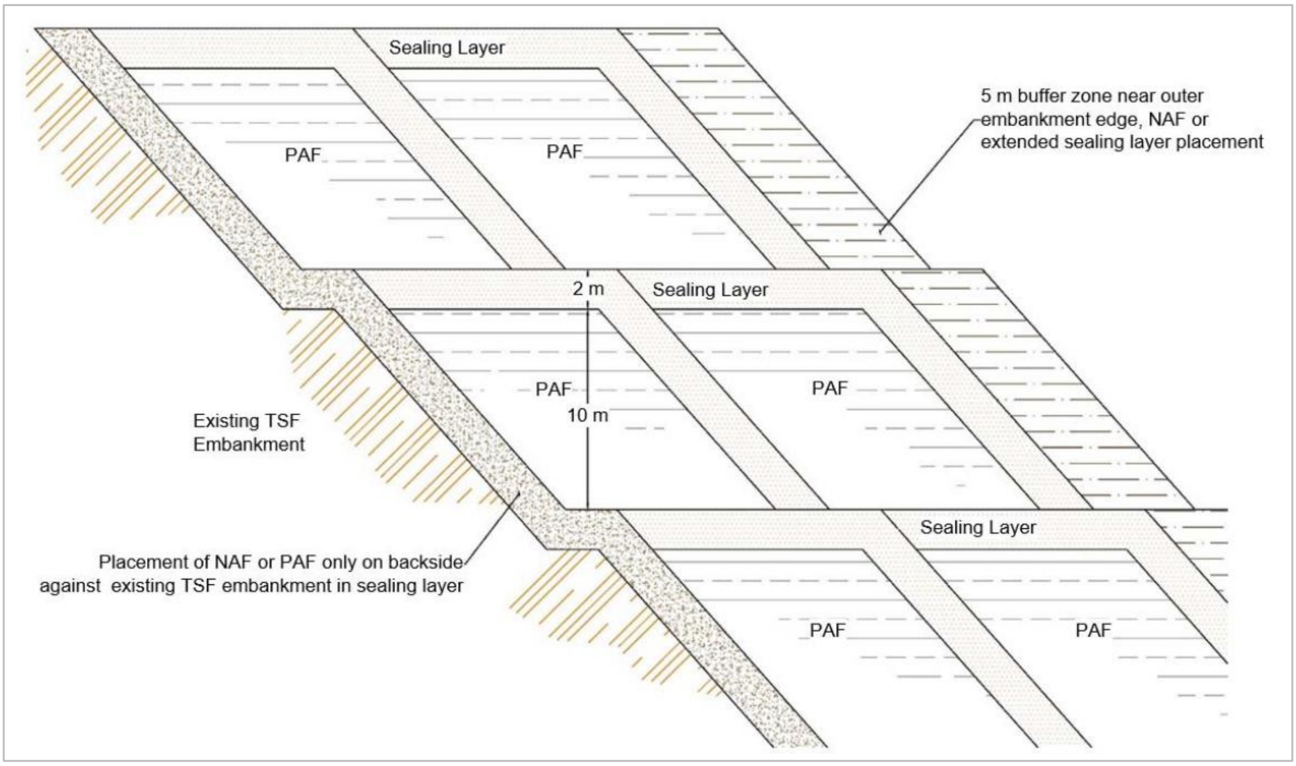

Figure 4-51: Concept waste rock dump PAF disposal method (Earth Systems and Okane, 2020)

GEOTECHNICAL LANDFORM STABILITY

The waste landforms are currently conceptual in design and in line with international standards; future planned studies into waste characterisation and landform stability (i.e., cohesion and friction strength / angle) modelling will be undertaken to optimise slope geometries with applied Factors of Safety (FoS), both for operational and closure phases.

The design basis for waste landforms at Razorback and Iron Peak are currently 20 m lift heights, 35^{o} slope angles (angle of repose for competent waste rock typically 37^{o}) and 25 m-wide minimum catchment berms (extended to 50 m when access ramps are operational). This results in an overall slope angle average of less than 20^{o}, reducing the future reshape requirements to leave safe, stable post mining landforms. As per industry standards and regulations, MGT will develop safe operating procedures for waste landform construction, including shift inspections by competent persons for geotechnical stability, and ultimately developing waste landforms with the appropriate controls.

POST-COMPLETION CHEMICAL AND EROSIONAL STABILITY

As detailed in Section 3.3, desktop assessment indicates that soils within the key proposed disturbance areas (HR / RS and ML) will have moderate erodibility, with an elevated erosion risk once disturbed. Several soil types are hard-setting with low infiltration capacities, higher rates of surface water runoff and increased erosion potential. Some soil types are also friable / powdery when disturbed and susceptible to wind erosion when disturbed (i.e. during vegetation clearing and soil stripping) and when re-handled during landform reinstatement and rehabilitation.

Though a detailed characterisation of cover material erodibility has not yet been undertaken, it is expected that reinstated soil covers will be susceptible to erosion loss both during material handling, and where final landform geometries (slope lengths and gradients) are incompatible with a soil cover.

Detailed erodibility characterisation, erosion modelling and landform evolution modelling (LEM) will be undertaken to inform the design of erosionally-stable post-mining WRDs. This indicative erodibility characterisation and final landform design process is summarised in Table 4-31.

The base case for the closure and completion of WRDs is re-shaping to a geotechnically stable and aesthetically acceptable landform and a final cover system consisting of reinstated soils (subsoils and topsoils) supporting native vegetation. Given the erodibility of local soils, the landform design process will therefore evaluate a range of alternative final surface cover systems (e.g. soil and vegetation, rock, rock/soil mulches and combinations thereof). This will identify alternative surface treatments that provide increased erosion performance generally and/or in circumstances where the final landform geometry requires a targeted cover solution, for example, locations with potential for concentrated surface water flows.

Table 4-31: Indicative erodibility characterisation and final landform design process

Process step	Description
Identify materials to be used as final cover on closure landform	• Confirm the soil types likely to be used in final landform rehabilitation (final cover).
Subsoil sampling and laboratory analysis	• Sampling of subsoils from soil types to be used in final landform rehabilitation. • Laboratory analysis to determine key physical and chemical erosion indicators.
Subsoil physical erosion testing	• Physical erodibility testing (e.g. simulated rainfall and flume testing) to determine key input parameters for erosion modelling (infiltration capacity, rill and inter-rill erodibility and critical shear).
Erosion modelling	• 2-dimensional modelling (e.g. RUSLE[1], WEPP[2]), using results from laboratory characterisation and physical erodibility testing to develop 'slope design rules' (final landform slope lengths and gradients and lengths that provide 'tolerable' rates of erosion under different final surface treatments (e.g. soil and vegetation, rock, rock/soil mulches and combinations of these).
Develop preliminary 3-dimensional final landform design	• Develop a preliminary 3-dimensional landform (digital elevation model) based on the slope design rules derived from erosion modelling. • Preliminary landform design considers any relevant constraints (e.g. final landform footprint/setbacks and geotechnical stability design requirements).
Landform evolution modelling	• LEM (e.g. SIBERIA model) to assess long-term erosional stability, including climate change effects. • LEM identifies any required adjustment to the final landform design to address significant erosion risks, and/or the need for additional final surface treatments (e.g. rock armouring or other). • LEM is re-run on any adjusted designs, if required.
Final landform design	• Final, post-mining landform design is confirmed/implemented.

1. REVISED UNIVERSAL SOIL LOSS EQUATION
2. WATER EROSION PREDICTION PROJECT

4.7.2. Tailings storage facility

Tailings material will consist of both fine and coarse reject material generated through the crushing and processing of ore, which will be disposed via pipelines to a single LOM TSF. The tailings material is classified within the processing plant to produce a coarse sand product and a fine tailings product as described in Section 4.6.1.2.

4.7.2.1. Tailings volumes

Annual and LOM tailings volumes, associated with the Ore Reserves and Mineral Resources estimates (Section 4.3.1) are provided in Section 4.5.3 (Table 4-10 and Table 4-11).

4.7.2.2. Tailings characterisation

The tailings material predominantly consists of various silicate minerals, dolomite and hematite, with minimal apatite or magnetite present (refer Table 4-32). Key characteristics of the tailings include non-acid generation, low leaching of dissolved metals and absence of asbestos fibres.

Table 4-32: Indicative tailings mineralogical composition (mass, as percentage)

Mineral	Mass (%)
Chlorite group	3
Mica group	9
Quartz	34
Dolomite group	12
Plagioclase	29
Apatite group	1
Hematite group	11
Spinel group	1

Preliminary geochemical characterisation studies (Golder, 2012; Parsons Brinkerhoff, 2013) determined that tailings will have very low sulfur concentrations (~0.01%), with low NAG potential and high ANC (100 kg H2SO4 / tonne) due the presence of carbonates. The risk of AMD from tailings is therefore considered to be low, further reduced by the low potential for PAF ore in the two ore bodies. The risk of metals mobilised by AMD is also considered low owing to both the NAF nature and ANC of the tailings material, as well as the lack of metals such as lead, arsenic or cobalt within the upstream ore feed. In summary, deposited tailings are considered geochemically benign.

A geotechnical characterisation study (Hatch, 2023a) has determined the parameters for fine and coarse grained tailings (see Table 4-33 below). Based on the geotechnical test work results, the coarse-grained sand tailings was deemed suitable for construction of the TSF embankment. Of particular note is the extremely low permeability of fine grained tailings which acts to limit seepage from the TSF.

Table 4-33: Tailings geotechnical parameters

Parameter	Coarse grained tailings (sand)	Fine grained tailings (Fines)	Units
Specific Gravity (S.G.)	3	2.88	-
Modified Maximum Dry Density (MMDD)	1.98		t/m3
Optimum Moisture Content (OMC)	12		%
California Baring Ratio (CBR)	14-30		-
Permeability	3.0 x 10^-7	2.5 x 10^-9	m/s
Coefficient of Consolidation (C_v)	-	250	m2/y
Compression Index (C_c)	-	0.02-0.13	-
Effective Strength Parameters	C=0 Ψ=36		kPa °

Parameter	Coarse grained tailings (sand)	Fine grained tailings (Fines)	Units
Critical State Line Parameters (CSL)	λ=0.137 Γ=1.486		
Post -cyclic Undrained Shear Strength Ratio (τ/σ_v)	0.16 @ 92% 0.45 @ 95%		%MMD
Small Strain Shear Modulus	101-204		MPa

Process water which is used to transport the tailings to the TSF will have an expected pH of 8.5–10.5, some of which will remain entrained in the tailings and will be lost through seepage, but most of which will be returned for re-use within the process plant. The pH range of deposited tailings will be consistent with the tailings water.

4.7.2.3. Location, design and construction

The TSF has been designed based on the selection of CTD as the method for tailings disposal (refer Section 4.2.1.3 for discussion on tailings disposal assessment and selection process). The TSF infrastructure includes the following elements of a starter embankment, coarse sand embankment, coarse sand tailings pipeline, fine tailings pipeline, seepage collection channel, seepage reclaim pond, water reclaim pipeline, north and south decant ponds, decant return line, various pumping facilities and an access road.

DESIGN APPROACH

MGT engaged Hatch as TSF design experts to scope, design and assess the TSF. An iterative approach has been taken to the design of the TSF, with several options considered and assessed through an MCA as discussed in Section 'Tailings'. The described design and analysis which will be progressed through to detailed design and construction has been developed in accordance with ANCOLD Guidelines, MPOL007, ICOLD and GISTM.

The following standards have been used in the design and analysis of the TSF and can be found referenced throughout the TSF descriptions within Section 4.7.2:

- Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure (ANCOLD, 2019).
- Guidelines on the Consequence Categories for Dams (ANCOLD, 2012).
- Guidelines on Selection of Acceptable Flood Capacity for Dams (ANCOLD, 2000).
- Guidelines for Geotechnical Investigations of Dams, their Foundations and Appurtenant Structures.
- Guidelines on Dam Safety Management.
- Global Industry Standard on Tailings Management (GISTM) 2020 (Global Tailings Review, 2020).

Detailed design for construction, operation, maintenance, closure and rehabilitation will be in accordance with these standards and other additional relevant standards including:

- relevant ICOLD bulletins
- Canadian Dam Association (CDA) dam safety guidelines 2007 (2013 edition) – Sections 4, Section 6.2
- elements of CDA Technical bulleting: Application of dam safety guidelines to mining dams (2019).

A summary of key design and operating parameters are presented in Table 4-34.

LOCATION

The final TSF dimensions will be approximately 5,000 m long (north-south) and 5,800 m (east-west), with a final embankment height of approximately 60 m. Design parameters, including operating conditions, are summarised in Table 4-34.

The ultimate TSF footprint and configuration is shown in Figure 4-52, while the starter configuration (representing the TSF at Year 10) is presented in Figure 4-53.

Table 4-34: Selected CTD TSF design parameters

Item	Unit	Coarse (sand) tailings	Fine tailings	Notes
Treatment method		Cyclone	DCT	Deep cone thickeners
Tailings source		Rougher, Secondary	Part Rougher, Secondary, Cleaner, OF	
Split between sand : fine tails	%	19.5	80.5	Estimated from Bulk Tails PSD
Estimated nominal mass flowrate	tph	727	3,002	Calculated based on 91.3% availability
Annual Tailings Production (average)	tpa	8,815,690	24,008,370	Calculated
Composite particle SG		3.00 average [2.88 - 3.16]	2.88 average [2.83 - 2.92]	From test work (Hatch, 2023b)
Liquor SG		1.0	1.0	Assumed
Underflow solids content	%	70	65	Assumed
Gravimetric moisture content	%	42.9	53.8	Calculated
Liquor in tailings	tpa	2,492,440	12,927,580	Calculated
Bulk tailings production	wtpa	8,308,130	36,935,950	Calculated
Annual tailings volume	m^3/a	4,431,000	21,263,820	Calculated
Bulk density for solids transport	t/m^3	1.88	1.74	Calculated
Tailings discharge dry density	t/m^3	1.31	1.13	Mass solids / total volume
Settled tailings dry density	t/m^3	1.52	1.43	From test work (Hatch, 2023b)
Estimated slurry settled solids content	%	75.5	74.0	Calculated
Total bleed water	m^3/hr	75.7	561.7	Calculated
Predicted percentage recoverable bleed	%	30	30	Estimated
Estimated return water to process	m^3/hr	22.7	168.5	Calculated
Final consolidated dry density	t/m^3	1.88 (95% MMDD)	1.67 (80% solids)	Post-closure
Entrained losses after consolidation	m^3/hr	144	760	Water trapped in pore spaces
Typical beach slope	%	25.0	1.5	Assumed
Peak allowable rate of rise[1]	m/a	-	5	Assumed for downstream

Item	Unit	Coarse (sand) tailings	Fine tailings	Notes
Total tailings tonnage	Mt	116	1,098	LOM Plan at end of Year 40 (MGT, 2024); conservative basis from Year 38
Total required storage	Mm^3	62	762	Calculated, settled density

1. THE RATE OF RISE FOR OPTIMUM DESICCATION DIFFERS FROM THE RATE OF RISE TO KEEP THE TAILINGS SATURATED TO LIMIT DUST GENERATION. GIVEN THE DRY CLIMATIC CONDITIONS AT THE SITE, HIGHER RATE OF RISE MAY BE TOLERATED TO ENSURE THE TAILINGS REMAINS SATURATED GIVEN DOWNSTREAM CONSTRUCTION IS PROPOSED (I.E. NOT ALLOWED TO DESICCATE).
2. COARSE SAND TAILINGS STORAGE VOLUME WILL BE DEPENDENT ON THE PERIMETER EMBANKMENT SIZING. BALANCE OF MATERIAL WILL BE MANAGED WITHIN THE FINES TAILINGS IMPOUNDMENT.

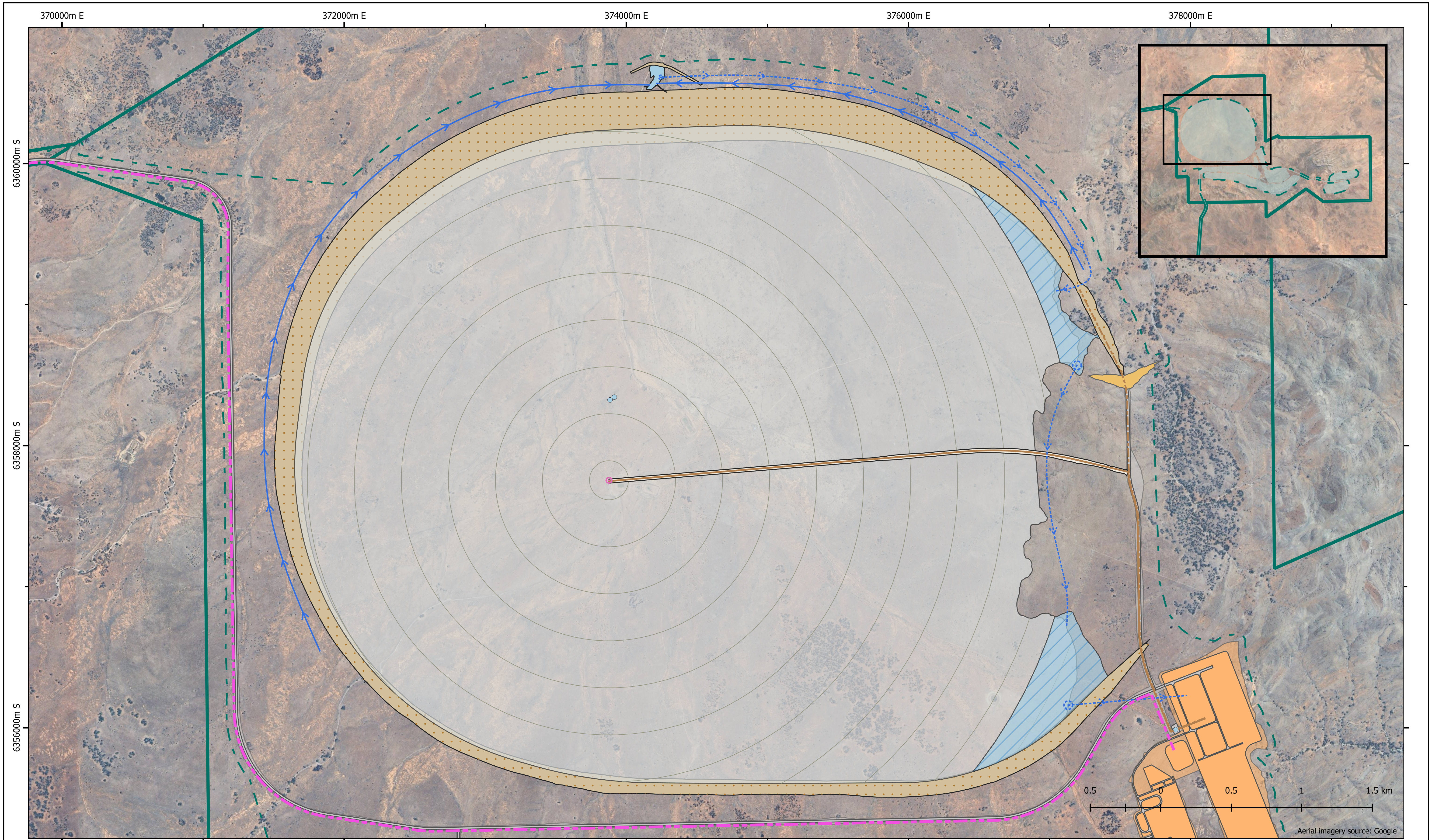

Figure 4-52: Proposed Tailings Storage Facility, ultimate configuration

Project Area
Conceptual Footprint

Water supply
Groundwater bore site (ind.)
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Primary facilities
Key facility compounds
Key facility batters

Ultimate TSF infrastructure
TSF Toe drain (with flow direction)
TSF Decant pipelines (with flow direction)
TSF Tailings slurry pipeline
TSF Coarse sand pipeline

TSF Spigot location
TSF Spigot access pier/road
TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond

TSF mounding profile
TSF Tailings beach extent
TSF Spillway
TSF Embankment

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Author: A Kane | Date: 31/01/2025
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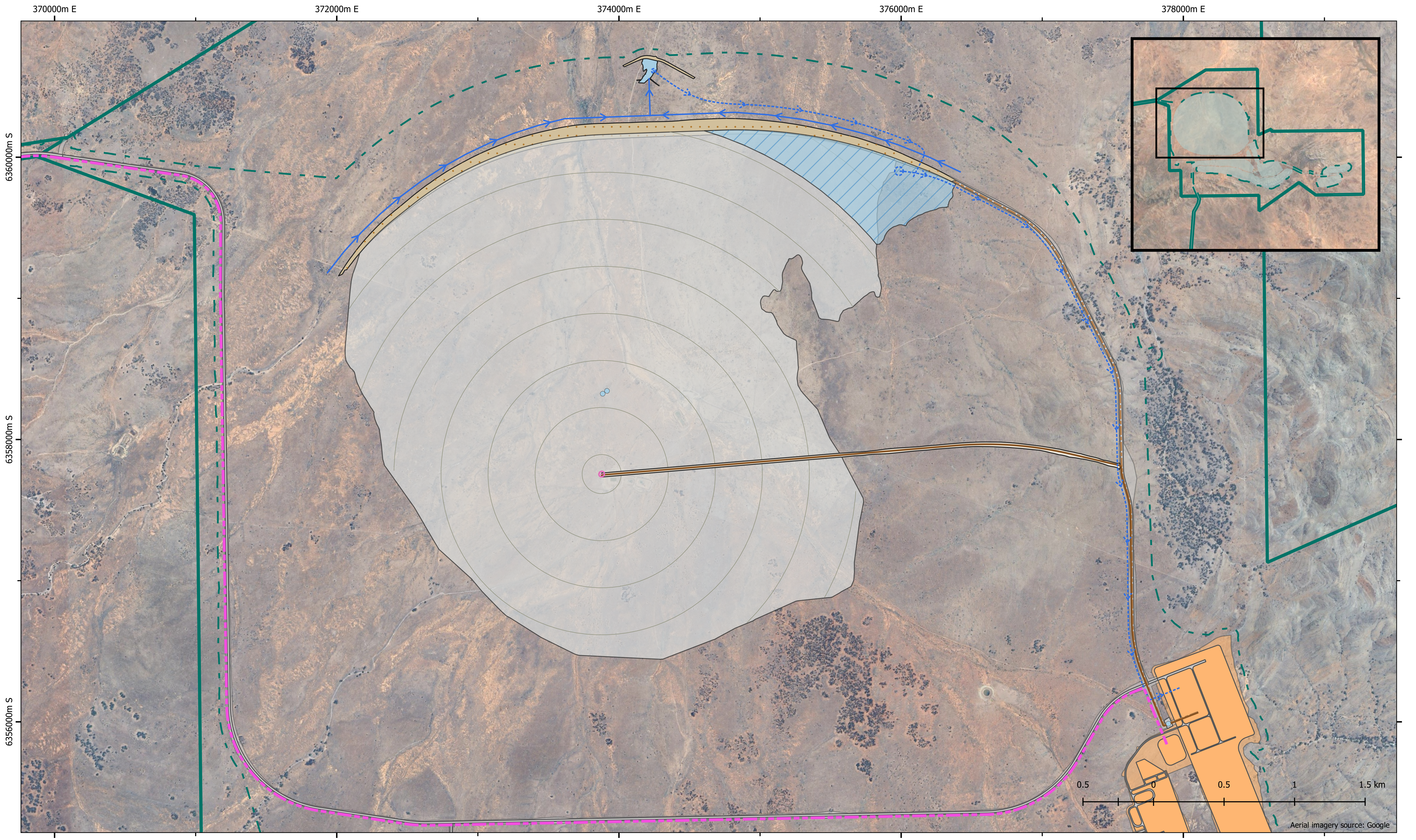

Figure 4-53: Proposed Tailings Storage Facility, starter configuration

Project Area
Conceptual Footprint

Water supply
Groundwater bore site (ind.)
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Primary facilities
Key facility compounds
Key facility batters

Starter TSF infrastructure
TSF Toe drain (with flow direction)
TSF Decant pipeline (with flow direction)
TSF Tailings slurry pipeline
TSF Coarse sand pipeline

TSF Spigot location
TSF Spigot access pier/road
TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond

TSF mounding profile
TSF Tailings beach extent
TSF Embankment

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MAGNETITE MINES

STARTER TSF CONSTRUCTION

Vegetation clearing, soil stripping and stockpiling for re-use in future rehabilitation will be undertaken prior to construction commencing in a manner consistent with that described in Section 4.5.4. This will be undertaken iteratively, aligned with the staged development and expansion of the TSF.

The TSF is constructed first of a starter perimeter embankment using waste rock from early mining and locally sourced clayey fill materials. The perimeter embankment will include an upstream seepage barrier consisting of HDPE / LLDPE or Geosynthetic Clay Liner (GCLx) geomembrane (selected / optimised based on the results of a lining system assessment completed by Hatch) to prevent and limit lateral seepage and piping through the embankment. The perimeter embankment lining system will be tied into an upstream cut-off trench excavated into the embankment foundation soils and back-filled with low permeability fill.

A perimeter toe drain (or seepage channel) is located external to the perimeter embankment fed by a series of embankment under-drains which diverts bleed water from the coarse sand tailings into a reclamation pond and subsequently pumped to the decant pond. The northern decant pond and associated decant return infrastructure will be constructed to collect and return water to the process plant. The decant pond will include a double HDPE / LLDPE or GCLx liner system to prevent and limit seepage. Its size and capacity will vary subject to the extent of the tailings beach at any one time.

A TSF access road will enable access to the embankment wall.

Coarse sands and fine sands discharge pipework will be constructed, with the coarse sands pumped to the perimeter for use in progressive dam wall lifts. A typical embankment cross-section is presented in Figure 4-54.

OPERATION AND PROGRESSIVE TSF LIFTS

During operation, the coarse sand tailings will be continuously pumped from the plant through the coarse sand tailings discharge pipework and hydraulically deposited to progressively build the TSF embankment (also referred to as ‘sand dam’). The raising of the embankment will include dozing and compaction of the classified sands to form the design geometry and achieve final required density, with progressive installation of the HDPE/LLDPE or GCLx liner. A spillway will be installed in the northeastern corner of the TSF.

The thickened fine tailings will be continuously pumped from the plant through the fine tailings pipeline and deposited into the TSF at the CTD location from an elevated causeway. The CTD and tailings pipework will be progressively raised during operation as the TSF height increases.

Tailings material and decant water will flow radially towards the perimeter embankment forming a conical tailings beach with decant water flowing ultimately to the decant ponds. An additional south decant pond will be constructed with an HDPE / LLDPE or GCLx liner when required during the TSF life. Decant water will be continuously pumped to the process water pond located at the process plant.

There is currently no limit to the elevation of the TSF, with current design complementary to the natural landscape, regional geomorphology and nearby site relief. Key geometric design criteria of the facility are listed in Table 4-35.

Table 4-35: Geometric design criteria, CTD TSF

Criteria	Unit	Value
Crest width	m	25
Upstream batter slope	V:H	1:2.5
Overall downstream batter slope	V:H	1:3 (starter wall); 1:4 (sand dam)
Intermediate beach width for starter wall	m	10
Beach slope	%	1.5

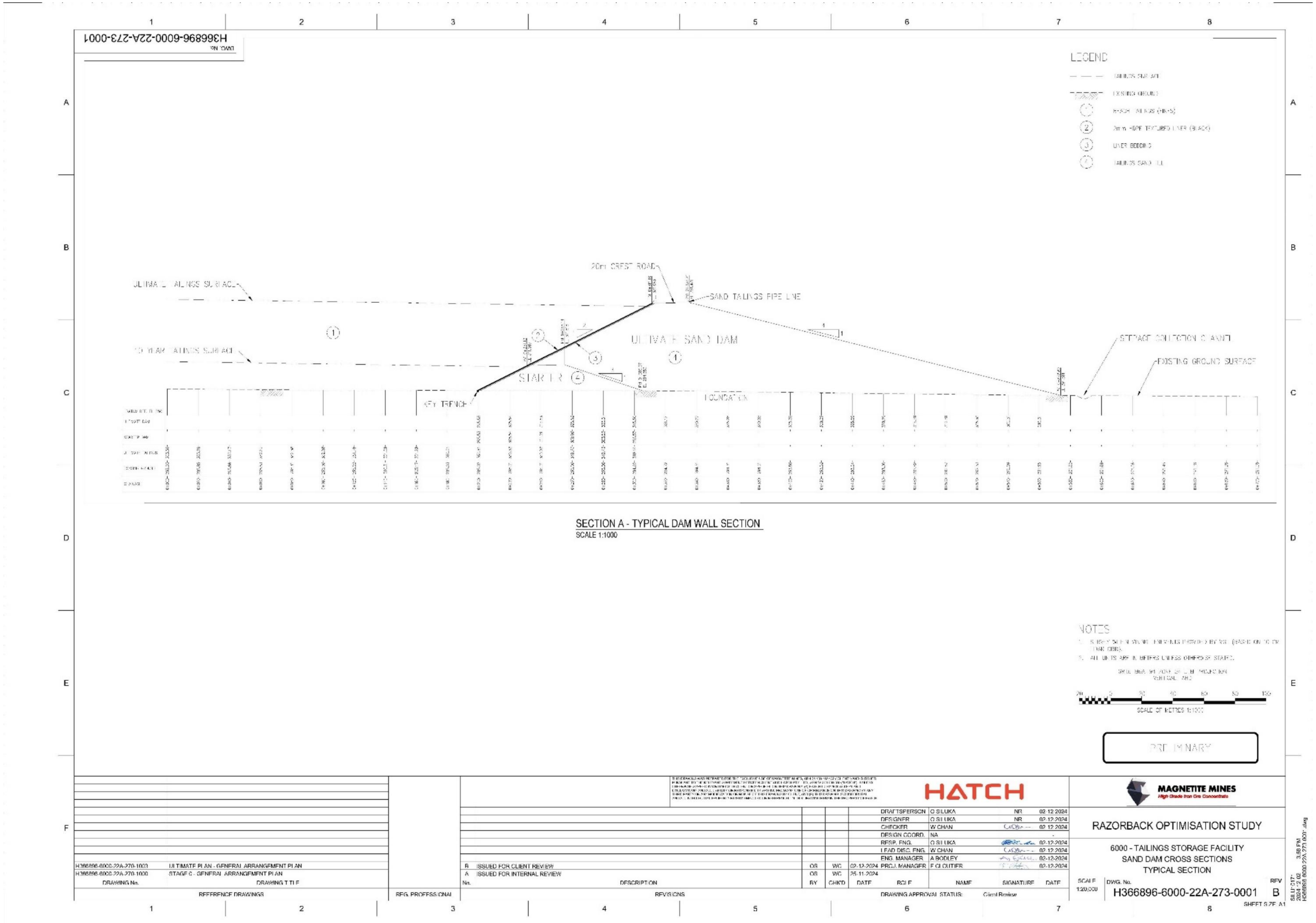

Figure 4-54: Typical TSF embankment cross-section (location in Figure 4-52)

DRAINAGE AND EROSION CONTROL

During the operations phase, the need to manage water erosion and sediment runoff from deposited tailings will only be relevant to coarse sand tailings material used in TSF embankment construction as this may have potential to generate sediment runoff and loss into adjacent undisturbed areas and downstream drainage features.

Emerson class and pinhole dispersion tests were carried out on the coarse sand tailings. Based on the Emerson class, coarse sand is classed as non-dispersive with presence of calcite. The more aggressive pinhole tests classified the sand as dispersive. The two test methods are based on the different testing procedures and erosion mechanism being investigated, hence some contradiction in the results. Emerson class indicates the erodibility of soils after wetting (similar to surface erosion) while pinhole dispersion tests assess the dispersivity of soils under concentrated water flow (similar to internal drainage through an embankment).

The coarse sand tailings material is considered highly erodible under jet pressures used for pinhole testing and therefore should not be used as primary core materials for seepage control. Where high hydraulic exit gradients are measured within the sand embankment shell materials (downstream of the clayey liner), adequate internal erosion control comprising internal filter zones and external erosion protection should be incorporated into the final design. External erosion control will likely include silt fencing during active tailings placement and the construction of downstream filters with a riprap cover layer (rock armouring) for passive closure.

No requirement to manage water erosion and sediment runoff from fine tailings within the TSF impoundment area will be required during the operations phase, with erosion control focused on the management of wind erosion and dust (generally through the strategic deposition/placement of the thickened tails).

TSF toe-drains and sediment basins will remain in place into the completion and closure phase until such time as the TSF final landform is considered stable and runoff water quality is deemed suitable for direct release to the environment without continued management intervention.

SEEPAGE ASSESSMENT

Steady state seepage analysis was carried out to estimate basal seepage into underlying soils during operation of the TSF under the conservative condition of fully saturated tailings. This analysis assessed seepage through both the starter embankment (first 10 years of operation) and the ultimate TSF configuration based on a conservative condition of fully saturated tailings.

The base case seepage rate through the TSF for the starter embankment (10 years operation) and ultimate TSF configuration is expected to be 1.44 L/hr and 4.12 L/hr, respectively. The high-case seepage rate, where the hydraulic conductivity of the fine tailings and foundation soils is increased, is expected to be 10.11 L/hr and 14.16 L/hr, respectively. The convergence of such conductivity factors is not considered likely, (i.e., hydraulic conductivity of the tails and alluvium are one and two orders of magnitude greater, respectively) and, therefore, a high-case scenario is not reasonably anticipated.

Closure condition seepage was not analysed by Hatch, though is expected to decline over time as a function of tailings cessation, application of the final cover system and gradual desiccation of deposited tailings until a state of equilibrium is reached between inputs (rainfall), outputs (residual seepage, evaporation) and entrained moisture. This has been further considered in the groundwater impact assessment (refer Section 7.6) with modelling completed to assess the short- and long-term conditions associated with the phreatic mounding from TSF seepage.

In addition to basal seepage, variation of the phreatic level within the embankment was also assessed through a sensitivity analysis considering the hydraulic conductivity of the fine tailings and coarse sand tailings (i.e., primarily constituent of the embankment fill). It was evident through the analysis that the worst-case scenario for phreatic level is where coarse sand tailings embankment material is the least pervious, as expected as it impedes water flow therefore leading to phreatic mounding within the embankment.

Based on current understanding of the foundation conditions and available tailings information, the base case phreatic levels are adopted for the geotechnical stability analysis. This is supported by the laboratory results of the coarse sand tailings which was considered the main driver of the embankment phreatic condition.

PAF TAILINGS MANAGEMENT

Given that tailings are expected to be non-acid generating no PAF tailings management controls are proposed. However, if encountered, AMD risk will be mitigated through potential measures such as deposition or segregation of PAF materials between ANC material or addition of a tailings slurry lime dosing system to neutralise acid generation potential within deposited tailings.

TSF WATER BALANCE

Water inputs and outputs from the TSF are represented in the overarching site water balance – refer Section 4.6.2 (Figure 4-46).

GEOTECHNICAL LANDFORM STABILITY

Geotechnical data from the characterisation of the tailings material discussed in Section 4.7.2.2 was used for the design and analysis of the TSF.

Geotechnical data of the foundational soils was based on the results of site geotechnical investigations, test work and desktop studies which included selected test-pitting within the TSF area, NPI, process plant, HR and RS. The site geotechnical investigations tested pH, conductivity, moisture content, sulphate, chloride, resistivity, gravel sand and fines percentages, liquid limit, plasticity index, linear shrinkage, Emerson class, pinhole dispersion, moisture content, optimum moisture content, maximum dry density and California Bearing Ratio.

Other geotechnical parameters were estimated based on engineering judgement and benchmarking of similar materials as identified in the site geotechnical and desktop investigations. Assumed geotechnical parameters include 50-100 kpa bearing capacities of near surface soils and 500kpa bearing capacities for shallow spread footings or 5 MPa for piles in weathered rock (found within 0-3m of the ground surface). Additional geotechnical investigations and data gathering exercises are planned for detailed design and will conform to ANCOLD Guidelines for Geotechnical Investigations of Dams, their Foundations and Appurtenant Structures. A preliminary geotechnical stability analysis was completed of the design of the TSF embankment Sections, including the starter and ultimate embankment resulting in a Factor of Safety (FoS) analysis (refer Table 4-36).

Based on the geotechnical stability analysis, the TSF embankment as designed is considered satisfactory as per the ANCOLD guidelines except for the post-seismic case for the ultimate embankment where the FoS is marginally lower than the guideline value. Further definition of the geotechnical data of the tailings material and foundation conditions will be undertaken for the next phase of design, which will evaluate the requirement (or otherwise) for engineering controls to improve the post-seismic FoS to within guideline limits (e.g. TSF embankment buttressing).

Table 4-36: Geotechnical factor of safety analysis, by TSF stage

Stage	Condition	Minimum guideline requirement as per ANCOLD guidelines	Calculated FoS
Starter	Long Term Drained	1.5	1.98
	Undrained	1.5	1.98
	Post Seismic	1.1	1.44
Ultimate	Long Term Drained	1.5	2.49
	Undrained	1.5	1.58
	Post Seismic	1.1	1.04

POST-COMPLETION CHEMICAL AND EROSIONAL STABILITY

A detailed characterisation of tailings chemical and erosional stability has not yet been undertaken, however the TSF final design and final cover system method will be determined in accordance with the erodibility characterisation and final landform design process summarised in Section 4.7.2 (Table 4-31). The cover system is expected to include an inert material covering, topsoil and revegetation.

It is expected that erosion risk is greatest on the batters of final embankments due to steeper slopes, whereas the broader TSF will has significantly lower erosion potential due to longer slope lengths and lower gradients.

Based on the mineralogical and geochemical composition of the tailings material (Section 4.7.2.2), both the sand and fine tailings material are expected to be inert (geochemically benign) from the time of deposition through to post-closure.

4.7.2.4. Failure impact and consequence category assessments

A preliminary Failure Impact Assessment (FIA) and Consequence Category Assessment (CCA) has been undertaken by Hatch (2024b) for three proposed breach locations, as presented in Figure 4-55.

Sunny Day Failure (SDF) and Flood-Induced Failure (FIF) events were considered, with the FIF event deemed a non-credible scenario in accordance with ANCOLD Guidelines on Selection of Acceptable Flood Capacity for Dams. This non-credible scenario categorisation is due to the design of the TSF spillway to convey a PMF event without overtopping the dam crest. As such, a SDF failure was carried forward in the analysis, designed to simulate failure due to an extreme non-flood event such as an earthquake, static foundation or piping failure.

The FIA assumed the SDF event to follow a conservative 1 in 1000 annual exceedance probability (AEP) 72 hour design storm event. Analysis occurred for three breach locations, as summarised in Table 4-37 and presented in Figure 4-55.

Table 4-37: Summary of TSF breach analysis locations

Location ID	Description	Embankment crest elevation (m)	Embankment crest height (m)
1	Considered to assess the potential impact on the adjacent process and non-process infrastructure, and access roads	349.8	~18.2
2	Considered due to proximity to downstream tributary to Manunda Creek	346.6	~11.7
3	Corresponds to the maximum water depth in the northern section of the Decant Pond, therefore representing the breach location of maximum credible release volume	347.4	~17.6

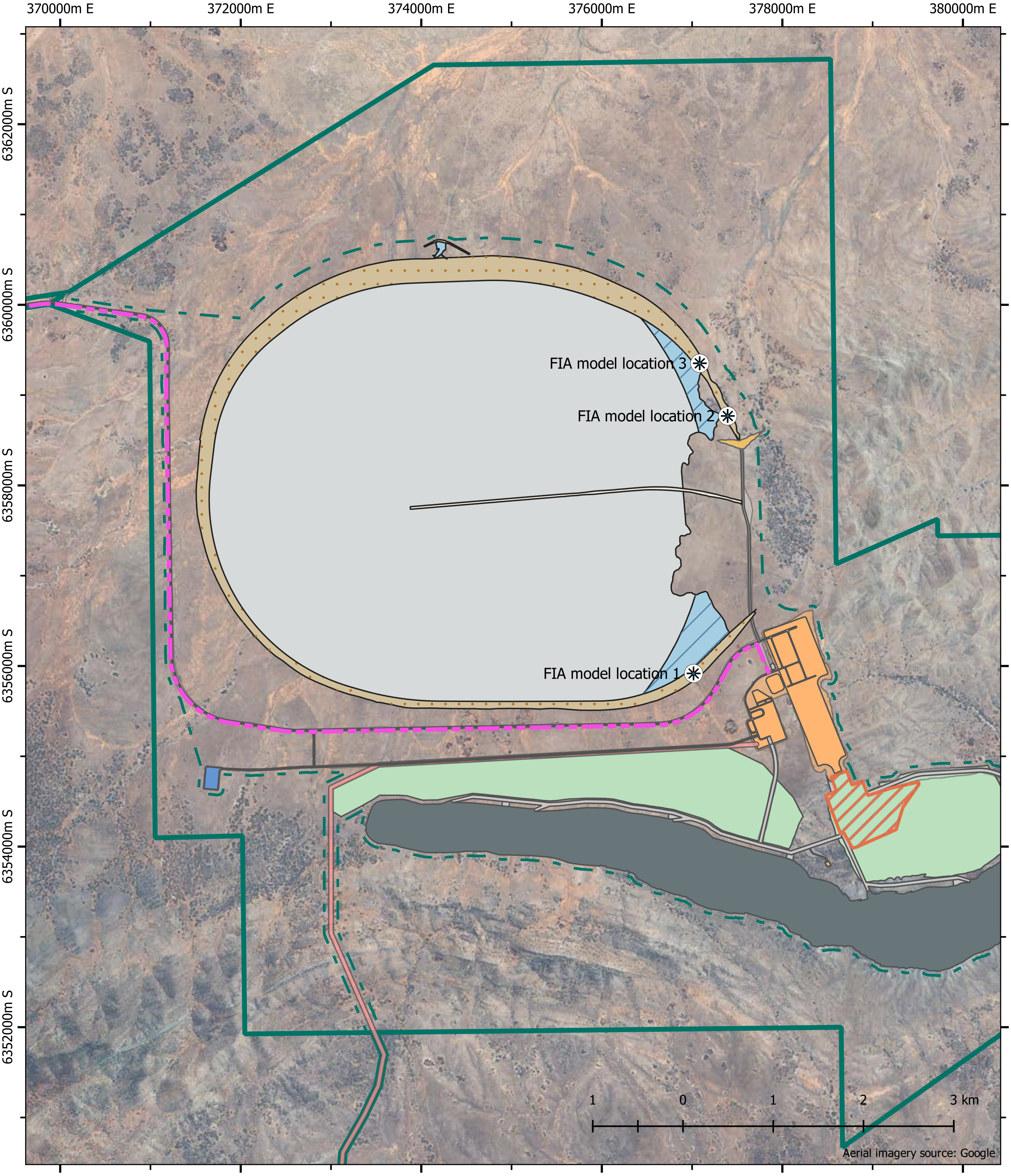

Figure 4-55: Failure impact analysis (FIA) model locations

Project Area
Conceptual Footprint

Water supply
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Accommodation camp

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile

Ultimate TSF infrastructure
TSF Spigot access pier/road
TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond
TSF Tailings beach extent
TSF Spillway
TSF Embankment

GDA 1994 MGA Zone 54
1:60,000 @ A4
Author: A Kane
Date: 25/02/2025
Razorback MLP/Referral

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MAGNETITE MINES

LOCATION 1 ANALYSIS RESULTS

The maximum inundation extent due to the failure breach at Location 1 is reported in Table 4-38.

Hydraulic modelling indicates a total downstream inundation extent of approximately 1 km^2. The Pualco Range was identified to the south of the site on the downstream side of Breach Location 1, and inspection of the topography identified that the natural ground is graded towards the TSF embankment; therefore, significant ponding occurs along the dam structure at the breach location with some backflow into the Decant Pond anticipated and the released volume is not conveyed further downstream of the site.

LOCATION 2 ANALYSIS RESULTS

The dam breach run-out results for Location 2 are reported in Table 4-38.

A modelled peak flow of 444 m^3/s has been recorded, reaching a peak modelled release volume of 5.5 GL. The maximum flood inundation extent due to the Location 2 breach is broad, with the peak dam breach flow taking approximately 100 hours from the initiation of the breach failure to reach the full downstream extent. The hydraulic modelling indicates a total downstream inundation extent of approximately 76 km^2.

Modelled maximum hazard values (a factor of modelled inundation depths and flow velocities) for the Location 2 analysis show highest potential hazard associated with the Location 2 breach are within the Vickery's Creek drainage line immediately downstream of the breach location. The hazard level dissipates significantly once it reaches the Manunda Creek and is generally negligible for much of the southern extent of the conceptual breach zone.

LOCATION 3 ANALYSIS RESULTS

The dam breach run-out hydrograph and volume for Location 3 is reported in Table 4-38. A modelled peak flow of 892 m3/s, was recorded, with the peak dam breach flow taking approximately 90 hours from the initiation of the breach failure to reach the downstream extent. Hydraulic modelling indicates a total downstream inundation extent of approximately 87 km^2.

Similar to the Location 2 analysis, maximum hazard levels for the Location 3 breach scenario are higher within the Vickery's Creek drainage line, with comparable dissipation of hazard levels once the breach reaches Manunda Creek. Modelled hazard levels are negligible in areas outside of the principal drainage lines and across the southern extent of the breach area.

The Razorback TSF Dam Break Assessment has been conservatively undertaken assuming Newtonian flows. In reality, a hypothetical embankment failure would contain a mixture of both Newtonian and non-Newtonian materials due to the anticipated release of an equal volume of decant water and tailings material. Further detailed analysis will likely be undertaken in future design phases to reduce the inherent conservatism adopted in this analysis.

CONSEQUENCE CATEGORY ASSESSMENT

The results of the FIA and CCA are a category of High B and High C based on ANCOLD and category of HIGH based on GISTM for all locations (Reference Table below). Location 1 category of high is dictated by the slightly higher PAR and PLL, while Location 2 & 3 are determined by the higher economic, social, cultural and environmental losses. Only location 1 has more than a negligible Population at Risk (PAR) and Potential Loss of Life (PLL), and is contained entirely within the ML.

Table 4-38: FIA and CCA results, CTD TSF

Location	Description	Maximum Inundation Length (km) / Extent (km^2)	PAR	PLL	ANCOLD CCA	GISTM CCA
Location 1	Nearby to NPI, Process plant and area reserved for potential rail loop	~1 km / 1 km^2 localised within lease boundary, ponding at TSF embankment	0.271	0.027	High B	High
Location 2	Close proximity to tributary to Manunda Creek	~80 km / 76 km^2 within 100 hrs primarily down Manunda Creek	0.004	Negligible	High C	High
Location 3	Corresponding to Maximum water depth of decant pond (maximum credible release volume)	~85 km / 87 km^2 within 90 hrs primarily down Manunda Creek	0.004	Negligible	High C	High

4.7.2.5. Monitoring and assessment

The proposed TSF will be monitored in accordance with Section 8.4 of ANCOLD (2019) Tailings Dam guidelines. TSF monitoring will comprise routine inspections every 48 hrs, with annual audits. Monitoring of a variety of instrumentations installed within the foundations and critical locations along the main embankment will be carried out using dataloggers connected to radio or wireless networks, reporting to a cloud access point.

The proposed instrumentation includes but is not limited to the following:

- tailings consistency and flow: in-line density gauges and flowmeters on deposition lines.
- geotechnical monitoring: vibrating wire piezometers, inclinometer or shape-arrays, survey monuments and prisms along critical geotechnical monitoring Sections of the northern and western perimeter embankments (allocation for up to eight geotechnical Sections)
- water quality/flow monitoring: flowmeter and level sensors within the decant ponds and broad weir to monitor any spill discharge points at closure.

In addition to installed instrumentations, the monitoring program during the TSF operation will also include quality control and assurance of the sand embankment construction to ensure material and compaction specifications are met. Quality control measures include periodic material testing (particle density, particle size and fines content), in-situ compaction testing and laboratory permeability and erodibility testing.

Interferometric Synthetic Aperture Radar (InSAR), aerial survey and satellite imagery may also be employed for observations for potential movement and to provide time-lapse imagery of the TSF's beach and decant pond development over time.

TSF inspections will be carried out at frequency recommended by ANCOLD (2012) for a High C consequence classification (refer Table 4-38).

4.7.2.6. Governance

The governance structure for the design, construction, operation, and closure of the TSF will align with industry best practices to ensure the safety and integrity of the facility throughout its lifecycle. In accordance with the principles from the Global Industry Standard on Tailings Management (GISTM), a comprehensive governance framework will be established, including clearly defined policies, systems, and accountabilities. The governance framework will include appointment of appropriate roles and responsibilities, establishing and developing procedures, systems, processes and ultimately a culture of safety, communication, consultation, collaboration and expertise. The governance structure will be built as the project progresses through final design and into construction, operation and closure of the TSF. MGT will ensure at each stage, the guiding principles of the GISTM are appropriately implemented for that stage of design, operation and closure.

The Board of Directors will adopt and publish a commitment through policy to the safe management of the TSF, including emergency preparedness and recovery measures. MGT will appoint an Accountable Executive, which in the following design phase would be the Study Director who will be responsible for overseeing the TSF’s safety and environmental impacts. During operation and closure the Accountable Executive role may change depending on organizational structure.

During further design an engineer of record (EOR) will be appointed with the corresponding engineering firm (to date, this has been Hatch). A site-specific Responsible Tailings Facility Engineer (RTFE) will be appointed, with the necessary qualifications and experience, to oversee the facility's integrity during operations. As the facility consequence classification is “High” a senior independent technical reviewer will be appointed during the design phase. Independent reviews and third-party verification will be utilized at critical stages of the facility’s lifecycle, including design, construction, and operation, and at least every five years in line with the guidance for the facility with a consequence classification of “High”. The EOR, empowered through a formal agreement, will ensure that the design intent is met, while external reviews will ensure transparency and compliance with safety standards.

Tailings facility design and performance will be regularly assessed through risk management, independent audits, third party review to verify compliance with all regulatory and safety requirements. In particular, third-party review and verification will be conducted during design and at completion of the detailed design of the TSF and will continue through construction at critical stages to ensure design and design intent are followed. During operation, it is anticipated that third party review of the operational performance of the TSF will be conducted at least every 5 years and when additional construction works are undertaken.

Magnetite mines will cultivate an organisational culture that promotes continuous learning, communication, and early problem recognition through formal training and education, procedures, consultation and engagement with front-line workers, cross functional collaboration, appropriate incident report capture and sharing, and formal process for reporting and addressing concerns. A robust whistleblower process including protections, will be established to allow personnel and contractors to confidentially report potential risks or violations without fear of retaliation.

4.7.3. Other processing wastes

The primary processing waste stream is tailings which are disposed to the TSF.

Primary ball mill, secondary ball mill and fine grinding mill scats will also be produced, which are broken or worn pieces of steel or ceramic mill balls (grinding media) that wear and break down over time during normal processing. The grinding media at each stage will be selected using economic and service life considerations, thus minimising fresh grinding media and generated wastes. Both ceramic and steel grinding media is considered non-hazardous.

As the grinding media breaks and wears, some will be lost to the process and ultimately end up in the TSF. The remainder will be caught on the outlet of the mills. It is estimated that approximately 1500 t of steel scats and approximately 100 t of ceramic scat will be produced per annum. The steel scats can be recycled through standard steel recycling processes once cleaned, while used ceramic grinding media will either be disposed of to an off-site EPA-licensed landfill or beneficially re-used on site subject to satisfying EPA waste derived fill (WDF) criteria.

4.7.4. Industrial and commercial wastes

The Project is expected to generate several general (non-hazardous) and listed (hazardous) waste streams.

All wastes will be managed in accordance with the SA EPA Waste Hierarchy (per the *Environmental Protection (Waste to Resource) Policy 2010*). Most waste generated across the life of project will be removed from site for disposal or resource recovery at EPA-licensed facilities. Selected waste streams may also be disposed or beneficially re-used on site subject to relevant statutory authorisations, and where they do not pose an ongoing impact to the environment or prevent the nominated post-mining land use. This strategy is achievable for the Project given its proximity to major rehandling, sorting, recycling and disposal centres in Adelaide and Port Pirie, and leverages vacant backloading capacity from material / goods supply transport.

An indicative list of waste types likely to be generated, and their management pathway, is provided in Table 4-39. Any other wastes generated will be managed in accordance with relevant legislation and guidelines.

Where wastes may be disposed or beneficially re-used on site the relevant secondary authorisation requirements are noted.

Waste management systems and infrastructure will include:

- Color-coded and labelled waste receptacles at key locations (e.g. accommodation camp, offices, first-aid facility and workshops).
- WWTP for the treatment of septic waste and greywater, located at the accommodation camp.
- Waste transfer station for the aggregation of wastes pending collection and transport off-site, to include:
    - bunded storage for potentially contaminating wastes (waste mineral oils. hydrocarbons etc.)
    - segregated interim storage and disposal of wastes with an incompatible dangerous goods classification, including toxic, flammable, corrosive and oxidising
    - segregated tyre waste
    - segregated steel and ceramic grinding scats for recycling or disposal, as required
    - appropriate emergency response equipment (e.g. extinguishers and spill response equipment).

Table 4-39: Anticipated waste streams and management

Waste type	Sources	Potential contaminants	Management pathway (waste and contaminants)		Secondary approvals
Industrial and commercial wastes – general and non-hazardous wastes					
Aluminium – used beverage containers	Various: • Kitchen (accommodation camp) • Dining facilities	N/A	Recycling (off-site)	• Collected in waste receptables and interim storage in the WTS. • Transport and disposal to off-site EPA-licensed facility.	N/A
Ceramics (used griding media)	Process plant	N/A	Disposal (off-site)	As above	N/A
			Recycling (on-site)	• Re-use on-site as 'waste derived fill' subject to satisfying relevant SA EPA guidelines: o Standard for the production and use of Waste Derived Fill [1] Current criteria for the classification of waste including Industrial and Commercial Waste (Listed) and Waste Soil [2]	N/A
Electronic waste (e-waste)	Various: • Administrative activities • Maintenance activities	N/A	Recycling (off-site)	• Collected in waste receptables and interim storage in the WTS. • Transport to off-site EPA-licensed facility.	
General commingled recycling	Various: • Kitchen (accommodation camp) • Dining facilities	N/A	Recycling (off-site)	As above	N/A
General waste (dry rubbish and refuse)	Various: • Administrative activities • Construction and maintenance activities • Decommissioning and demolition activities	N/A	Disposal (off-site)	As above	N/A
Glass – used beverage containers	Various: • Kitchen (accommodation camp) • Dining facilities	N/A	Recycling (off-site)	As above	N/A

Waste type	Sources	Potential contaminants	Management pathway (waste and contaminants)		Secondary approvals
Glass – Other	Various: • Construction and maintenance activities • Decommissioning and demolition activities	N/A	Disposal (off-site)	As above	N/A
Paper and cardboard	Various: • Used packaging • Administrative activities	N/A	Recycling (off-site)	As above	N/A
Plastic – Bulk hard plastics	Various: • Construction and maintenance activities • Decommissioning and demolition activities	N/A	Recycling (off-site)	As above	N/A
Plastic – Bulk soft plastics	Used packaging	N/A	Recycling or Disposal (off-site)	As above	N/A
Plastic – used beverage containers	Various: • Kitchen (accommodation camp) • Dining facilities	N/A	Recycling (off-site)	As above	N/A
Putrescible waste (food waste)	Various: • Kitchen (accommodation camp) • Dining facilities	N/A	Disposal (off-site)	As above *(assess composting options and applications)*	N/A
Rubber (excluding tyres)	Various: • Construction and maintenance activities • Decommissioning and demolition activities	N/A	Disposal (off-site)	As above	N/A

Waste type	Sources	Potential contaminants	Management pathway (waste and contaminants)		Secondary approvals
Scrap metal	Various: • Construction and maintenance activities • Decommissioning and demolition activities • Process plant – used steel grinding media	N/A	Recycling (off-site)	As above	N/A
Waste concrete, bricks and rubble (at surface)	Various: • Construction and maintenance activities • Decommissioning and demolition activities.	N/A	Disposal (off-site)	Transport and disposal or recycling off-site EPA-licensed facility.	N/A
		N/A	Recycling (on-site)	• Re-use on-site as 'waste derived fill' subject to satisfying relevant SA EPA Guidelines: ○ Standard for the production and use of Waste Derived Fill 1 Current criteria for the classification of waste including Industrial and Commercial Waste (Listed) and Waste Soil 2	N/A
Waste concrete (subsurface footings and foundations)	Decommissioning and demolition activities.	n/a	Disposal (on-site)	Leave in-situ and bury/cover with soil or other substrate to a depth appropriate to the post-mining land use (per MCP)	N/A
Timber pallets and packaging	Various: • Freight activities • Packaging	Timber treated with Copper, Chromium and Arsenic (CCA) (if applicable) (not controlled waste)	Various: • Recycling (on-site) • Recycling (off-site) Disposal (off-site)	• CCA pallets returned to owner for repair/re-use • Untreated, single-use pallets and packaging either: ○ crushed and re-used on site (e.g. mulches in rehabilitation) • disposed off-site to EPA-licensed facility	N/A

Waste type	Sources	Potential contaminants	Management pathway (waste and contaminants)		Secondary approvals
Commercial and Industrial Wastes – Hazardous and Controlled Wastes					
Batteries *	Various: • Vehicles and mobile plant Maintenance activities	Various – e.g.: • Cadmium (D150) • Lead (D220) • Mercury (D120) • Nickel (D210) Lithium (C100)	Recycling (off-site)	• Interim storage in WTS (bunded, segregated storage based on Dangerous Goods Class) • Transport to off-site EPA-licensed processor.	N/A
Chemical wastes (various) # *	Various: • Ore processing • Water treatment • Maintenance activities • Environmental activities	Liquid or solid chemical wastes – e.g.: • Acidic reagents (B100) • Basic reagents (C100) • Resins/glues (F110) • Solvents (G110, G150) • Pesticides (H100) • Herbicides (H100)	Disposal (off-site)	• Interim storage in WTS (bunded, segregated storage based on Dangerous Goods Class) • Transport to off-site EPA-licensed processor	N/A
Clinical, medical and pharmaceutical wastes (R100, R120, R130)	Various: • First-aid facilities • Medical emergency response • Personal care wastes (camp accommodation and ablutions)	Various – e.g.: • Sharps • Pathogens • Cytotoxins	Disposal (off-site)	• Dedicated waste receptacles (prescribed containers) at point of generation (e.g. sharps and personal waste receptacles) • Transport to off-site EPA-licensed facility	N/A
Grease trap waste (K110) #	Kitchen (accommodation camp)	Plant and animal oils and fats	Disposal (off-site)	Traps pumped out by EPA-licensed contractor and disposed to off-site EPA-licensed facility	N/A

Hydrocarbon contaminated soil
(N120) #
	Various:
	• Hydrocarbon leaks and spills
	• Vehicle wash bay sediments
	• Plant washdown
		Hydrocarbons	Treatment and beneficial re-use
			(on-site)
				• On-site treatment (bioremediation)
				• Re-use on-site as 'waste derived fill' subject to relevant guidelines:
				  ○ Standard for the production and use of Waste Derived Fill 1
				  ○ Current criteria for the classification of waste including Industrial and Commercial Waste (Listed) and Waste Soil [2]
				• ASC NEPM [3]
					EPBC Act (treatment of listed waste)

Waste type	Sources	Potential contaminants	Management pathway (waste and contaminants)		Secondary approvals
			Disposal (off-site)	If soils cannot be remediated to acceptable levels for on-site re-use: • Interim bunded and covered storage in WTS • Transport to off-site EPA-licensed facility	N/A
Hydrocarbon wastes (J100) #	Various: • Vehicles and mobile plant • Construction and maintenance activities • Decommissioning and demolition activities	Liquid hydrocarbons and residues in the following forms: • used mineral oil • used oil filters • oily rags • transformer oil	Disposal (off-site)	As above	N/A
Oil/water emulsions (J110) #	Various: • Vehicle washdown bays • Plant washdown • Maintenance activities (parts washdown)	Hydrocarbons	Disposal (off-site)	As above	N/A
Radioactive wastes	Used (spent) sealed radioactive sources – e.g.: • Laboratory apparatus (e.g. XRD/XRF devices) • Radiation density gauges	Ionising radiation	Disposal (off-site)	• Removed, packaged and transported by licensed radiation specialist • Transport to off-site EPA-licensed facility	Radiation licensing under the RPC Act – includes Radiation Use Licences and Radiation Management Licences for the use of radiation apparatus, and handling and transport of radioactive materials.
Sewage and greywater (K130)	Various: • Camp accommodation • Site ablutions	Various – e.g.: • Bacteria/pathogens • Cytotoxins	Treatment and beneficial re-use (on-site)	• Discharge to WWTP • Wastewater chlorinated and beneficially re-used (dust suppression and irrigation) • Biosolids disposed to landfill	Approvals under SA *Public Health Act 2011* to construct and operate the WWTP, and re-use treated wastewater.
Used cooking oil (K120) #	Kitchen (accommodation camp)	Plant and animal oils and fats	Disposal (off-site)	• Interim bunded and covered storage in WTS • Traps pumped out by EPA-licensed contractor and disposed to off-site EPA-licensed facility	N/A

Waste type	Sources	Potential contaminants	Management pathway (waste and contaminants)		Secondary approvals
Waste explosives (inc. surplus or expired explosives) #	Various: • Un-used/surplus explosives • Expired explosives	Explosive material	Disposal (off-site)	• Disposal in accordance with AS 2187.2	N/A
Waste tyres (T140) #	Vehicles and mobile plant	Hydrocarbons (rubber)	Recycling (off-site)	• Interim storage in WTS (minimal quantities to mitigate fire risk) • Transport to off-site EPA-licensed facility	N/A

1. SA EPA – STANDARD FOR THE PRODUCTION AND USE OF WASTE DERIVED FILL (UPDATED OCTOBER 2013)
2. SA EPA PUBLICATION 889/10 – CURRENT CRITERIA FOR THE CLASSIFICATION OF WASTE—INCLUDING INDUSTRIAL AND COMMERCIAL WASTE (LISTED) AND WASTE SOIL (ISSUED MARCH 2010)
3. NATIONAL ENVIRONMENT PROTECTION (ASSESSMENT OF SITE CONTAMINATION) MEASURE 1999
POTENTIALLY FLAMMABLE
* POTENTIALLY CORROSIVE

4.7.5. Sewage treatment facilities

Sewage generated on site, such as at the NPI or process plant areas, will be contained within septic tanks as required at the point of production. The sewage will be periodically trucked to the accommodation camp WWTP (refer Section 4.8.5.1 for further information) by a licensed waste management contractor for treatment, disposal and potential re-use of water.

4.7.6. Rehabilitation strategies and timing

General strategies and indicative timeframes for the rehabilitation and closure of WRDs and the TSF are provided below.

Detailed rehabilitation strategies will be documented within the RMP and MCP. Strategies will evolve and adapt over time as the project-specific rehabilitation knowledge base is improved through rehabilitation trials, research and monitoring.

4.7.6.1. Waste rock dumps

WRDs will be re-shaped at closure to a final landform design that provides long-term geotechnical and erosional stability, and which integrates with / ties into the surrounding environment in terms of runoff / drainage and visual character, as far as practicable.

The final design will likely adopt a conventional berm / batter design, or potentially an alternative design such as single-lift concave slopes. Once re-shaped, WRDs will be as assessed and signed-off as geotechnically stable.

The following general approach applies to WRD rehabilitation and closure:

- Establish a berm / windrow (~0.5 m in height) from in-situ material at the pit crest to protect outer batters from pit crest concentrated surface water runoff.
- Re-profiling of lifts and back-sloping of berms, with final slope angles sympathetic to the waste rock and final cover material.
- Back-sloped benches to drain at approximately 3 degrees or less along contour.
- Construction of drainage management measures are adopted where required to prevent surface water flows and down-slope erosion (e.g. crest bunds).
- Deep ripping to alleviate compaction.
- Placement and contour ripping of topsoil (or suitable alternative growth media) into the underlying final surface to facilitate revegetation, except on any surfaces planned to be capped with rock or rock / soil mulch to mitigate erosional risks (e.g. locations of potential concentrated surface water runoff).
- Application of native seed.

Detailed WRD final landform designs will be developed once detailed erodibility characterisation of potential final cover materials has been completed (refer Section 4.7.1). This will inform the selection of a cover system and complimentary final landform design that best achieves long-term erosional stability and the nominated post-mining land use.

WRDs will be available for rehabilitation broadly following the completion of mining in the respective deposits, nominally Mining Year 12 for the Iron Peak WRD and Mining Year 38 for the Razorback WRD.

Concept WRD final landform designs and cross-sections are provided in Section 4.10.5.2 (Figure 4-81– Figure 4-84).

4.7.6.2. Tailings storage facility

PROGRESSIVE CLOSURE

In the latter years of the mining operation and prior to closure (approximately Mining Year 32), the TSF will be converted into a multi-cell operation to allow for progressive rehabilitation, as presented in Figure 4-57 and noted in Table 4-40. Cells will be segmented through the construction of internal walls, with surplus coarse sand tailings anticipated to be used. The progressive closure of each cell will include shaping to final tailings surface in accordance with the final landform design, and installation of the final cover system in accordance with general methodologies outlined later in this Section.

Table 4-40: Cell area, ultimate TSF

Cell	Order of closure	Closure Area (km^2)
Cell 1	1	5.0
Cell 2	2	6.3
Cell 3	3	6.0
Cell 4	4	7.2

As with WRDs, the TSF will be re-shaped at interim / progressive and final closure stages to a final landform design that provides geotechnical and erosional stability and integrates with the surrounding environment in terms of drainage and visual character.

The progressive closure sequence will start from the southwestern cell (Cell 1), with recontouring of the tailings beach profile to direct stormwater flows into installed interception channels and perimeter (or peripheral) drains on the inside of the embankment. These controlled drainage flows will deport to the northern and southern decant ponds (as relevant) during the residual operating period.

Major reforming of the external TSF embankment wall is not envisaged given its construction will achieve the required 4(H):1(V) slope for closure. It is anticipated that the coarse sand pipeline supplying Cells 1 and 2 will be removed concurrently. The installation of final closure covers and preliminary revegetation strategies employed in Cell 1 will inform and assist to optimise cover placement and revegetation methodologies for the remining cells.

The cross-section in Figure 4-56 depicts the intended landform outcome of the CTD TSF

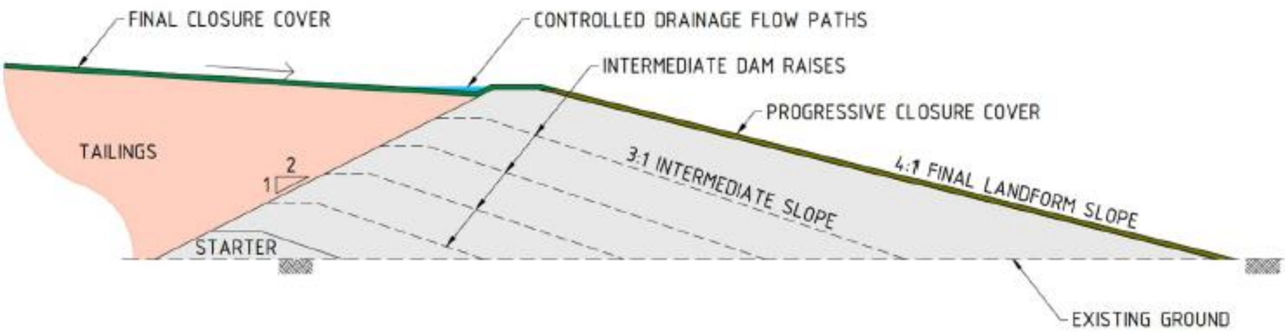

Figure 4-56: CTD TSF closure sequence cross-section

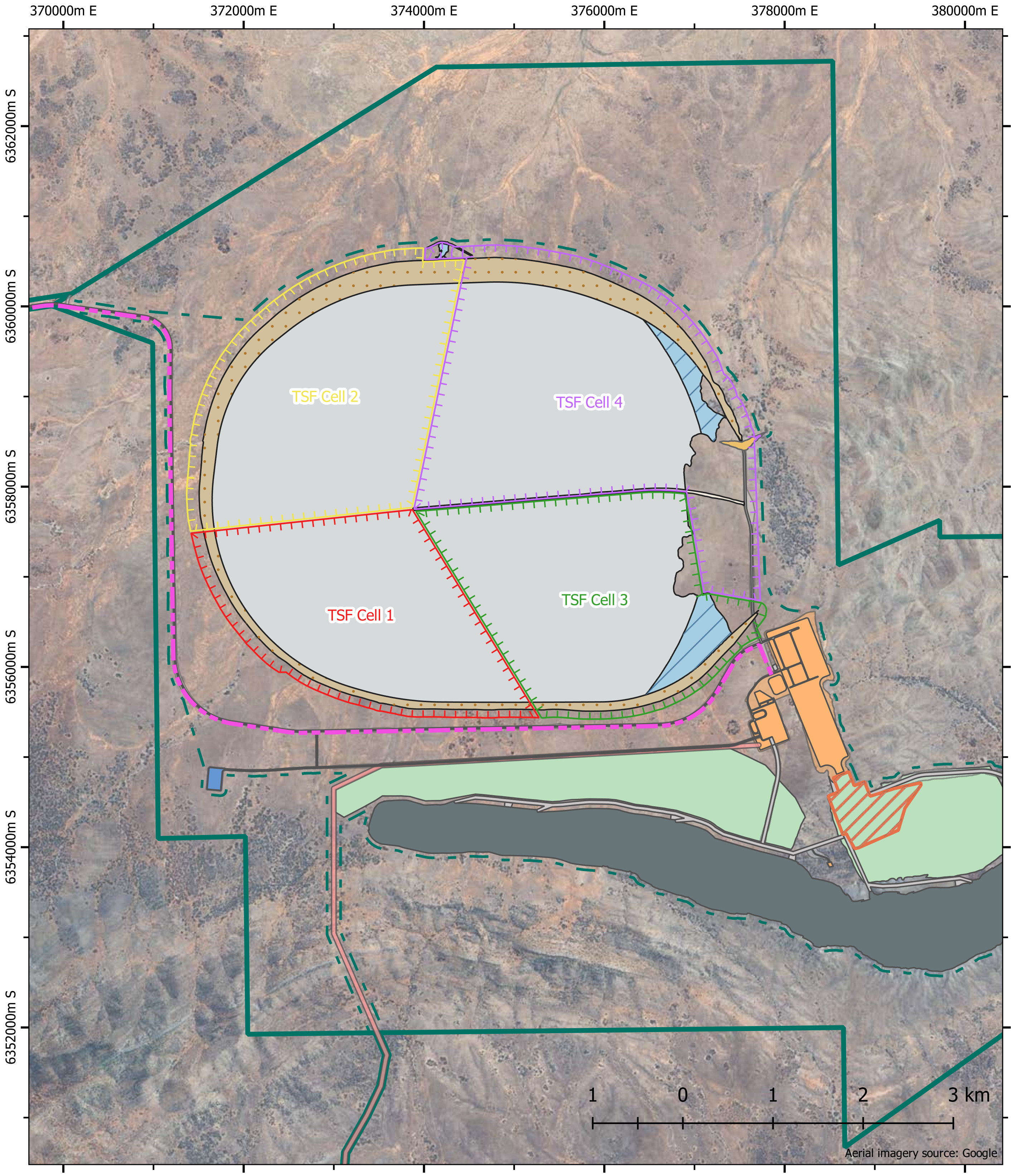

Figure 4-57: Conceptual TSF cells for progressive closure outcomes

Project Area
Conceptual Footprint

Water supply
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Accommodation camp

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile

Ultimate TSF infrastructure
TSF Spigot access pier/road
TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond
TSF Tailings beach extent
TSF Spillway
TSF Embankment

GDA 1994 MGA Zone 54
1:60,000 @ A4
Author: A Kane
Date: 25/02/2025
Razorback MLP/Referral

FINAL CLOSURE

As described previously, the TSF will be closed progressively towards end-of-life through the construction of cells which will allow for targeted, Sectional fill and rehabilitation of the designated impoundment area. This will allow staged shaping to final design and installation of the final cover system while tailings deposition continues in remaining cell(s) across the final four years of mining and processing.

At final closure, remaining landforms (i.e., those not previously closed through progressive closure approaches) will be contoured to follow the final tailings beach slopes and, ultimately, achieve the final landform design that provides geotechnical and erosional stability and integrates with the surrounding environment.

The management of stormwater in the final closure stage is critical to the long-term performance and integrity of proposed rehabilitation plans. An overview of the proposed stormwater management approached is presented in Figure 4-58.

As initially implemented in the progressive closure phase (from Cell 1), contoured interception channels are installed to direct water towards the perimeter of the TSF, following the radiating final beach gradient from the high-point at the former spigot discharge location. Interception channels will drain to peripheral drains, located on the inside of the TSF embankment. These peripheral drains will be connected together through the internal tailings cell walls as deposition to individual cells is complete and the cell becomes available for rehabilitation.

Batters will be installed from the peripheral drains to drains located at the toe of the embankment (expected re-use of the TSF's toe seepage drains from the operations phase) to deport water out of the TSF embankment in a controlled yet efficient manner. Additional erosion protection measures are likely to be installed at each batter site. To achieve the necessary drainage outcomes in Cell 3, a drain will be excised from the eastern margin of Cell 3 into the peripheral drain in Cell 4, while the eastern most portion of the Cell 3 beach area will be counter-contoured to drain to the west and into the newly excised channel.

The spillway will be maintained (or reconfigured, if required) to safely pass a maximum probable flood event.

It is intended that the internal drains, batter chutes, toe drains and spillway will remain in-perpetuity.

Stormwater from the closed TSF will deport to a detention pond that will use or be formed within the former reclaim pond downstream of the TSF embankment, via the embankment toe drains. Water from the rehabilitated area will be monitored for quality and discharged into the environment through the Vickery's Creek sub catchment when water quality requirements are achieved.

The detention pond will be removed and backfilled once the rehabilitated TSF surfaces are considered stable and associated runoff water quality is appropriate for direct release to the environment without any ongoing intervention or control.

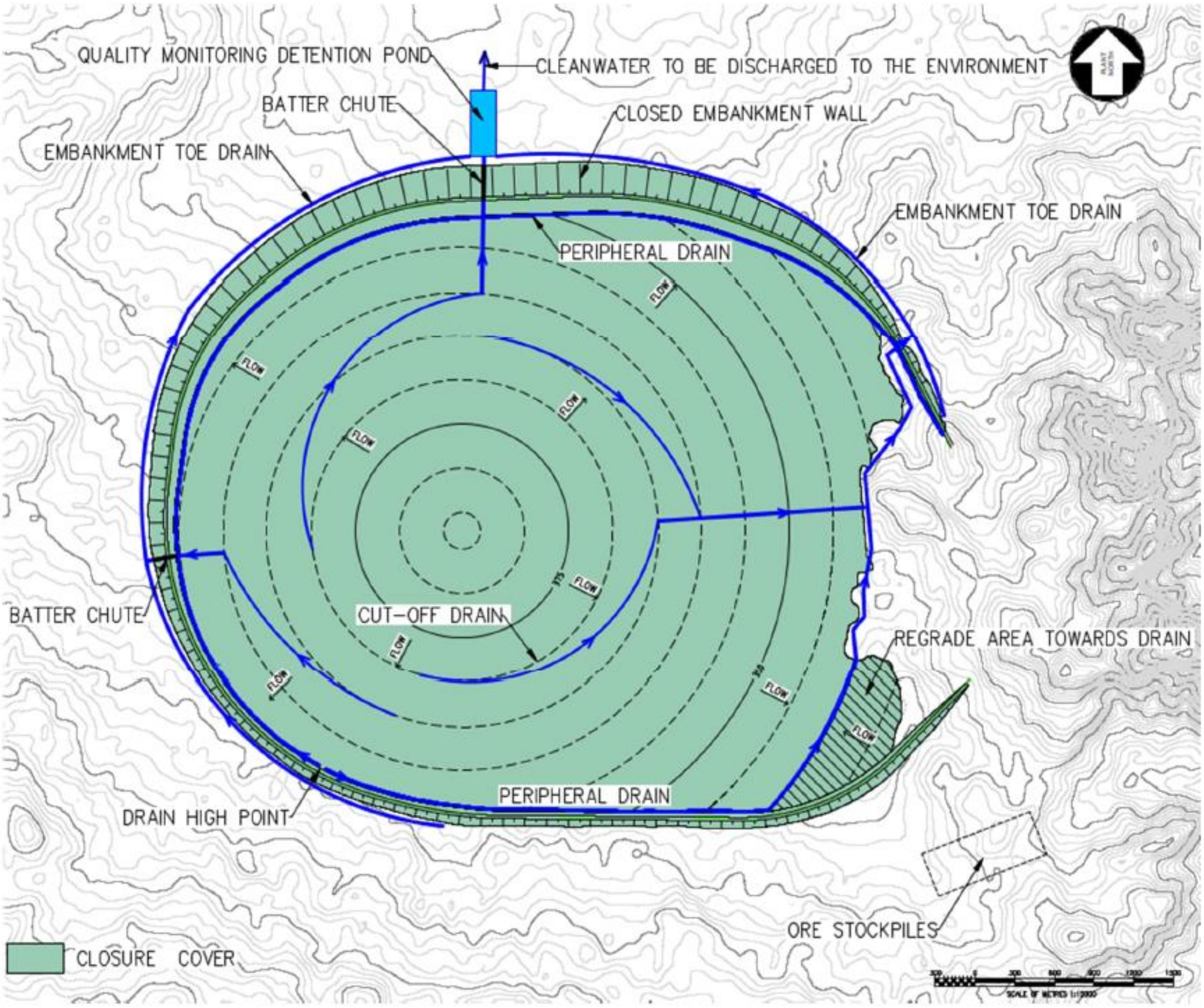

Figure 4-58: Concept TSF post-closure landform and drainage general arrangement (Hatch, 2024a)

The following general approach applies to TSF rehabilitation and closure:

- tailings will be given sufficient time to consolidate and dry (desiccate) until the point it is trafficable by mobile equipment
- tailings surface shaped to final design, including removal of minor berms and other potential water concentrating features, and installation of contour cut-off drains and peripheral drains within the inside perimeter of the TSF. If required, embankments may be sheeted with waste rock to mitigate erosion risk.
- once re-shaped, landforms will be as assessed and signed-off as geotechnically stable
- deep contour ripping of the final tailings surface to alleviate compaction, if required
- installation of waste rock in areas that will receive and convey concentrated surface water runoff (contour cut-off drains, peripheral drains, final embankment toe drains, and batter chute and detention pond)
- placement and contour ripping of topsoil (or suitable alternative growth media) into the underlying final surface to facilitate revegetation. Subject to erosion characterisation and modelling, the use of rock or rock-soil mulches may also be used as a final cover
- application of woody debris (logs and branches), if available
- application of native seed.

The detailed TSF final landform design will be developed once detailed erodibility characterisation, erosion modelling and LEM has been completed (refer Section 4.8.10). This will inform the selection of a cover system and complimentary landform design that best achieves long-term erosional stability and the nominated post-mining land use.

Further information on conceptual TSF final landform design is provided in Section 4.10.5.3, with associated cross-sections presented in Figure 4-85.

4.8. Supporting surface infrastructure

4.8.1. Air access

It is noted that no dedicated, on-site airstrips or aerodromes are proposed for the Project. Provision for a helipad will be made within the NPI area for any emergency evacuation or medical support requirements.

4.8.2. Site access and haul road

Site access will be via the unsealed, two-way HR. Once constructed, this HR will provide access to support construction of the main site and, subsequently, ongoing vehicle access during mining and closure operations. This ongoing use of the HR includes use for concentrate (product) haulage between site and the RS at Hillgrange (refer Figure 4-59).

The HR will be constructed between Crocker Road, a public road under the control and management of DC Peterborough, and the ML. The HR continues through to the process plant and also connects to an access road for the accommodation camp.

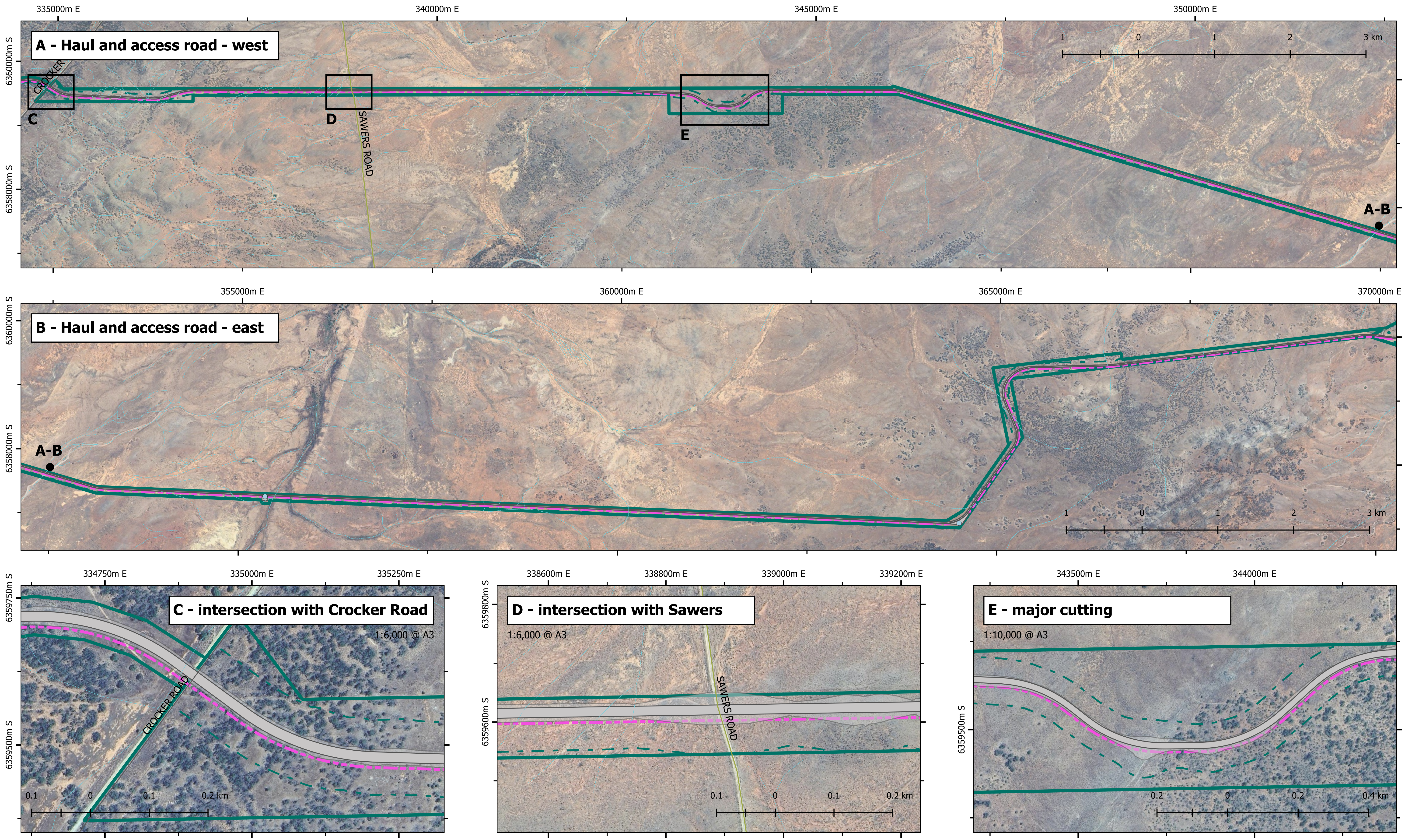

Figure 4-59: Haul and access road general layout - Crocker Road to ML

Project Area
Conceptual Footprint
Watercourses
Minor
Existing roads
Local
Track
Water supply
Coastal raw water line
Groundwater bore site (ind.)
Roads
Haul, access and other roads
Road batters

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Author: A Kane | Date: 31/01/2025
Razorback MLP / Referral

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4.8.2.1. HR design parameters

Codes and standards referenced in road design works completed for the Project include (but not limited to):

- Recognised standard 19 Design and construction of mine roads – August 2019
- Austroads Guide to Road Design (AGRD) series
- SA DIT – Master specification and relevant Council supplements
- AS 3798 Guidelines for earthworks for commercial and residential developments
- AS/NZ 2890.1:2004 – Parking Facilities – Part 1 Off-street car parking
- AS/NZ 2890.1:2004 – Parking Facilities – Part 1 Off-street parking for people with disabilities
- AS1742.1 – Manual of uniform traffic control devices.
- 2019 Australian Rainfall and Runoff Guidelines.

As the HR will be a private MGT asset that may be accessible to the public to the mine "gate" or visitor area, it is to be designed generally in accordance with an appropriate Australian Code or Standard, namely the Austroads guidelines and the DIT supplements.

Adopted design vehicle data and design criteria for the HR are presented in Table 4-41 and Table 4-42, respectively.

Table 4-41: General design vehicle data

Road type	Design vehicle	Overall length (m)	Overall width (m)
Mine HR	CAT 789	12.0	8.0
Site access and HR	A-triple road train	53.6	2.5
Delivery road	Articulated semi-trailer	19.0	2.5
Accommodation access roads	Articulated semi-trailer	19.0	2.5
Other light vehicle access roads	Service truck	8.8	2.5
Services roads	LV (four-wheel drive)	5.1	1.95

Table 4-42: Site Access and haul road design criteria

Item	Basis
Operating speed	80 km/hr
Cross-section	Minimum 3.0 m lanes with 1.0 shoulders
Earthworks batter slopes	1(V):4(H) fill typically; steeper with road safety provisions
Drainage specification	Piped drainage – 0.2 AEP Major event – 0.01 AEP
Design vehicle	A-triple

New road intersections will be designed to intersect at 90 degree angles. Final horizontal and vertical alignments will be designed in accordance with the design references listed above. While existing public road alignments (Sawers Road, Crocker Road) will retain their existing alignment, the location and layout of new intersections will take into account the following:

- prioritisation of traffic flow to the HR
- impacts of background lighting
- visibility
- light absorption.

4.8.2.2. HR design outcomes

The HR alignment has been optimised to ensure the safe operation of all vehicles, including A-triple road trains at the intended operating speed of 80 km/hr, while also optimising the cut-fill balance of all roads within the MPL. Based on these preliminary designs, materials won during HR construction exceed fill requirements by a factor of 1.6. Residual material will be stockpiled

Typical cross-sections of the HR are provided in Figure 4-60. These cross-sections demonstrate the implementation of the design criteria in various settings, including bends, cuttings and level-grade scenarios.

The HR will intersect Crocker Road near to the Hillgrange RS and extend east to the RS. Reprioritisation of traffic flow to the HR is proposed given the very limited traffic load on Crocker Road. Safety signage and other traffic controls will be implemented in accordance with relevant standards, and a conceptual intersection plan is provided in Figure 4-61.

The HR also intersects with Sawers Road, a public road under the control and management of DC Peterborough, with priority to HR traffic also proposed. This intersection is proposed to be gated, given the road is already gated to the north (adjacent Bullyaninnie Road) and south (near Pitcairn Homestead). A conceptual intersection plan is provided in Figure 4-62.

4.8.2.3. HR operational vehicle movements

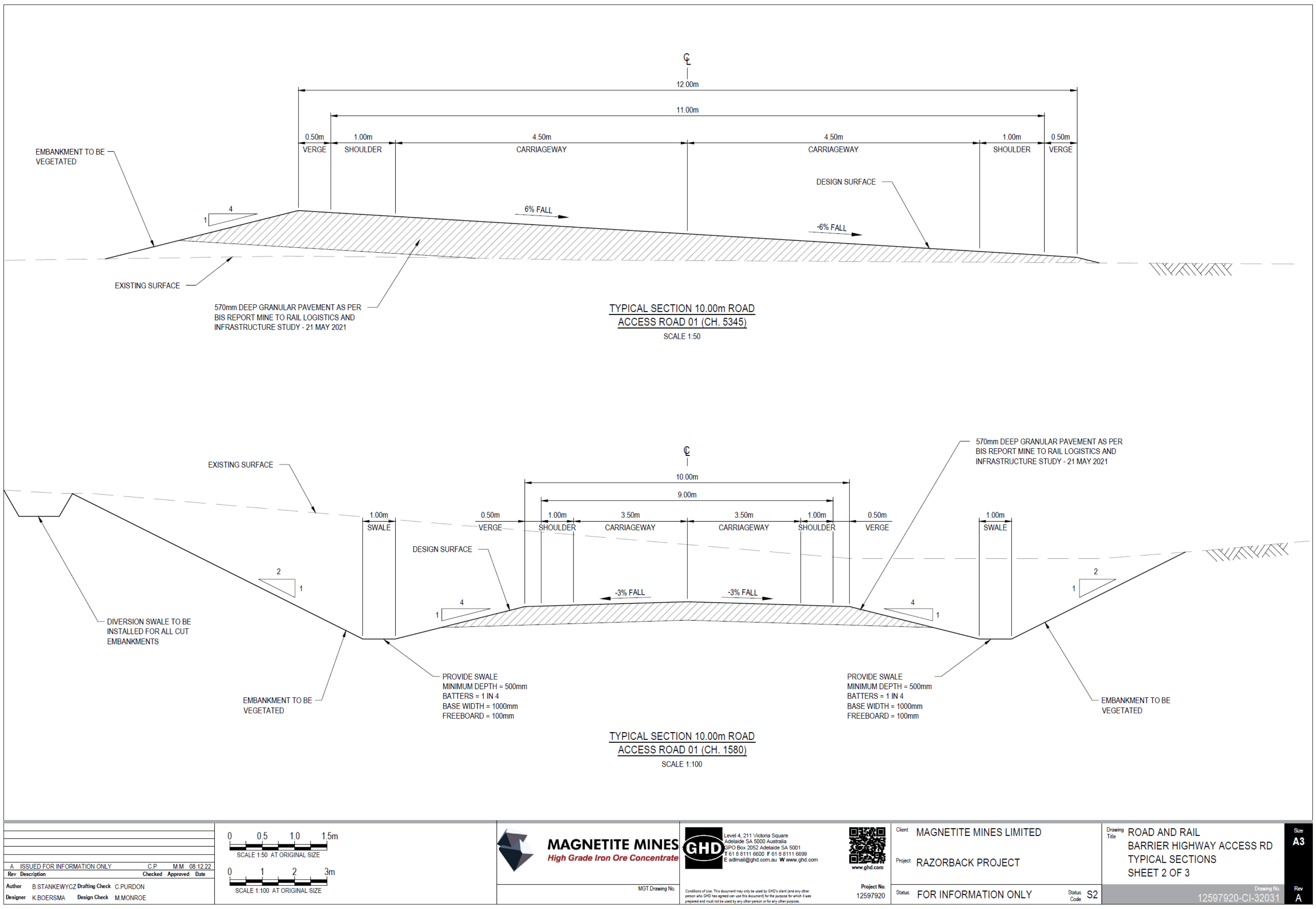
A summary of estimated mine-related HR vehicle movements is provided in Table 4-43.

Table 4-43: HR estimated daily vehicle movements (excluding intra-ML movements)

Type	Estimated average daily vehicle movements
A-Triple	70
Personnel Bus/Coach	3
Light Vehicles	7
Freight Vehicles	10
Road Maintenance	1
Dust Suppression	16

The HR will be subject to continued dust management activities, including the application of water and the continued trial of binding agents.

Ongoing maintenance of the HR will be required from time to time to ensure appropriate road surface conditions and safety factors.



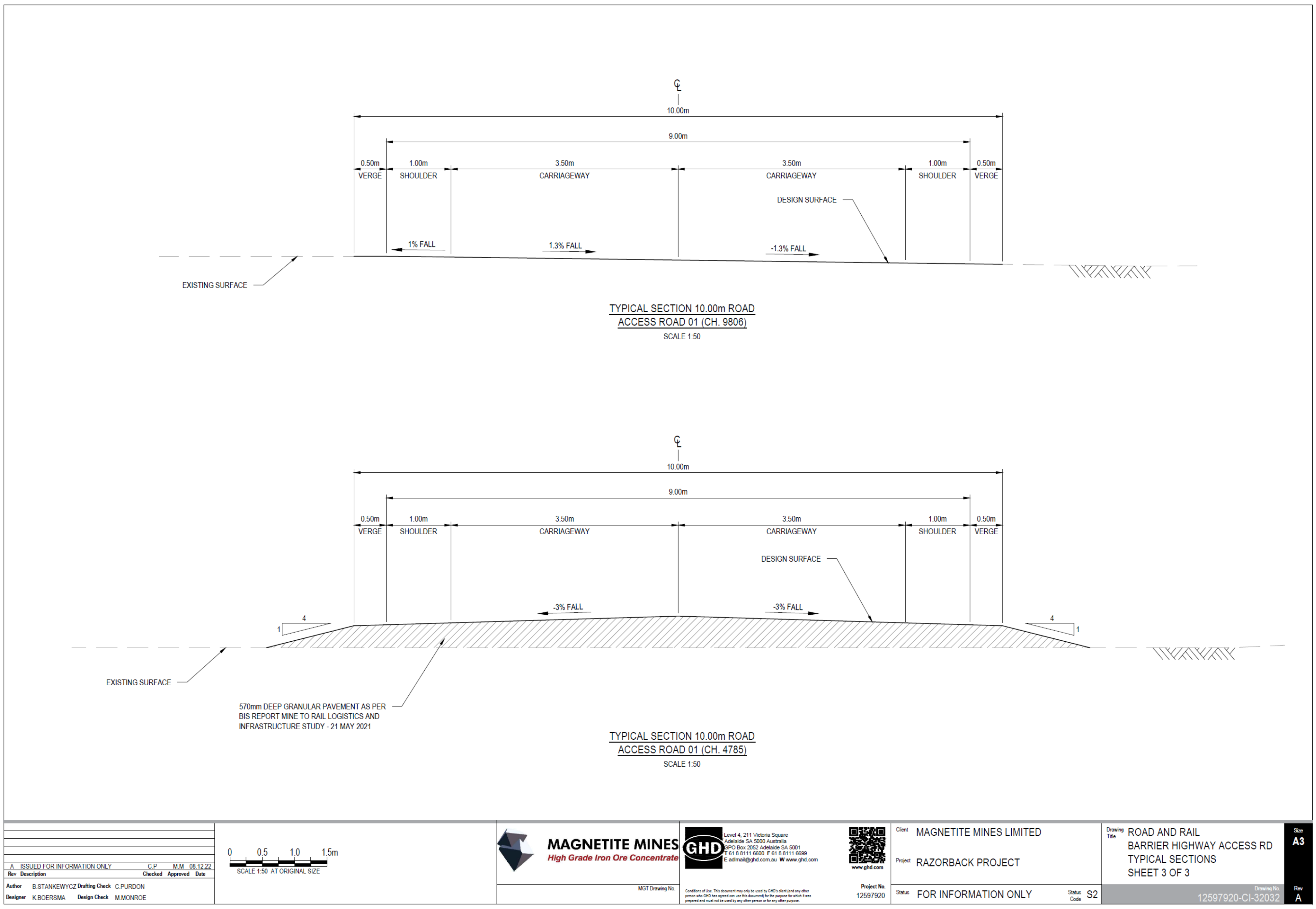


Figure 4-60: Typical HR cross-sections

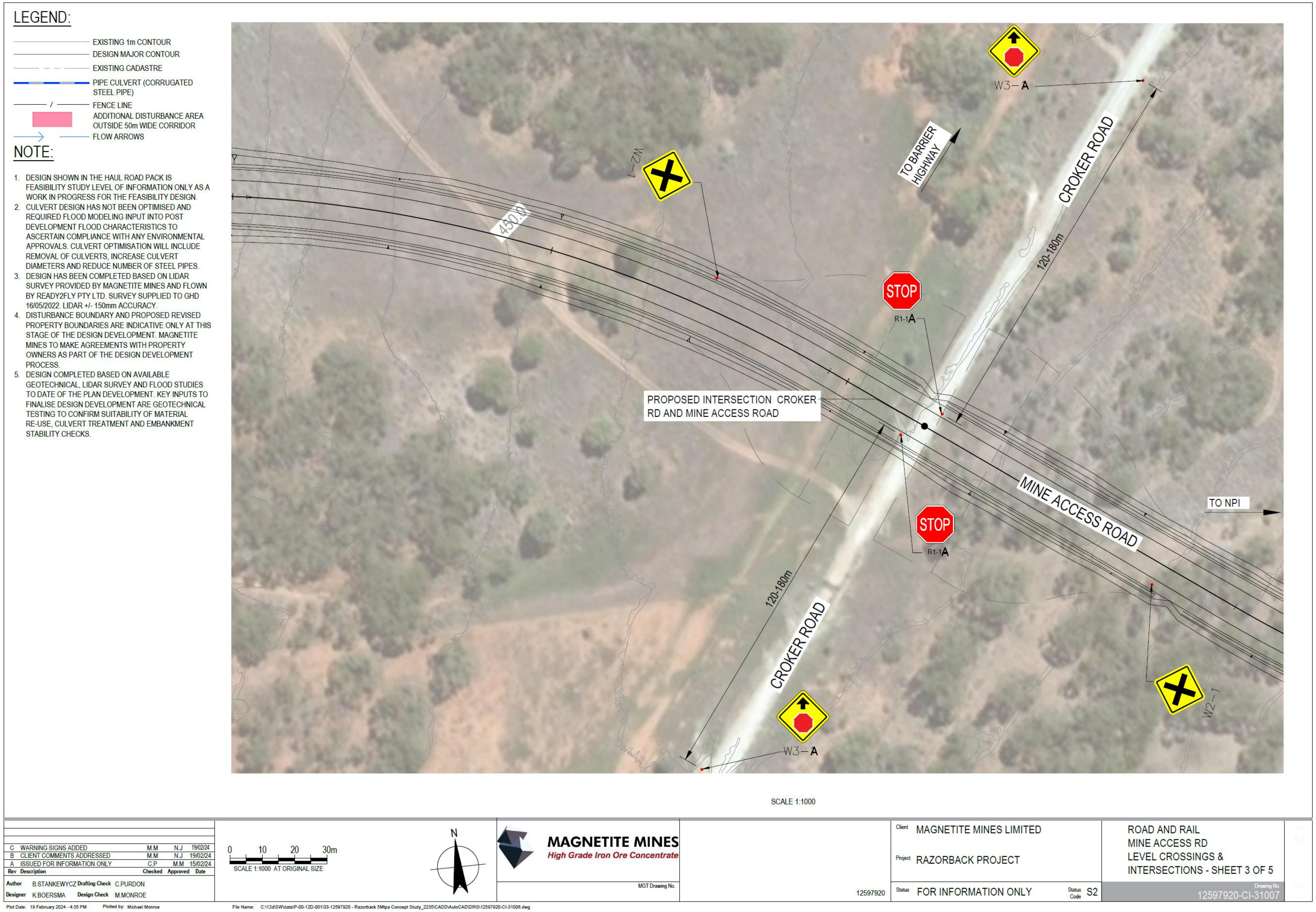


Figure 4-61: Conceptual intersection configuration, HR and Crocker Road

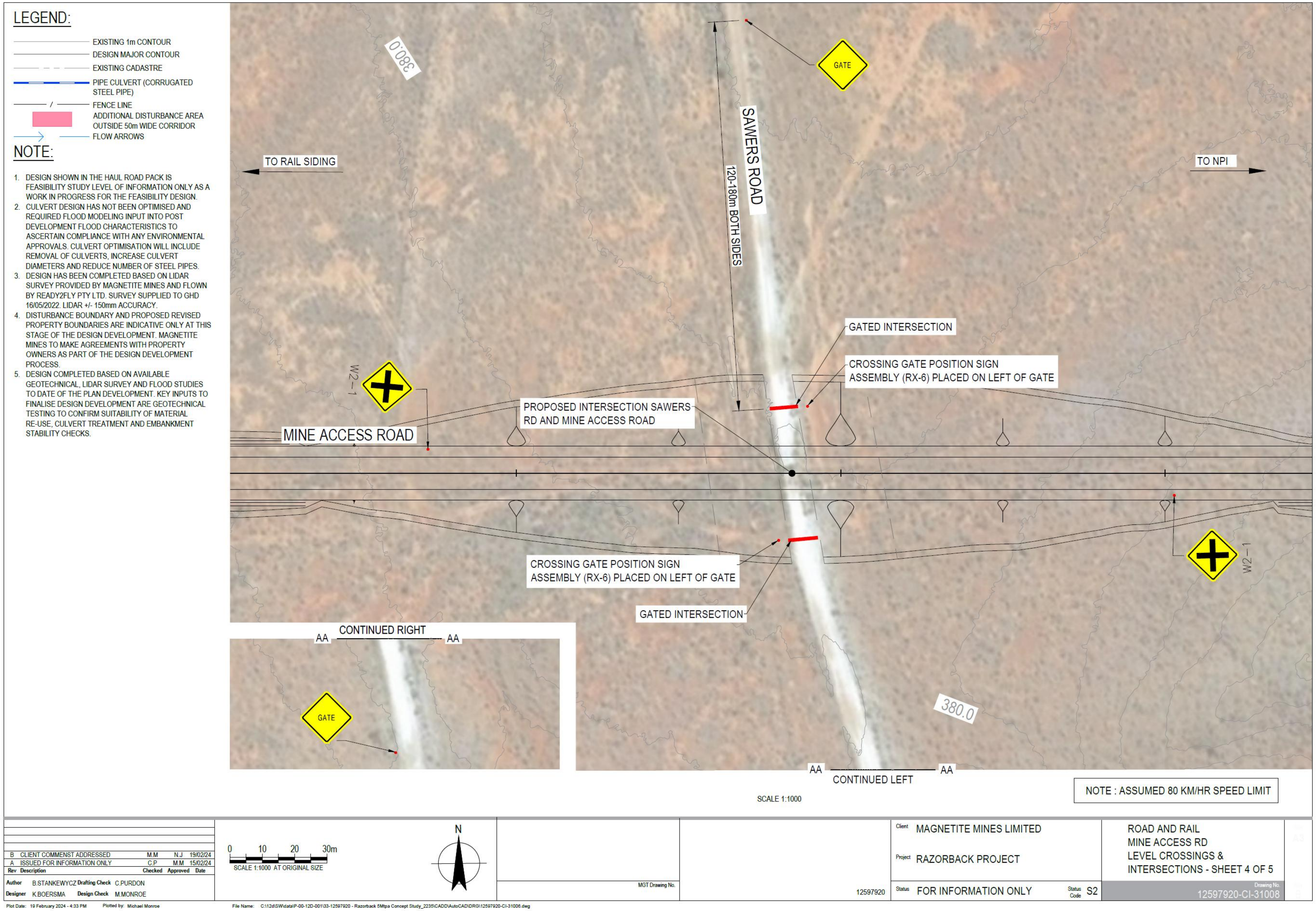


Figure 4-62: Conceptual intersection configuration, HR and Sawers Road

4.8.2.4. HR construction

Construction of the HR will be one of the initial activities within the construction phase.

Standard construction techniques are anticipated for the HR construction, commencing with clearing/grubbing of the principal corridor. A pioneer road will be cleared to enable access along the length of the HR from Crocker Road to its terminus at the process plant. Concurrent to the development of the pioneer road, permanent fencing will be erected to ensure separation of activities from surrounding pastoral activities. Gates will be installed, as necessary and as agreed with landowners.

As previously noted, the majority of the fill requirements of the HR will be sourced within the corridor, with a mobile crushing and grading plant to be used. Large cuttings may be blasted by a licensed contractor to ensure efficient development and liberation of materials. Conceptual road designs indicate a general pavement depth of 570 mm, with road surface falls implemented to manage drainage requirements in accordance with relevant standards.

Cross-structures for surface water management will be defined during the detailed design process, with the objective to maintain flow regimes and existing flood risk profiles. Options for culverts, pipes or other structures will be required along the HR, with three principal drainage feature crossings identified in the preliminary design stage.

Locally-won material will be tested for its suitability as a road-capping material. If and where it is deemed not suitable for use, material may be processed on-site to improve its quality, additional materials may be will be imported from existing quarries in the mid-north region, or materials may be imported from the ML if the material has suitable qualities. MGT will trial the use of binding agents within the laying of final capping layer(s) to reduce dust generation risks.

Groundwater bore development and extraction is proposed from several sites along the HR to supply water for compaction and dust suppression applications. Bores will be equipped with pumps, water storage, standpipes and potential temporary local reticulation.

Required safety infrastructure, such as signage, will be installed as per final designs.

The HR corridor will also host the Project's bulk water supply pipeline. Further information on this infrastructure is included in Section 4.8.6.2.

4.8.2.5. Supporting road infrastructure not subject to this MLP

As described in Sections 1.8.2 and 1.8.3, the Project will access the Barrier Highway at its intersection with Rucioch Road, approximately 17 km northeast of Oodla Wirra. and the access corridor forms with the use of Rucioch Road before turning south-west onto Crocker Road.

Intended upgrades to this non-assessed route include:

- upgrade of the Rucioch Road and the Barrier Highway intersection to include:
    - a turning lane for vehicles turning 90° right into Rucioch Rd
    - a slip lane for vehicles turning 90° left into Rucioch Rd
    - a turn-out/merging lane for vehicles turning left onto the Barrier Highway
- likely widening of Rucioch and Crocker Roads following their existing alignments
- upgrade of the ARTC rail crossing on Rucioch Road.

4.8.2.6. HR closure

It is expected that closure of the HR will be part of the final rehabilitation program, given the need for continued site access for a number of years for ML rehabilitation activities following completion of mining. Subject to further detailed planning, it is expected that rehabilitation of the HR will include:

- removal of the road surface / base and culverting at drainage channels and disposal / re-use of material
- potential deep ripping of the road sublayers to remedy compaction
- reinstatement of subsoils and topsoils
- recontouring, reprofiling and stabilisation of soils, especially at drainage channels
- installation of protective (fall) measures at crests of deeper cuttings
- shallow ripping of soils to promote seed capture and water retention, in conjunction with defined revegetation processes (including spreading of felled vegetation)
- removal of selected fencing and reinstatement of other fences and gates, in consultation with landowners.

MGT will target re-use of road materials within the local area that may include the issue of such materials to road authorities for other road construction or maintenance programs.

4.8.3. Rail siding

Development of a sub-parallel rail spur siding at the existing Hillgrange RS is part of the logistics network for transporting iron ore concentrate from the Project to the Port of Whyalla (as the initial proposed export location). The existing siding, situated approximately 55 km from the Project's process plant (refer Figure 4-2 for location), acts as a rail passing loop between the Yunta (westward) and Peterborough (eastward) rail sidings on the Broken Hill – Crystal Brook section of the national freight network. A 130 m long goods loop / maintenance siding is also located at the siding (refer Figure 4-63 for an area schematic).

This section of the rail network is a 25 t axel weight capable, standard gauge rail line and is operated and maintained by the federally-controlled Australian Rail Track Corporation.

The scope of MGT's RS includes the development of rail and supporting infrastructure. The layout is presented in Figure 4-64 and includes:

- a new rail spur, approximately 2.0 km in length that extends from the existing goods loop/maintenance siding
- a parallel hardstand area along the full alignment of the new rail spur, to support the unloading, management and train loading of concentrate products
- a workshop and administration / facilities area at the northern end of the rail spur
- an access road between the RS and Crocker road and connection to the HR.

The workshop and administration facilities include:

- a workshop for HV and LV maintenance
- an administration office for operational personnel
- ablutions and crib room
- storage facilities (likely containerised)
- diesel generator for power supply
- bunded diesel storage facility for LV, HV and generator uses.
- lighting infrastructure to support night-time operations
- potable and non-potable water storage.

A potable water tank is located with proximity to the ablutions and crib room, with water to be trucked from the ML or from a nearby community (such as Peterborough). Grey and black wastewater streams are to be collected and disposed of off-site via an approved facility; disposal may occur via the WWTP at the accommodation camp.

Non-potable water is required for dust suppression purposes, both on roads and for concentrate (if required). Groundwater may be extracted at or near the RS to supply this water; alternatively, water may be trucked to site or be supplied from the bulk process water supply, which is located within the RS and RS access road corridor (refer Section 4.8.6.2 for further information).

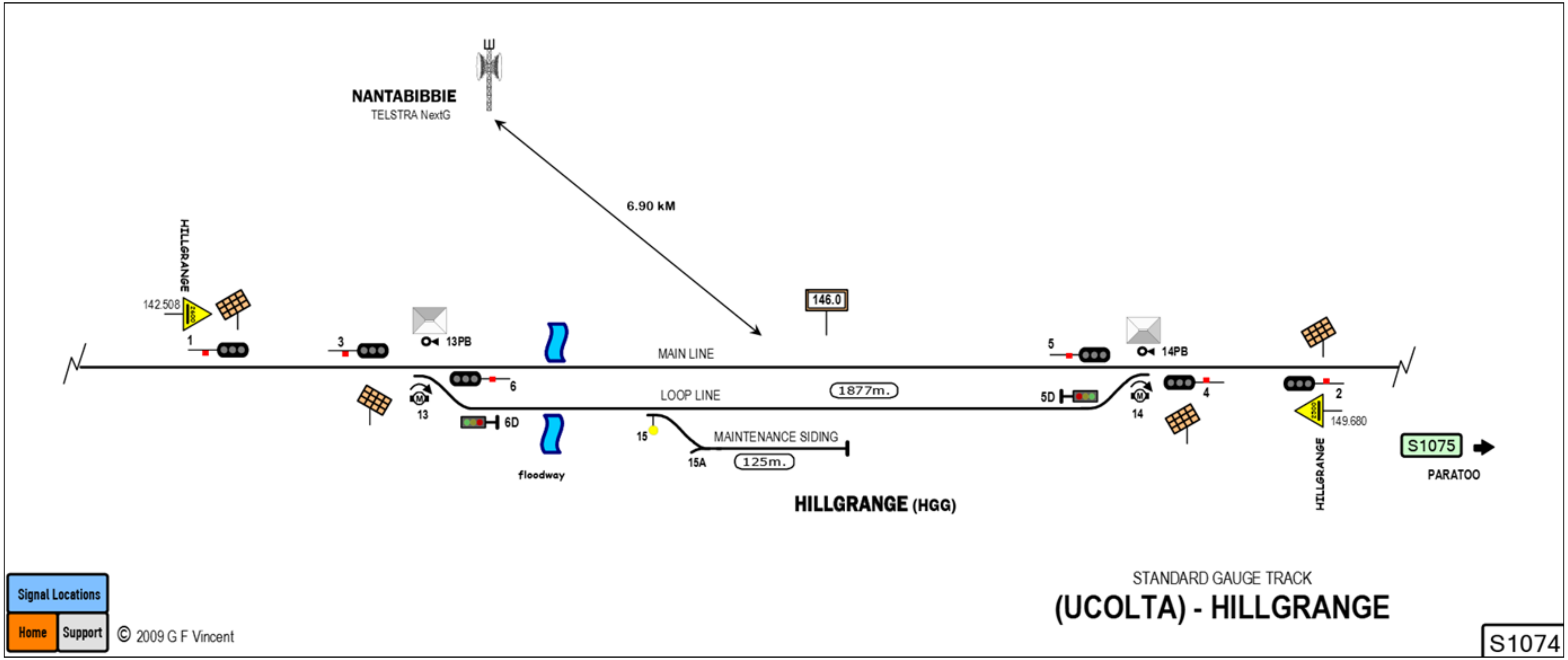


Figure 4-63: Schematic of ARTC's Hillgrange Rail Siding

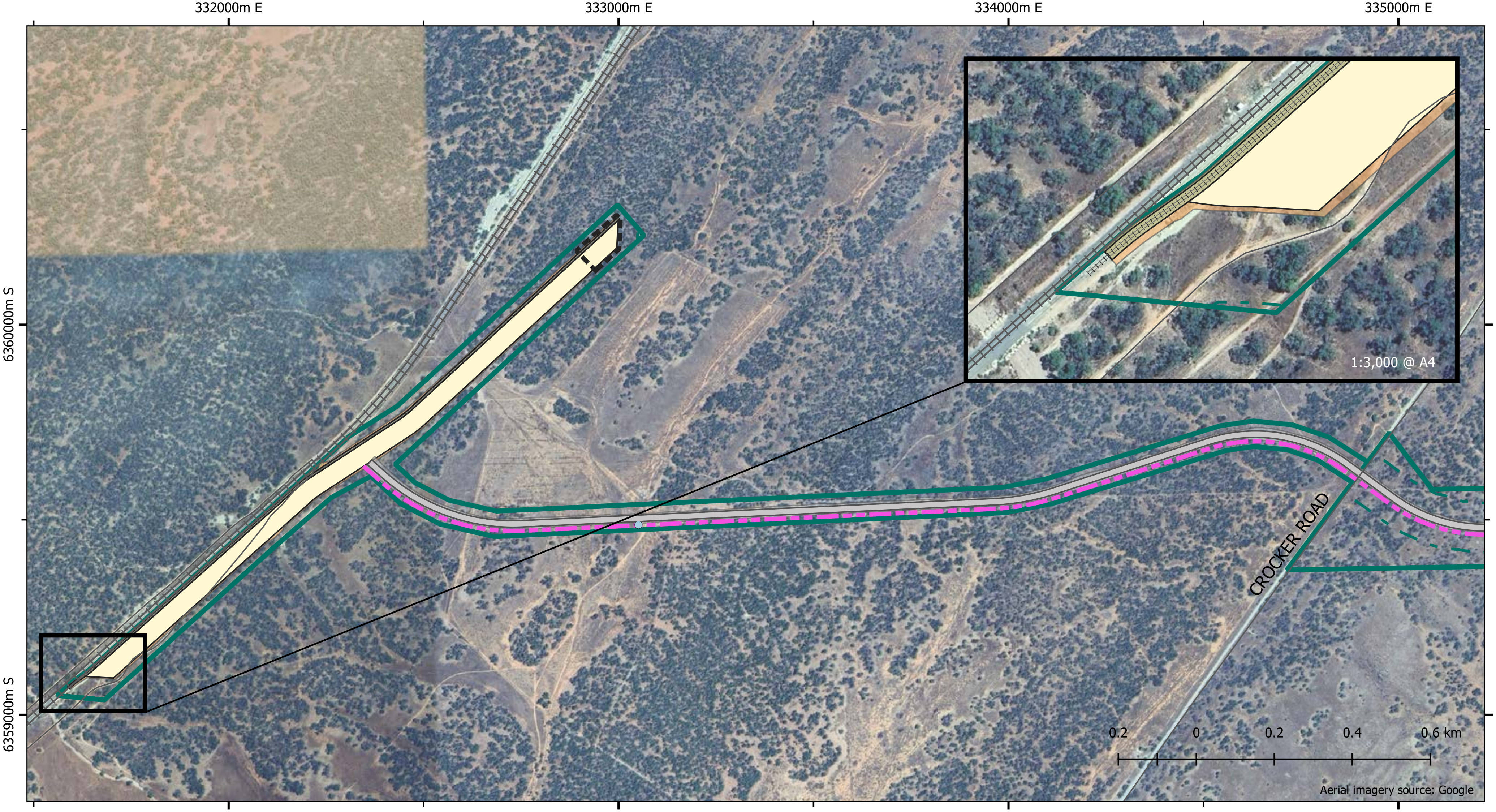


Figure 4-64: Rail Siding layout

Project Area
Conceptual Footprint
Existing railways
Existing roads
Local

Water supply
Groundwater bore site (ind.)
Coastal raw water line
Roads
Haul, access and other roads
Road batters

Rail siding
New rail line
Siding workshop and administration area
Siding corridor
Siding hardstand
Siding batters

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Author: A Kane | Date: 23/01/2025
Razorback MLP / Referral

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4.8.3.1. RS operations

The RS will receive iron concentrate products from the process plant via A-triple road trains with side-tipping capability. The road trains arrive via the HR from the ML to Crocker Road, then the access road from Crocker Road to the RS. Trucks will operate in a clockwise direction within the hardstand.

The road trains will deliver concentrate for a total of 5 Mtpa (dry equivalent), operating at a frequency of up to 70 deliveries per day (every 21 minutes). Trucks will deliver a payload of approximately 230 t per delivery for a total of up to 16,000 t per day. The haulage operation is a 24-hour operation with an assumed 21 hr/day utilisation allowance per truck. Trucks will employ standard side-tipping wagons, offloading concentrate in a linear embankment onto the hardstand parallel to the rail spur. FELs will position the concentrate stockpile as required prior to loading the train consist directly.

Concentrate stockpiles will occupy much of the hardstand forming linear piles along the length of the RS (i.e., 1.8 km to 2 km) to a height of up to 2 m, averaging 1.6 m for a 1.8 km stockpile holding 16,000 t and an assumed angle of repose of 40 degrees. Concentrate will be delivered to the RS with a moisture content of 8% based on rheological transportable moisture limits. A rigid body water tanker with a 14,000 L capacity is stationed at the RS to perform stockpile watering, minimising dust and, if required, to maintain moisture within the magnetite product. The truck will be operated by staff located at the RS and on an as-required basis. Water will be sourced from either a local groundwater bore, the bulk water supply pipeline or trucked from elsewhere, with allocation for up to three 50,000 L fixed water tanks. Fixed spray systems may also be employed.

Two FELs will recover ore concentrate from the stockpiles for top-loading into the bulk hopper wagons. An allowance of 6 hours loading time has been made for each train, for a sustained load rate of 2,250 t/hr.

Rail operations are likely to utilise four alternating current traction locomotives, each rated at 4300 horsepower, hauling 160 bulk hopper wagons equipped with bottom dump unloading. Each train has a length of 1,790 m and a net payload of 12,640 t per train. The unloaded and gross loaded weights of each service are 3,948 t and 16,588 t, respectively.

The trains operate at a frequency of eight per week, covering a total distance of 630 km between Hillgrange to the Port of Whyalla and return. This operating scenario assumes 95% utilisation. The system operates under ARTC pathing and scheduling guidelines, noting compliance with the 25 t axle load limit.

A series of visual renders are provided in Figure 4-65.

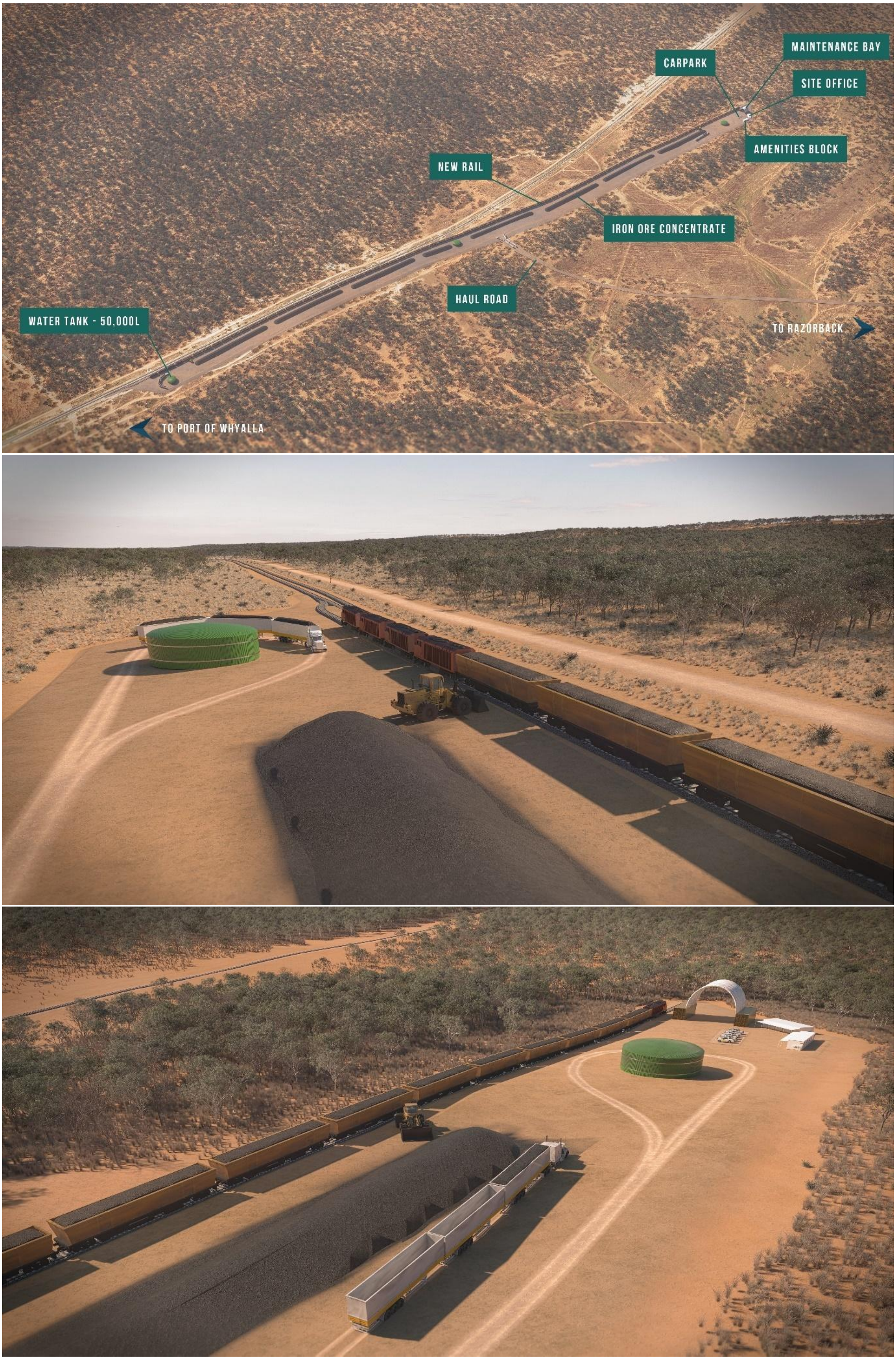

Figure 4-65: Rail Siding visual renders

4.8.3.2. RS construction

The construction of the RS involves earthworks, rail track installation, and development of supporting infrastructure.

A new rail spur will be constructed, emanating from the end of the current goods loop/maintenance siding and following a general northwest orientation generally parallel to the existing rail line that has been optimised to reduce excavation and land disturbance. Track works will include the placement and compacting of and profiling of ballast, as well as sleeper and track placement.

The siding gradient is maintained within ARTC's 0.667% limit for siding operations.

Signalling infrastructure is minimised by integrating the siding into manual switching ("dark territory").

The location of the new MGT RS avoids the major drainage feature to the southeast. The final design will include culverts under the rail spur and hardstand areas to allow controlled water flow in the vicinity of an existing farm dam northeast of the existing ARTC siding area.

The RS requires the construction of a hardstand pad of approximately 1,90 m by 50 m that abuts the new spur line. The pad surface is to be constructed with an immunity that exceeds the AEP1 event profile/extent. The pad is to be graded at a minimum 1% towards the southeastern boundary of the hardstand area, with a drain or v-channel installed to intercept surface water flows. A central sump system with sediment controls will be implemented at the lowest point to prevent water and sediment release, as well as to capture water for reuse (i.e., for dust suppression).

The access road between the RS and Crocker Road will be constructed and operated as per the HR specifications detailed in Section 4.8.2. The access road will also host the Project's bulk water supply pipeline. Further information on this infrastructure is included in Section 4.8.6.2.

4.8.3.3. RS closure

Similar to other rehabilitation approaches detailed in this MLP, the RS will require the decommissioning of facilities and rehabilitation of the rail spur, hard stand and access road areas.

Facilities and other infrastructure to be decommissioned will include:

- demobilising of office, ablutions and workshop structures
- removal of water and diesel storages
- dismantling of rail track and sleepers, and reinstatement of ballast buffer at end of maintenance siding/goods loop
- removal and potential re-use of ballast
- extraction of culverts / pipework (subject to further assessment)
- excavation of hardstand pad (re-use of material, if possible).

Subject to further planning, it is expected that rehabilitation of the RS will include:

- potential deep ripping of affected areas to remedy compaction
- reinstatement of subsoils and topsoils
- recontouring, reprofiling and stabilisation of soils, especially at drainage channels
- shallow ripping of soils to promote seed capture and water retention, in conjunction with defined revegetation processes (including spreading of felled vegetation)
- removal of selected fencing and reinstatement of other fences and gates, in consultation with landowners.

Sediment control measures may remain in place until landform stability is achieved.

4.8.4. Hillgrange Laydown area

The Hillgrange Laydown Area is located on a parcel of land adjoining Hillgrange Road (refer Figure 4-2) and is proximate to both the RS and the western access point of the HR. The maximum extent of the area is approximately 10 ha and has been proposed as a flexible use area for temporary applications during the construction phase.

It is intended that a temporary accommodation camp will be installed at the site as the first Project activity, with use of the camp maintained as overflow capacity during peak construction workforce periods.

4.8.4.1. Site establishment

The site will generally be cleared and grubbed in preparation for its intended use. The area will be fenced from the surrounding private property to limit interaction with and disturbance to the landowner's pastoral activities.

Where possible, the Hillgrange Laydown Area will avoid establishment of hardstands to reduce impacts associated with this temporary land use; however, the development of the temporary accommodation camp will likely require preparation of a suitable, safe surface with required flood immunity (subject to further assessment).

4.8.4.2. Hillgrange temporary accommodation camp

This temporary camp will be a self-sufficient facility and is anticipated to be in operation for up to three years, providing:

- approximately 25-33 accommodation units (likely skid-mounted) for a total of 100 beds
- equipped kitchen and mess hall(s)
- recreational facilities
- administration and first aid facilities
- laundries and ablutions
- potable water supply and reticulation within the camp
- independent WWTP (secondary to tertiary treatment) with on-site recycling / reuse via dust-suppression and off-site disposal of solids / sludge
- car parking.

4.8.4.3. Construction laydown area

This area provides capacity for the laydown of construction materials, pre-fabricated equipment or other supplies, as well as for mobile equipment, and particularly for the HR and water pipeline construction period. This laydown area may also be used for temporary concrete batching.

4.8.5. ML accommodation, offices and other non-process infrastructure

4.8.5.1. Accommodation camp

An on-site, 398-room accommodation camp will be constructed to house personnel during the late construction phase, the mining phase and, potentially, the post-mining rehabilitation phase (following downscaling). The camp will be constructed primarily of portable modular buildings and assets, and will include:

- single-person living quarters (with and without ensuite)
- toilet, shower, and laundry facilities
- kitchen and mess halls
- administration and first aid building
- gymnasium and recreation areas
- carparks and hardstands
- storage facilities
- site services (power, communications, fire and potable water, sewerage)
- WWTP with treated water used as a dust suppression water source and solids disposed offsite by licensed waste management contractor.

Further detail on the camp facilities is provided in Table 4-44. A general layout of the accommodation camp is shown in Figure 4-66.

Table 4-44: Living quarters by type and supporting infrastructure

Type	Quantity
Ensuite room	336
Basic room (no ensuite)	43
Accessibility rooms	19
Total	**398**
Supporting infrastructure	**Quantity**
Administration building	1
Dining mess and kitchen	1
Wet mess	1
Gymnasium and recreation areas	1
Laundry blocks	3
Toilet / shower blocks	5
Bus shelter	1
Wastewater treatment plant (WWTP)	1
LV parking bays	108

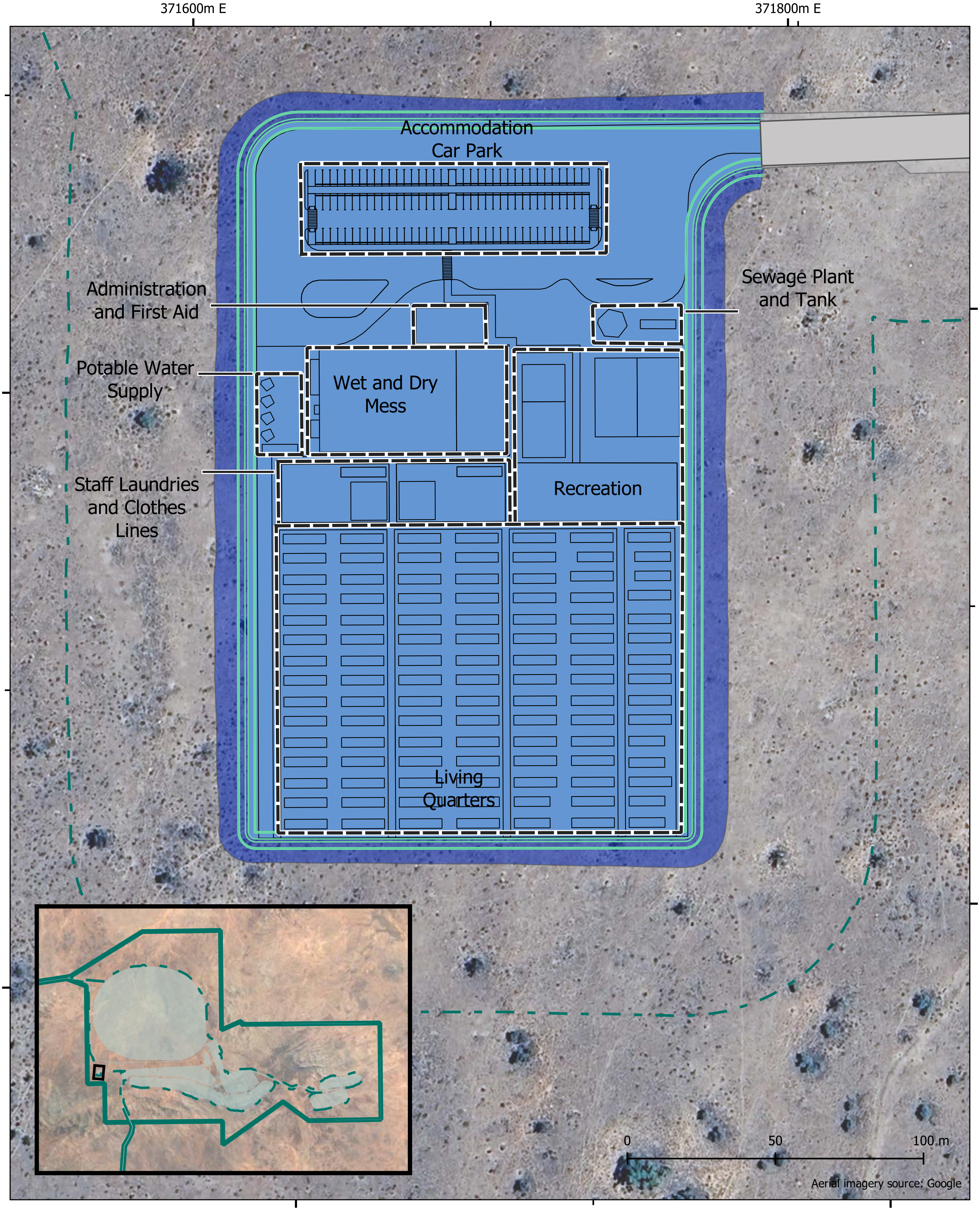

Figure 4-66: Proposed accommodation camp layout

Project Area
Conceptual Footprint
Roads
Haul, access and other roads
Road batters

Accommodation camp
Accommodation camp area
Accommodation camp layout
Accommodation camp area batters
Accommodation camp civils profile

GDA 1994 MGA Zone 54 | 1:1,500 @ A4
Author: A Kane | Date: 28/01/2025
Razorback MLP / Referral

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ACCOMMODATION CAMP CIVIL CONSTRUCTION

The accommodation camp requires the construction of a hardstand pad of approximately 238.0 m by 146.2 m, for an area of 3.47 ha. The pad surface is to be constructed with an immunity that exceeds the AEP1 event profile/extent.

Indicatively, with limited cut available from the accommodation camp site, the majority of fill will be sourced from within the ML area (approximately 55,000 m^3 on current design).

The pad is to be graded at a minimum 1% towards the northeast or northwest corner for surface water runoff and potential capture / recovery. A swale has been designed around the perimeter of the accommodation camp pad to support evaporation and infiltration of surface waters. The swale will be constructed with a minimum depth of 500 mm and a base width of 1000 mm, with batters angled at a 1:4. Freeboard of 100 mm has been designed for.

SERVICE INFRASTRUCTURE DEVELOPMENT

In addition to the living quarters and supporting infrastructure identified previously, the accommodation camp also includes:

- LV power reticulation to all buildings from local kiosk transformers, with HV power to be reticulated from the mine substation to the accommodation camp via an overhead 11 kV line
- communications to buildings, including the primary administration and first aid building, with Wi-Fi coverage for mess halls and living quarters
- external lighting to building perimeters and lighting for car park areas and footpaths
- potable water to buildings as required, reticulated from the NPI
- wastewater / sewage from buildings to the on-site WWTP
- fire system requirements to meet relevant standards.

It is expected that the installation and operation of the WWTP will require an on-site wastewater works approval pursuant to the SA Public Health (Wastewater) Regulations 2013 and in compliance with the On-site Wastewater Code. As the wastewater system to be operated is within the Unincorporated Area, the Department for Health and Wellbeing is the responsible authority.

As MGT intends on recycling the wastewater post-treatment, a recycled water approval with a recycled water management plan will be required.

Subject to further review and engagement with the EPA, it is anticipated that the WWTP will not require licensing under the EP Act as a prescribed activity of environmental significance. Based on a forecasted treatment capacity of 22 ML/a (sufficient for a 400 equivalent persons (150 L/d) operation), the planned operation of the WWTP does not exceed the stipulated 50 ML/a trigger.

VEHICLE ACCESS

The accommodation camp is accessible from the HR via an unsealed access road to the northeast. A LV-only road between the accommodation camp and NPI compound is proposed and occupies a section of the TL corridor to reduce overall land disturbance.

The accommodation camp has a bus stop positioned outside of the administration block, with buses providing staff transfers to and from the NPI compound and processing plant, as well as for coach services arriving from and departing to the transit hub in Peterborough.

A total of 100 LV parking bays have been allowed for to provide sufficient car parking for 20% of on-site personnel. An additional 20 bays have been allowed for to accommodate company or contractor personnel, OEM representatives and other visitors who may attend site from time to time.

4.8.5.2. Temporary accommodation facilities

Additional temporary accommodation facilities will be required during the Project's construction phase. A preliminary forecasted maximum of 720 beds is required to meet expected peak demand during the construction phase.

With the main accommodation camp (refer Section 4.8.5.1) and Hillgrange temporary camp (refer Section 4.8.4.2) providing up to 500 beds in aggregate, an additional supplementary camp within the ML is proposed. This supplementary temporary camp will be a self-sufficient facility and is anticipated to be in operation for up to two years, providing:

- approximately 55-70 accommodation units (likely skid-mounted) for a total 220 beds
- equipped kitchen and mess hall(s)
- recreational facilities
- administration and first aid facilities
- laundries and ablutions
- potable water supply and reticulation within the camp
- independent WWTP (secondary to tertiary treatment) with on-site recycling / reuse via dust-suppression and off-site disposal of solids / sludge.

A final location for the proposed supplementary temporary camp will be defined during the construction planning phase; however it is anticipated that the camp can be developed within an area already cleared or proposed for clearance. Such locations may include:

- surplus land within the NPI compound, adjacent the administration centre
- within the footprint of the Razorback West WRD
- within the footprint of the Razorback Central WRD.

It is acknowledged that the temporary facility's WWTP may require approval as per the primary accommodation camp WWTP, unless previous system approvals apply.

The camp will be constructed on a hardstand area with a minimum 1% gradient to drain runoff towards a sump for sediment control and short-term water recovery.

The camp will be removed once the construction workforce has peaked and accommodation demand can be met by the primary accommodation camp, with the site monitored for the interim period until the commencement of its intended primary use (i.e., as a WRD).

4.8.5.3. Offices and other non-process infrastructure

Office, administrative and other NPI will be principally located in two key areas, the Non-Processing Infrastructure Area and the Process Plant Area.

Information on the NPI located in each of these areas is provided below.

NON-PROCESSING INFRASTRUCTURE AREA

The Site will include a NPI area serving as a centralised administration and maintenance precinct. The NPI facilities located in the NPI Area are listed in Table 4-45 and shown in Figure 4-37 (georeferenced). Additional information on the NPI layout is presented in the drawing in Figure 4-67.

Table 4-45: Non-Processing Infrastructure Area – proposed NPI

Facility	Description
Office and Administration Facilities	

Main administration building	• Approximate building area of 800 m².
	• Constructed of prefabricated demountable buildings.
	• Includes:
	  ○ office space and amenities for technical services, commercial, and health, safety and environmental (HSE) personnel
	  ○ first-aid facility
	  ○ storeroom.
	• Capacity for 29 regular staff and 15 visitors.

Other NPI	
Assay laboratory	• Metallurgical and assay laboratory to undertake drill and blast, grade control and plant sampling assays as well as additional bench scale metallurgical test-work in support of mining and processing operations. • Located within the non-process infrastructure area.
Bulk fuel storage facility	• Tank farm consisting of 6 x 92 kilolitre (KL) self-bunded fuel storage tanks. • Concrete hardstands for refuelling points. • Bunded compound. • 1 HV refuelling bay and reticulation pipework. • 2 LV refuelling bays and reticulation pipework. • 1 bulk fluid offloading bay and reticulation pipework. • Capacity for 3 days fuel storage capacity.
Hazardous goods store	• Bunded shed storage for packaged hazardous goods and chemicals. • Located at distance from other facilities.

HV and LV workshop and warehouse	• Approximate area of 2,200 m².
	• Concrete slab with external concrete hardstand.
	• Includes:
	  ○ 5 HV bays with 15t overhead gantry crane and service fluid reticulation system.
	  ○ 2 LV bays (with LV vehicle hoists)
	  ○ 16,00 m² warehouse, 6 m high with forklift access, external hardstand for deliveries
	  ○ Maintenance office, crib room, bathrooms, and storeroom.

HV wash bay	• Single HV wash bay. • Manual operation wash system. • Capacity to wash 8 HVs (or equivalent) per day. • Concrete hardstand with drive in concrete sump for cleanout by front end loader.
LV wash bay	• Single LV wash bay. • Automatic operation wash system. • Capacity to wash 20 LVs (or equivalent) per day. • Concrete hardstand with drive in concrete sump for cleanout.

Raw water dam and pump station	• Raw water dam for the storage of bulk water received from the off-site source (outside scope of this MLP).
	• ~500 litres/second pump station capacity to suit ~11.5 GL/p.a. process water demand – water transferred to the process water dam.
	• Dam features:
	  ○ 80 megalitre capacity (approximately 2.5 days raw water storage)
	  ○ dimensions approximately 180 m (L) x 80m (W) x 6.0 m (D)
	  ○ clay lined.

Sewage storage tanks	• Interim storage of office-derived sewage for periodic collection and transfer to WWTP located at accommodation camp.
Tyre change and storage facility	• 1 HV tyre change bay with concrete jacking pad. • 50 x 10 m tyre storage hardstand with concrete wall. • Compressed air system, reticulated from HV workshop.
Water cart filing station	• Diesel powered pump and standpipe. • Suitable for CAT 777G water cart and B-double water cart.
Water treatment plant	• Filtration and treatment of raw water from raw water pond and feed to accommodation camp, offices and ablutions (potable).

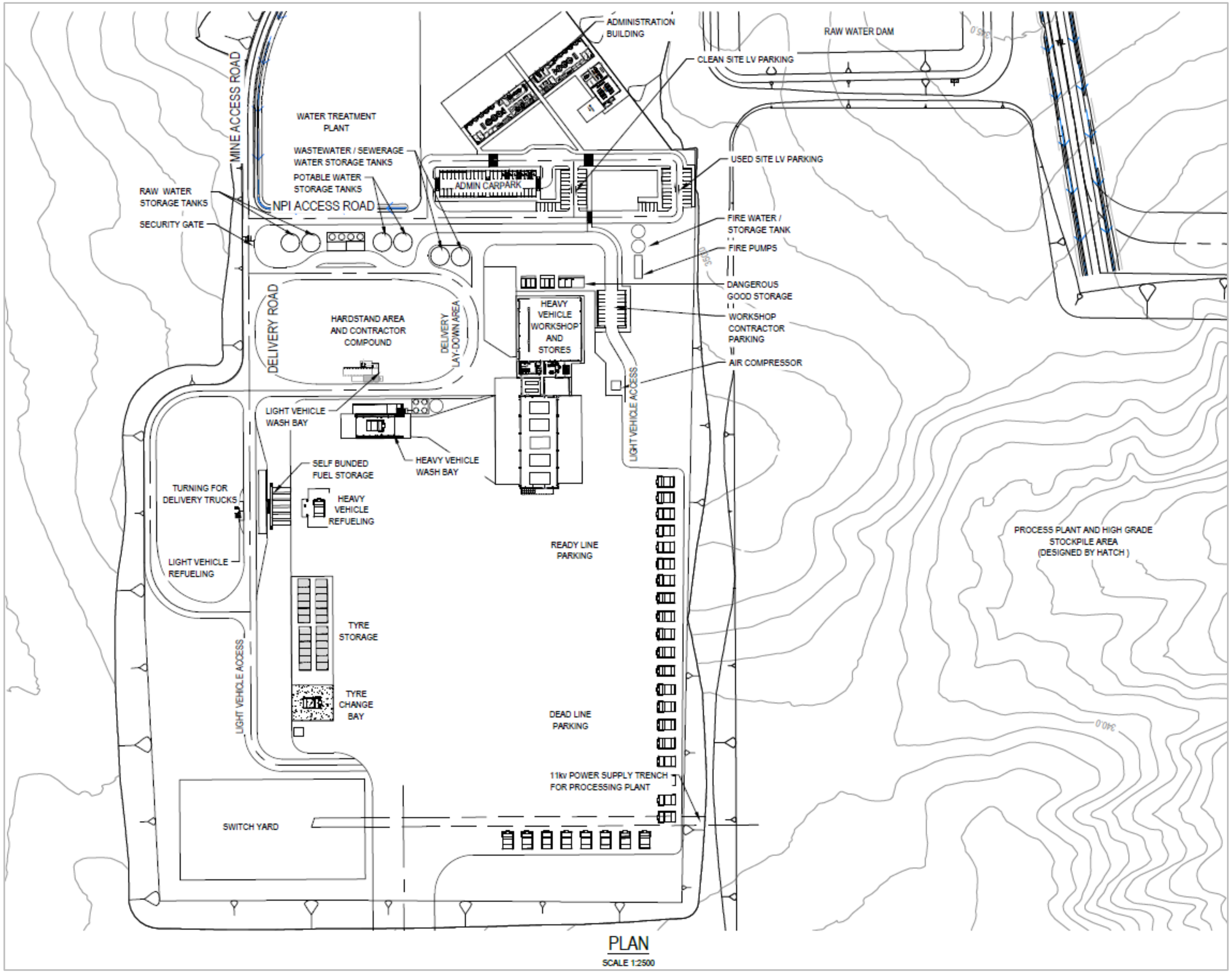

Figure 4-67: Non-Processing Infrastructure Area – proposed general arrangement

PROCESS PLANT AREA

NPI to be located within the Process Plant Area are listed in Table 4-46 and shown in Figure 4-37.

Table 4-46: Process Plant and Operations Area – proposed NPI

Facility	Description
Office and administration Facilities	
Mining building – training, crib and BBQ facilities	• Approximate building area of 30 m^2. • Constructed of prefabricated demountable buildings. • Place of muster, offices, crib (lunchroom) and amenities for mining and logistics personnel. • Capacity for 54 regular staff and 10 visitors.
Other NPI	

Process water dam and pump station	• Process water dam for the storage of process water reclaimed from tailings thickener overflow, concentrate filtrate and TSF.
	• Dam features:
	  ○ 35 ML capacity
	  ○ dimensions approximately 150 m (L) x 65 m (W) x 4.5 m (D).
	• HDPE-lined.

Bulk chemical storage facilities	• Various tank- and containerised storage facilities for processing beneficiation chemicals (e.g. frothers, collectors, pH adjusters, depressants and flocculant) (refer Section 4.8.8). • Storage facilities bunded including provision of segregated storage for incompatible substances.

4.8.6. Public and private services and utilities

Key public and private services and utilities to be used for the project will include:

- the 275 kV TL, constructed within the TL MPL Area, connecting to the Project Energy Connect 330 kV substation at Bundey.
- fibre-optic telecommunications, to be strung on the TL infrastructure.
- the bulk water supply system for provision of the ~11 GL/p.a. process water supply.

4.8.6.1. Transmission line

The proposed route for the TL is shown in Figure 4-2. The TL will be approximately 126 km in length from the Bundey Substation to a new substation to be constructed within the ML. Configuration and construction specifications are provided below.

TL CONFIGURATION

The TL is comprised of a single line monopole arrangement (refer to Figure 4-68 for conceptual design) with a proposed orange type conductor, providing capacity to support future expansion options. The 275 kV TL will connect to a 20 MVA substation within the NPI compound, with power stepped down to 11 kV (or potentially 33 kV, subject to final power system review) for power supply to site infrastructure via intra-site distribution lines.

The fibre-optic cabling, routed with the TL, will provide for both wired telecommunications for key facilities and area telecommunications via an on-site telecommunications tower.

A summary of the TL specifications is provided in Table 4-47.

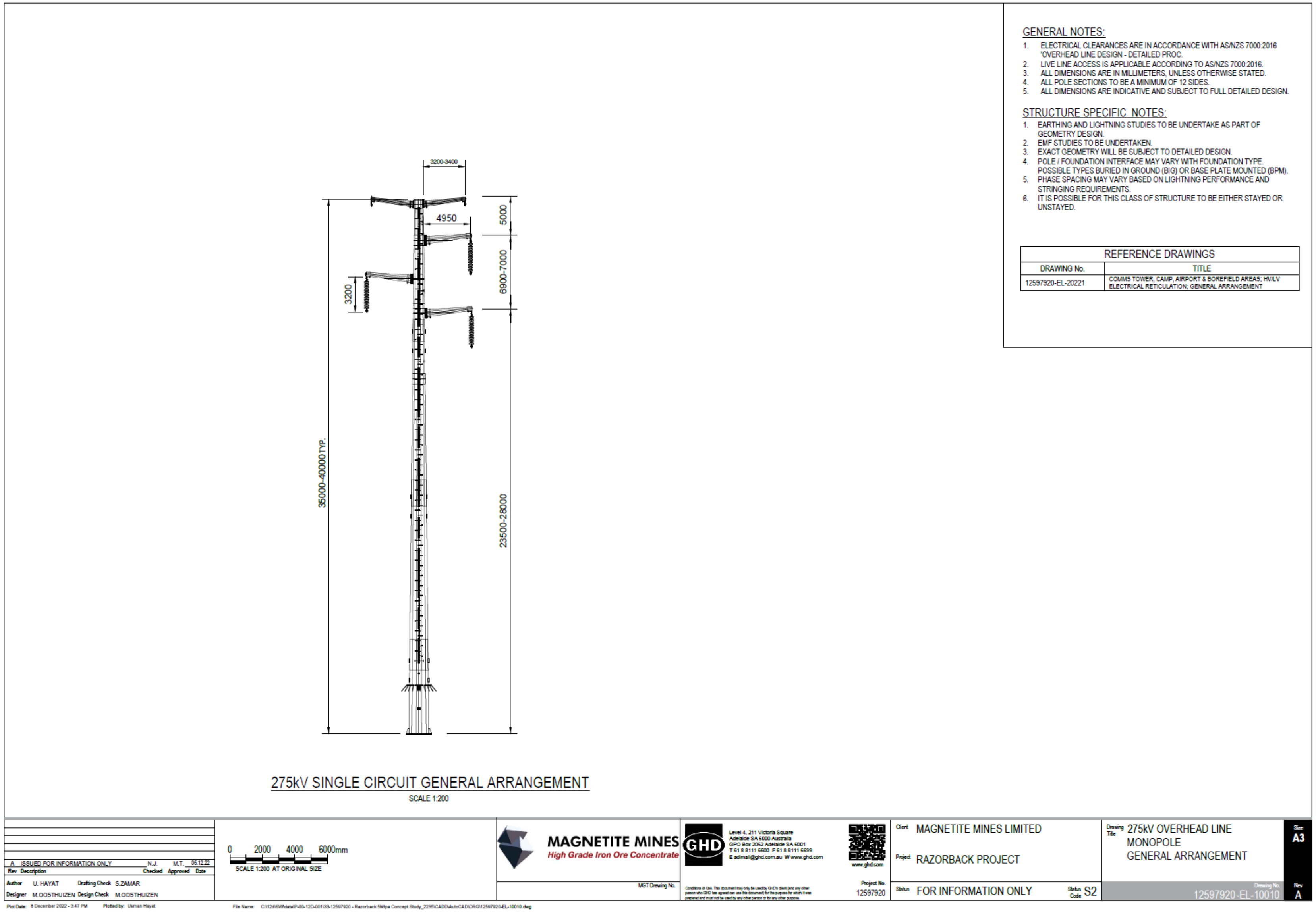

Figure 4-68: TL monopole configuration

Table 4-47: Proposed overhead TL specifications

Specification type	Value
Line length	126 km
Total capacity	400 MVA
Voltage	275 kV
No. of circuits	Single
Structures	Monopole
Conductors per phase	1 – Orange
Earthwires	1 x earthwire 1 x optical ground wire

MGT will review whether the proposed single-circuit configuration remains preferable for the Project. It is noted that, while higher in capital costs, a double-circuit 275 kV line provides additional reliability benefits in the event of a single transformer failure. Any future decision to change to a double-circuit configuration does not change the overall construction methodology, operational profile and resulting impacts, although pole structures would be reviewed and optimised.

TL CONSTRUCTION

Detailed construction planning will define the construction staging, including whether one or multiple construction fronts will be used.

Access along the TL corridor is required to support line construction. Location studies for the TL prioritised the placement of infrastructure along or adjacent to existing roads, access tracks or accessible fence lines; as a result, almost half of the corridor can be accessed via existing thoroughfares with approximately 66 km of new access track required. Where new access track is required, land will be cleared and grubbed with vegetation and topsoils stockpiled nearby. Each area (including existing and new tracks) will be assessed for accessibility requirements, and gravel (or similar material) may need to be imported to ensure road surfaces remain accessible. Drainage channels will not be filled during construction activities to reduce impacts to flow regimes and flood risks.

Access to the TL corridor will be via existing public roads, including Powerline Road, Sutherlands Road, Goyder Highway, Grassville Track, Eastern Road, Hogbacks Lane and Lilydale Road, as well as from within the ML.

Pads will be prepared at regular intervals, with vegetation cleared, grubbed and stockpiled. Spacing between pads will be up to 50 m by 50 m in size and occur every 280 to 350 m, dependent on geotechnical investigation outcomes, topography, required line clearances, vegetation avoidance strategies and line alignment requirements (i.e., at changes in line orientation).

Footings will be excavated within each pad to specifications defined following geotechnical assessments at each site (or within each construction type domain). Reinforced concrete footings will be installed prior to the erection of the pre-fabricated monopoles. Conductors will be strung in the most-efficient manner, which may include both ground and aerial methodologies.

Construction activities will be enabled with a series of temporary construction laydown and accommodation compounds along the TL corridor. A total of six compounds have been proposed for use, and will include:

- temporary fencing and preparation of a hardstand/pad
- temporary, self-contained accommodation camp for up to 80 personnel, including trucked potable water supply and closed-system WWTP
- laydown for construction supplies and transmission poles, including bulk water storage
- LV and mobile plant parking
- development of a groundwater bore for low-quality water uses, such as dust suppression
- concrete batching plant
- temporary construction waste storage (for off-site disposal).

Compounds are located at the following sites, and are presented in Figure 4-69:

- Sutherlands Road, Bundey
- Goyder Highway, Bundey (southern site)
- Goyder Highway, Bundey (northern site)
- Grassville Track, Burra Eastern Districts
- Eastern Road, Warnes
- Lilydale Road, Faraway Hill.

Following construction and commissioning of the TL, MGT will commence rehabilitation of the temporary construction compounds. Access along the corridor will be maintained for the life of the Project; however, access to and within each property will be subject to agreements made with the relevant owner (i.e., required notifications, designated access locations).

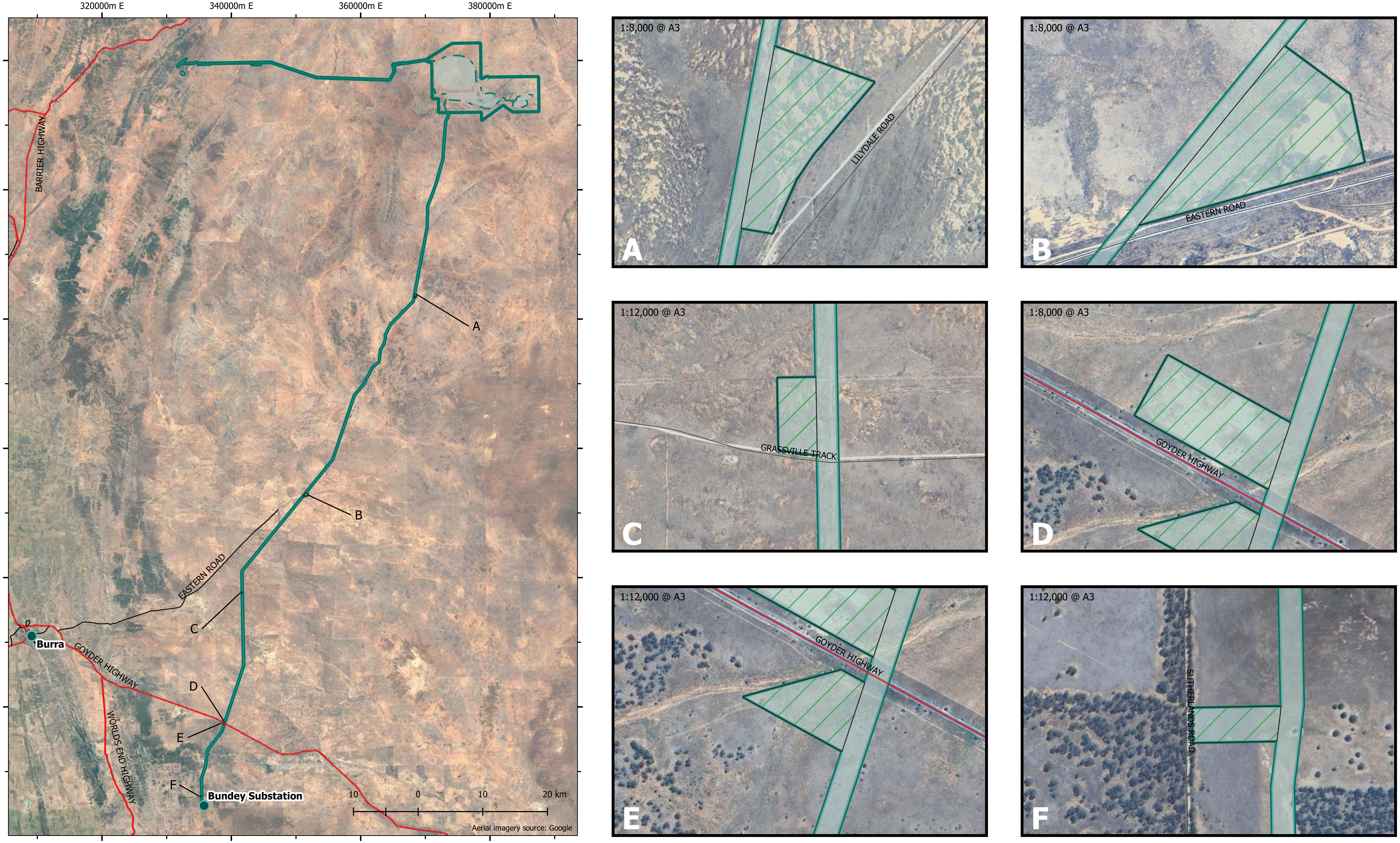

Figure 4-69: Location of proposed TL construction and accommodation compounds

Project Area
Conceptual Footprint
Disturbance Footprint
Localities
Existing roads (by type)
Main
Collector
Construction phase infrastructure
TL compounds

GDA 1994 MGA Zone 54 | 1:550,000 @ A3
Author: A Kane | Date: 26/02/2025
Razorback MLP / Referral

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PROJECT SUBSTATION AND SITE RETICULATION

The mine substation steps the power supply voltage down from 275 kV to 11 kV, including 415 V for some local substation supply circuitry. High-level concept specifications for the substation is listed in Table 4-48.

The location of the mine substation is within the NPI compound, as presented in Figure 4-37, with an indicative substation design/layout presented in Figure 4-70.

Table 4-48: Conceptual substation transformer specifications

Transformer	Value
Type	Three-winding transformer
Rating	150/75/75 MVA
Voltage	275/11/11 kV
Colling type	ONAN
Connection type	Star/Delta/Delta

The substation allows for a total of ten feeders (plus two spare) to be distributed to the process plant via two independent, but interconnectable, switchboards. A separate, but also interconnectable, switchboard allows for the connection of NPI and other circuits.

A three-winding transformer was selected to improve footprint economy and was rated to suit the 5 Mtpa load requirements. During the final design phase, further consideration will be given to operational reliability requirements. Alternatives to be assessed include a twin 75 MVA 275/11 kV transformer configuration.

The distribution of 11 kV feed to the process plant and NPI compound will be via underground cable trenches from where they emanate from the substation switchboards. The supply feed to the accommodation camp will start off underground at the substation switchboard and transition to overhead at or outside the perimeter of substation.

NETWORK IMPACTS

MGT commissioned a Connection Options Report (COR) in October 2023 (ElectraNet, 2023). The COR assessed the technically-feasible grid connection options and the potential impact of the proposed connection to the network (on a high-level basis only).

ElectraNet, as network operator, completed a steady state load flow assessment on a conceptual 150 MW/300 MW expansion connection scenario at Bundey Substation to identify thermal limitations on the transmission system after the connection of the proposed facility. High load conditions were considered in this assessment, and the potential impact of this connection on the deeper transmission network also considered. The assessment was based on key assumptions regarding, but not limited to:

- development, commitment, and retirement of other generation in any part of SA
- growth or reduction of demand including new large load and retirement of large existing load in SA
- power flows across the Heywood and HVDC Murraylink Interconnectors that connect SA to the NEM
- new interconnection between SA and rest of the NEM via Project EnergyConnect
- transmission network augmentation in the Eyre Peninsula and Mid-North regions of SA.

The assessment found that thermal overloads were not observed under reasonably foreseeable single credible network contingencies for connection option 1, with mine load supplied without any network constraints at peak demand with high import from Project EnergyConnect EC and the Heywood interconnector.

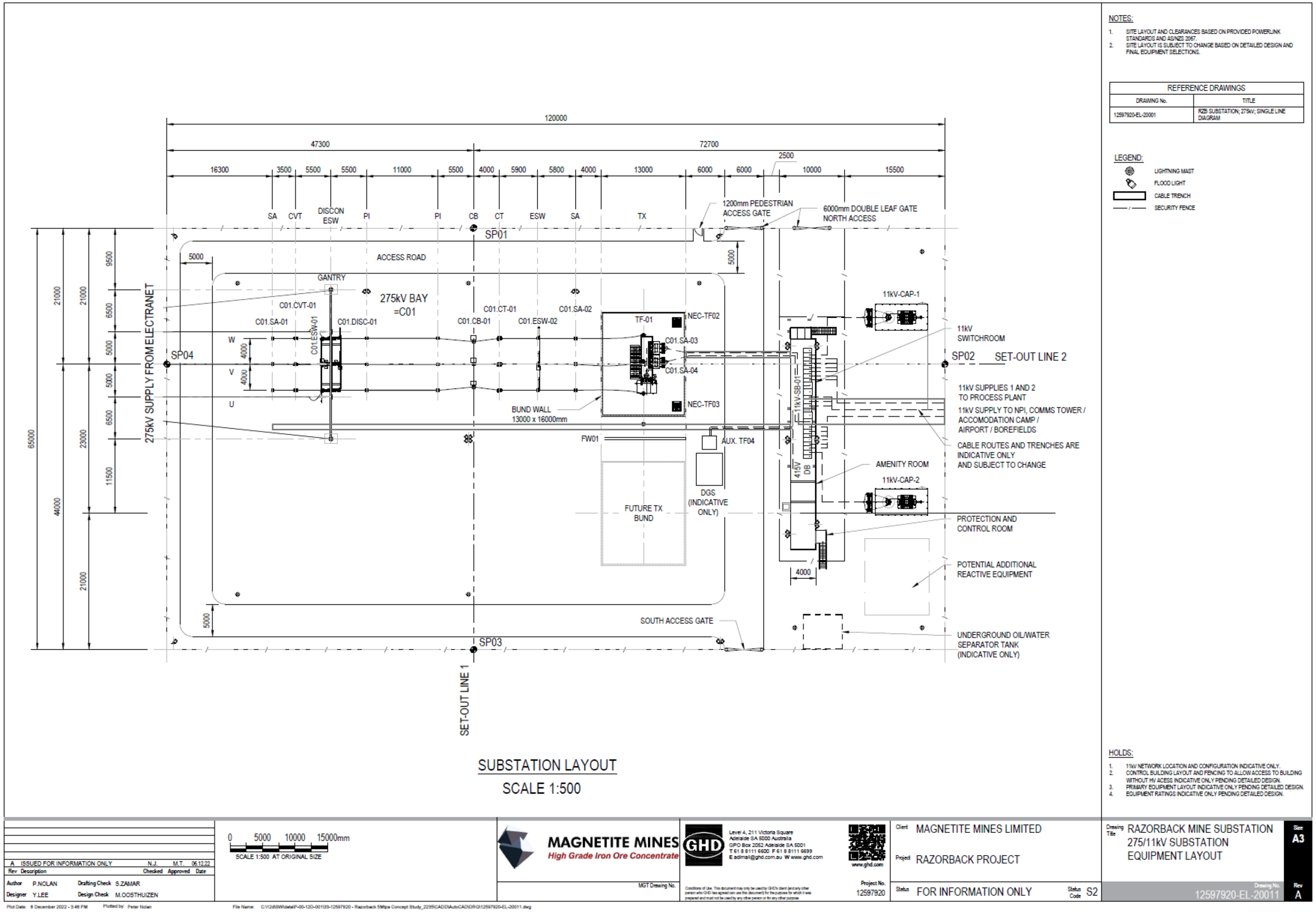

Figure 4-70: Mine substation configuration

4.8.6.2. Process water supply pipeline

The Project's process water supply system, as introduced in Section 1.7.6, includes a buried pipeline from the RS at Hillgrange to the process plant area (and, therefore, is located within the RS MPL, HR MPL and ML). The general alignment of the pipeline conforms to the southern margin of the RS access road and HR, as presented in Figure 4-1 and Figure 4-2. This location takes advantage of the proposed road corridors to support pipeline construction activities and to significantly reduce land disturbance and vegetation clearance when compared to development within a separate corridor.

For clarity, it is noted that the section of the process water supply pipeline within the ML and relevant MPLs is within the scope of this MLP; the residual section of the pipeline and coastal pumping/desalination infrastructure is outside of the scope of this MLP and will be subject to assessment via alternative processes, as described in Section 1.8.1.

ENGINEERING CONCEPT AND DEVELOPMENT

Raw water is transported to the Project Area through a buried cross-country pipeline, deporting to the raw water dam located between the NPI and process plant areas. Terrain along the pipeline route is considered typically open country, flat to undulating terrain, good soil and minimal rock within the trench zone with limited lengths of steep, rough or rock terrain.

An engineering study was completed by GHD based on the following preliminary construction and design parameters, as presented in Table 4-49 and Table 4-50, respectively.

Table 4-49: Water supply pipeline preliminary construction parameters

Parameter	Description / value
Construction method	Buried steel pipe, butt-welded joints
Pipe section length	18 m
Initial pipe specifications	DN 750, telescoped pressure ratings including: • ASME Class 600 (9,250 kPa) – API 5L-X60, 14.1 mm WT • PN 35 (3,500 kPa) and PN 21 (2,100 kPa) – grade 300 mild steel 8 mm WT
Coatings	Internal epoxy lined, 0.5 mm DFT (Internal weld joint lining using robotic spray epoxy) External coating FBE, 0.5 mm thickness
Depth of pipe cover	0.75 m typically 1.2 m under roads 2 m across major watercourses
Trench condition assumption	Good excavation material with occasional weather rock outcrops
Weld NDE	20% RT or UT
Hydrostatic testing	Water medium, 1.25 x MAOP

Table 4-50: Water supply pipeline preliminary design parameters

Parameter	Description / value
Availability	90%
Design capacity	2,537 m^3/hour
Design pressure classifications	Telescoped pressure ratings including: • ASME Class 600 (9,250 kPa) • PN 35 (3,500 kPa) • PN 21 (2,100 kPa)

Parameter	Description / value
Design pressure margin	1.05
Minimum flowing pressure	10 m water
Water flowing velocity allowable range	No constraints

DESIGN OUTCOMES

The elevation profile for the pipeline within the Proejct Area is generally consistent that for the HR, as presented in Figure 3-3. The hydraulic grade line, water pumping pressure, pipeline design pressure and surplus water delivery pressure were influenced significantly by the pipeline elevation profile that includes a high plateau area from the Hillgrange area to Jamestown, approximately 70 km further west. The delivery pressure from a single size pipeline is high and therefore a pressure reducing station towards the pipeline end is required to dissipate excess energy.

Final design and construction of the pipeline will be in accordance with AS 2885 series due to design pressure being greater than typical water industry applications and with adjusted design rules as appropriate for low-risk clean water.

Engineering assessment validated the indicated pipeline size of DN 750 (NPS 30 inch). It was determined that fully welded carbon steel pipe for class 600 segments was suitable, while PN35 and PN21 segments may be fully welded or rubber ring joint connections.

The study determined that the pipeline be externally and internally epoxy-lined, as opposed to typical water pipelines constructed in ductile iron cement-lined pipe or HDPE. The welded pipeline proposed is required to be carbon steel due to the high design pressure, while the internal epoxy lining is required due to the pipeline supplying desalinated water. Recent project experience has demonstrated desalinated water is incompatible with cement lining and results in a short service life.

Table 4-51 summarises outcomes of the engineering and design study.

Table 4-51: Water supply pipeline analysis outcomes and indicative configuration / profile

Parameter	Description / value
Pipeline flow capacity	2,537 m^3/hour
Pipeline nominal size	DN 750 (NPS 30 inch)
Pump head	898 m water, 8,805 kPa
Waer flowing velocity	1.63 m/s
Operating from	Four installed pumps (three duty, one standby) (at coast)
Static pressure for no-flow and closed packed pipeline	587m water at origin (pump station) 240 m water at pipeline end (mine site)
Maximum pipeline design pressure (based on 1.05 factor)	9,245 kPa

CONSTRUCTION APPROACH

Construction of the pipeline within the MPLs and ML will occur in a rolling development sequence along the corridor. It is anticipated that between 1-2 km of pipeline install will occur per day.

Temporary facilities required to support the construction of the pipeline, such as amenities, construction laydown and service yards, can utilise developed areas such as the RS, Hillgrange Laydown Area, construction laydowns allocated along the HR and other areas proposed for disturbance within the ML.

The construction of the pipeline will either follow or occur in parallel with HR development; the clearing, grubbing and other site preparation works required for pipeline construction will be largely completed as part of the HR construction package. Any minor additional site clearance works will ensure the separation of vegetation, topsoil and subsoil for stockpiling and reinstatement.

A standard pipeline installation process will occur across the majority of the pipeline's alignment within the MPLs and ML. A continuous trench will be excavated using a 20-50 t track-mounted trencher (or similar). To meet depth of cover requirements, pipeline diameter and bedding requirements, trench depth will be between 1.8-3.0 m (deeper at creek crossings). Excavated material (top soil, sub soil) will be temporary stockpiled adjacent the trench.

While MGT does not envisage any other development methods (i.e., directional drilling, hydraulic rock-breaking), final construction methodologies will be determined following completion of all in situ geotechnical characterisation and engineering studies.

An ESCP for the pipeline program will assess control options for soils with increased erosivity and sodicity potential, as reported in Section 3.3.1.

Suitable bedding material will be placed within the trench, while individual pipe Sections will be floated to the active construction area, strung and welded on surface. Final coatings will be applied before the pipeline is lowered into the trench. Inspection and defect repair will occur prior to backfilling of the trench.

Traffic control will be used to ensure safe road conditions during the pipeline installation process.

Following the completion of construction and any testing/commissioning programs, the pipeline corridor will be rehabilitated through the placement of subsoils and topsoils (including of landform contouring), as well as the return of felled vegetation.

Waste materials will be removed and disposed of (as per Section 4.7.4) and any residual/surplus subsoils will be stockpiled locally. Temporary facilities will be demobilised unless they are required to support other construction activities.

Final commissioning of the pipeline will occur prior to the commissioning of the process plant; however, hydrostatic testing may occur earlier.

4.8.7. Visual screening

Given the remote nature of the Site and HR / RS infrastructure, and limited opportunity for discrete visual impact on local landowners, no visual screening is required or proposed.

Measures to mitigate visual amenity impacts during the operations phase will be limited to the installation of buildings and relevant infrastructure with colours that blend with the environment.

To mitigate ongoing visual amenity impacts operations post-closure, post-mining landforms will be designed and rehabilitated to integrate with the surrounding environment, as far as practicable and subject to geotechnical stability and design requirements.

4.8.8. Fuel and bulk chemical storage facilities

The site bulk fuel storage facility will be located within the non-processing infrastructure area – refer Figure 4-67. This facility will include:

- tank farm consisting of 6 x 92 kL self-bunded fuel storage tanks
- concrete hardstands for refuelling points
- bunded compound with local sump
- 1 HV refuelling bay and reticulation pipework
- 2 LV refuelling bays and reticulation pipework
- 1 bulk fluid offloading bay and reticulation pipework
- capacity for 3 days fuel storage capacity.

Bulk chemical storage facilities include the processing beneficiation chemical storage facility and ANFO / ANFO emulsion storage facility. ANFO storages and stored quantities are described in Section 4.5.5.3.

The beneficiation chemical storage facility will be located in the process plant area as shown previously in Figure 4-37, with storage quantities and annual consumption rates provided in Section 4.5.5.

Bulk storage facilities will be designed in accordance with relevant EPA Bunding Guidelines, Australian Standards, the Australian Dangerous Good Code and the material SDS. Liquid reagents (pH adjuster, collector, frother) will be stored within storage tanks within bunded areas with local sumps along with their associated pumping and filling infrastructure. Dry reagents (depressant, flocculant) will be stored within shipping containers on a suitable hardstand with local drainage and sump. Reagent mixing facilities will be contained within bunded areas. All sump pumping within reagent storage areas will be manually controlled, with any spillage either returned to holding tanks, returned to the process or disposed of by a licensed contractor.

Various other chemicals will be kept in small, packaged containers and quantities across the site. These include lubricants, solvents / thinners, cleaning products, laboratory reagents and other. Storage will include bunded pallets, self-bunded chemical stores and flammable storage cabinets.

4.8.9. Site security

Site security will consist of an un-manned, automated boom gate on the HR nearer to the Site. Despite the remote location, the ML boundary will be fenced in most areas by benefit of existing property boundaries (either at or outside of the ML boundary) and new fencing, where required. It is noted that a small section of the southern ML boundary may not be fenced due to the extremely rugged nature of the landscape; in this area, the southern mine pit wall will be bunded appropriately and other controls, such as access track closures, will be considered. A map of the existing fencing and indicative proposed new fencing is presented in Figure 4-71.

Any potential points of access into the ML (i.e. existing gates / access tracks) will be gated, locked and signposted.

The HR and RS will be fenced to ensure separation of operational areas with surrounding pastoral activities. Existing fencing will be used, where available. Signage will be erected at the intersection of the HR and RS access road with Crocker Road to advise of restricted access and hazards associated with the road. Further, traffic management signage will be installed at the Crocker Road/HR intersection and Sawers Road/HR intersection in accordance with relevant standards. Indicative signage requirements and placements in this regard are presented in Figure 4-61 and Figure 4-62, respectively.

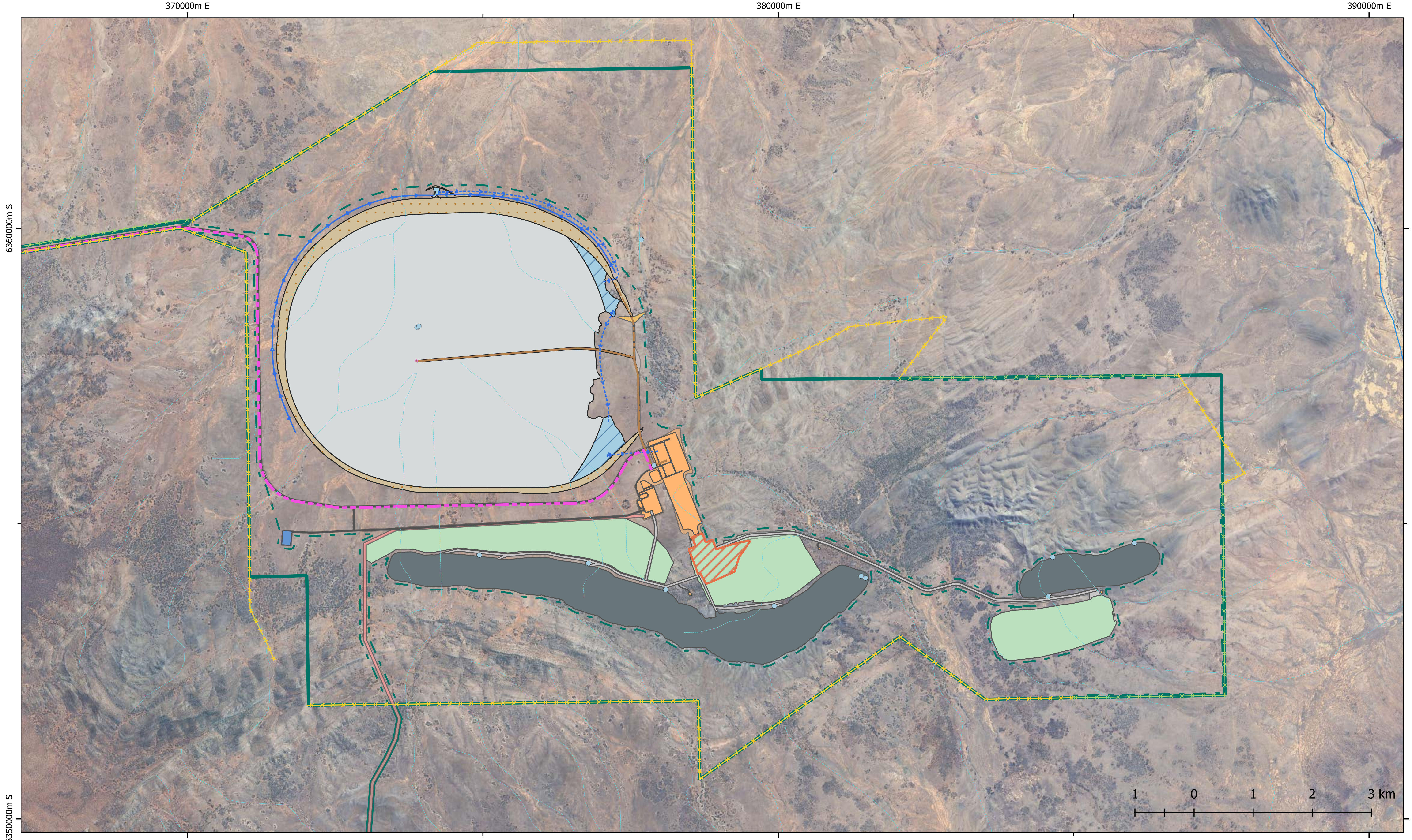

Figure 4-71: Location of existing and proposed fencing, ML

Project Area
Conceptual Footprint

Watercourses
Major
Minor

Fencing forming access boundaries
Existing fences
Proposed fences

Water supply
Groundwater bore site (ind.)
Coastal raw water line

Roads
Haul, access and other roads
Road batters

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Accommodation camp

Ultimate TSF infrastructure
TSF Toe drain (with flow direction)
TSF Decant pipelines (with flow direction)
TSF Tailings slurry pipeline
TSF Coarse sand pipeline
TSF Spigot location
TSF Spigot access pier/road

TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond
TSF Tailings beach extent
TSF Spillway
TSF Embankment

GDA 1994 MGA Zone 54 | 1:60,000 @ A3
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4.8.10. Run-off, erosion, sediment and silt control

4.8.10.1. Control approach and standards

All disturbed areas will have infrastructure for the management and containment of surface water runoff and associated sediment.

The location, design and configuration of runoff and sediment control structures will be determined based on location-specific surface water modelling (contributing catchment area) and potential erosion sediment sources (e.g. material stockpiles, laydown areas, roads, and operational areas) and with reference to best-practice erosion and sediment control guidelines, including but not limited to:

- IECA, 2008, *Best-Practice Erosion and Sediment Control*. Prepared for International Association of Erosion and Sediment Control Australasia. November 2008.
- DLWC, 2001, *Guidelines for Erosion & Sediment Control on Building Sites*. Department of Land and Water Conservation, New South Wales.
- Landcom, 2004, *Managing Urban Stormwater: Soils and Construction Volume 1* (‘the Blue Book’), 4th edition.
- SA EPA, 2004, *Handbook for Pollution Avoidance on Commercial and Residential Building Sites*, 2nd Edition. SA EPA, June 2004.

Per these guidelines, the type and scale of controls will depend on the nature and extent of ground disturbance, the local hydrology and hence erosion risk. General strategies will include, but are not limited to, the following:

- Installation of:
  - upstream cut-off drains and culverts to intercept and divert clean (non-mine impacted runoff) surface flows around and through disturbed areas
  - down-gradient interception drains and sediment basins to intercept sediment-laden runoff from disturbed areas and water infiltration/evaporation
- Erosion control techniques including:
  - interim revegetation of stockpiles
  - application of water and/or commercial stabilisers and suppressants
  - application of physical erosion mitigation controls (e.g. waste rock cover)
- Local re-use of intercepted runoff (e.g. dust suppression).

The design, layout and configuration of drainage, erosion and sediment controls will be location-specific and will change / evolve over the life of project. These will be documented in point-in-time and location-specific erosion and sediment control plans (ESCPs) / soil erosion drainage management plans (SEDMPs).

4.8.10.2. Diversion and containment of run-off

Surface water from rain events will be contained and managed within the bounds of the ML and MPLs to prevent interaction between water from mine-affected land and undisturbed land.

Water run-off from mine-affected land, including the accommodation facility, mining infrastructure NPI, process plant areas, RS and stockpiles will be diverted through drains and bunds into sumps. Where appropriate, water will be pumped from sumps back into the process water pond for re-use in the process or allowed to evaporate for areas not near to the NPI and process plant area. All sumps will have an allowance for settling of sediments which will be periodically disposed of in the TSF. Management of run-off water from roads will be by typical methods, including the installation of swales, gutters and culverts. Surface water that falls within the TSF catchment area will collect in the decant ponds and be re-used in the process.

Surface water from undisturbed areas will be diverted around disturbed lands into the existing surface water catchment areas using excavated drains or pipes.

A conceptual model of anticipated run-off flow directions and management for relevant areas is presented in Figure 4-72. The Project's advantageous position at the head of catchment, together with the aggregation of mine, tailings, process and non-process facilities areas in a continuous area, enables a simplified containment and diversion approach. Further, given the location of the TSF downstream from the Razorback pit, Razorback WRDs, process plant and NPI area, any major rainfall events that exceed individual containment strategies will be intercepted within the TSF embankment.

In circumstances where mine-impacted surface water runoff is intercepted and is proposed for managed release to the downstream environment, the quality of released water will be tested and confirmed as compliant with the *Environment Protection (Water Quality) Policy 2015*, including consideration of any site-specific water quality criteria/objectives. Sediment will be retained in the stormwater traps and drains and periodically cleaned out, with the silt included in existing appropriate stockpiles.

Note: given that surface water flows will generally be minimal and limited to large episodic rainfall events that are difficult to predict, these cannot be reliably considered and are not included within the site water balance presented in Section 4.6.2. MGT can reduce the production/importation of raw water to enable efficient use of any large surface flows contained within the TFS or other part of the ML.

4.8.11. Rehabilitation strategies and timing

General strategies and indicative timeframes for the rehabilitation and closure of site supporting infrastructure and associated disturbance areas are outlined in Table 4-52.

Detailed rehabilitation strategies will be documented within the RMP and MCP. Strategies will evolve and adapt over time as the project-specific rehabilitation knowledge base is improved through rehabilitation trials, research and monitoring.

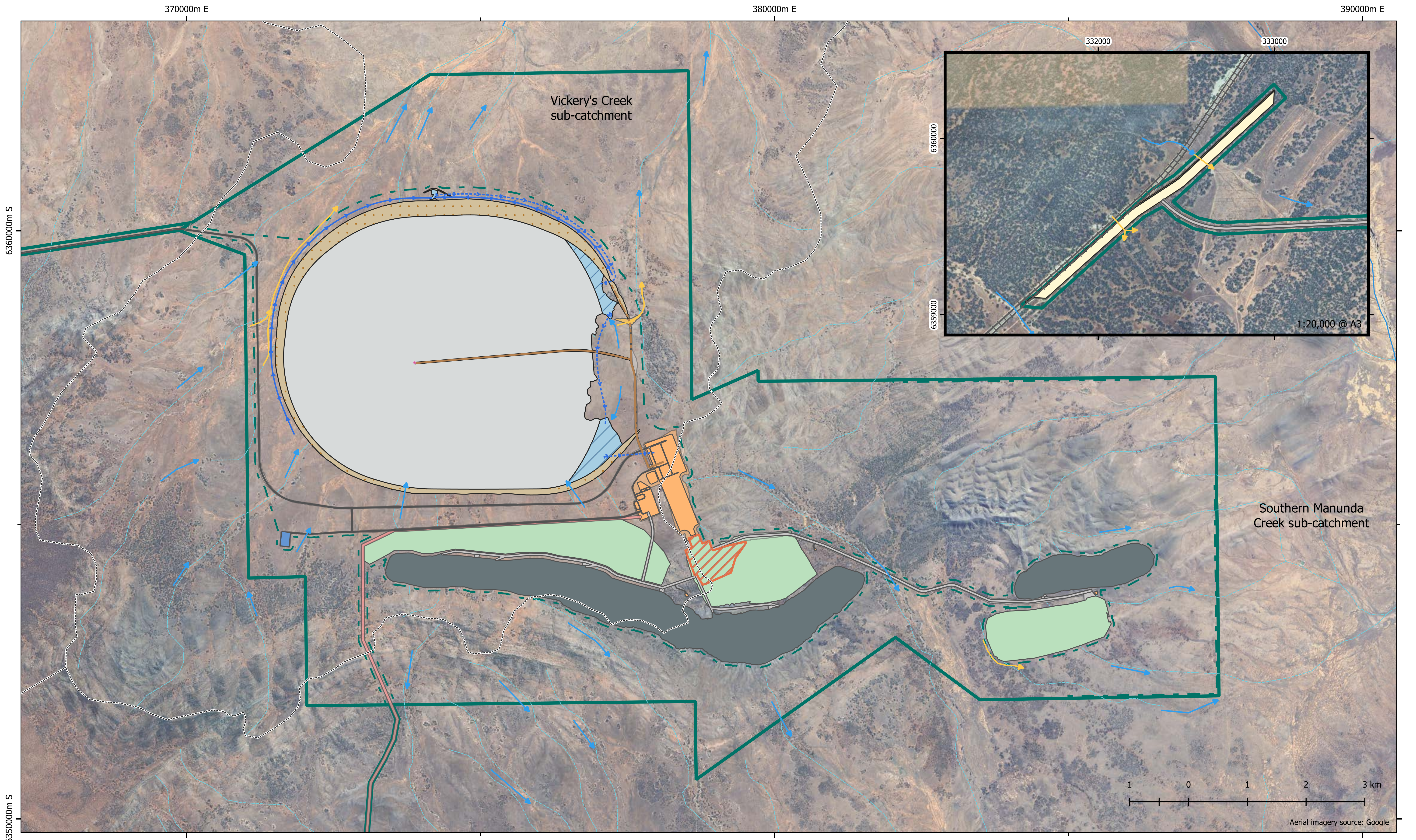

Figure 4-72: Conceptual site run-off model

Project Area
Conceptual Footprint

Watercourses
Major
Minor
Catchment head boundary

Flow direction
Surface flow
Diversion

Roads
Haul, access and other roads
Road batters

Mine and stockpile infrastructure
ROM operations area
Mine pit
Waste rock stockpile

Primary facilities
Transmission line corridor
Key facility compounds
Key facility batters
Accommodation camp

Ultimate TSF infrastructure
TSF Toe drain (with flow direction)
TSF Decant pipelines (with flow direction)
TSF Tailings slurry pipeline
TSF Coarse sand pipeline
TSF Spigot location
TSF Spigot access pier/road

TSF Reclaim pond
TSF Reclaim pond embankment
TSF Decant pond
TSF Tailings beach extent
TSF Spillway
TSF Embankment

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Table 4-52: Supporting site infrastructure and associated areas – general rehabilitation and closure strategy

Infrastructure / area	General strategy
Accommodation camp	• Services disconnected. • Portable buildings removed from site (e.g. for sale or re-use). • At-surface concrete footings and pavements broken, crushed and re-used. • Wastewater treatment plant water and biosolids removed and beneficially re-used on site. HDPE pond linings removed and disposed off-site and pond backfilled. • Wastes removed for disposal, recycling or re-use. • Areas ripped or scarified to alleviate compaction, if required. • Subsoil and topsoil (or suitable alternative growth media) reinstated and ripped into underlying surface.
Access roads, power corridors, laydown areas and other areas	• All ancillary mining consumables and equipment removed from site (e.g. for sale or re-use). • Access road surface water drainage infrastructure (e.g. pipes and culvert) removed. • Wastes removed for disposal, recycling or re-use. • Areas ripped or scarified to alleviate compaction, if required. • Soil (or suitable alternative growth media) reinstated and ripped into underlying surface and native seed applied.
Fuel and hazardous materials storages	• Services disconnected. • Surplus fuels and chemicals removed and disposed off-site per EPA requirements. • Structures demolished or removed from site (e.g. for sale or re-use). • Concrete pads and bunds broken, crushed and disposed off-site as potentially-contaminated material. • Former storage sites subject to soil sampling and testing to determine presence or absence of any site contamination. If contaminated, remedial plan implemented. • Soil (or suitable alternative growth media) reinstated and native seed applied.
TL	• System de-energised and disconnected from Bundey substation. • Poles, towers and wires removed and materials sent for resource recovery. • Transmission tower concrete pads broken, crushed and recycled. • Access and maintenance tracks scarified. • Disturbance areas revegetated to applicable end land use (e.g. cropping, pasture or native vegetation depending on future landowner requirements).
Intra-site power supply infrastructure	• System de-energised and disconnected from on-site substation. • Poles, towers and wires removed and materials sent off-site for resource recovery. • Substation removed off-site for sale, re-use or scrap.

Industrial and commercial wastes generated will be managed as per Section 4.7.

Indicative timing for rehabilitation and closure of supporting site infrastructure and associated areas is provided in Section 4.5.8.2.

4.9. Vegetation clearance

4.9.1. Description of vegetation clearance

A description of the vegetation associations present within the Project Area is provided within Section 3.8.5, whilst the area expected to be cleared resulting from the Project is shown in Section 7.3.

4.9.2. Significant Environmental Benefit (SEB)

Any native vegetation clearance in SA requires an environmental offset that provides a SEB under the NV Act and Native Vegetation Regulations 2017.

The aim of the environmental offset is to compensate for the loss of native vegetation from an approved clearance activity, hence, a SEB must provide an environmental gain over and above the impacts of any approved clearance (DEWNR, 2017). To achieve a SEB the Native Vegetation Council (NVC) can approve the establishment and management of on land native vegetation; the protection and management of existing areas of on land native vegetation; the entry into a Heritage Agreement which provides for ongoing protection of established native vegetation on land (must also be approved by the Minister); or monetary contribution / payment into the Native Vegetation Fund (NVF).

An indicative estimate of the SEB requirement for the Project has been assessed by an Accredited Consultant (ELA) based on Rangeland Assessment Method (RAM) and Biodiversity Assessment Method (BAM) sampling undertaken during the ecology surveys completed since 2020 within the Project Area. The provisional SEB calculations for clearing of vegetation on the ML and all four MPLs is summarised in Table 4-53, and shown in detail in Appendix F.

It should be noted that the calculation presented is provisional only, and will require updating for the following matters:

- The SEB estimate assumes direct impacts to native vegetation will occur to 100% of land within the Conceptual Footprint. However, only a proportion of the buffer area within the Conceptual Footprint will be cleared.
- The data points for the SEB calculation are for 85 sites which are a mixture of BAM and RAM sites with resultant variation in valuation. Precedent has shown the final calculation will likely be based on only BAM or RAM site methodology rather than a mixture of both, with resultant change to SEB points.
- The final detailed area of clearing is yet to be determined accurately (as discussed above), hence the assessment sites relevant to the vegetation loss have not been finalised, and the calculation in Table 4-53 results from an average score of all RAM and BAM sites. Once the final disturbance area is known, the score would be recalculated based on only the relevant assessment sites

Table 4-53: Provisional SEB calculations

VA	Landscape score	Vegetation Score	Conservation Score	Unit Biodiversity Score	Total Biodiversity Score	SEB points	On ground SEB (Ha)
VA1	1.11	35.96	1.07	43.13	233,477.51	233,477.51	30,567.05
VA2	1.17	36.01	1.10	46.34	65.34	65.34	8.58
VA3	1.06	36.81	1.06	41.36	779.64	779.64	102.31
VA4	1.14	40.33	1.07	49.97	19,215.76	19,215.76	2,523.31
VA5a (non-TEC)	1.13	45.10	1.09	56.30	24,976.48	24,976.48	3,316.90
VA5b (non-TEC)	1.12	38.83	1.46	63.35	911.64	911.64	125.36
VA6	1.17	44.49	1.10	57.26	0.00	0.00	0.00
VA7	1.17	39.84	1.07	50.12	12,908.94	12,908.94	1,693.38
Proposed impact area		**6,533.14**					

It should be noted that the valuation methodology for SEB was updated by NVC in late in 2024. Table 4-53 has not been updated using the new valuation methodology (in effect as of 1 January 2025) as the area of each VA cleared will be refined in 2025 (as discussed above). When the final clearance area is known, the SEB will be re-calculated using the new methodology for use in the PEPR documentation, and for submission to NVC.

Once the valuation of the SEB is more accurately known, a decision will be made as to whether the SEB is provided via land-based or financial offsets.

4.10. Completion

This Section contains summary information on Project completion and closure. A comprehensive MCP has been developed and is included as Appendix L. The plan includes closure outcomes for the project, these are presented and discussed in further detail in Chapter 7.

4.10.1. Description of site at completion

It is intended to rehabilitate all disturbed areas consistent with the original pre-mining / pre-disturbance land use, except for the pits which will be remain as remnant voids with pit lakes.

Figure 4-73 presents an indicative post-closure scenario for the ML, reflective of:

- natural land profiles not disturbed
- the potential land uses by area (as described in Section 4.10.4)
- anticipated final landforms (as described in Section 4.10.5)
- infrastructure to remain (as described in Section 4.10.6.1)
- conceptual vegetation cover types (as described in Section 4.10.6.2)
- the location of residual hazardous materials (as described in Section 4.10.6.3).

A visual render of the post-closure scenario is presented in Figure 4-74 and a cross-section in Appendix M.

4.10.2. Rehabilitation strategies

General rehabilitation strategies for key project areas and features are provided in previous Sections:

• Mining features and facilities.	Section 4.5.8
• Crushing, griding and processing infrastructure / area.	Section 4.6.7
• Key waste facilities (WRDs and TSF).	Section 4.7.6
• Supporting infrastructure and areas.	Section 4.8.11

It is estimated that the maximum area of land disturbed by proposed mining operations at any time during the LOM is at around Year 38, with 4,870 ha of proposed disturbance. This is equivalent to ~ 92.7% of the Project’s total disturbance profile. It is noted that this includes all active disturbance areas at that time, being the RS, HR, TL, TSF, Razorback pit and WRDs, ROM pad process plant, NPI area, accommodation camp, other minor facilities, access roads, ML fences and an allocation for stockpiles within the HR corridor.

For clarity, this figure does not include Iron Peak pit, WRD and HR, as well as the Hillgrange and TL construction laydown areas, given these are proposed to be rehabilitated and closed prior to Year 38.

This is a conservative assessment given it includes:

- the full spatial extent of pit development at Razorback, which is considered unlikely based on current mine planning
- the full TL area as being disturbed, even though disturbance of this extent arising from construction activities is considered improbable.

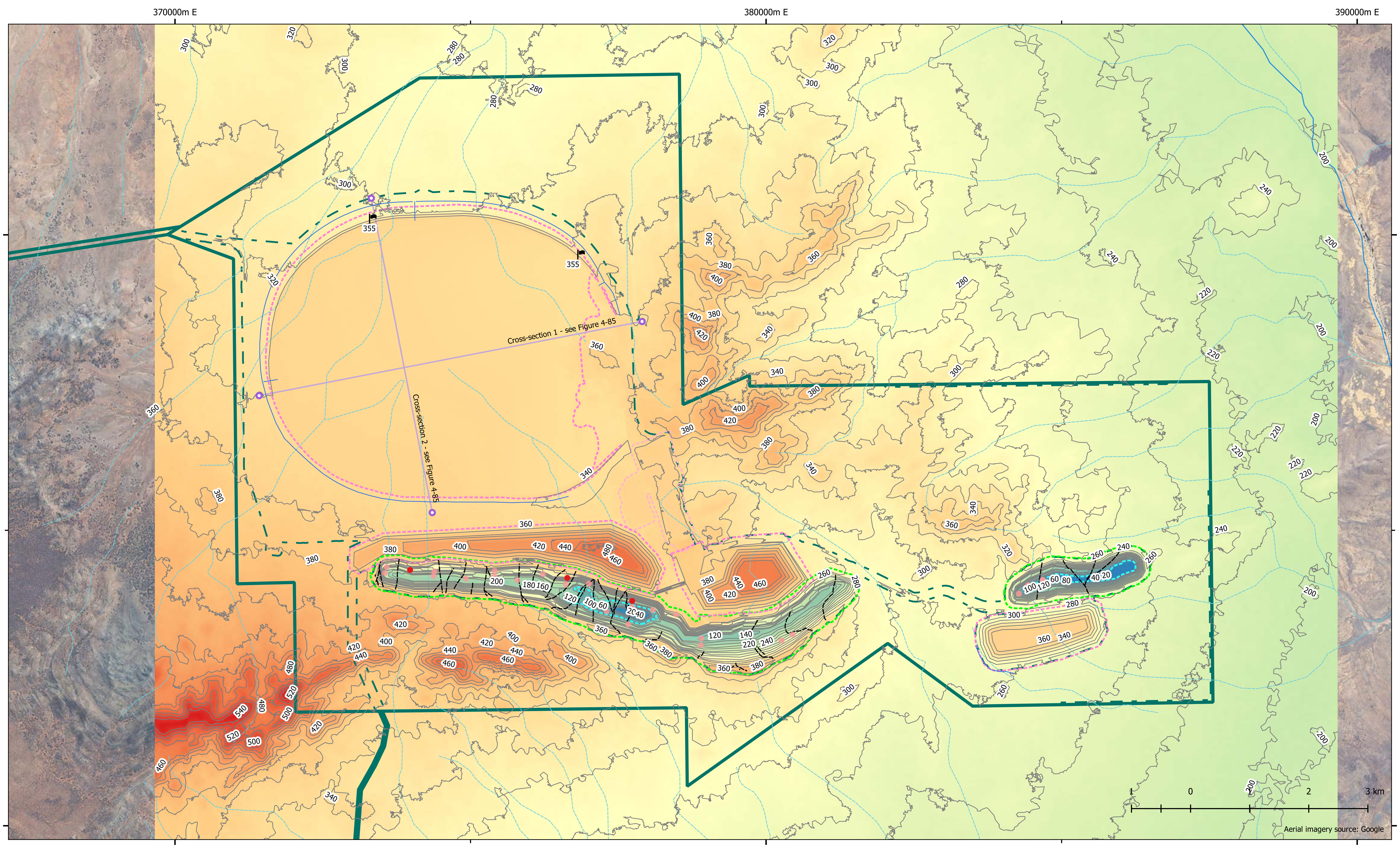

Figure 4-73: Indicative post-closure/relinquishment condition, ML

Project Area
Conceptual Footprint
(note: areas outside of the conceptual footprint are considered undisturbed, natural land profiles)

Watercourses
Major
Minor

Remaining infrastructure
Drainage infrastructure (S. 4.10.7.4)

Anticipated final landforms
Void
New landform
Minor residual landform

Anticipated final groundwater state
Pit lake levels (steady)

Potential residual hazardous materials
Faults (clipped to voids)
Sulfur occurrences - >3.5 wt% (low-moderate risk)
Sulfur occurrences - 1 to 3.5 wt% (low risk)

Final landform elevation
m AHD
566.123077
0

Contours
Derived countours (10 m)
Selected spot heights

TSF cross-sections
TSF cross-section location
TSF cross-section end points

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Author: A Kane | Date: 28/02/2025
Razorback MLP/Referral

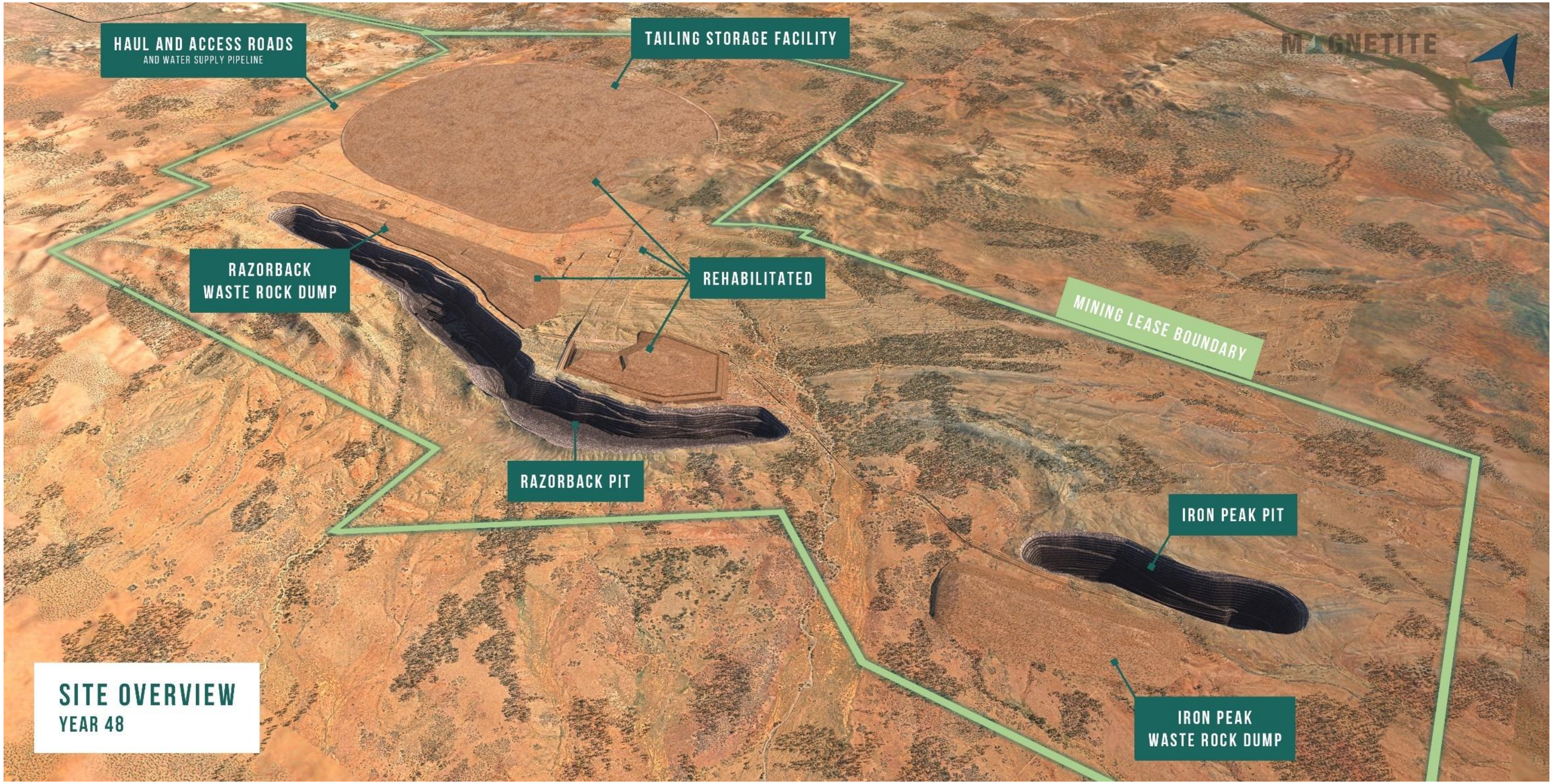

Figure 4-74: Visual render of the indicative post-closure/relinquishment condition, ML

4.10.3. Closure domains

Several closure domains are proposed for the Project Area, as presented in Table 4-54 and Figure 4-75.

Closure domains and sub-domains are used to group post-mining areas and features with similar characteristics, and thus similar rehabilitation and closure requirements, providing a framework for efficient closure planning and execution.

Table 4-54: Closure domains and sub-domains

Domain	Sub-domain	Domain ID	Description
Pits	Razorback Pit	P01	Mined pits – to remain as voids (pit lakes)
	Iron Peak Pit	P02	
WRD	Razorback WRD	WD01	Waste rock dumps developed during mining phase – to remain as novel post-mining landforms
	Iron Peak WRD	WD02	
TSF	-	T01	The CTD-TSF developed during mining phase – to remain as a novel post-mining landform
Infrastructure	Infrastructure (Site)	IN01	Includes: • Crushing, grinding and processing plant. • Explosives magazine. • Supporting surface infrastructure: o Accommodation camp. o WWTP. o Administration offices. o Vehicle parking areas. o Fuel and hazardous materials storage facilities. o Vehicle wash bays. o Tyre change / storage facility o Laydown yards. o Workshops and warehouses. o Water holding ponds. o Water treatment and reticulation systems (e.g. pump stations, water storage tanks, standpipes, water filtration systems and pipelines). Electrical infrastructure (e.g. site substation and intra-site distribution lines)
	Infrastructure (Hillgrange RS)	IN02	Includes: • Demountable administration offices, storage sheds and ablutions, hardstand. • Rail spur.
HR	-	HR01	Includes: • Mine site internal access roads. • Main site access and RS connecting the Hillgrange RS[1].
TL	-	TL01	TL connecting the Site to the Bundey substation.

1. EXCLUDES COUNCIL OWNED ROADS PROPOSED TO BE UPGRADED AND MAINTAINED BY MGT (RUCIOCH AND CROCKER ROADS) DURING OPERATIONS UNDER THE TERMS OF A MEMORANDUM OF UNDERSTANDING (MOU) THAT WILL REMAIN AS COUNCIL ROADS.

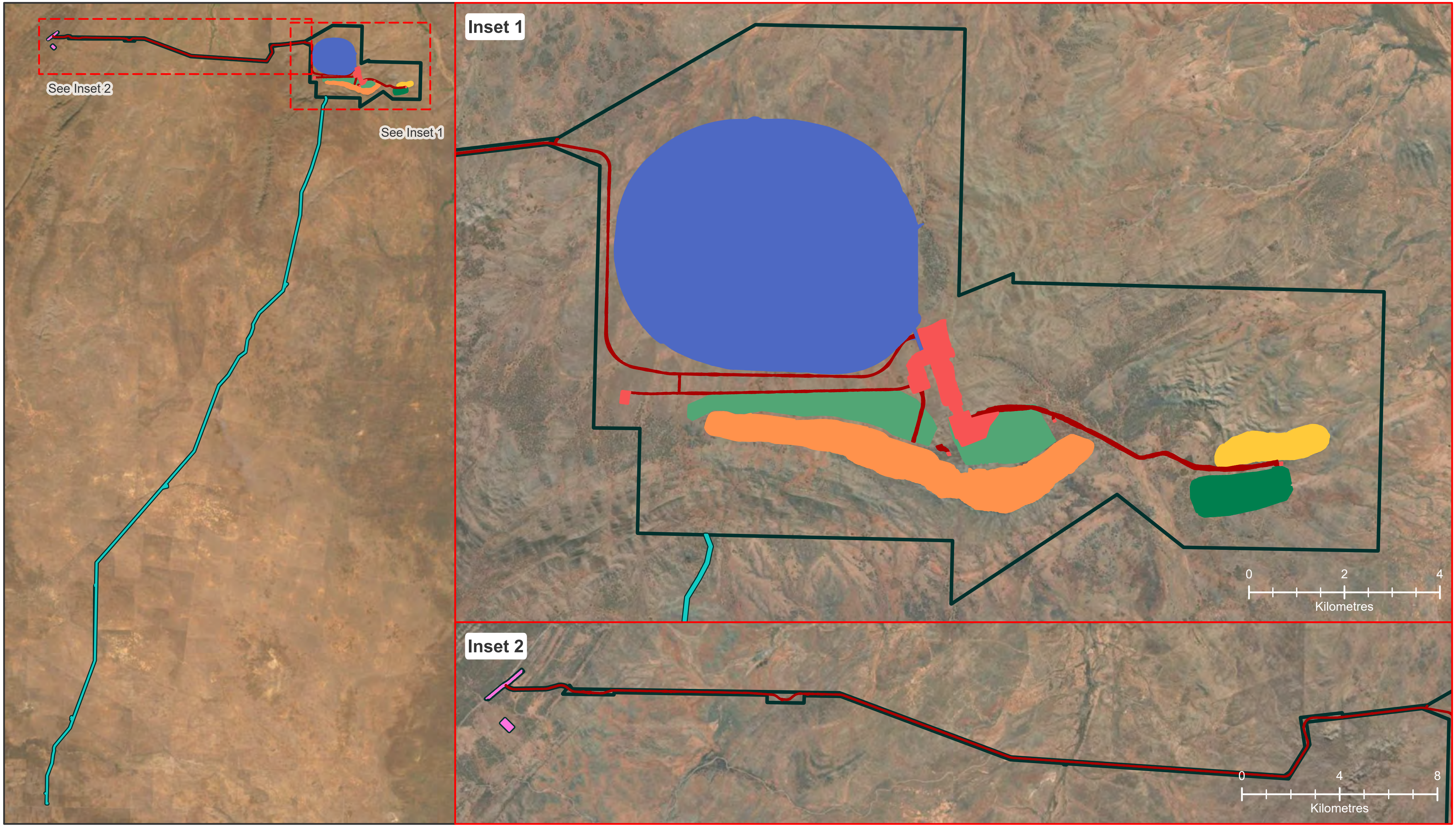

Figure 4-75: Closure domains

4.10.4. Post-mining land uses

The nominated post-mining land uses (PMLUs), by domain, are listed in Table 4-55 and shown in Figure 4-81–Figure 4-84.

Most disturbance areas and new post-mining landforms (e.g. WRDs, TSF) will be rehabilitated to native vegetation systems consistent with the pre-mining land use (ecological and low-intensity pastoral / rangeland grazing uses) and to provide improved long-term visual amenity outcomes.

The mined pits will be left as voids forming pit lakes. As noted in Section 4.5.10, no backfilling of pits with waste rock is proposed given this is not economically viable and would result in the sterilisation of un-mined ore that exists both laterally and vertically beyond the proposed pit shells. No ongoing rehabilitation intervention is proposed post-closure given that adverse impacts on receptors or groundwater beneficial uses is unlikely (Section 4.10.2).

The southern-most portion of the TL corridor intersects and will be returned to an agricultural land use, either cropping or grazing, based on future consultation with relevant landowners.

Table 4-55: Post mining land uses by closure domain

Post-mining land use (PMLU)	Applicable Domains
Remnant voids (pit lakes)	P01 – Razorback Pit P02 – Iron Peak Pit
Native vegetation (ecological and pastoral)	HR01 – Haul roads IN01 – Infrastructure (Site) IN02 – Infrastructure (Hillgrange RS) T01 – Tailings storage facility TL01 – Transmission Line WD01 – Razorback waste rock dump WD02 – Iron Peak waste rock dump
Agriculture (cropping and / or grazing)	TL01 – Transmission Line

Novel post-mining land uses with a higher commercial value, such as the establishment of a renewable energy hub, are unlikely to be viable in the long term due to the remote location.

As discussed elsewhere, it is proposed that all redundant infrastructure will be decommissioned, demolished and removed from site. Selected infrastructure may, however, be retained where it supports the PMLUs (for example roads, culverts, water bores and sheds) and subject to formal agreement with the relevant landowner or land manager. Where this occurs, the infrastructure will be certified as safe and the asset transferred through legal agreement, including waiver in favour of MGT for any ongoing liability.

4.10.5. Final landforms

4.10.5.1. Final voids

The configuration of the final voids are as previously represented in Section 4.5.8.1 (final pit geometry at completion of the Iron Peak and Razorback pit development sequence).

Representative cross-sections of final pit void forms are provided for Iron Peak in Figure 4-76 and Figure 4-77, and for Razorback in Figure 4-78 – Figure 4-80.

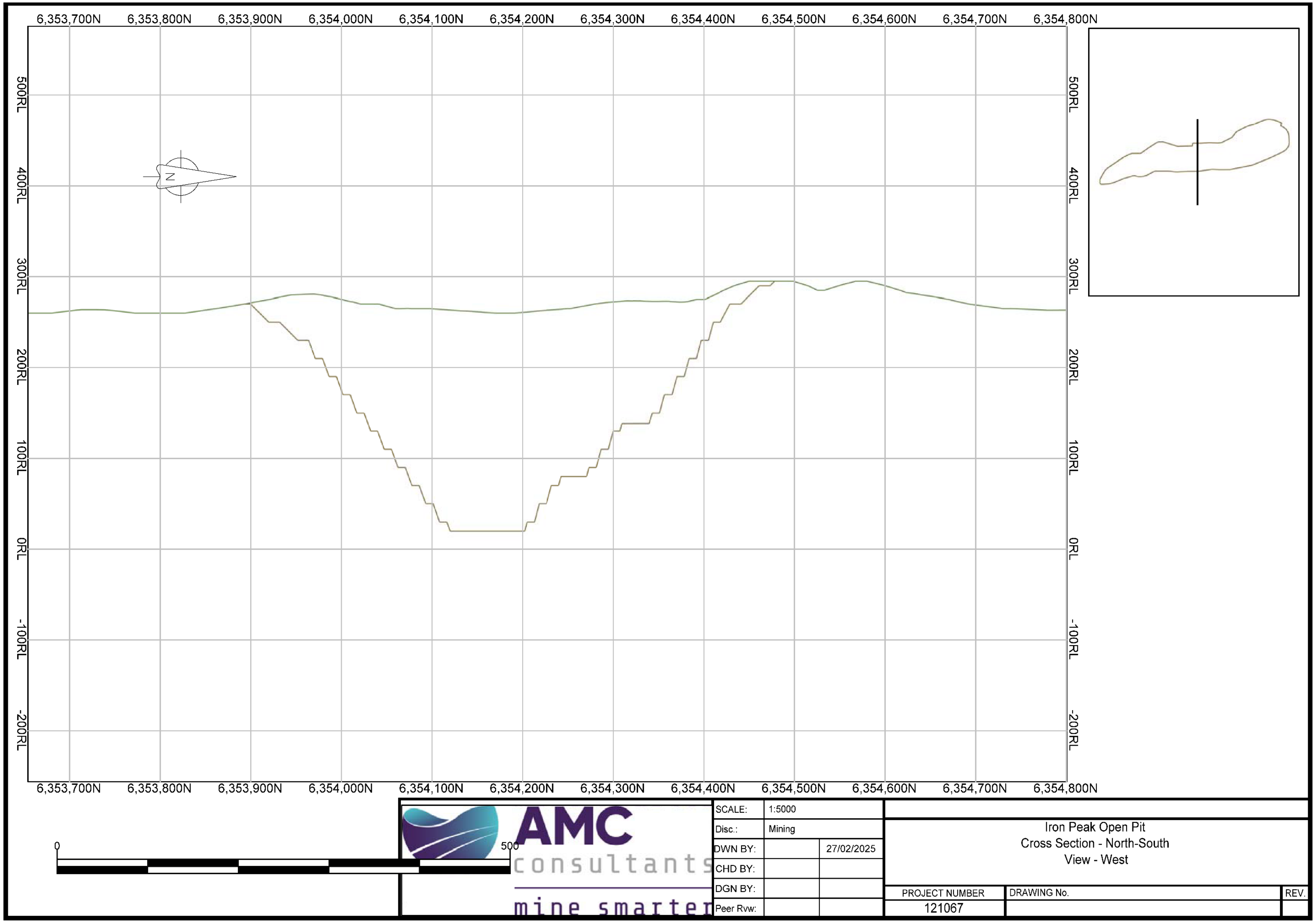

Figure 4-76: Iron Peak pit cross-section, north-south position

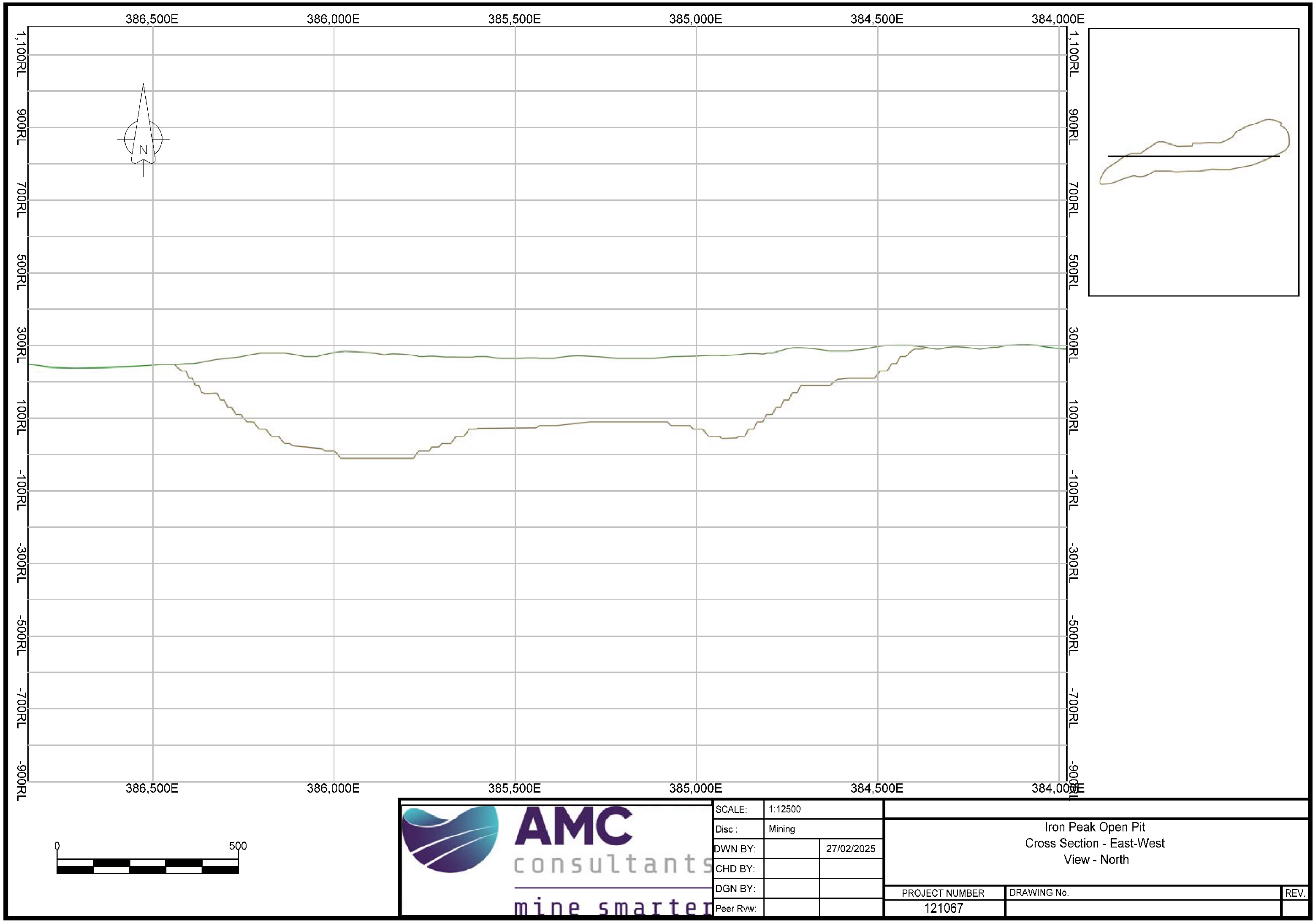

Figure 4-77: Iron Peak pit cross-section, east west position

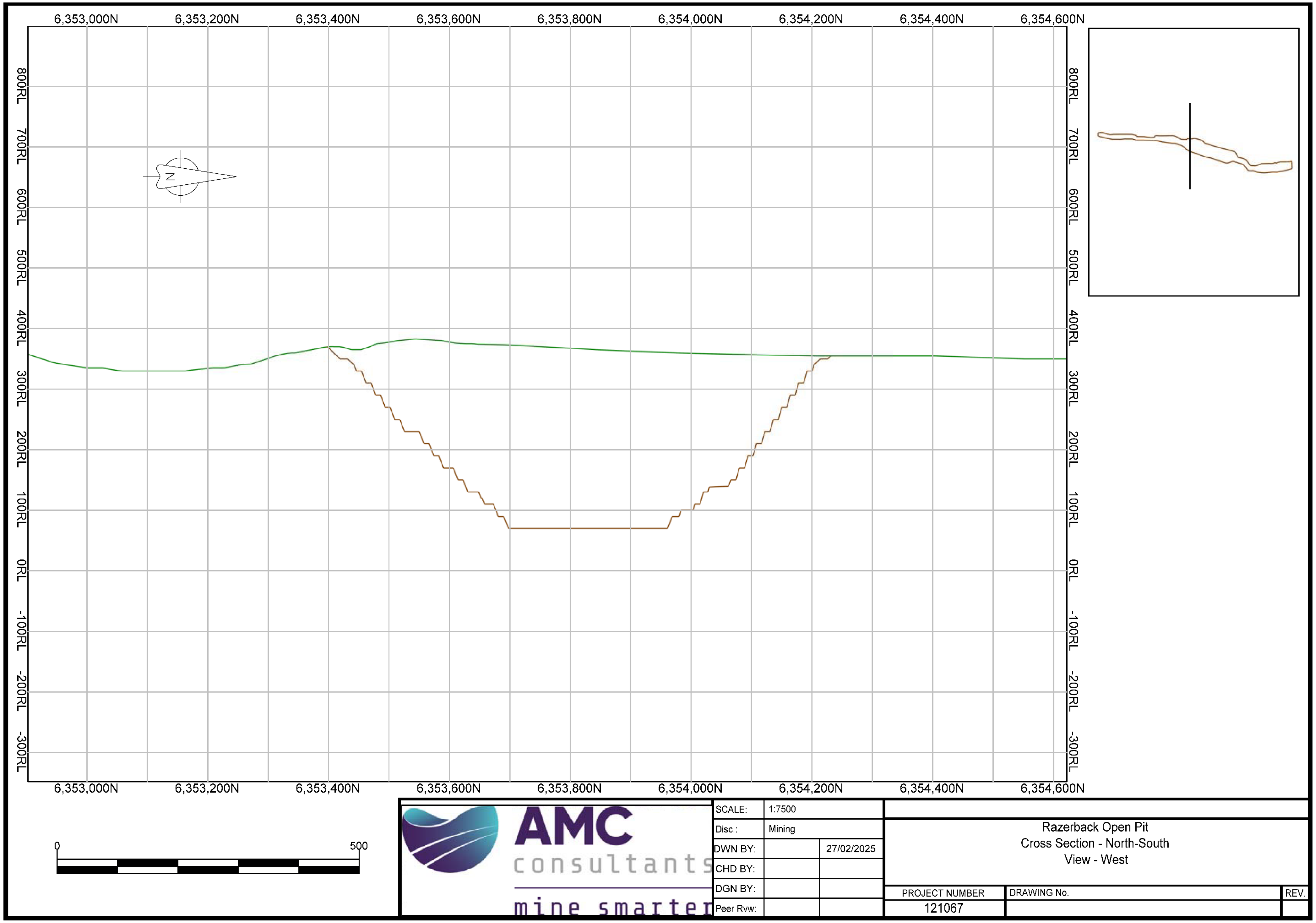

Figure 4-78: Razorback pit cross-section, north-south position

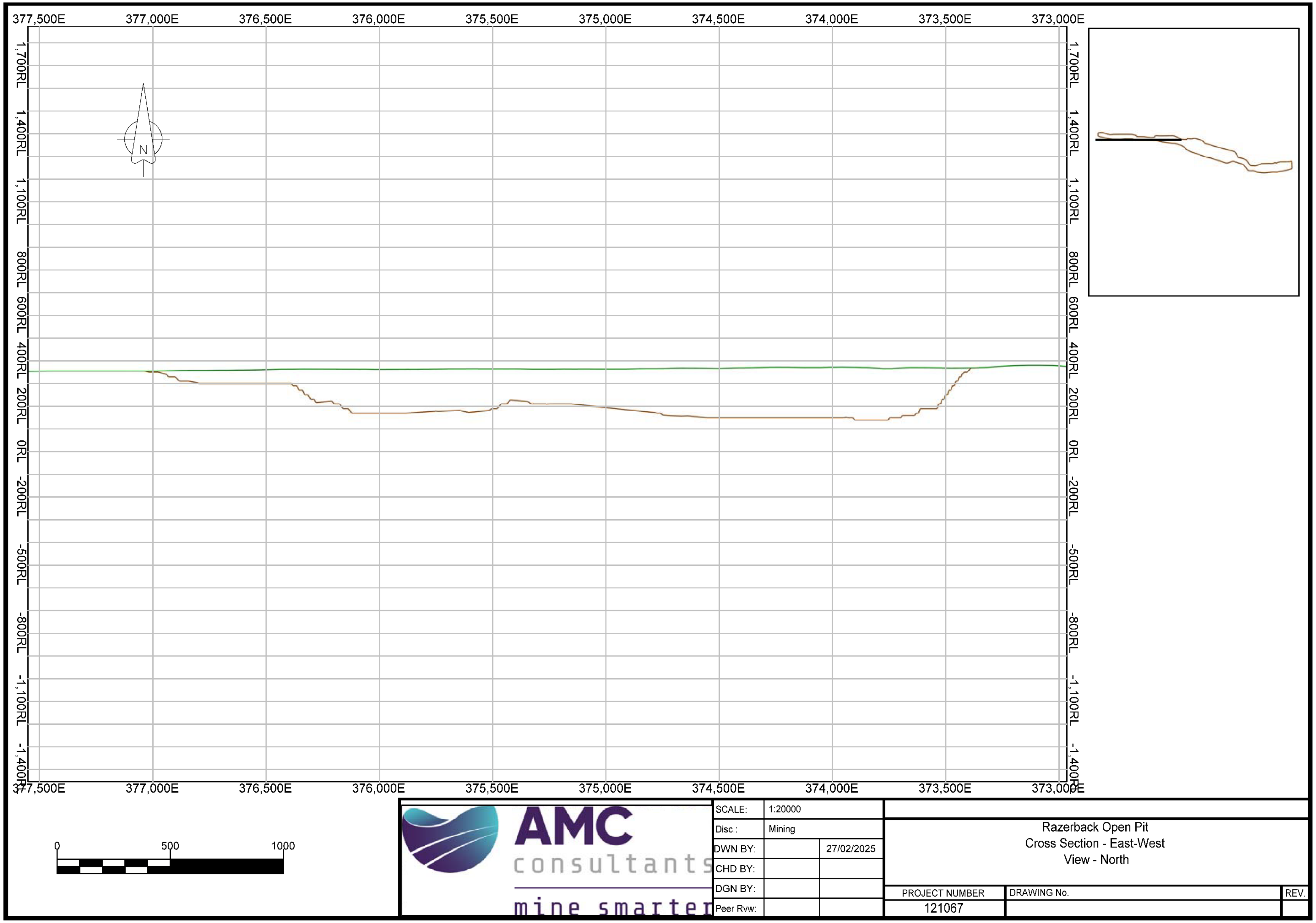

Figure 4-79: Razorback pit cross-section, east-west position (western sector)

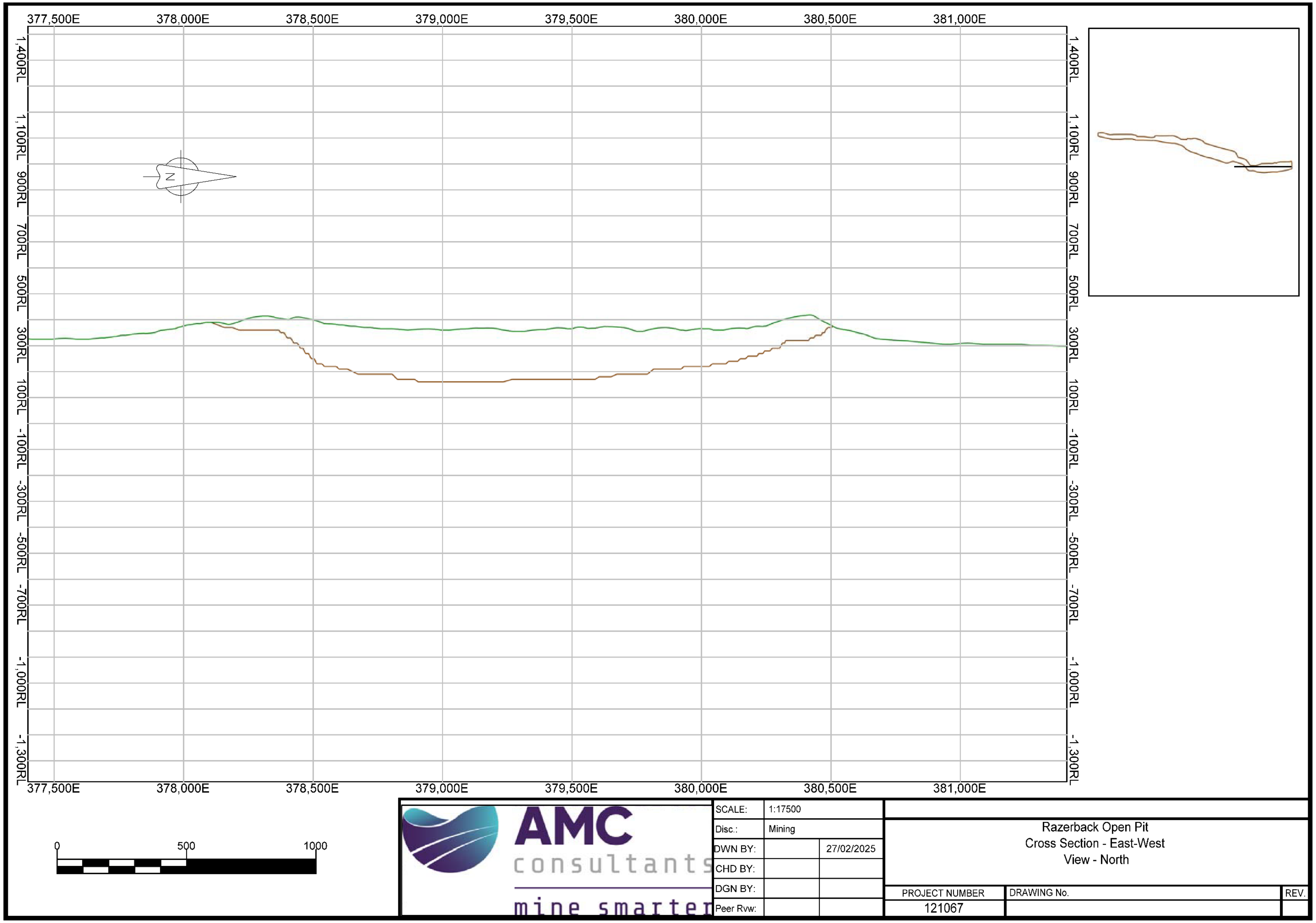

Figure 4-80: Razorback pit cross-section, east-west position (eastern sector)

4.10.5.2. Waste rock landforms

Concept designs and representative cross-sections for the Razorback and Iron Peak final WRDs are provided in Figure 4-81– Figure 4-84. It is noted that the green line is the existing ground surface elevation, while the grey line is the post closure WRD landform elevation.

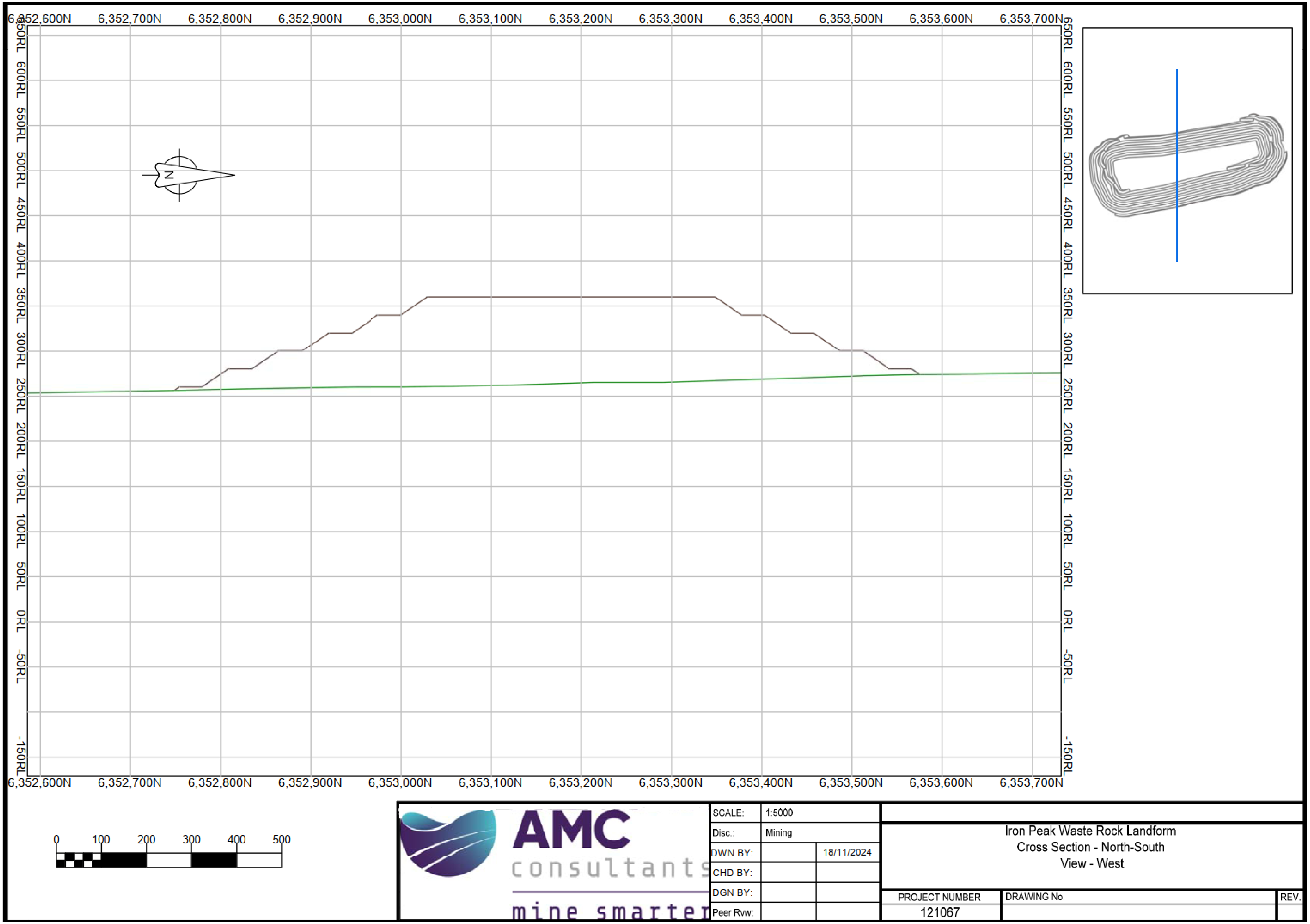

Figure 4-81: Iron Peak concept final waste rock landform – representative north-south cross-section

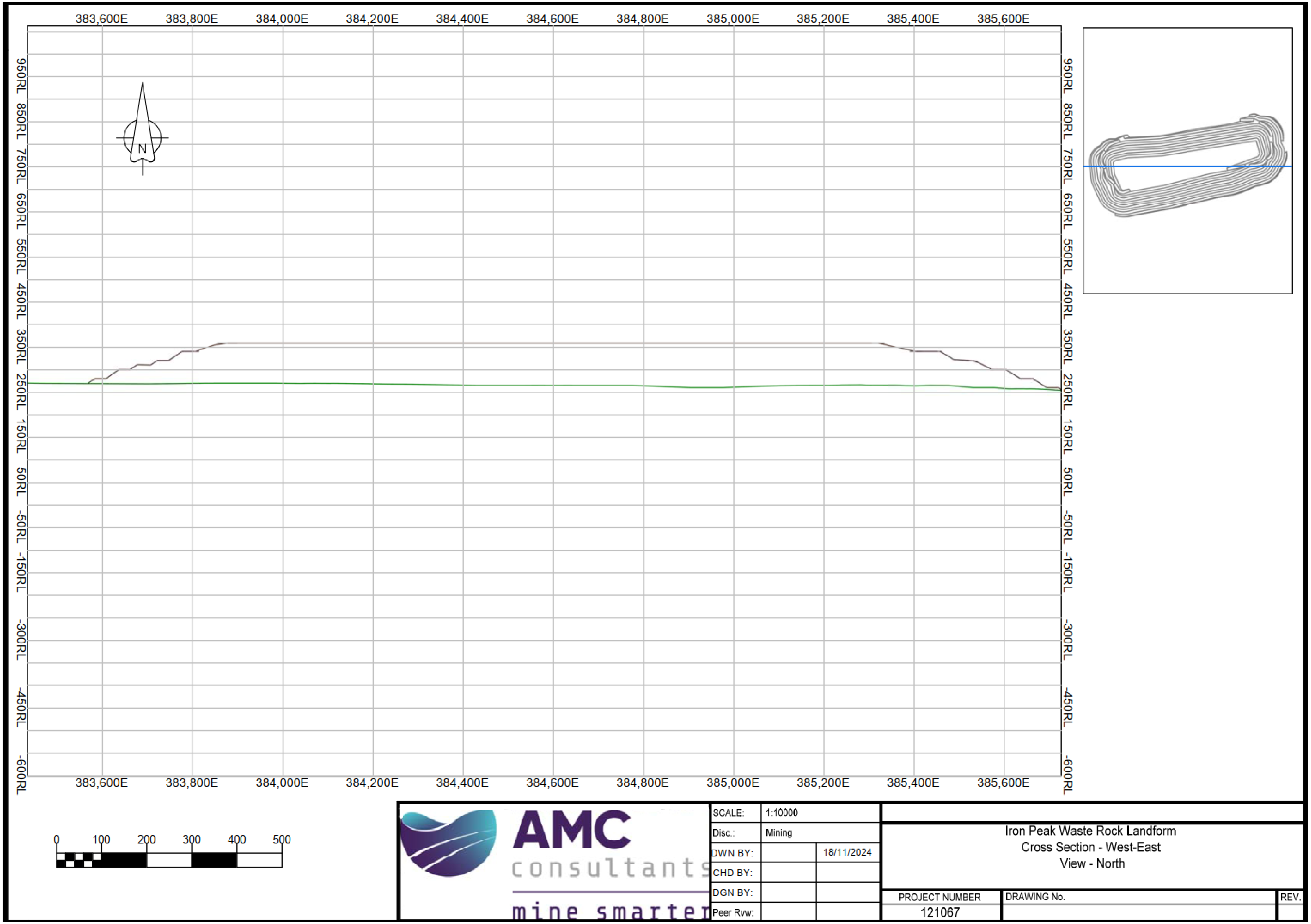

Figure 4-82: Iron Peak concept final waste rock landform – representative east-west cross-section

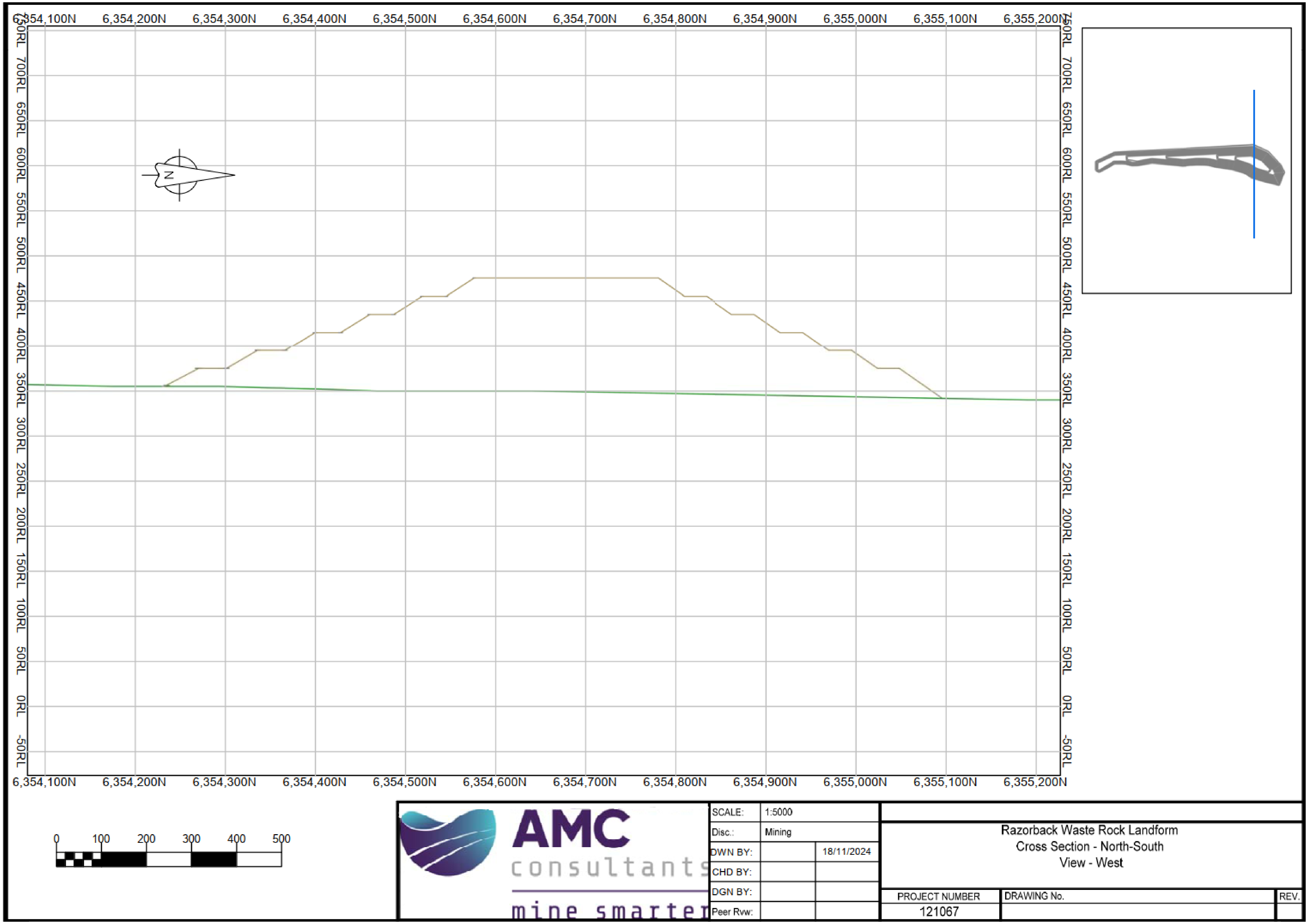

Figure 4-83: Razorback concept final waste rock landform – representative north-south cross-section

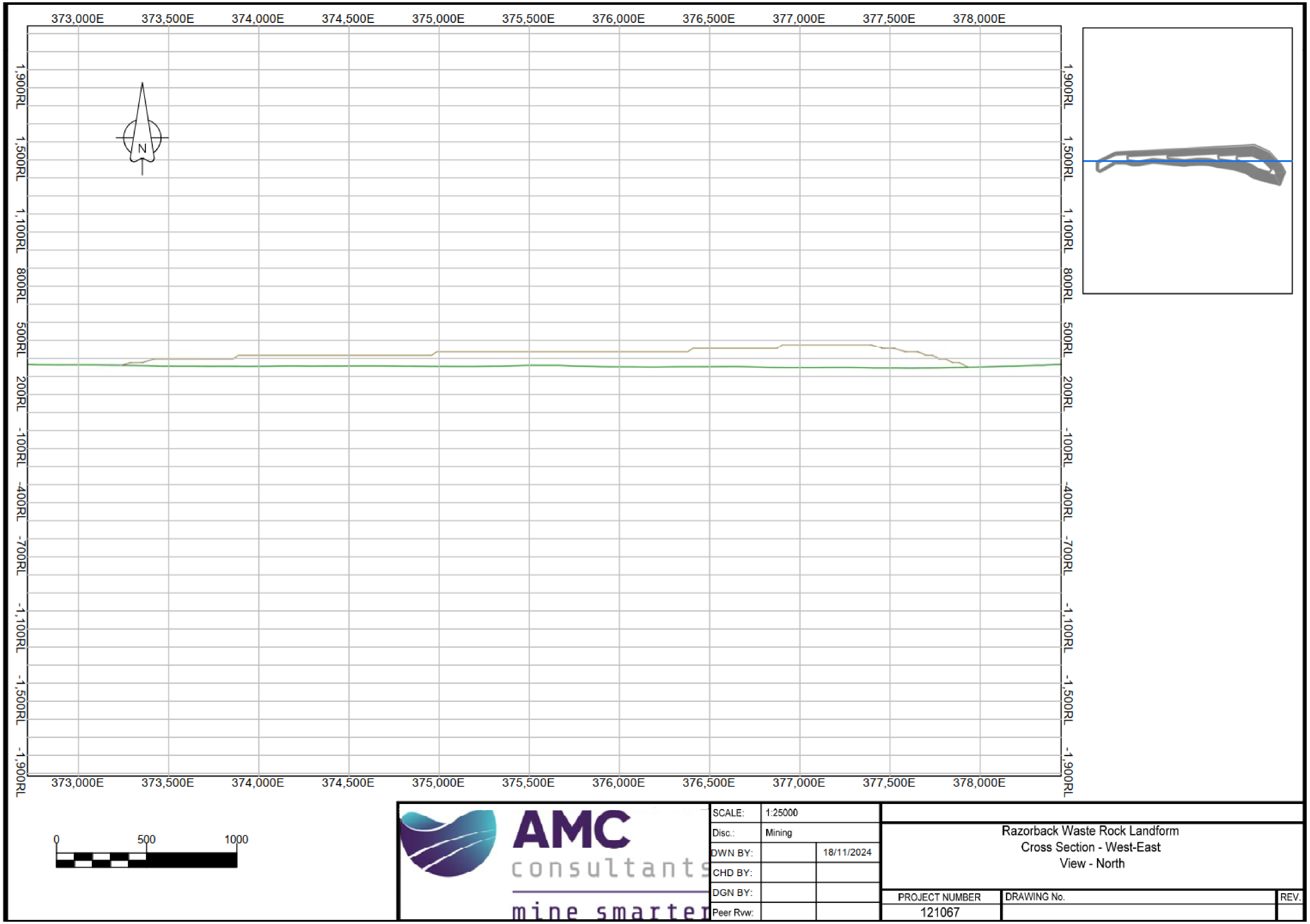

Figure 4-84: Razorback concept final waste rock landform – representative east-west cross-section

4.10.5.3. Tailings storage facility

Concept designs and cross-sections for the TSF final landform are provided in Figure 4-85. The location of the cross-sections are presented in Figure 4-73.

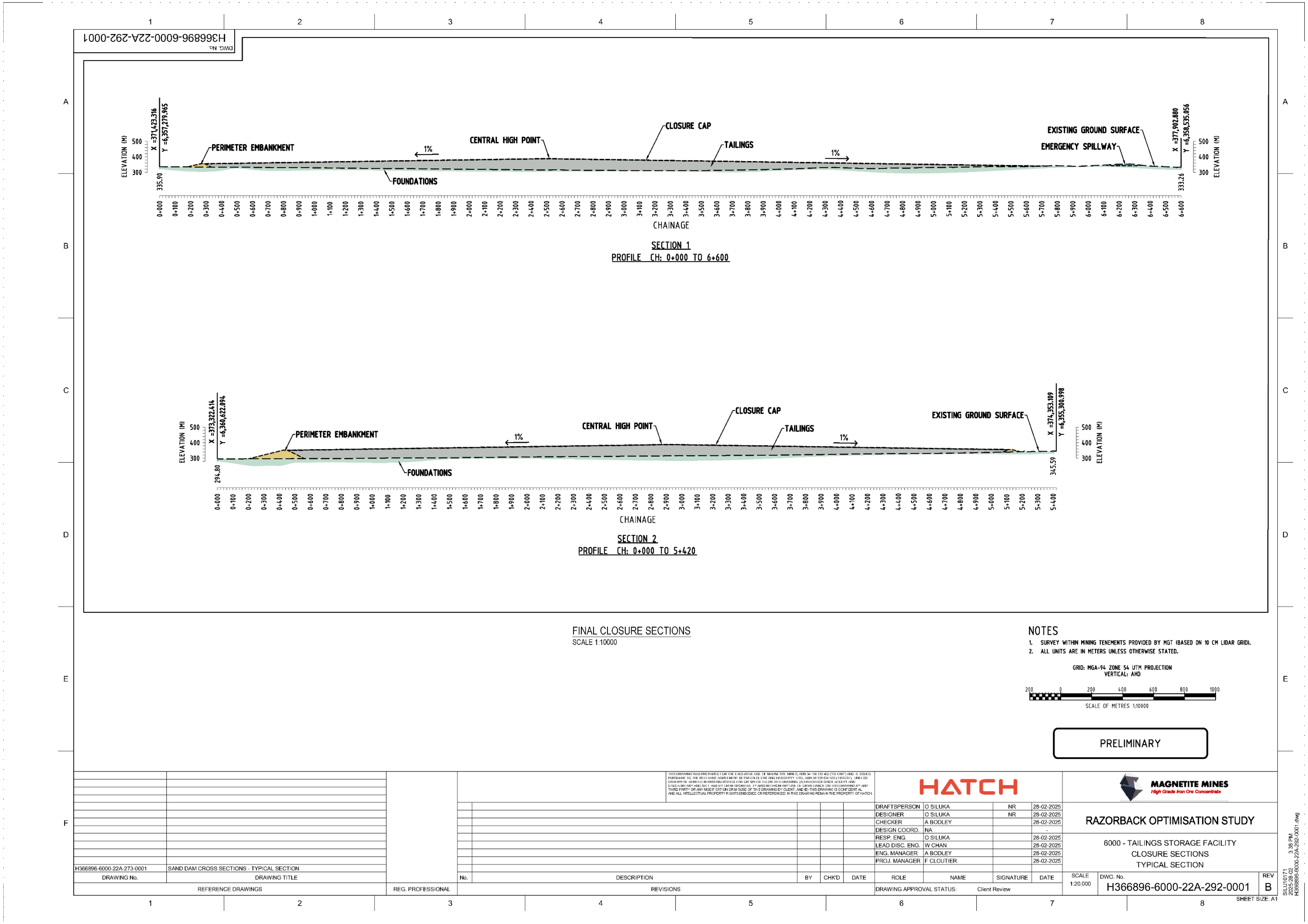

Figure 4-85: TSF post-closure landform – representative cross-sections

4.10.6. Other closure factors

4.10.6.1. Infrastructure to remain

Based on the intended PMLUs, there are very limited opportunities to transfer ownership and use of Project infrastructure to existing or future landowners; as such, there is no specific intention on behalf of MGT to seek such options with infrastructure to be decommissioned as per previous descriptions. As part of the decommissioning process, footings, piles and similar foundation infrastructure will be removed to below ground surface and will remain buried on site; it is not expected to impact intended land uses or the environment.

It is anticipated that some landowners may be interested in retaining access to or use of some infrastructure developed pursuant to Project approvals. This may include:

- access roads / tracks, for the purpose of access within properties (and this is prudent for future land uses, including pastoral)
- fences, gates and / or grids – for pastoral applications
- accommodation, office, workshop or associated small-scale structures – of scale to pastoral applications for landowner use and amenity.

Where such requests are made, MGT will consider these on a case-by-case basis and identify suitable processes to enable the transfer in accordance with tenement conditions and other relevant Acts (i.e., prevailing legislation for pastoral activities).

4.10.6.2. Proposed vegetation covers

At this early stage of Project planning, vegetation cover types to be deployed through rehabilitation activities has not been determined; relevant research will be undertaken across the LOM to better understand the parameters leading to successful revegetation of the Project Area, considerate of growth media, rainfall, assemblage, seedstock availability and other factors.

Much of the disturbance area within the ML is located within VA1 (*Maireana sedifolia* +/- *Maireana pyramidata* low open grassy shrubland), with some representation of VA4, VA5 and VA7. VA4 is commonly associated with areas of moderate ruggedness off the northern and southern flanks of the ranges, while VA7 is coincident with drainage channels over flat country.

It is expected that vegetation covers within the Project Area will reflect the former or adjacent vegetation cover types; therefore, it is reasonable to assume that vegetation covers will resemble those open shrublands currently dominant in the area, with *Maireana* and *Eremophila* representation. Options for open mallee and casuarina woodlands will be assessed further.

High-level, conceptual options for vegetation cover types within disturbed areas are provided in Figure 4-73.

4.10.6.3. Residual hazardous materials matters

MGT has assessed for residual hazardous material issues that may be relevant within the post-closure period. The presence and nature of sulfides and acid-forming potential is described in Sections 0 and 3.5.4; while considered low risk given the ANC of the host ore / rock and the other controls proposed within this MLP. The location of potential in-situ PAF material and indicative location of potential PAF waste rock is included in Figure 4-73.

4.10.6.4. Surface water management

The intended management outcome for surface water during closure planning is based on achieving a steady-state system that mimics the hydrological system of the area, that being characterised as a semi-arid environment with an ephemeral flow regime that generally only runs during times of large rainfall and flood events.

As the pits are at the head of their respective sub catchments, it is not expected that they will receive from or deport to catchment surface waters. The TSF marks the major landform feature altering surface water flows within the ML. The TSF design has been optimised to reduce retention of surface water and support drainage via a series of contoured channels, perimeter drains and batters, after which the surface water enters the Vickery's Creek sub catchment via an intermediate detention basin (to assess water quality before discharge). Additionally, drainage features on the western side of the TSF are intercepted by the TSF embankment; a diversion channel, installed in the operations phase, will be maintained to enable water to flow around the TSF and into the lower reaches of the sub catchment. Surface waters will also be drained from other residual landforms, such as the WRDs, back towards natural drainage outlets.

These approaches assume achievement of surface water quality requirements prior to release. Additional controls will be implemented should interim water qualities not meet requirements.

It is expected that closure and rehabilitation of the HR, RS and TL will result in the removal of installed surface water infrastructure (culverts, pipes) to reinstate original flow dynamics. Bank stabilisation measures will be incorporated to reduce erosion and sedimentation risks in these areas.

Figure 4-86 demonstrates the conceptual flow regime in the post-closure phase. The original (pre-mining) flow regimes are also demarcated as minor drainage channels.

4.10.6.5. Transfer of residual liabilities subsequent to tenement surrender

The land on which the Iron Peak mine pit void and the Iron Peak WRD are located sits within the Manunda pastoral lease. The land will be returned to the pastoral lease holder at the completion of the Project's closure phase and after surrender of the tenement. Based on current mine planning, it is anticipated that closure of the Iron Peak area will occur by Mining Year 26, with full Project closure complete by Year 50. Early relinquishment of the Iron Peak area will be considered in consultation with the pastoral lease holder and DEM. Where material land management / maintenance programs are required post-relinquishment (i.e., it has been determined that there will be a residual liability) and are considered above general land management practices for pastoral land uses, MGT may negotiate a resourcing agreement to support the pastoral lease holder to undertake necessary works for an agreed period of time. The use of the Mining Rehabilitation Fund under Section 62AA of the Mining Act will also be considered at time of relinquishment.

It is the intention of MGT to purchase the residual balance of the ML area, thus providing the opportunity to manage any residual liabilities associated with the former operations or to covenant any ongoing monitoring and management requires with a subsequent owner in accordance with good management principles.

Given the lower-impact profile associated with activities in the HR, RS and TL, it is not expected that ongoing material monitoring and management activities are going to be required; however, where such a scenario is validated, MGT will aim to negotiate a resourcing agreement to support the property owner to undertake necessary minor works for an agreed period of time. As noted previously, the Mining Rehabilitation Fund may also be considered as a mechanism for reserving resources to undertake more complex or sustained management activities.

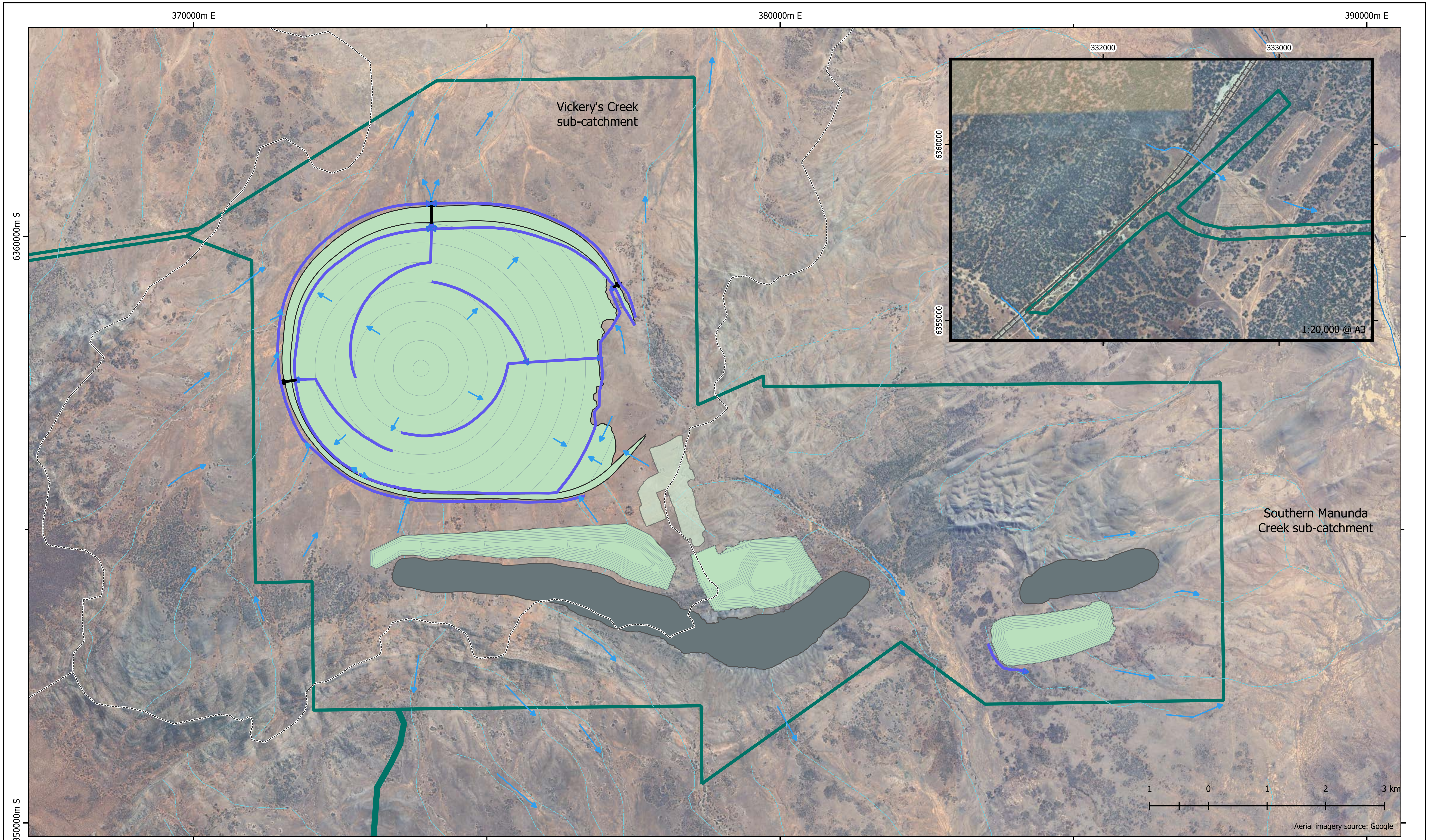

Figure 4-86: Post-closure surface water systems, ML and RS

Project Area	Watercourses	Mine and stockpile infrastructure	Surface water infrastructure at full closure
	Major	Mine pit void	Batter chute
	Minor	Residual new landform	Channel / drain
	Catchment head boundary	New landform mounding profile	Flow direction
		Other minor residual landform (potential)	

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Author: A Kane | Date: 26/02/2025
Razorback MLP/Referral

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MAGNETITE MINES

4.11. Resources Inputs

4.11.1. Workforce and local procurement

4.11.1.1. Workforce operation and job creation

The mine operations workforce would be variable over LOM, comprising an average of 445 people, with up to 280 people on site at any one time. Approximately 20-30% would be from local and regional communities. The operations workforce will also span part of the construction phase (operations readiness) and the post-mining rehabilitation and closure phase.

The workforce will operate primarily on a FIFO basis from Adelaide to Peterborough with connecting buses to/from Site, and DIDO for local personnel. Construction and operations personnel will be housed within the various temporary construction camps, and the permanent on-site accommodation camp, as described in Section 4.8.5.

An indicative breakdown of the operations phases site workforce, by role type, is provided in Table 4-56.

Table 4-56: Indicative workforce breakdown by role type

Role	People per shift	Day / night	No. of shifts	Total of people
Processing personnel (78)				
Superintendent – Processing Plant	1	D	1	1
Senior Metallurgist	1	D	1	1
Metallurgist	1	D/N	4	4
Training Officer	1	D	1	1
Shift Supervisor – Processing Plant	1	D/N	4	4
Control Room Operators	1	D/N	4	4
Maintenance Planner	1	D	1	1
Lubrication Technician	2	D/N	4	8
Process, Control & Reliability Engineer	1	D	2	2
Maintenance Engineer	1	D	2	2
Electrical Engineer	1	D	2	2
Instrument Technician	1	D/N	4	4
Mechanic and Electrical Fitters	3	D/N	4	12
Electricians	2	D/N	4	8
Boilermaker and Welders	3	D/N	4	12
Trade Assistants	3	D/N	4	12
Processing area operators (64)				
Primary & Secondary Crushing	1	D/N	4	4
HPGR Circuit & Air Classification	2	D/N	4	8
Secondary & Ultrafine Grinding	3	D/N	4	12
Filtration & Tailings	3	D/N	4	12
Samplers	3	D/N	4	12
Laboratory Supervisor	1	D	2	2

Role	People per shift	Day / night	No. of shifts	Total of people
Laboratory Technician	2	D/N	4	8
Day Crew	3	D	2	6
Management, administration and support (10)				
General Manager	1	D	1	1
Site Manager	1	D	2	2
Office Administrator	1	D	2	2
Finance & Administration Manager	1	D	1	1
Supply & Logistics Superintendent	1	D	1	1
Store person	1	D	2	2
Information Technology (IT)	1	D	1	1
Mining and technical services (17)				
Manager	1	D	1	1
Pit Supervisor	1	D/N	4	4
Admin Assistant	1	D	2	2
Training Coordinator	1	D2	1	1
Technical Services Manager	1	D	1	1
Long-Term Planner	1	D	1	1
Short-Term Planner	1	D	1	1
D&B Engineer	1	D	1	1
Pit Geologist	1	D	2	2
Resource Geologist	1	D	1	1
Surveyor	1	D	2	2
Maintenance operations (38)				
Maintenance Manager	1	D	1	1
Maintenance Supervisor	1	D/N	4	4
Reliability Engineer	1	D	1	1
Graduate Engineer	1	D	1	1
Warehouse Officer	1	D	1	1
Stores Assistant	1	DAY	2	2
Service Bay Fitter	1	D/N	4	4
Field Fitter	1	D/N	4	4
Long Term Fitter	1	D/N	4	4
Boilermaker	1	D/N	4	4
Electrician	1	D/N	4	4
Auto Electrician	1	D/N	4	4
Trades Assistant	1	D/N	4	4
Mining (148)				
Excavator operator	3	D/N	4	12

Role	People per shift	Day / night	No. of shifts	Total of people
Dozer operator	5	D/N	4	20
Rear Dump operator	15	D/N	4	60
Ancillary operator	4	D/N	4	16
Wheel Loader operator	3	D/N	4	12
Pump Crew	2	D	2	4
Driller	3	D/N	4	12
Drill Fitter	1	D	2	2
Drill & Blast Supervisor	1	D	2	2
MMU Operator & Bench Hand	3	D	2	6
Blast Crew Fitter	1	D	2	2
HSE and commercial services (11)				
HSE Manager	1	D	1	1
Safety Officer	1	D	2	2
OH&S Nurse	1	D	1	1
SHMS Control	1	D	1	1
Environmental Officer	1	D	1	1
Commercial Manager	1	D	1	1
Site Accountant	1	D	1	1
Contracts Manager	1	D	1	1
Accounts Payable	1	D	1	1
Purchasing Officer	1	D	1	1
Camp operations (24)				
Manager, desk attendant	1	D	2	2
Cleaners	3	D	2	6
Kitchen	3	D/N	4	12
Maintenance	2	D	2	4
Logistics (55)				
Logistics Officer	1	5/2	1	1
TLO Operator	2	D/N	4	8
Road Train Operator	8	D/N	4	32
Loader Operator	1	D/N	4	4
Grader Operator	1	D/N	4	4
Water Truck Operator	1	D	2	2
Fitter, Boilermaker, Auto electrician	1	D/N	4	4
			Total	**445**

ADAPTED FROM MAGNETITE MINES LTD OPTIMISATION 2' MODEL

The estimated number of direct and indirect full-time equivalent (FTE) jobs to be created by the Project, by key project phase and geographical area, are given in Table 4-57. Data is based on project economic modelling by BDO EconSearch (2023), with values expressed as annual averages based on a ~3-year construction phase and up to 56-year LOM operations phase, respectively.

Table 4-57: Estimate of average annual full-time equivalent (FTE) positions

	Average Annual FTE Roles (by Region)		
	Peterborough	SA	Australia
Construction Phase			
Direct	48	1,226	1,474
Indirect (Flow-On)	14	1,471	3,000
Total	**62**	**2,697**	**4,474**
Operations Phase			
Direct	36	403	448
Indirect (Flow-On)	22	2,446	2,863
Total	**58**	**2,849**	**3,311**

ADAPTED FROM BDO ECONSEARCH (2023)

Construction roles will be filled iteratively according to the construction sequence and timing/need for certain skills. The general sequence of construction employment will be as follows and will span the initial ~3-year construction phase.

Pre-Construction Phase

- Project Managers and Planners
- Engineers and Surveyors
- Health, Safety and Environmental Specialists

Site Preparation Phase

- Site Supervisors
- Earthworks/civil crews

Construction Phase

Construction crews – covering:

- foundations
- steelworks
- electrical and plumbing
- heating, ventilation and air conditioning

Commissioning Phase

- electrical and plumbing
- heating, ventilation and air conditioning
- architects and registered certifiers (building and occupancy permits)

Recruitment for operation roles will occur in the ~18-month period prior to construction completion, commissioning and commencement of mining operations. Operational roles will apply to life-of-project.

4.11.1.2. Peterborough Hub Model

MGT is currently collaborating with DC Peterborough representatives to assess options for the Peterborough Hub Model. This model contemplates Peterborough forming as the central service hub for the Project, and particularly for the movement/transfer of Project staff.

Peterborough's advantageous position near the start of the Project's HR, along with its existing aerodrome, provides the opportunity for staff to arrive at a central location (via self-drive, scheduled buses or schedule flights) prior to a private coach shuttle to the Site. Benefits of this approach are numerous, and include:

- enhanced accessibility to the Project for local residents, including improved resident attraction to Peterborough
- improved connectivity into the Project for workforces based in the Mid North and Upper Spencer Gulf regions
- increased movement of people through Peterborough with potential for additional local spending
- improved safety and environmental performance outcomes by limiting private vehicle use along the HR
- potential for improved services within Peterborough (i.e., additional airside and/or landside facilities at the Peterborough Aerodrome).

Several potential sites for a central workforce parking and transfer facility have been discussed with DC Peterborough representatives, with further strategic planning and community engagement planned.

4.11.1.3. Employment pathways and training

MGT is committed to providing training, development and employment opportunities to targeted cohorts. Prioritised groups may include:

- near-project residents, such as those from the DC Peterborough and Unincorporated areas
- regional residents, such as those across the Mid North (i.e., Goyder, Northern Areas, Orroroo-Carrieton areas)
- members of the Ngadjuri Community, and other Aboriginal People
- youths from local and regional areas.

It is acknowledged that many members of these cohorts are unlikely to have relevant industry experience and may not have the necessary formal and informal skills required for the planned operations. As such, MGT envisages collaborating with key stakeholders, including government representatives, training services providers and schools, to provide a range of development pathways, including:

- Industry awareness – working with prospective future employee groups, such as local school students, to promote opportunities available within the resources sector and the Project more specifically; MGT has already commenced such activities with Peterborough High School.
- Pre-employment and work-readiness programs – industry led initiatives.
- Apprenticeships, traineeships and cadetships – dedicated programs across technical and non-technical streams with recurring intakes.
- Targeted upskilling – based on existing local and regional skill profiles, there is potential to offer preliminary or on-the-job training to elevate skills to industry standards.
- Cultural safety – in conjunction with NNAC, employing strategies to support Aboriginal employees to transition into the resources sector or remote work and promoting culturally-safe work environments.
- Case management and facilitation – a potential dedicated service to support local and other targeted residents into employment where traditional pathways may not be suitable.

4.11.1.4. Local business participation and procurement

MGT is committed to providing opportunities to local, regional and other SA-based businesses through the construction and operations phases. MGT has already commenced investigations into supply and service chain opportunities, having engaged broadly with Tactic in the period between 2023 and 2025.

Prior to the commencement of the primary procurement phase for construction, MGT will establish a local procurement strategy and will ensure subcontracted entities enable participation of SA businesses, including Indigenous enterprises. In recognition of the high prevalence of small businesses within SA, MGT will assess options to scale prequalification processes and provide facilitation or other support for small and medium-sized enterprises to meet the Company's procurement and prequalification standards.

The advertising of procurement opportunities will occur. Relevant services, such as the Industry Capability Network, will be used where appropriate.

4.11.2. Energy sources

4.11.2.1. Electricity sources for construction phase

Within the ML, diesel generators will be used for power supply during the construction phase until such time that the permanent high-voltage TL and intra-site substation and power reticulation systems are built and commissioned.

Diesel generators will also be used at remote sites, such as the Laydown Area at Hillgrange and for any temporary accommodation and other facilities located within the proposed TL construction compounds.

4.11.2.2. Electricity sources for operations phase

During the operations phase, power will be supplied by the TL that is connected to the SA grid at the Bundey Substation, as discussed in Section 4.8.6.1. Emergency power will be supplied by diesel generation in case of power outage, with generation capacity sufficient to keep safety systems active and enable safe plant shutdown.

Estimated annual electricity consumption during the operations phase, as supplied through grid connection, is provided in Table 4-58.

Table 4-58: Estimated grid-based electricity consumption during operations

Area	Electricity Consumption (MW[1])	MWh/yr[2]
Processing (including crushing and grinding)	134	1,054,116
Supporting infrastructure	3.5	28,152
Camp	0.5	4,195
Total	**138**	**1,086,463**

1. MEGAWATTS
2. MEGAWATT HOURS PER YEAR

MGT will benefit from the increasing penetration of renewable generation within the SA sector of the National Electricity Market, with the SA Government is targeting 100% renewable power generation by 2027. An assessment of green energy opportunities for the Project has been completed by CQ Energy (2023) that has identified options to achieve a targeted net zero Scope 2 emissions profile. MGT will assess these options, including direct contract via renewable power purchase agreements or large-scale generation certificates, closer to or during the Project construction stage.

Remote sites with low power demands will use diesel generation during the operations phase. This includes the RS where power is required for the limited demand associated with the proposed office, ablutions, workshop and dust suppression systems.

4.11.2.3. Electricity sources for closure phase

It is expected that during the majority of the closure phase power demand will be too low to sustain the safe operation of the TL; therefore, remote power generation is anticipated. Generation type will be assessed closer to the closure phase to reflect contemporary power supply options/technologies.

4.11.2.4. Diesel consumption

Diesel fuel is required for operation of light and heavy vehicles and mining plant. Estimated diesel consumption over the life of project, by project phase, is provided in Table 4-59 (Greenbase, 2024).

Table 4-59: Estimated diesel fuel consumption

Area	Estimated Fuel Consumption (KL)
Diesel consumption - construction phase	39,128
Diesel consumption - mining phase	344,562
Diesel consumption - rehabilitation phase	10,636
Total	**394,327**

4.11.2.5. Carbon emissions

Estimated carbon emissions for the life-of-project are given in Table 4-60 (Greenbase, 2024). The total Scope 1 and Scope 2 GHG emissions for the life of Project, including construction and rehabilitation phases, are projected to be 7,026,62 tCO2-e. The average annual total Scope 1 and Scope 2 emissions are projected to be 163,410 tCO2-e/year.

The forecast annual average Scope 1 emissions are 34,186 tCO2-e, below the 100,000 tCO2-e Safeguard Mechanism trigger threshold under the *Commonwealth National Greenhouse and Energy Reporting Act 2007*.

Table 4-60: Estimated carbon emissions over the LOM

Emissions Category	Emissions over LOM (tCO2-e)	Average Annual Emissions (tCO2-e / yr)
Scope 1 emissions		
Diesel consumption - construction phase	106,028	35,343
Diesel consumption - mining phase	933,668	24,570
Diesel consumption - rehabilitation phase	28,823	14,411
Land clearance	401,484	9,792

Emissions Category	Emissions over LOM (tCO2-e)	Average Annual Emissions (tCO2-e / yr)
Scope 2 emissions		
Electricity consumption (grid supply)	5,556,620	146,227

It is noted that the Greenbase assessment of Scope 2 emissions utilised grid factors published in 2023. The release of updated forecasted grid factors (to 2040) by DCCEEW in late 2024 saw significant revision compared to those published in 2023; as such, the use of the new grid factor forecasting would significantly decrease the Project's estimated Scope 2 emissions.

MGT will periodically update the Project's Scope 2 emissions profile forecast to reflect changes in DCCEEW's grid factors. It is expected over the life of the Project that SA's energy generation will continue to become more renewable based and, as such, lead to further decreases in the Scope 2 and 3 emissions.

4.11.3. Water sources

During the construction phase local groundwater (indicative extraction locations provided in Figure 4-1 and Figure 4-2, and in each construction compound presented in Figure 4-69) will be used for dust suppression and watering for engineering compaction requirements; this is applicable to the ML, HR, RS and TL. Potable water will be trucked to respective sites within the broader Project Area to supply the construction camp and personnel consumption requirements, and for concrete production due to water quality requirements.

During operation, water supply for production (processing) and ancillary uses within the ML and RS will be provided from a coastal desalination plant and supply pipeline from the Spencer Gulf. This will comprise a desalination plant located at the coast, feeding a supply pipeline terminating at Hillgrange at the boundary of the site access road / HR MPL (refer Section 1.7.6 for further information). Consistent with the site water balance (Figure 4-46), the desalination plant will provide approximately 11 gigalitres per annum (GL/pa) of fresh water. The desalination plant and desalinated water supply pipeline to the MPL boundary is outside the scope of, and is not assessed within, this MLP; however, the approvals pathway for this infrastructure is proposed in Section 1.8.1.2.

Within the site access road / HR MPL, a water supply pipeline will be constructed between Hillgrange and Site to transfer water from the off-site desalinated water supply pipeline to the site raw water dam. Refer to Section 4.8.6.2 for further information

During operation, some local groundwater may also continue to be used for dust suppression along the HR, at the RS and at remote sites within the ML (i.e., at Iron Peak). Groundwater and surface water inflows to the pits will also be used for dust suppression and watering of access roads.

A summary of water use by source is provided in Table 4-61.

Table 4-61: Water supply use, recycling and fate

Water source by Project phase	Annual water use (ML)	More than 5% of total annual withdrawal from source	Recycling rates and reuse opportunities	Principal use (discharge / fate)
Construction				
Groundwater (SA Murray GS6)	500	On estimated annual take: Yes On prescribed SDL: No	Nil	Dust suppression (infiltration / evaporation at point of application); Road construction / compaction (entrainment, evaporation)

Water source by Project phase	Annual water use (ML)	More than 5% of total annual withdrawal from source	Recycling rates and reuse opportunities	Principal use (discharge / fate)
SA Water reticulated supply	35	No	*WWTP wastewater reuse for dust suppression*	Concrete mixing (entrainment); Workforce consumption (WWTP)
Operations				
Desalinated seawater (processed)	11,000	N/A	9.4x recycling (103 GL; includes TSF decant return) *WWTP wastewater reuse for dust suppression*	TSF (entrainment, infiltration, evaporation); Concentrate (offsite); Workforce consumption (WWTP)
Groundwater (SA Murray GS6)	125	On estimated annual take: Yes On prescribed SDL: No	Nil	Dust suppression (infiltration/evaporation at point of application)
SA Water reticulated supply	0.2	No	*WWTP wastewater reuse for dust suppression*	Workforce consumption (WWTP)
Operations and Closure				
Groundwater (SA Murray GS6)	1,000 (range midpoint)	On estimated annual take: Yes On prescribed SDL: No	Nil	Pit lake evaporation (evaporation)

Considerations of the quality of discharged waters are material to desalinated seawater deporting to the TSF (entrainment, infiltration) and wastewaters from the WWTP; other water qualities are generally not modified by their uses and are considered effectively analogous to their source quality. Considerations of groundwater and surface water impacts arising from TSF and WWTP operations are presented in Sections 7.6 and 7.7, respectively.

4.11.4. Construction materials sources

MGT will utilise site-won material for construction applications, where practicable. Fixed or mobile crushing and grading plants will be used to generate and classify materials suitable for the construction of roads, pads and hardstands.

Table 4-62 outlines the estimated cut and fill balances for major developments within the ML and for the HR and RS. Due to the HR's design as a singular entity (i.e., not completed by proposed tenement), the associated cut and fill requirements are reported as one set of values; the section of the HR within the ML is considered to have a minor net fill requirement (owing to the flat land surface and proposed 570 mm fill levels for road construction) while the section in the HR corridor is considered to be generating the majority of the excess material.

Not included within this table are any construction material requirements (including clays) for the TSF that would be sourced from within the TSF footprint. Further, these balances exclude the development of ex-pit haul roads at the Razorback pit.

Table 4-62: Estimated construction cut / fill balances, by Project activity

Infrastructure	Cut to fill (m^3)	Fill import requirement (m^3)	Excess to stockpile (m^3)
ML			
Process plant pad	603,650	192,455	0
NPI Pad; NPI access road	227,960	273,375	0
Raw water dam	17,730	32,195	0
Magazine pad	0	1,375	0
Magazine access road	285	0	1,413
ANFO 1 (Iron Peak) pad	5	1,447	0
ANFO 1 (Iron Peak) pad access road	200	2,890	0
ANFO 2 (Razorback) pad	0	2,270	0
ANFO 2 (Razorback) pad access road	1	110,250	0
Accommodation camp pad	0	62,849	0
Accommodation camp-NPI access road	40,950	49,900	0
Main HR to accommodation camp road	1,700	660	0
Iron Peak HR	75,150	2,376,620	0
ML Cut-fill balance		**-3,106,286 (deficit)**	
HR and RS MPLs			
Main HR (including ML Section)	338,800	0	216,000
RS spur and hardstand	26,769	0	47,465
HR/RS MPL cut-fill balance			**+263,465 (surplus)**

MGT will have a net surplus of material generated from the construction of the HR and RS, which will require minor stockpiling within the respective tenement areas (material will not be removed from the respective MPLs). The management of these stockpiles will be included as part of long-term rehabilitation planning exercises, subject to their final optimised placement.

The demand for construction materials within the ML will be met with site-won materials, likely from within the mine pit (targeted overburden), WRD and TSF areas.

MGT may seek to import selected materials for construction and maintenance applications (including for the TL) whose specifications cannot be achieved through site-won materials. Nominal volumes of concrete aggregates and sands, specialist materials such as rail ballast/capping and engineered road surface capping (or capping inputs) all may be required by the Project. Under these circumstances, MGT will seek to import materials from existing operating quarries of suitable recent production capability in the Mid North of SA, including at Hallett, Spalding, Waterloo, Worlds End and Clare.

Chapter 5

Stakeholder engagement

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter outlines the planning and delivery of community and stakeholder engagement completed in support of the Razorback Iron Ore Project.

A description of Magnetite Mines' engagement principles and alignment to planning standards and guides is provided. An overview of the Company's sustainability ecosystem maps stakeholder systems relevant to the Project while also assessing the preliminary materiality of Project impacts/risks and their importance to stakeholders.

Engagement planning, including identification of risks, engagement planning and resourcing, is described.

Detailed information on the delivery of engagement programs is provided in the Chapter to demonstrate the consultative processes enacted by Magnetite Mines. These include general community programs, targeted engagement and development of engagement materials.

The Chapter also describes the results of engagement activities and their impact, including resulting changes to the Project and assessment of impacts within the MLP.

5. Stakeholder engagement

The participation of stakeholders and communities in the Project is a priority for MGT. The Company has sought to establish meaningful relationships and connections with those with a direct, indirect or other interest in the Project.

Under the f**ore**sight sustainability initiative (see Section 5.1 and 10.2.1), MGT has committed to meaningful engagement with all Project stakeholders. The Company's engagement approach is driven by three responsibilities – to be accessible, accountable and informative.

Be accessible	**The Company respects the right of Project stakeholders to be engaged in a manner that enables their active participation.** This is achieved through the delivery of engagement models that meet the format, timing and frequency expectations of stakeholder groups.
Be accountable	**The Company recognises the right of Project stakeholders to engage directly with proponent representatives.** This is achieved through the active involvement of MGT's management and staff in engagement activities, including those with the ability to influence change and make decisions regarding the Project.
Be informative	**The Company recognises that, for stakeholders to participate effectively in Project engagement activities, they must have timely access to reliable and accurate information.** This is achieved through the development and delivery of content in different formats and access types that provides for the differing needs and preferences of Project stakeholder groups and communities.

The development and implementation of progressive engagement plans for the Project, including internal reporting and assessment of outcomes, has been informed by the following adopted standards, guides and references:

- Initiative for Responsible Mining Assurance (IRMA) draft IRMA Standard for Responsible Mineral Exploration and Development (Stage 4 – Mining Project Pre-Permitting and Stage 5 – Mining Project Permitting)
- International Association for Public Participation (IAP2) Australasia Quality Assurance Standard for Community and Stakeholder Engagement
- Local Government Association of SA Community Engagement Handbook (6th Edition)
- Government of SA TOR006, MG2a and MG34 *Preparing a community engagement plan*
- Government of SA Better Together: Principles of Engagement (2nd edition)
- Ministerial Council on Mineral and Petroleum Resources Principles for Engaging with Communities and Stakeholders.

MGT has also committed to align its future activities to the Ten Principles of the UN Global Compact and the Sustainable Development Goals, with each of these programs assisting the Company to identify material issues to the Project and align engagement actions to proposed program outcomes, where relevant.

5.1. foresight sustainability program

f**ore**sight is MGT's sustainability program driving Environment, Social and Governance (ESG)-related actions from the project scoping and design stages. As the traditional iron ore sector transitions to a new future centred on sustainable practices, MGT aims to emerge as a producer of high-grade iron feedstocks with a collaborative sustainability culture embedded from the outset.

Under f**ore**sight, project delivery plans and project optimisation studies will demonstrate pathways to net zero carbon operations, prescribe actions that support and build resilient communities and underscore a commitment to adaptive governance.

As part of the f**ore**sight program, MGT has also executed its Environment, Social and Governance Statement (May 2023) (refer Figure 10-1), a document that establishes the Company's commitment to realising sustainable magnetite operations through the building of an organisation and project portfolio with corporate sustainability as a core basis of its culture, business planning and delivery.

5.1.1. foresight sustainability framework – overview

A strategic sustainability framework has been developed to embed the Company's ESG efforts and establish an authoritative and accountable proposition that:

- codifies the company values into behaviours and actions that promote leading sustainability outcomes
- creates an operating structure to enable and disclose company performance and supports a continual improvement focus
- provides clear demonstration of MGT's proposed program of action to its broad stakeholder groups, and promotes participation for the creation of shared value.

A three-stage development cycle has been planned, with the framework to be progressively developed in scale to the growth of the company and in response to changes in key stakeholders, emerging material issues and assurance requirements. A three-staged framework model will enable MGT to identify ESG-related opportunities, grow its sustainability capabilities and maximise its performance as its dynamic systems mature.

The Company has developed its Stage 1 framework, which aligns to the project conceptualisation and planning phase. The Stage 2 and 3 frameworks are anticipated to be developed during the pre-execute engineering studies period and the construction phase, respectively.

5.1.2. foresight sustainability framework – Stage 1

The Stage 1 framework establishes a strategic roadmap that provides the foundation for effective and collaborative sustainability planning. While commanding early action to embed sustainability outcomes for the Project life cycle, the Stage 1 framework crucially provides for flexibility to adapt to changes relating to the company's stakeholder groups and application of ESG standards.

5.1.2.1. Sustainability leadership model of planning

Through emerging and future sustainability planning exercises, MGT is implementing a sustainability leadership approach to its strategic business and operational activities. The sustainability leadership model is recognition by the Company that effective, collaborative and long-term planning and decision-making must embed sustainability as a key driver of business value, multi-factor performance and shared value creation.

MGT's sustainability leadership model of planning:

1. Integrate sustainability into the company's strategic focus
2. Engage early and broadly with stakeholders on complex environmental, social and cultural matters
3. Champion sustainable practices
4. Ensure ESG metrics are included in company decision-making
5. Establish a long-term view to future-proofing company and project development.

It is this leadership model that establishes the Company's three responsibilities that define the engagement approach:

Engage early and broadly with stakeholders on complex environmental, social and cultural matters	**Be accessible** **Be accountable** **Be informative**

5.2. Sustainability ecosystem

Acknowledging the stakeholder network of the Project as an 'ecosystem' is recognition of the multi-faceted, complex relationships between MGT and local/regional stakeholders, as well as between Project stakeholders themselves. Interests and needs of stakeholders may be complimentary or opposing, and projects may align with community-level interests or exacerbate areas of division.

MGT has identified Project stakeholders (refer Section 5.2.1) and has undertaken an early assessment of material issues (Section 5.2.2) on which it has assessed engagement objectives, requirements and approaches (Section 5.3).

5.2.1. Stakeholders

MGT acknowledges the relevance of its activities to a broad range of stakeholders. Principally through its resource assessment, project development and mine planning activities, the Company has multiple potential interfaces with stakeholders, and particularly through its environmental, socio-economic and ethical practices.

It is integral that the Company understands the needs, aspirations and concerns of each stakeholder, and forms engagement approaches where interests align. MGT has identified stakeholders relevant to the Project and mapped priority areas of interest. Various processes were used to identify stakeholders; however, with over 15 years of activity in the region, MGT has developed a large network of local relationships.

Table 5-1: Project stakeholders, with priority areas of interest

Stakeholder groups / stakeholders	Priority areas of interest
First Nations groups	
Ngadjuri Nation Aboriginal Corporation	Native title, cultural heritage, economic development, employment, environmental management
Ngadjuri People, including Elders	Native title, cultural heritage, economic development, environmental management
Linked knowledge holders	Cultural heritage
SA Native Title Service	Native title
First Peoples of the Murray and Mallee Region #2 Native Title claimants	Native title, cultural heritage, environmental management

Stakeholder groups / stakeholders	Priority areas of interest
Landowners, occupiers and interest holders	
Pastoral lessees	Land use, agreements, environmental management, water supply, impacts to pastoral activities, heritage
Other pastoral property owners and interest holders (including Crown Perpetual leaseholders and Freehold landowners)	Land use, agreements, environmental management, water supply, impacts to pastoral and other farming activities, accessibility, amenity/nuisance, heritage
Neoen	Infrastructure development (adjacent major project proponent), land access
Other project proponents with overlapping or adjacent interests	Infrastructure development, land access
Local Government (including Unincorporated Areas) and development agencies	
DC of Peterborough	Economic development, employment, community planning, resident attraction, use of assets (roads), corporate responsibility, community engagement
RC of Goyder	Economic development, employment, use of assets (roads), corporate responsibility
Port Pirie RC	Economic development, employment, water supply optionality
OCA	Regional planning, economic development, employment, access
Yunta Town Hall Association	Economic development, employment, access
Regional Development Australia – Far North	Economic development, employment
Regional Development Australia – Yorke and Mid North	Economic development, employment, community planning, training and development
Communities	
Yunta	Economic development, employment, training and development, Project access, reliance on community services (including emergency services)
Peterborough	Economic development, employment, training and development, reliance on community services (including emergency services), environmental management, amenity/nuisance
Burra/Burra Eastern Districts	Employment, training and development, environmental management, road conditions and traffic, environmental nuisance
Robertstown/Bundey	Supply chain participation, road conditions and traffic, amenity/nuisance
People living in areas adjacent to the Project Area (including Nackara, Hardy, Warnes and Grampus)	Land use, agreements, environmental management, water supply, impacts to pastoral and other farming activities, accessibility, amenity/nuisance, heritage, road conditions and traffic
Barrier Highway communities (Riverton to Oodla Wirra)	Traffic, amenity/nuisance
Community service providers	
SA Police	Accessibility, resourcing, Project emergency response capabilities
SA Ambulance Service (inclusive of volunteers)	Accessibility, resourcing, Project emergency response capabilities
Peterborough High School	Employment pathways, training and development
St Joesph’s Catholic School	Employment pathways, training and development

Stakeholder groups / stakeholders	Priority areas of interest
Government	
Commonwealth	
DCCEEW	Matters of National Environmental Significance, Commonwealth Lands
Local member of Commonwealth Parliament	Economic development, regional development, employment, community engagement
SA Government	
DEM	Project approvals planning, development coordination, mining regulation (including Matters of National Environmental Significance), tenement regulation, infrastructure planning, environmental management (various), engagement, Native Title matters, SA Green iron and steel strategy and and the SA's Green Iron Opportunity: Expression of Interest[64]
DEW	Environmental management (various), water supply optionality, licensing and regulation, Crown land management, Crown lease management
Attorney General's Department	Aboriginal cultural heritage matters, Native Title matters
EPA	Environmental management (including groundwater, surface water, air quality, noise), licensing
Landscapes SA	Environmental management (including ecology, groundwater, surface water), development regulation
Department of Primary Industries and Regions	Pastoral lease management
Department for Housing and Urban Development	Project approvals planning
DIT	Road network planning and capacity, road upgrade planning (Barrier Highway intersection), logistics capacity requirements, infrastructure planning (including power, water)
Department for Treasury and Finance	Water supply optionality (Unsolicited proposal – SPSMB)
Department for Trade and Investment	Investment attraction
Office for Northern Water Delivery	Water supply optionality
Office for Hydrogen Power SA	Matters aligning to the SA Green iron and steel strategy and the SA's Green Iron Opportunity: Expression of Interest
Local member of State Parliament	Economic development, regional development, employment, community engagement and participation, traffic and amenity/nuisance, integration and responsible/ethical development
Business and Infrastructure	
Tactic (local supply chain capability organisation)	Supply chain development, local content provisions
SA Chamber of Mines and Energy	Industry development, infrastructure planning, industry policy
Local & regional businesses (value chain)	Supply chain development, local content provisions
SA Water	Water supply planning, water security
ElectraNet	Power supply, system reliability and security (load profile)

[64] https://www.energymining.sa.gov.au/__data/assets/pdf_file/0005/1017824/South-Australias-Green-Iron-Opportunity.pdf

Stakeholder groups / stakeholders	Priority areas of interest
ARTC	Rail corridor utilisation, rail logistics and pathing, water pipeline alignment
Flinders Ports	Port utilisation; port logistics and development

5.2.2. Project materiality

In 2023 MGT completed an initial impact and materiality analysis that also considers alignment with stakeholder matters and engagement activities. Key issues have been identified and their materiality assessed through an internal workshop, with consideration given to those material issues identified in mining sector-specific standards, results from contemporary industry materiality analysis and engagement activities completed to date. Materiality has been periodically reviewed with results consistent with the original 2023 assessment.

Five matters of high materiality to the Project have been defined as part of this assessment, and are presented in Figure 5-1.

Workplace health and safety

Safety starts at project and program design

Shared responsibility

Founded in human rights principles

Carbon emissions

Low Scope 1 and Scope 2 emissions profiles

Decarbonisation pathway and future-proofing

Water use and management

Sustainable, non-competing sources of water required

Water recovery and re-use embedded in design

Tailings and waste management

Tailings safety and verification

Indirect environmental impacts – surface water, groundwater

Stakeholders, community and First Nations' rights

Community engagement, participation and benefit

Land access for mining

Native Title and cultural heritage management

Figure 5-1: Materiality assessment outcomes (April 2023)

The outcomes of this materiality assessment have influenced engagement planning for the Project. By assessing those items that may have the greatest impact on the Project, its stakeholders and its environment, MGT can ensure its engagement plans are appropriately assessing and responding to the most significant engagement risks. A review of the materiality assessment in Figure 5-1 identified the following five issues as being relevant to engagement planning in the project conceptualisation, definition and design, and pre-approvals phases:

1. Sustainable, non-completing sources of water – stakeholders will have a high sensitivity to water security factors, particularly for existing pastoral uses
2. Water recovery and re-use embedded in design – stakeholders will have a high interest in MGT's water management strategy

3. Tailings safety and verification and Indirect environmental impacts – tailings management can be a poorly-understood issue by many stakeholders but it's indirect impacts may be material for a number of stakeholders
4. Community engagement, participation and benefit – stakeholders have reasonable expectations to be involved in the Project and for their communities, as Project hosts, to benefit from its success
5. Native title and cultural heritage management – through existing relationships with First Nations stakeholders associated with the ML, the Company understands and respects the intrinsic cultural values of Country and enshrined rights that intersect with proposed Project activities.

5.3. Engagement planning

MGT's engagement planning process has been periodically reviewed through the project conceptualisation, definition and design, and pre-approvals phases, as well as in response to material changes in project design and in stakeholders or stakeholder interests. This iterative process ensures that MGT's engagement focus reflects the needs and interests of its stakeholders while also considering reviews of previous engagement activities in a continual improvement cycle.

The engagement planning process broadly utilises seven steps, as described below. These steps are generally followed sequentially in forming and reviewing the Project's engagement plans.

Plan inputs	1.	Identified project stakeholders (refer Table 5-1)
	2.	Identified potential areas of interest by each stakeholder (Table 5-1)
	3.	Material project issues and engagement considerations (Figure 5-1)
Plan development	4.	Determine principal risks (refer Table 5-2)
	5.	Link risks to stakeholders/interests (Table 5-2)
	6.	Determine preferred engagement methods (Table 5-2)
	7.	Set approach, action list, implement, monitor and report

Review process

5.3.1. Engagement risks

5.3.1.1. Risk categorisation

MGT acknowledges that potential perceptions of the Project are shaped by values and beliefs about specific issues; therefore, three stakeholder 'categories' have been adopted to assist in the identification of project risks and to aid in determining suitable engagement approaches/control methods. These categories are:

- "rights-based" stakeholders – those people who live on or near the site and have a 'right to know' as they are directly affected
- "power-based" stakeholders – those who are elected representatives and Government authorities that have power to influence the project outcome, and
- "interest-based" – usually non-local interest groups with larger agendas – who can escalate issues to further their agendas.

5.3.1.2. Risk and control identification

Project risks have been summarised in Table 5-2 and are listed by stakeholder category. It is noted that this is a preliminary process as the public statutory consultation process will provide additional context and feedback. General control methods have also been developed to support identification of management and mitigation measures.

It is envisaged that an engagement risk register will be updated regularly to consider any changes that may arise or are realised through interactions with the community and stakeholders and through the consultation process. Similarly, the register will be revised during later project delivery phases to ensure new and emerging issues are identified and proactively managed.

Table 5-2: Project preliminary engagement risk assessment, by stakeholder group

Stakeholder category	Project risks	Proposed risk control methods
Power-based; i.e.: Commonwealth Government agencies Commonwealth Government – Local Member of Parliament SA Government agencies SA Government – Local Member of Parliament	Approvals studies are not deemed adequate. Environmental impacts are unacceptable. Community (constituents) oppose project.	Implement a Government engagement program that incorporates a collaborative approach to study scoping and data interpretation. Use a wide variety of channels to communicate activities, timeframes and potential impacts with stakeholders.
Rights-based; i.e.: First Nations groups Landowners, occupiers and interest holders Local Government (including Unincorporated Areas) and development agencies Local communities Local businesses / business groups Other local interest groups	Consultation is inadequate (nature, extent, access, impact). Stakeholders feel unable to build relationship with or trust Company. Stakeholders feel unaware of approvals process. Stakeholders feel unaware of investigation activities or study outcomes. Potential adverse impact on pastoral business plans and viability (especially through access to water). Potential for economic opportunities to bypass surrounding communities. Impact to local housing/accommodation and community service availability through use by new workforce. Reduction in local labour availability through mine employment. Change in local community character through new residents or transient workforces. Traffic impacts arising from additional vehicle movements. Increased loss of wildlife through potential vehicles interactions. Concern by local and regional communities about loss of grazing lands. Concern by local and regional communities about impacts on flora and fauna. Potential dust impacts to vegetation and grazing livestock through project-related dust generation.	Promote communication channels early and often. Build processes that enshrine commitment and accountability – MOUs, etc. Develop project information assets and distribute through targeted channels. Build trust through the accessibility of project and baseline information. Communicate findings of impact assessment, bringing focus to anticipated areas of high concern. Provide individuals with environmental or social impact concerns an exploration/resolution process, as appropriate. Engage local councils early and often on topics of high-community concern. Maintain a presence in the community to build relationships and understand local priorities and values. Attend local events and engage with local clubs to establish rapport. Establish clear and consistent lines of communication with landowners and communicate anticipated impacts early. Begin traditional owner engagement early and foster integrity-based partnerships based on mutual trust and transparency. Ensure engagement occurs with due consideration to timing of approvals process and local needs. Provide community information sessions at targeted population centres during relevant milestones.

Stakeholder category	Project risks	Proposed risk control methods
	Potential loss of amenity through project-related noise generation. Potential disruption to stock through project-related noise generation. Visual impacts of open cut mine. Potential for groundwater pollution. Project groundwater use/interaction reducing availability of groundwater for pastoral uses. Project activities changing surface water flow regimes and limiting access to water for pastoral and environmental uses. Concerns about waste management including the environmental impacts of tailings. Concern for potential adverse impacts to heritage, both Indigenous and European. Traditional owner opposition to project activities. Management of project activities and Native Title rights. Concerns about rehabilitation following mine closure.	Provide meet and greet opportunities with staff. Host targeted site visits with key stakeholders. Ensure all agreements are developed with FPIC principles. Demonstrate closure pathways and explain liability/bond guarantees.
Interest-based; i.e.: Regional businesses / business groups Infrastructure groups Community service providers Other interest groups Media	Potential for economic opportunities to bypass surrounding communities. Reduction in local labour availability through mine employment. Duplication of large-scale infrastructure through project-specific solutions. Negative media story of the project. Environmental groups oppose project on specific grounds.	Participate in regional business engagement programs. Participate in infrastructure-focused forums and planning exercises to assess for common user approaches. Communicate clearly project activities and locations, and consult local communities on environmental matters. Maintain connectivity to local and regional media operators.

5.3.2. Principal engagement approaches

An ‘engagement approach’ is a high-level target or strategy for engagement and consultation activities, and generally represent a number of aligned individual engagement actions. Reflecting the three responsibilities identified in Chapter 5 – be accessible, be accountable, be informative – MGT has developed a number of engagement approaches that formed the basis of its engagement effort for the Project.

Be accessible **The Company respects the right of Project stakeholders to be engaged in a manner that enables their active participation.**

Principal approaches:

1. Engage with community-level representative bodies to negotiate agreements that demonstrate a tangible commitment to engagement and participation, provide channels for community advocacy and improve accountability.
2. Deliver engagement activities that provide for community and personal-level interactions, recognising that stakeholders may seek passive to highly engaged levels of participation (no one-size fits all approaches).
3. Provide engagement options that respect stakeholder and community function, such as seasonal farming commitments.

Be accountable **The Company recognises the right of Project stakeholders to engage directly with proponent representatives.**

Principal approaches:

1. Company representatives must be present in those communities affected by the Project to deliver engagement activities; improved understanding of local context is also to be achieved.
2. Stakeholders and community members must be afforded access to decision-makers when engaging on material Project matters.
3. Engage with community-level representative bodies to negotiate agreements that demonstrate a tangible commitment to engagement and participation, provide channels for community advocacy and improve accountability.

Be informative **The Company recognises that, for stakeholders to participate effectively in Project engagement activities, they must have timely access to reliable and accurate information.**

Principal approaches:

1. Provision of information is not passive; information must be proactively made available to community members – using trusted traditional and digital communications channels accessible to the majority of stakeholders (such as local councils).
2. Written information must be made available to enable distribution and discussion amongst personal networks.
3. Provision of information is iterative and disclosure should occur as early as possible to build awareness progressively.

5.3.3. Delivery and resourcing

In accordance with the 'Be accountable' responsibility, the delivery of all engagement activities was directly managed by MGT. Further, at least one senior management representative was in attendance at all public engagement events. The Company engaged additional assistance to deliver engagement activities. Community engagement specialists, including from GHD and Linking Futures, supported MGT's engagement delivery.

MGT acknowledges the important contributions of the NNAC, DC Peterborough and RC Goyder to the community engagement program. Each group provided advice on the engagement approach for their respective communities and assisted, either directly or indirectly, in the hosting of community information sessions, workshops or site visits.

During the course of the main engagement program, community-level events and activities were held in Peterborough, Burra, Robertstown and Yunta. Significant effort was committed to hold Ngadjuri engagement activities and meetings with NNAC on Country, where possible. Engagement activities were held across Ngadjuri Country, including Clare, Freeling, Jamestown, Burra, Peterborough and Lyndoch, while also hosting events in Adelaide and Port Victoria proximate to the main population centres of Ngadjuri People, as recommended by NNAC.

5.4. Engagement activities

Engagement activities conducted in support of the Project have ensured that project stakeholders and communities have been offered reasonable opportunities to participate in engagement activities within their own communities or via alternative modes (***be accessible***), have been able to connect with MGT representatives ***(be accountable)*** and have been provided access to necessary information on which they can provide feedback ***(be informative)***.

The following Sections 5.4.1, 5.4.2, 5.4.3 and 5.4.4 summarise key activities and actions taken by MGT as part of its engagement program. Section 5.4.5 provides an overview of the principal engagement materials develop to support engagement activities, particularly at community interest levels, while Section 5.4.6 demonstrates actions implemented to increase awareness of community engagement opportunities.

A summary of access to engagement activities by each stakeholder group is provided in Table 5-3.

5.4.1. Targeted engagement

5.4.1.1. Landowners and interest holders

With over 15 years of exploration and project conceptualisation activities undertaken for the Project, MGT has maintained communication with an extensive network of local landowners. This network has continued to expand as options for site access and power supply were assessed.

A series of meetings with landowners and other interest holders has been held across the last four years for purposes including project introductions, project briefings and updates, land use reviews, infrastructure planning, environmental reviews and short- and long-term land access negotiations. Meetings are generally held one-to-one, given confidentiality considerations; however, MGT has obliged on those occasions where selected landowners have requested to meet as a small group.

For information on engagement with those with overlapping mineral exploration interests (EL holders), please refer to Section 1.7.3.1.

5.4.1.2. Ngadjuri Nation Aboriginal Corporation

MGT and NNAC Directors have met routinely since 2022, with recurring deputations, presentations and workshops held to progress a range of matters associated with the Project. Key matters include project updates, cultural processes, heritage surveys, heritage management processes, native title, and economic development and participation. Native title agreement negotiations have also commenced.

To ensure project development concepts are understood from a cultural perspective, MGT has hosted two visits for NNAC Directors to the Project site – one in September 2022 and another in June 2023. The site visits provided opportunities for NNAC Directors to reference project development footprints to cultural or landscape features, while also forming an important occasion to build relationships between the organisations.

Given the limited mining development within Ngadjuri Country, both MGT and NNAC identified the benefit of a more-comprehensive understanding of magnetite mining and processing activities. As such, a site visit to GFG SIMEC's Iron Duke mine on the Eyre Peninsula was held. The site visit enabled NNAC Directors to experience a large-scale magnetite mining operation and to witness individual activities that are proposed as part of the Project (i.e., drill and blast mine development, materials handling, processing, tailings and waste disposal).

Photographs of the MGT-NNAC visits to Razorback and Iron Duke are included in Plate 5-1.

Table 5-3: Summary of access to engagement activities by stakeholder subgroup

Activity type	Ngadjuri (NNAC, community)^	FP Murray and Mallee #2^	Landowners – project footprint*	Landowners – adjacent*	Other land interest holders*	Local government authorities#	Regional Development Aust.#	Yunta+	Peterborough+	Burra / Burra Eastern Dist.+	Robertstown / Bundey+	Other regional localities+	Emergency res. providers@	Schools@	Cwlth Gov - MPs~	Cwlth Gov - agencies~	SA Gov - MPs~	SA Gov - agencies~	Regional businesses&	Infrastructure providers&
Targeted engagement																				
Project briefings	✓	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓		✓
Targeted meetings	✓		✓	✓	✓	✓	✓						✓	✓	✓	✓	✓	✓		✓
Land access negotiations	✓		✓		✓	✓														
Project site visits	✓		✓														✓			
Formal deputations	✓					✓														
Workshops	✓					✓												✓		
Community-level agreements																				
Partnering Agreement	✓																			
MoU						✓			✓			✓								
Community sessions																				
Drop-in information sessions								✓	✓				✓							
Town hall meetings									✓	✓	✓	✓								
Field days / stalls								✓	✓											
foresight One-to-One Meetings									✓			✓							✓	
Conference and trade presentations							✓												✓	✓
Community engagement materials																				

Activity type	Ngadjuri (NNAC, community)^	FP Murray and Mallee #2^	Landowners – project footprint*	Landowners – adjacent*	Other land interest holders*	Local government authorities#	Regional Development Aust.#	Yunta+	Peterborough+	Burra / Burra Eastern Dist.+	Robertstown / Bundey+	Other regional localities+	Emergency res. providers@	Schools@	Cwlth Gov - MPs~	Cwlth Gov - agencies~	SA Gov - MPs~	SA Gov - agencies~	Regional businesses&	Infrastructure providers&
Information panels (phase 1 - overview)									✓			✓								
Information panels (phase 2 – impact assessment)								✓	✓	✓	✓	✓								
Town hall meeting presentation									✓	✓	✓	✓								
Project community information sheets	✓		✓	✓		✓		✓	✓	✓	✓	✓		✓					✓	
Ngadjuri annual reports	✓																			
Peterborough Informer project updates									✓			✓								
MGT website	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓							✓	
Publication of engagement opportunities																				
Plains Producer			✓	✓					✓	✓	✓	✓								
Peterborough Informer			✓	✓		✓			✓			✓								
DC Peterborough social media			✓	✓		✓			✓			✓								
RC Goyder social media			✓	✓		✓				✓	✓									
MGT social media	✓		✓	✓																
In-community posters and flyers						✓		✓	✓	✓	✓	✓								

STAKEHOLDER GROUP CLASSIFICATION (AS PER TABLE 5-1):
^ FIRST NATIONS GROUPS
* LAND OWNERS, OCCUPIERS AND INTEREST HOLDERS
# LOCAL GOVERNMENT AND DEVELOPMENT AGENCIES
+ COMMUNITIES
@ COMMUNITY SERVICE PROVIDERS
~ GOVERNMENT
& BUSINESS AND INFRASTRUCTURE

Plate 5-1: Photographs of MGT and NNAC site visits (Razorback and Iron Duke)

5.4.1.3. SA Government

Extensive engagement with SA Government representatives has occurred throughout the development of this MLP. The MLP process has been supported with case management services from DEM, which has facilitated cross-government engagement activities.

Project engagement with SA Government representatives has largely focused on formal meetings, often using hybrid approaches to ensure participation from specialists located in regional areas (i.e. Landscapes SA offices). Formal meeting types have included project introductions, iterative project scope briefings and targeted sessions on specific themes.

Targeted sessions have been scheduled for the presentation of baseline characterisation/condition findings, scoping and alignment of expectations for impact assessments, presentation of and consultation on impact assessment outcomes, MNES considerations and administrative/tenement functions. Key participants from SA Government departments attending Project briefings include those listed in Table 5-4.

Table 5-4: Lead SA Government agencies by study area

Study areas		
Ecology	**Aquatic ecology**	**Groundwater**
DEM, DEW (including NPWS), Landscapes SA	DEM, Landscapes SA	DEM, DEW, Landscapes SA
Surface water	**Noise and vibration**	**Air quality**
DEM, DEW, Landscapes SA	DEM, EPA	DEM, EPA
Social	**Traffic**	
DEM	DEM, DIT	

5.4.1.4. Commonwealth government

MGT has engaged with DCCCEEW regarding environmental impacts and Commonwealth approvals. Engagement on MNES considerations, both prior to and following project referral under the EPBC Act, have been progressed through videoconferences as part of the formal referral assessment process, with outcomes presented in Section 8.

5.4.1.5. Local government

An extensive meeting schedule with local government stakeholders has supported the Project's engagement program, particularly with DC Peterborough as the nearest authority to the ML. MGT recognises the value of engaging with local government authorities as both a key project stakeholder and representative of community interests.

MGT's engagement with DC Peterborough has principally occurred through recurring meetings with their Chief Executive Officer. Deputations to the elected member body have occurred to develop project awareness with these community representatives. Further, several workshops have been held with DC Peterborough senior staff, including a review of impact assessment outcomes as well as an investigation into the potential of Peterborough to form as a transit hub for the Project.

Engagement with RC Goyder has focused on the development of the TL and the intended use of roads under the care and control of the council. Further, RC Goyder have expressed their interest in ensuring that economic development outcomes are achieved more broadly across the region, whether through employment or direct contribution.

5.4.2. Community-level agreements

5.4.2.1. Memorandum of Understanding with the District Council of Peterborough

A MoU with DC Peterborough was signed in May 2023 to collaborate on programs that support local participation, shared infrastructure development and community engagement with the Razorback Project.

The MoU is unique in nature and establishes a strong, collaborative commitment to the responsible and sustainable development of the Project and its interactions with local communities. MoU terms enable broad level strategic support for the Project with the objective of bringing together the DC Peterborough, MGT and key stakeholders to:

- collaborate on matters of shared local interest, including to maximise significant social, environmental, employment and other economic opportunities
- support engagement between MGT and DC Peterborough, and with local residents, businesses and other entities
- identify opportunities to develop, fund or manage shared infrastructure
- provide a structure to consider support for ancillary developments that may benefit the Razorback Project, its local workforce and its local stakeholders.

Plate 5-2: Photograph of the MGT-DC Peterborough MoU signing ceremony

5.4.2.2. Walking Together – One Team Partnering Agreement with NNAC

In December 2023, MGT and NNAC signed a partnering agreement that marks a shared commitment to elevate the relationship between the two groups by enshrining the principles of equality, trust and respect.

The *Walking Together – One Team Partnering Agreement* provides a framework for a long-term, respectful and collaborative relationship that acknowledges the continuing spiritual and cultural connections to Country as the Razorback and Iron Peak resources are developed for the enduring benefit of both partners.

Under this best-practice agreement, MGT and Ngadjuri Nation will collaborate on matters associated with the development of the Project, supporting infrastructure, other future mines, exploration, land management and economic and social development. Engagement with community is a central focus.

By Walking Together as One Team, both partners will strive to take action to create a sustainable future for generations to come, across economic, social, cultural and environmental pathways, centred on the Razorback Project.

Plate 5-3: Photograph of the *Walking Together – One Team Partnering Agreement* signing ceremony

5.4.2.3. Memorandum of Understanding with the Port Pirie Regional Council

A MoU with Port Pirie RC was signed in January 2024 to elevate the development potential of Port Pirie as a future green iron production hub and service centre for the Braemar iron region.

This MoU establishes a framework for Port Pirie RC and MGT to collaborate and position Port Pirie for future value adding opportunities while ensuring community involvement throughout planning processes. Included in the MoU framework is planned cooperation on the development of supporting infrastructure for the Razorback Project, including potential water supply elements and future port development for the bulk export of magnetite products.

Plate 5-4: Photograph of the MGT-Port Pirie RC MoU signing ceremony

5.4.3. Community sessions

A series of community information sessions were scheduled to enable engagement with a larger cohort of potential stakeholders and interested persons from across the region. A review of the stakeholder mapping and materiality exercises noted that the main population centres proximate to the Project were:

- Peterborough – located ~80km west of the ML, the closest major town to the ML and the likely hub to support ML and HR construction and operational activities
- Yunta – located ~40 km north of the ML, the interim service centre supporting exploration activities to date
- Burra (including Burra Eastern Districts) – located ~40 km west of the TL and a potential hub to support TL construction activities
- Robertstown (including Bundey) – located ~15 km southwest of Bundey Substation and a potential hub to support TL construction activities.

Other remote communities, such as those residents in Oodla Wirra, Nackara, Hardy, Warnes and Grampus, were either already engaged by MGT or likely to associated with one of the Peterborough, Yunta or Burra communities.

Community sessions are split into two phases – (1) an initial project introduction/overview phase and (2) an impact assessment consultation phase.

5.4.3.1. Phase 1 engagement sessions

Phase 1 engagement sessions aimed to provide clear information on the known scope of the Razorback Project, identify locations of project activities and, importantly, provide a forum for stakeholders and community members to seek clarification on relevant Project matters.

Three engagement sessions were held, each with a different focus and relevant stakeholder cohort.

Peterborough community information (drop-in) session, Peterborough, May 2023

A major community information session was held in the Peterborough Town Hall following the signing of the MoU with DC Peterborough. A series of information panels were presented that covered themes including company information, project history and detailed project information. As the first formal engagement activity with the Peterborough community, this drop-in information session aimed to demonstrate MGT's commitment to working with the community while clarifying the scope of the Project.

Approximately 150 people attended the two-hour session (see Plate 5-5), which was supported by the DC of Peterborough, with the majority of people from the Peterborough LGA area. A feedback board was used to draw formal responses from attendees; however, limited responses were received as most attendees sought to discuss matters directly with company representatives.

Plate 5-5: Photograph of the 2023 Peterborough community information session

Ngadjuri Nation community information session and workshop, Adelaide, August 2023

Following extensive engagement with the Directors of NNAC over the preceding two years, MGT sought to extend its consultative processes by hosting a community information session and workshop for Ngadjuri Nation community members.

The format included a drop-in session using information panel displays, with MGT representatives attending to prompt discussion and answer questions. NNAC Directors facilitated a group workshop with all attendees, with a particular focus on the relationship between MGT, NNAC and the broader Ngadjuri community. Detailed feedback regarding the relationship expectations was recorded, and was used to assist in the development of the *Walking Together – One Team Partnering Agreement* (refer Section 5.4.2.2).

Plate 5-6: Photograph of the 2023 Ngadjuri Nation community information session

Yunta District Hall Committee workshop, Yunta, October 2023

A workshop has held with members of the Yunta District Hall committee at the Yunta Telecentre. An initial project overview was presented, along with information on the impact assessment process and interim outcomes.

Discussion centred on what options MGT can present to ensure opportunities to participate in the Project were available to Yunta residents, businesses and the community as a whole. Further, the potential reliance on Yunta-based emergency services, particularly volunteer brigades, was explored.

Examples of the materials presented during this Phase 1 program are provided in Section 5.4.5.

5.4.3.2. Phase 2 engagement sessions

Phase 2 engagement sessions focussed on the community-scale presentation of interim impact assessment outcomes, and the validation or testing of impact types and management approaches. Individual information panels were presented for each technical impact study area (ecology, groundwater, surface water, air quality, noise and vibration, social, traffic), along with updated information on project configuration and operating conditions.

Two delivery modes were used for these sessions. A town hall meeting format with concurrent drop-in session was held in selected communities. This was in response to a clear demand from those communities for a traditional project presentation format. Information panels were presented for viewing and discussion before and after MGT's formal presentation. In other locations, a standard community drop-in information session approach was adopted to provide a flexible format that could respond to the number, interests and needs of attendees.

Community sessions were held in the following locations:

- Town Hall, Peterborough – 2x community town hall meetings, February 2024
- Town Hall, Burra – community town hall meeting, February 2024
- Peace Hall, Robertstown – community town hall meeting, February 2024
- Salisbury Civic Centre, Adelaide – Ngadjuri Nation community information session, February 2024
- Community Hall, Port Victoria – Ngadjuri Nation community information session, February 2024
- Telecentre, Yunta – Yunta community information session, April 2024

Approximately 200 people attended the seven community sessions (see Plate 5-5, Plate 5-6 and Plate 5-7 for photographs). Support to deliver the engagement sessions was provided by DC Peterborough (for Peterborough sessions) and RC Goyder (for Burra and Robertstown sessions). Importantly, Walking Together – One Team partner NNAC co-hosted the Ngadjuri community information sessions and facilitated group discussions at both events (see Plate 5-8 for photographs).

Feedback was sought for each impact assessment area, with MGT representatives providing support to attendees to provide responses for each impact assessment theme.

To complement the community sessions, MGT operated stalls at two major regional events to provide additional opportunities to present and discussion impact assessment activities and outcomes. Owing to the nature of these events, the presentation of impact assessment panels was not possible; however, this information was made available digitally on an on-demand basis. Stalls were held at the following locations:

- National Carriage Driving Championships, Peterborough (2 days) – March 2024
- Yunta Gymkhana and Motorkhana, Yunta – April 2024

Examples of the materials presented during this Phase 2 program are provided in Section 5.4.5.

Plate 5-7: Photographs of the 2024 Peterborough, Burra and Robertstown community information sessions

Plate 5-8: Photographs of the 2024 Ngadjuri Nation community information sessions

5.4.3.3. *f**ore**sight One to One Meeting program*

With the significant interest of community members in the Peterborough and surrounding areas in the Razorback Project, MGT has recognised community-scale engagement events are not always conducive to discuss and investigate all types of issues stakeholders and communities have interest in.

In response, MGT established the ***fore**sight One-to-One Meeting program*, offering community members an opportunity to meet directly with a senior company representative and discuss any subject matter of interest. The meeting program was scheduled in October 2023 and October 2024, with a total of 70 meetings offered to the community. Meeting times were made available between 7.00 am and 7.00 pm to provide flexibility for individuals that may be working or have other daytime commitments.

While interested parties have travelled from surrounding communities to attend a ***fore**sight One-to-One Meeting*, the majority of participants have been from the immediate Peterborough area. Stakeholders have included town residents, farmers, business owners, environmental advocates and community advocates.

5.4.4. Conference and trade presentations

Engaging with local and regional businesses, as well as infrastructure owners and proponents, has been included as part of MGT's consultative processes under the MLP. Recognising the potential economic contribution of the Project within regional SA and reflecting the expectation of local stakeholders to drive economic outcomes for host communities, MGT has ensured that it commenced building its understanding of the capabilities and capacities of the value and supply chain.

As such, the Company has engaged with the Tactic supply chain connectivity cluster and has participated in several events to engage directly with potential supply chain partners. This preliminary engagement has been extended to a series of meetings to further explore alignment in service demand and supply, as well as visits to business to witness and assess capabilities first-hand.

5.4.5. Community engagement materials

A range of materials and media have been produced to support those community-focused engagement activities discussed in Sections 5.4.1 to 5.4.4. The production of these materials has considered a number of factors, including the targeted distribution methods, accessibility requirements and cultural considerations.

Engagement materials produced by MGT include:

- information panels for the Phase 1 engagement session program – refer Figure 5-2
- information panels for the Phase 2 engagement session program and local government workshops – refer Figure 5-3
- project presentations (PowerPoint format) for town hall meetings as part of the Phase 2 engagement session program
- additional project presentations for targeted groups, including DC Peterborough, RC Goyder and NNAC
- a series of community information sheets that address project scope/description, environmental impact management and community impact management themes – refer Figure 5-4
- project information published on the MGT website
- explanatory videos distributed by social media and access maintained on the MGT website
- media releases, including publication on the MGT website and social media accounts.

Selected materials, such as the community information sheets, were also made available on the Company website in addition to distribution at community events.

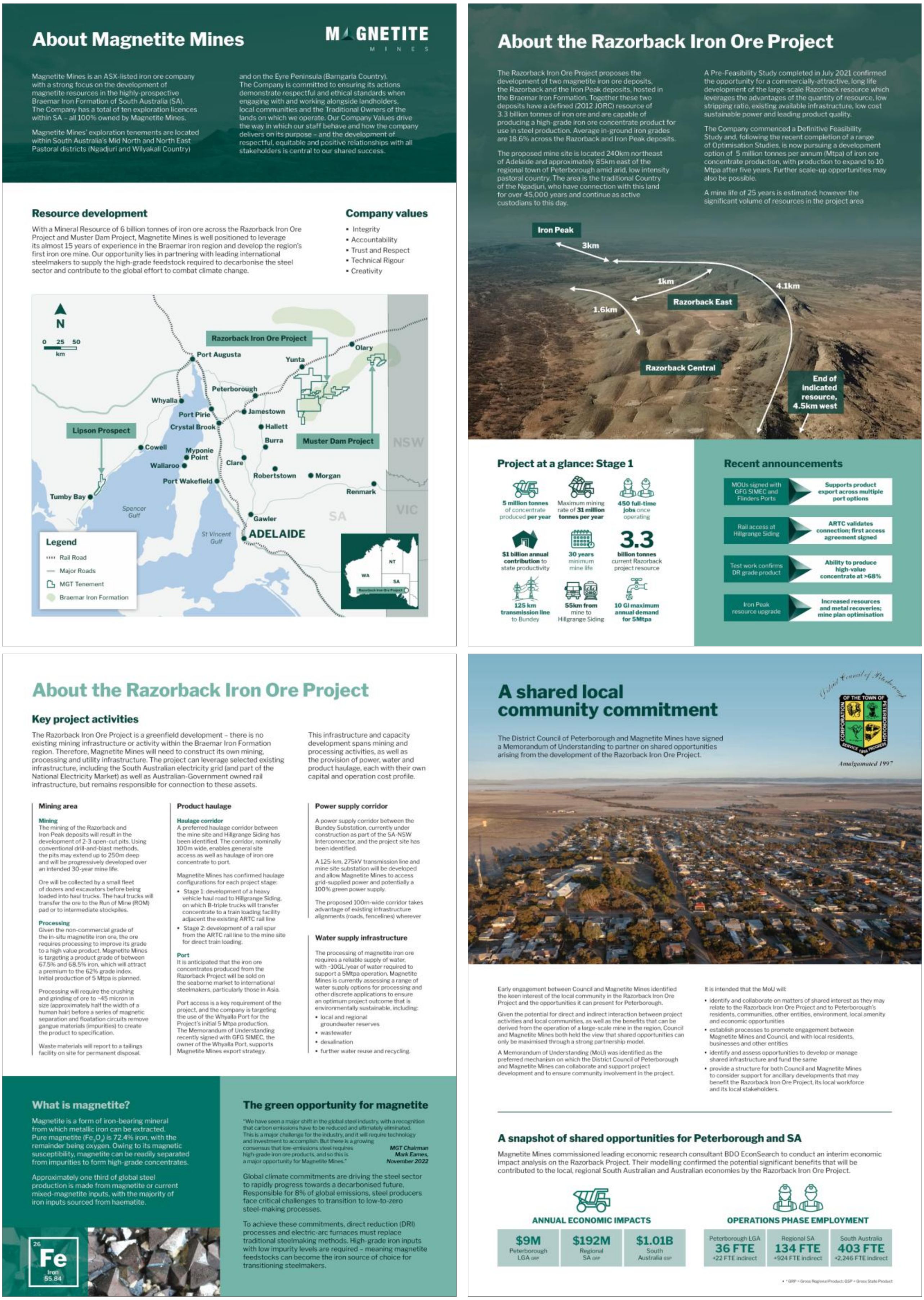
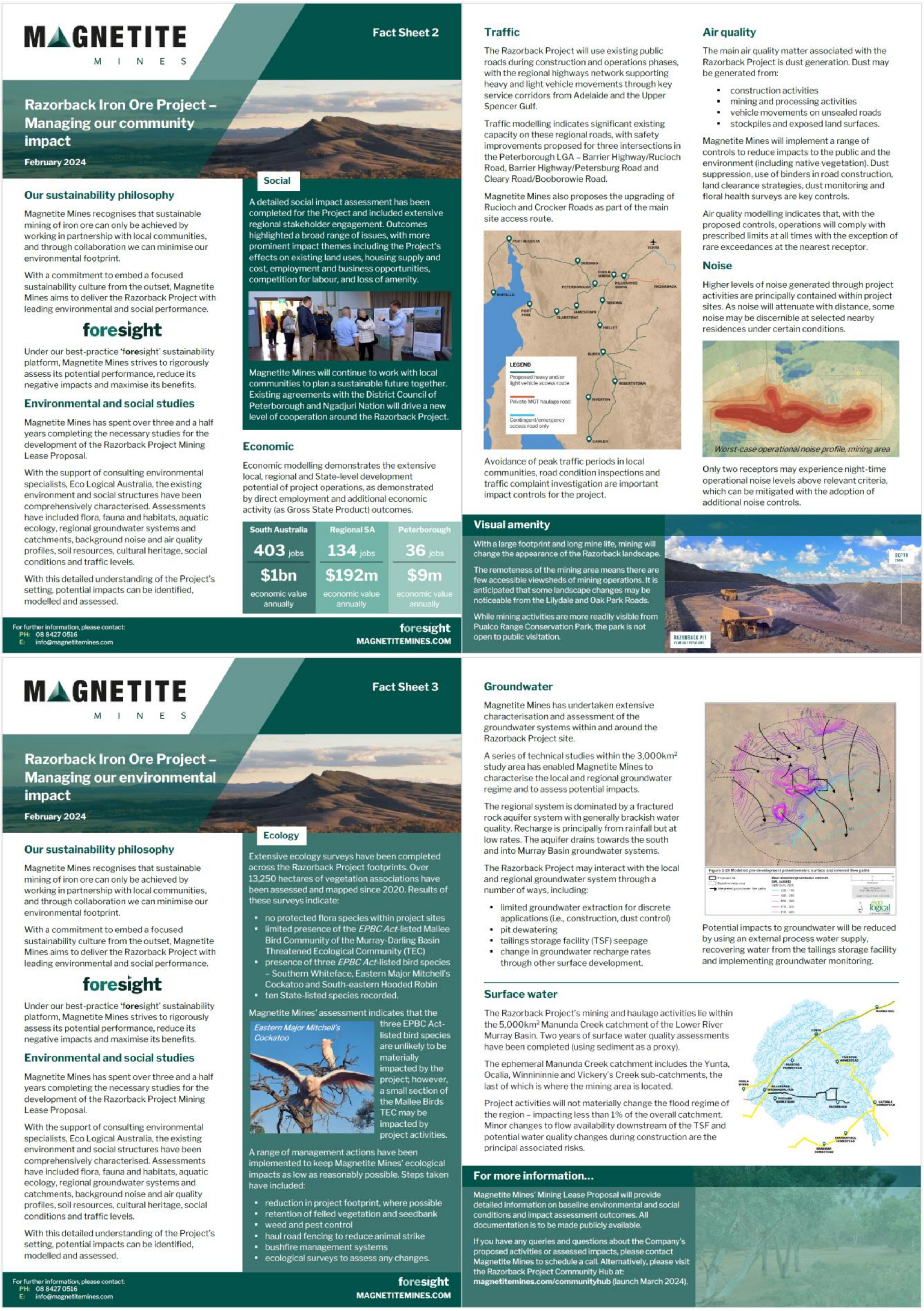


Figure 5-2: Selected information panels from the Phase 1 engagement session program

Figure 5-3: Selected information panels from the Phase 2 engagement session program



MAGNETITE MINES

Fact Sheet 2

Razorback Iron Ore Project – Managing our community impact

February 2024

Our sustainability philosophy

Magnetite Mines recognises that sustainable mining of iron ore can only be achieved by working in partnership with local communities, and through collaboration we can minimise our environmental footprint.

With a commitment to embed a focused sustainability culture from the outset, Magnetite Mines aims to deliver the Razorback Project with leading environmental and social performance.

foresight

Under our best-practice '**fore**sight' sustainability platform, Magnetite Mines strives to rigorously assess its potential performance, reduce its negative impacts and maximise its benefits.

Environmental and social studies

Magnetite Mines has spent over three and a half years completing the necessary studies for the development of the Razorback Project Mining Lease Proposal.

With the support of consulting environmental specialists, Eco Logical Australia, the existing environment and social structures have been comprehensively characterised. Assessments have included flora, fauna and habitats, aquatic ecology, regional groundwater systems and catchments, background noise and air quality profiles, soil resources, cultural heritage, social conditions and traffic levels.

With this detailed understanding of the Project's setting, potential impacts can be identified, modelled and assessed.

Social

A detailed social impact assessment has been completed for the Project and included extensive regional stakeholder engagement. Outcomes highlighted a broad range of issues, with more prominent impact themes including the Project's effects on existing land uses, housing supply and cost, employment and business opportunities, competition for labour, and loss of amenity.

Magnetite Mines will continue to work with local communities to plan a sustainable future together. Existing agreements with the District Council of Peterborough and Ngadjuri Nation will drive a new level of cooperation around the Razorback Project.

Economic

Economic modelling demonstrates the extensive local, regional and State-level development potential of project operations, as demonstrated by direct employment and additional economic activity (as Gross State Product) outcomes.

South Australia	Regional SA	Peterborough
403 jobs	134 jobs	36 jobs
$1bn economic value annually	$192m economic value annually	$9m economic value annually

For further information, please contact:
PH: 08 8427 0516
E: info@magnetitemines.com

foresight
MAGNETITEMINES.COM

Traffic

The Razorback Project will use existing public roads during construction and operations phases, with the regional highways network supporting heavy and light vehicle movements through key service corridors from Adelaide and the Upper Spencer Gulf.

Traffic modelling indicates significant existing capacity on these regional roads, with safety improvements proposed for three intersections in the Peterborough LGA – Barrier Highway/Rucioch Road, Barrier Highway/Petersburg Road and Cleary Road/Booborowie Road.

Magnetite Mines also proposes the upgrading of Rucioch and Crocker Roads as part of the main site access route.

LEGEND
Proposed heavy and/or light vehicle access route
Private MGT haulage road
Contingent/emergency access road only

Avoidance of peak traffic periods in local communities, road condition inspections and traffic complaint investigation are important impact controls for the project.

Air quality

The main air quality matter associated with the Razorback Project is dust generation. Dust may be generated from:

- construction activities
- mining and processing activities
- vehicle movements on unsealed roads
- stockpiles and exposed land surfaces.

Magnetite Mines will implement a range of controls to reduce impacts to the public and the environment (including native vegetation). Dust suppression, use of binders in road construction, land clearance strategies, dust monitoring and floral health surveys are key controls.

Air quality modelling indicates that, with the proposed controls, operations will comply with prescribed limits at all times with the exception of rare exceedances at the nearest receptor.

Noise

Higher levels of noise generated through project activities are principally contained within project sites. As noise will attenuate with distance, some may be discernible at selected nearby residences under certain conditions.

Worst-case operational noise profile, mining area

Only two receptors may experience night-time operational noise levels above relevant criteria, which can be mitigated with the adoption of additional noise controls.

Visual amenity

With a large footprint and long mine life, mining will change the appearance of the Razorback landscape.

The remoteness of the mining area means there are few accessible viewsheds of mining operations. It is anticipated that some landscape changes may be noticeable from the Lilydale and Oak Park Roads.

While mining activities are more readily visible from Pualco Range Conservation Park, the park is not open to public visitation.

MAGNETITE MINES

Fact Sheet 3

Razorback Iron Ore Project – Managing our environmental impact

February 2024

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With the support of consulting environmental specialists, Eco Logical Australia, the existing environment and social structures have been comprehensively characterised. Assessments have included flora, fauna and habitats, aquatic ecology, regional groundwater systems and catchments, background noise and air quality profiles, soil resources, cultural heritage, social conditions and traffic levels.

With this detailed understanding of the Project's setting, potential impacts can be identified, modelled and assessed.

Ecology

Extensive ecology surveys have been completed across the Razorback Project footprints. Over 13,250 hectares of vegetation associations have been assessed and mapped since 2020. Results of these surveys indicate:

- no protected flora species within project sites
- limited presence of the *EPBC Act*-listed Mallee Bird Community of the Murray-Darling Basin Threatened Ecological Community (TEC)
- presence of three *EPBC Act*-listed bird species – Southern Whiteface, Eastern Major Mitchell's Cockatoo and South-eastern Hooded Robin
- ten State-listed species recorded.

Magnetite Mines' assessment indicates that the three EPBC Act-listed bird species are unlikely to be materially impacted by the project; however, a small section of the Mallee Birds TEC may be impacted by project activities.

Eastern Major Mitchell's Cockatoo

A range of management actions have been implemented to keep Magnetite Mines' ecological impacts as low as reasonably possible. Steps taken have included:

- reduction in project footprint, where possible
- retention of felled vegetation and seedbank
- weed and pest control
- haul road fencing to reduce animal strike
- bushfire management systems
- ecological surveys to assess any changes.

For further information, please contact:
PH: 08 8427 0516
E: info@magnetitemines.com

foresight
MAGNETITEMINES.COM

Groundwater

Magnetite Mines has undertaken extensive characterisation and assessment of the groundwater systems within and around the Razorback Project site.

A series of technical studies within the 3,000km² study area has enabled Magnetite Mines to characterise the local and regional groundwater regime and to assess potential impacts.

The regional system is dominated by a fractured rock aquifer system with generally brackish water quality. Recharge is principally from rainfall but at low rates. The aquifer drains towards the south and into Murray Basin groundwater systems.

The Razorback Project may interact with the local and regional groundwater system through a number of ways, including:

- limited groundwater extraction for discrete applications (i.e., construction, dust control)
- pit dewatering
- tailings storage facility (TSF) seepage
- change in groundwater recharge rates through other surface development.

Potential impacts to groundwater will be reduced by using an external process water supply, recovering water from the tailings storage facility and implementing groundwater monitoring.

Surface water

The Razorback Project's mining and haulage activities lie within the 5,000km² Manunda Creek catchment of the Lower River Murray Basin. Two years of surface water quality assessments have been completed (using sediment as a proxy).

The ephemeral Manunda Creek catchment includes the Yunta, Ocalia, Winninninnie and Vickery's Creek sub-catchments, the last of which is where the mining area is located.

Project activities will not materially change the flood regime of the region – impacting less than 1% of the overall catchment. Minor changes to flow availability downstream of the TSF and potential water quality changes during construction are the principal associated risks.

For more information...

Magnetite Mines' Mining Lease Proposal will provide detailed information on baseline environmental and social conditions and impact assessment outcomes. All documentation is to be made publicly available.

If you have any queries and questions about the Company's proposed activities or assessed impacts, please contact Magnetite Mines to schedule a call. Alternatively, please visit the Razorback Project Community Hub at: **magnetitemines.com/communityhub** (launch March 2024).

Figure 5-4: Examples of published project community information sheets

5.4.6. Publication of engagement activities

MGT has used a number of methods to publish and promote engagement activities to stakeholders and communities. This strategy has been implemented to maximise attendance and participation at community engagement activities and events, and to ensure community and stakeholder interests and concerns can be recorded and considered by the Company.

The methods used by MGT include:

- advertisements within the Plains Producer as the most relevant weekly news publication in the region
- advertisements within the Peterborough Informer, published by DC Peterborough monthly, and distributed to ~1,000 households within that council area plus ~200 other recipients
- posts on MGT's social media channels, inclusive of LinkedIn (3,000 followers) and X (1,400 followers)
- posts on social media channels by partners, including:
    - DC Peterborough's Facebook page (547 followers)
    - RC Goyder's Facebook page (2,300 followers)
    - Yunta District Hall Inc.'s Facebook page (112 followers)
- posters displayed on community noticeboards, within council offices and by local businesses in Peterborough, Yunta, Burra, Robertstown and Point Pearce
- direct mail out of event flyers to registered Ngadjuri members.

5.5. Stakeholder enquiry and grievance mechanism

MGT has maintained a stakeholder enquiry and grievance management process throughout the approvals phase of the Project. Matters may be raised initially with the Company through mail, email, webform or telephone, or directly with MGT representatives during engagement events such as ***fore**sight One-to-One Meetings.*

Additionally, enquires have been referred from community partners, such as the DC Peterborough.

MGT aims to acknowledge receipt of all enquiries and any complaints within 48 hours, at which point a triage process is implemented and response process initiated.

The majority of enquiries received by MGT are related to business development and employment opportunities, as well as requests for sponsorship.

Additionally, a number of enquiries have been made in regard to the proximity of proposed operations to communities or residences and associated potential impacts. Where MGT has received such enquiries, it has maintained a proactive approach and provided information as it has become available through the MLP development process, such as results of impact assessment modelling.

5.6. Results of engagement

Results of engagement activities described in Section 5.4 were recorded by MGT and have been progressively considered in Project optimisation studies and in MLP development.

A discussion on the results of engagement activities by primary stakeholder group is provided in Section 5.6.1, while engagement outcomes have been summarised by social/economic, environmental and cultural classifications in Section 5.6.2. Changes made to the Project or the MLP as a result of engagement activities have also been identified and cross-referenced.

Further discussion on views of affected parties, including environmental elements, is provided in Section 7.1.

5.6.1. Engagement results by stakeholder group

5.6.1.1. First Nations groups

MGT's varied engagement activities with First Nations groups, principally centered on NNAC and the Ngadjuri Nation community, has provided significant context and direction to the Company's planned operations, management strategies and agreement-making processes. Targeted meetings and site visits with NNAC Directors has enabled the development of a strategic framework for progressing the Razorback Project with NNAC as a partner, while community sessions have ensured broader representation, including from different family groups, Traditional Owners and other knowledge holders.

Through the engagement session in Phase 1, MGT was able to build a clear understanding from the Ngadjuri community its expectations of the Company as a potential future partner – ultimately leading to the signing of the *Walking Together – One Team Partnering Agreement* (refer Section 5.4.2.2).

Targeted meetings have supported discussion on a broad range of issues, including the development of heritage baseline information, future heritage management processes (including MLP environmental outcomes), cultural processes that must be reflected in consultation and agreement-making processes, building cultural competencies for future operations, economic and community development outcomes and employment opportunities. Recurring project updates are also provided.

Facilitated group discussion during the Phase 2 engagement sessions identified community interest in the interaction between the Project and Aboriginal and Ngadjuri law and lore, opportunities and impacts for future generations (including post-mining), management of the relationship with MGT, heritage management, future engagement processes and economic contributions.

SUMMARY

The following matters discussed with First Nations groups and stakeholders have been assessed as being relevant to the Project and the MLP:

1. Additional cultural processes are required as part of the cultural heritage management process (ongoing).
2. A native title agreement is required to resolve relevant matters and ensure commitments from MGT that support future generations (ongoing).
3. Ongoing engagement efforts should include both Adelaide and regional events, including culturally-safe processes of participation.

5.6.1.2. Landowners, occupiers and interest holders engagement results

The use of targeted meetings has been the basis of discussions with landowners. MGT has engaged with pastoral lessees, Crown perpetual lessees and freehold property owners, as well as those with an interest in those properties (i.e., option rights holders).

While property-specific issues have been discussed and responded to, particularly through initial project design and then land access negotiation stages, key interests and concerns have been raised by multiple parties.

The interaction of the Project with the regional groundwater systems has been the dominant area of concern. As an important water resource for the majority of pastoral operations within the Project footprint, sustainable access to this water is paramount. While groundwater modelling indicates long-term reductions in groundwater levels in some bores, make good provisions have been proposed as a control measure. Stakeholders expect active monitoring, reporting and forecasting by MGT throughout the life of the Project.

Surface water is also an area of interest for some landowners, with the principal matter being the potential for the restriction of surface flows into existing dams or ground tanks. A reduction in surface water availability for stock use would be a major impact in some paddocks, given fresher surface waters are the preferred stock water supply. While few ground/tanks dams could potentially be affected by Project activities, MGT will ensure the retention of flow regimes, where possible, by not embanking drainage channels along key infrastructure corridors.

Reductions in pastoral productivity for all affected landholders is a key concern, which will be reflected in land access negotiations on a case-by-case basis.

Other matters raised during engagement with landowners and occupiers include:

- concerns about safety on rural roads through increased traffic and heavy vehicle use
- management controls for the HR, including fencing/stock protection, disturbance to stock movements/grazing and limitation of public access into the Project area
- the generation of dust and indirect impacts such as grazing palatability
- general nuisance matters associated with noise generation, particularly from the HR
- long-range light emissions, particularly to the south from the southern flanks of the mine pits
- TL construction processes, including the use of gates and grids, and reinstatement post activity, to support MGT's access while preventing unintended third-party access or the escaping stock.

For information on engagement with those with overlapping mineral exploration interests (EL holders), please refer to Section 1.7.3.1. Other interest holders, such as those with option rights over specific parcels of land, have been supportive of MGT's activities, collaborating to identify infrastructure plans that enable the objectives of all parties.

SUMMARY

The following matters discussed with landowners, occupiers and interest holders have been assessed as being relevant to the Project and the MLP:

1. Groundwater and surface water security is a priority issue; access must be maintained long-term for all current users.
2. Pastoral productivity is multi-faceted and lost operational efficiencies must be considered in compensation valuations.
3. Mining activities can create unintended outcomes, such as increased public access to private areas; controls must be applied to retain the current seclusion of private properties near the Project area as well as reduce impacts to stock.
4. Dust, noise and light emissions can all impact on the amenity of the region and should have reasonable controls applied.
5. MGT, as a future owner of land, should be responsible for collaborative management approaches as pastoralists are (i.e., part of regional land management or pest control programs).

5.6.1.3. Local government and development agencies engagement results

Targeted meetings, project briefings, formal deputations and workshops with both elected members and staff of DC Peterborough and RC Goyder have provided a clear understanding of the concerns, opportunities and expectations of local councils relevant to the Project.

Elected members of the DC Peterborough expressed their interest in the opportunity for Peterborough to serve as the service hub for the Project. The elected members affirmed that being the Project's service hub is consistent with their broader community goals – with agreement to develop a "Peterborough Hub Strategy" at a future date. Several potential sites for a central workforce parking and transfer facility (hub) were identified by DC Peterborough elected members and staff. Use of Council roads as part of the main site access route was also supported subject to the negotiation of a suitable road maintenance agreement

Reflecting the aspirations of community members (refer Section 5.6.1.4), DC Peterborough representatives have expressed the need to maximise the economic opportunity for the region resulting from the development of the Project. Key elements include:

- the prioritisation of training, development and employment opportunities for locals, and particularly young people through early engagement with local schools
- attraction and integration of new residents (especially families) to Peterborough, reversing current declining population trends
- coordination on long-term housing and civic infrastructure development to support increased or new populations
- community development contributions.

A briefing to RC Goyder elected members served primarily as a project introduction; elected members requested that feedback from the community information session be shared following the event (which was subsequently actioned). In a workshop with RC Goyder senior staff, key topics of discussion focused on use of council assets (i.e., roads to be used for TL construction) and the need to implement control measures for road maintenance, including:

- preliminary reviews of road weight capacities and planning of any required upgrades
- road surface maintenance programs during construction activities
- post-TL construction road surface inspections and maintenance activities.

Representatives of RC Goyder also flagged their interest in local employment and business engagement outcomes and community development contributions.

Discussions with RDA – Yorke and Mid North and RDA – Far North have both focused on the economic potential of the Project and the opportunities to achieve local content and employment outcomes.

SUMMARY

The following matters discussed with local government and development agency stakeholders have been assessed as being relevant to the Project and the MLP:

1. The concept of the Peterborough Transit Hub aligns to broader community goals of the DC Peterborough and requires further strategic planning.
2. Training, development and employment outcomes are essential for numerous communities and other stakeholders.
3. Long-term strategic planning is recommended to maximise the proportion of the Project's workforce residing in regional areas, including the development of supporting infrastructure
4. Local governments are not in the position to fund road surface upgrades, maintenance and repairs arising from Project activities; road maintenance agreements are sought.
5. Investment in communities through a contributions fund is sought by local government authorities.

5.6.1.4. Communities engagement results

Community engagement activities have provided significant context and information to MGT for consideration within MLP development. The community sessions held in Peterborough, Burra, Robertstown and Yunta yielded the broadest range of issues, while individual ***fore**sight One-to-One Meetings* and unsolicited enquiries provided more detailed considerations on fewer matters.

Overwhelmingly, interest in the Project at community level has focused on its potential social and economic impacts. Approximately two thirds of all responses provided to the impact assessment information panels were received on the 'social and economic' and 'traffic' panels. The training, development and employment of locals was a common interest across Peterborough, Yunta and Burra, with diversity of employment opportunities and support for youth being specific challenges raised by many community members. Issues cascading from employment outcomes, such as housing availability, housing diversity, community integration and community identity (heritage), were also a focus in several communities.

Opportunities for local businesses to participate in the Project was a key theme, particularly in Burra and Robertstown; continued updates on project timings and contracting methods where highlighted. Recommendations to secure local content quotas in agreements with councils was proposed as a management strategy.

Other themes of interest included the role of existing emergency and community services and whether the development of the Project would change the demand and supply profile. Issues such as the availability of doctors at public hospitals and the current reliance on volunteers for staffing ambulance and fire-fighting/recovery services were of specific concern. Such concerns were more pronounced in Peterborough and Yunta. Importantly, community members flagged expectations for MGT to not only understand the impacts to service availability but also be a valued part of the solution – highlighting that the Company's social licence is about the manner in which it participates and not just the outcome.

The impact of increased traffic, and particularly from heavy vehicles, was another focus point. Clear concern was held for the condition of local roads; community members expressed concern as to who would be responsible for maintaining road conditions, what standard roads would be maintained to and the indirect impacts arising from increased traffic (i.e., noise). MGT was able to address a number of concerns that concentrate road haulage would not occur through communities such as Peterborough.

Feedback from community members in Robertstown identified the preference for any accommodation facility supporting TL development to be located within the town to support the local economy.

Environmental concerns raised by community members included the potential for impact to groundwater through localised extraction, as well as the long-term effects post-mine closure; sustainable access to water for farming and pastoral enterprises was the principal issue. The effect of the TSF on ecological and surface water systems was also raised at the Burra session, with concern regarding the potential for and effect of a major tailings breach.

SUMMARY

The following matters discussed with community stakeholders have been assessed as being relevant to the Project and the MLP:

1. Ensure economic and social benefits from the Project are available to host communities; young people should be central to this.
2. Employment opportunities, with commensurate training and development support, are expected by all communities.

3. Additional labour, housing and service demand from the Project will compound existing shortages, and coordinated responses are required between Government, councils, communities and MGT.
4. Public road conditions are a focus for community members; the responsibility for maintenance should reflect the dominant users.
5. The Project must target a level of self-reliance on emergency services and health management; coordination with community-based services is desirable.
6. Regional groundwater systems.
7. Further information on MGT's tailings management processes is required to provide greater context to community members to demonstrate potential impacts in the event of a breach.
8. Opportunities for local business involvement require planning and commitment (refer to Section 5.6.1.7 for related discussion).

5.6.1.5. Community service providers engagement results

Reflecting the community interest in providing opportunities for young people, MGT has engaged with the two middle/senior schools in Peterborough – Peterborough High School and St Joseph's Catholic School. Feedback from both schools highlighted a strong desire to promote careers in the mining sector to students and for MGT to support learning outcomes of students by providing industry-relevant content and experiences. This feedback was also supported by Catholic Education SA.

Matters regarding community services, such as emergency response, were also discussed with representatives of SA Ambulance Service (volunteers brigade) and SA Police. As raised during community engagement activities (see Section 5.6.1.4), concerns existed regarding the potential reliance on community emergency responders. Coordination of formal emergency response procedures (i.e., SA Police) was requested to ensure efficient and effective response and support.

SUMMARY

The following matters discussed with community service providers have been assessed as being relevant to the Project and the MLP:

1. Partnering with local schools is an important step to ensuring young people's participation in the Project, providing pathways into secure local employment.
2. The Project must target a level of self-reliance on emergency services and health management; coordination with community-based services is desirable.

5.6.1.6. Government engagement results

An extensive meeting schedule with SA Government representatives has been held between 2020 and 2025 to support MLP development. Discussions with SA Government representatives have centered around three key themes; (1) project management of the approvals program, (2) targeted reviews of baseline characterisation studies and impact assessment activities, and (3) pre-submission and enabling activities.

The targeted reviews of baseline characterisation studies and impact assessments provided the opportunity to present proposed assessment methodologies to ensure alignment with regulator expectations, with results of modelling programs also presented. Significant feedback was received across a number of meetings with amendments made to assessment and modelling methodologies, identification and assessment of impacts.

Further, engagement on EPBC Act matters has been held with DEM and DCCEEW, with a focus on mitigating impacts to TECs.

5.6.1.7. Business and infrastructure engagement results

Engagement with business owners and operators, primarily through trade events, ***fore**sight One-to-One Meetings* and unsolicited enquiries, has demonstrated continued interest in participating in the Project and ensuring that regional SA benefits appropriately. Further, businesses are seeking opportunities to demonstrate their capabilities, investigate if and where they may have a future role in the Project and to better understand the likely timing of construction and operations phases.

Queries regarding contracting and prequalification processes were also common, reflecting the proactive nature of the supply chain and their previous experience in supplying major resources projects and operations.

Infrastructure operators, such as those involved in power generation, power transmission, rail track and above-rail service provision, identified a number of future opportunities to collaborate on development projects. These matters will be considered as part of MGT's residual feasibility study programs.

SUMMARY

The following matters discussed with business and infrastructure stakeholders have been assessed as being relevant to the Project and the MLP:

1. Business owners and operators are seeking opportunities to participate in the construction and/or operation of the Project.
2. Maximising of local content, and strategies to achieve this.
3. Continuing communication on Project timeframes, and contracting/procurement methodologies.
4. Infrastructure operators, such as for power and rail, identify opportunities to collaborate with MGT on the provision or operation of ancillary infrastructure.

5.6.2. Engagement outcomes

The extensive results of engagement activities, as summarised in Section 5.6.1, demonstrate a significant interest in the Project from broad stakeholder groups. Strong alignment is evident between the five principal engagement issues identified from the Company's materiality assessment (refer Section 5.2.2) and the feedback recorded throughout the engagement program; this indicates that engagement planning was undertaken in a manner that appropriately modelled the most significant engagement risks and enabled stakeholder and community participation accordingly. A summary of the engagement results against the five material engagement issues is listed below.

1. **Sustainable, non-competing sources of water**, and
2. **Water recovery and re-use embedded in design**
   Sustainable access to groundwater and surface water was identified by landowners, occupiers and communities as a key issue; the level of potential water use by MGT is of major interest. Stakeholders indicated that monitoring and modelling investigations must continue throughout the life of the Project through a robust, technical standard.
3. **Tailings safety and verification and indirect environmental impacts**
   The management of tailings was raised by limited community members, but the responses received demonstrated that additional information on tailings characterisation, disposal methods and management controls are needed to ensure all interested stakeholders are informed. Government stakeholders also flagged the materiality of tailings management.

4. **Community engagement, participation and benefit**
   The dominant responses from communities, local government and development agencies, community service providers and businesses centred on the role of MGT, through the Razorback Project, to positively contribute to host communities through economic participation outcomes, social programs and other initiatives.
5. **Native title and cultural heritage management**
   Native title and cultural heritage matters were raised by many First Nations stakeholders; heritage considerations were also identified through some responses from community sessions and by individual pastoral landowners. Empowered participation and agreement-making were identified as key management controls.

Feedback received has been considered by MGT, ELA and impact assessment specialists, and has prompted changes in project footprint, project design, baseline characterisation study methodologies, impact assessment methodologies, impact identification and assessment, impact management, delivery of engagement and other Sections of this MLP.

A summary of engagement responses and resulting MLP/impact assessment amendments made for social and economic issues is included in Table 5-5.

A summary of engagement responses and resulting MLP/impact assessment amendments made for environmental issues is included in Table 5-6.

A summary of engagement responses and resulting MLP/impact assessment amendments made for cultural heritage issues is included in Table 5-7.

Table 5-5: Summary of stakeholder and community engagement responses – social and economic

Subject type	Area of interest (issue/opportunity)	Relevant to impact (by ID)	Comments / other matters
Social	• Continued engagement with communities throughout the mine life • Change in community character and integration of new residents • Access to housing, infrastructure and services in regional communities • Better job opportunities close to communities • Segregation in communities arising between mine and non-mine workers (i.e., economic disparity) • Reduction in quality of life due to proximity to Project activities (direct, indirect) • Reversal of population decline	PI38, PI40, PI42, PI44 *Social objectives – SO1, SO3, SO4*	Engagement: activities to continue through approvals phase
Economic	• Training, development and employment opportunities for locals • Training, development and employment opportunities for Aboriginal community members • Competition for labour • Project content provisions for local and regional businesses • Improvements in access to business services for local residents • Community investment	*Social objectives – SO1, SO2, SO3*	Engagement: activities to continue through approvals phase
Land use and productivity	• Land productivity/carrying capacity changes due to groundwater availability variations • Land productivity/carrying capacity changes due to feed palatability variations • Mining and associated activities affecting stock movements and feeding behaviours • Permanent diminution of land value arising from pits, etc. • Stock losses	PI04, PI15, PI18, PI19, PI20, PI24, PI27, PI28, PI33, PI34, PI37, PI48, PI64, PI67, PI68, PI70, PI71.	Land access negotiations: current negotiations including valuation of productivity impacts
Traffic	• Additional heavy vehicle traffic in communities • Maintenance of public roads used by Project vehicles • Increased rail movements limiting vehicle movements within Peterborough (especially for emergency services) • Cost of road upgrades and maintenance	PI55, PI56, PI57	
Public safety	• Volume of traffic, and risks of individual drivers on road after shifts/swings • Traffic interfaces at key locations, including Barrier Highway • Unapproved use of public and private roads and tracks	PI56	Engagement: Peterborough Transit Hub strategy being assessed with local stakeholders
Closure	• Post-mining land use type (pastoral, conservation, other economic use) • Availability of land for pastoral activities, including progressive release	PI03, PI10	

Table 5-6: Summary of stakeholder and community engagement responses – environmental

Subject type	Area of interest (issue/opportunity)	Relevant to impact (by ID)	Comments / other matters
Ecology - flora	• Loss of native vegetation • Management of weeds, including working with local landcare initiatives • Management of listed ecological communities	PI03, PI06, PI07, PI08, PI09, PI11, PI16, PI33, PI45 PI47, PI49, PI50	EPBC Act: MLP accredited to assess MNES (TEC)
Ecology - fauna	• Native and other fauna entrapment/deaths (roads, pits, TSF) • Management of pest species, including working with local landcare initiatives • Management of listed species	PI03, PI04, PI06, PI07, PI09, PI23, PI33, PI39, PI41, PI43, PI45, PI47, PI49 PI50, PI51, PI52	Project scope: fencing of HR committed to with relevant landowners
Land and landscape	• Loss of landscape features through mining activities (i.e., Razorback Ridge) • Changes in microclimates arising from major changes in landforms	PI12, PI54, PI62	
Groundwater	• Change in groundwater levels (drawdown, mounding) • Change in water qualities, including scope of baseline studies • Prioritising use of other water sources other than groundwater	PI14, PI15, PI16, PI17, PI18, PI19, PI20, PI21, PI22, PI23, PI24, PI25, PI26, PI27, PI28, PI29, PI30, PI31, PI36, PI64, PI65, PI66, PI67, PI68, PI69, PI70, PI71	Project scope: selection of alternative process water supply Other: biannual groundwater sampling program to be continued during approvals phase, with further monitoring during operations
Surface water	• Changes to Vickery's Creek sub-catchment flow regime • Susceptibility of infrastructure to major flooding events • Surface water quality (especially sedimentation)	PI11, PI13, PI14, PI32, PI33, PI34, PI35, PI36, PI37	Other: biannual surface water sampling program to be continued during approvals phase, with further monitoring during operations
Air quality	• Dust generation and dispersion affecting vegetation, stock • Dust generation and dispersion affecting nearby residents	PI45, PI46, PI47, PI48, PI49, PI50	
Noise and vibration	• Noise generation affecting nearby residents • Noise generation affecting stock movements	PI38, PI40, PI42, PI44, PI57	
Amenity – visual, light and other	• Light spill from mine pit • Visual impact of TL in undeveloped areas	PI53	Project scope: TL alignment planned to maximise distance from some residences
Wastes	• Nature/fate of wastes stored in TSF • Loss of TSF containment events / breach • Non-tailings waste management strategies, including not relying on local government waste services	PI11, PI13, PI14, PI35, PI37, PI61, PI62	Project scope: waste handling and transfer facility proposed – no on-site dump for non-tailings waste streams

Subject type	Area of interest (issue/opportunity)	Relevant to impact (by ID)	Comments / other matters
Closure	• Compatibility of final landforms, including stability • Surface water flows • Long-term and post-mining groundwater levels • Revegetation strategies and selection of species	PI03, PI10, PI12, PI13, PI15, PI19, PI20, PI21, PI22, PI35, PI37, PI62	

Table 5-7: Summary of stakeholder and community engagement responses – cultural

Subject type	Area of interest (issue/opportunity)	Relevant to impact (by ID)	Comments / other matters
Native title	• Application of native title over different parts of the Project Area • Negotiation of native title agreement for native title land; FPIC principles	*Social objectives – SO1, SO3*	Land access negotiations: ILUA proposed and initial discussions commenced
Aboriginal heritage	• Management and protection of Aboriginal heritage sites, lines • Engagement with knowledge holders for lines, stories	PI01, PI02, PI62, PI63	
Land and landscape	• Access to land before mining • Recording and visualisation of cultural landscape • Collaboration on the protection and management of the environment	PI01, PI02	Partnering: Issue to be considered as part of the Walking Together – One Team Partnering Agreement
Ecology - fauna	• Responsibility to protect fauna (e.g., cultural totem)	PI03, PI04, PI06, PI07, PI09, PI23, PI33, PI39, PI41, PI43, PI45, PI47, PI49 PI50, PI51, PI52	Partnering: Issue to be considered as part of the Walking Together – One Team Partnering Agreement
Community heritage	• Maintenance of community heritage values, including Peterborough’s rail heritage	*Social objectives – SO1*	Partnering: Issue to be considered as part of the DC Peterborough MOU
Closure	• Post-mining land use type • Management of tangible and intangible heritage post-mining (healing) • Ongoing access to land	PI01, PI02, PI10, PI54, PI63	

Chapter 6

Impact Assessment Framework

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter provides information on the framework for the impact assessment undertaken for the Project, including information on:

- which elements of the environment are relevant to the Project and will be assessed
- how a potential linkage will be determined between the Project and the receiving environment
- how sensitivity to change and uncertainty of potential impacts are considered
- the framework by which the level of risk for each potential impact is measured

A description of the outcomes of the impact assessment, such as proposed outcomes and how the Project will be measured against the outcomes, is also provided.

6. Impact Assessment Framework

The TOR and MG2a require a mining proponent to assess the environmental impacts of a project and subsequently develop outcomes, outcome measurement criteria and leading indicators to manage potential impacts. This Chapter describes the impact assessment framework which has been used throughout the assessment of the Project.

Ecological impacts are considered within the State's assessment framework (refer Section 7), however as the Commonwealth Government requires more detail to be provided on MNES, and in particular an assessment of the residual significant impact to these species, a different assessment methodology has been applied for MNES and this can be found in Section 8.

MGT has opted to consider the social and economic impacts of the project as specialist studies and the outputs of this are included within this MLP. The adopted framework for social impacts varies marginally from the State's assessment framework. The adopted social assessment framework is described further in Section 7.13.

6.1. Determining project elements

The TOR requires proponents to describe the specific elements of the environment that may reasonably be expected to be impacted by the proposed operation during the whole life cycle of the Project (i.e., construction, operation, and closure). The environmental elements which have been identified by the TOR, have had baseline established in Chapter 3, and are reasonably expected to be impacted by the proposed operations are:

- amenity values
- air quality
- caves
- climate
- exempt land
- fauna
- geological environment
- geochemistry, geotechnical and geohazards
- groundwater (quality and quantity)
- heritage (Aboriginal, European and geological)
- local community
- landowners and land use
- noise and vibration
- proximity to infrastructure and housing
- public health and safety
- surface water (quality and quantity)
- topography and landscape
- topsoil and subsoil
- traffic
- vegetation, weeds and plant pathogens
- waste

Each of the relevant elements are assessed in detail in Section 7.

This MLP also includes information on economic benefit (Section 9) as required under the 'Additional Information Requirements' Section of the TOR.

6.2. Potential impact events

Potential impact events are considered for each of the identified elements. Potential impact events are the elements of the environment that may be impacted directly or indirectly, in a perceived positive or negative way by the proposed Project. Direct impacts are caused directly by the proposed operations (e.g., clearing of vegetation), whilst indirect impacts are secondary events that occur and are substantially caused by the operations (e.g., dust generation might impact the vitality and/or fecundity of flora and fauna).

Where stakeholder consultation identified perceived potential impacts, these impacts were also assessed.

Potential impact events for each Project element identified for the Project are discussed in detail in Chapter 7.

6.3. Source, pathways, and receptors

For every potential impact event, the source-pathway-receptor (S-P-R) of that event is then considered. The S-P-R are defined as:

- Source: a project component or element that can affect and interact with the environment.
- Pathway: a medium by which the effect reaches a receptor from a project source (e.g., air or water)
- Receptor: a discrete, identifiable attribute or associated value that can be impacted by a project source via a pathway.

Where the absence of an S-P-R linkage is clear, the event is considered unable to occur and no further assessment is required. Where the S-P-R is confirmed or there is high uncertainty or sensitivity in the data upon which the decision is made, the impact event was considered further as outlined below. Note in the event of an S-P-R resulting in a perceived benefit only, an S-P-R is still recognised and evaluated.

S-P-R linkages for each potential impact event are discussed in Section 7.

6.4. Impact assessment

An environmental impact is a change to an environmental, social, or economic value which will occur as part of the construction, operation, and closure of the Project.

For each relevant impact event (i.e., those with a confirmed S-P-R linkage, an uncertain linkage or those with no linkage but high uncertainty) an assessment of potential impacts from the Project on identified receptors was completed. This assessment included consideration of control measures and management strategies, uncertainty, and sensitivity. Each of these factors is described further within this Chapter.

Impact assessment of confirmed impact events is shown in Chapter 7.

6.4.1. Control measures and management strategies

Adverse environmental impacts can be minimised or avoided using control measures and management strategies. These measures and strategies should be proportionate to the consequence of the impact, comply with the other applicable statutory requirements, and be technically and economically achievable.

The impact assessment framework considers the 'hierarchy of controls' approach where each potential impact event is assessed with consideration of inherent design controls, physical controls, and management controls, in line with the following:

- **Design** – elimination or prevention of impact through design and/or redesign. For example:
    - Remove the hazard (source).
    - Use alternate processes that do not result in the impact.
    - Replace the material or process with a less hazardous one (substitution).
- **Control** – engineering; usually physical controls that can be incorporated into the mine and infrastructure. For example:
    - Location of plant and equipment.
    - Mining method.
    - Encapsulate or contain hazardous materials, pollutants, and emissions.
    - Change height or location of major structures.
    - Install engineered barriers to control access by receptors.
    - Treat/ destroy the pollutant/emission.
    - Control release to a level the environment can absorb (e.g., dilute the pollutant/emission).
- **Management** – management system, identification of management approaches, procedures and plans to be implemented to manage the risk and the way the activity is conducted by personnel, for example:
    - Trigger and response plan for managing dust emissions.
    - Clearance permit system for ensuring native vegetation clearance is in accordance with approved clearance.
    - Induction and training of new employees to ensure awareness of Aboriginal heritage and to avoid unauthorised disturbance

Control measures for each impact event are shown in Section 7.

6.4.2. Uncertainty

The Mining Regulations (Section 46(7)(c) and (d)) require the proponent to identify any matter where there is a significant lack of information or degree of uncertainty. The uncertainties could derive from factors such as lack of information, limitations on modelling, and quality or availability of data. Any significant uncertainties and assumptions regarding the likely effectiveness of proposed control measures or management strategies in managing and mitigating impacts and achieving environmental outcomes for mine operations and post-mine completion must be described. Any assumptions used in modelling are included in the assessment of the effectiveness of proposed control strategies.

Uncertainty regarding the likely effectiveness of control measures or management strategies is shown in Section 7.

Two factors should be considered as part of the uncertainty assessment:

1. **Inputs**: the nature of any assumptions made and the quality of the data used in predicting the effect on the pathway. Uncertainty relating to inputs are ranked according to Table 6-1.

Table 6-1: Uncertainty relating to inputs

Value	Description
A	Extensive data, field verified, limited use of assumptions
B	Limited data, use of industry recognised or benchmarked data, some assumptions
C	Plugged data, limited (if any) verification, numerous assumptions

2. **Method and model**: the quality of methods and models used in the pathway, effect or receptor impact assessment. Uncertainty relating to methods and models are ranked according to Table 6-2.

Table 6-2: Uncertainty relating to methods and models

Value	Description
A	Recognised method and its application, industry standard approach
B	New method or application of existing method, not industry recognised
C	Ad hoc methodology; informal approach

6.4.3. Sensitivity

The Mining Regulations (Section 46(7)(c) and (d)) require the applicant to provide an assessment of a change in any assumption related to any significant uncertainty concerning proposed control strategies and management measures. It is important to perform a sensitivity analysis to see if the sensitivity to change in an assumption relating to a significant uncertainty can result in significant changes to the predicted potential impact event. Sensitivity has been ranked according to Table 6-3.

Sensitivity analysis for changes to assessment outcomes are shown in Chapter 7.

Table 6-3: Sensitivity analysis

Value	Description
A	Predictions not sensitive to input variation
B	Some sensitivity to input variations
C	Predictions sensitive to input variation

6.5. Risk assessment

Risks are those unplanned events that lie outside of the previous impact assessment stages. Risks are assessed through the consideration of likelihood and consequence. Treatments (control measures) are developed to reduce the risk (via reduction of likelihood and/or consequence) and the risk is re-assessed post control. Risk assessment is undertaken using the criteria in Table 6-4, Table 6-5 and Table 6-6.

Table 6-4: Likelihood assessment

Weighting	Description	Frequency	Probability
A	Almost certain	Likely to be high frequency	>90%
B	Likely	Likely to occur within a six-month period	76-90%
C	Possible	May occur within a 12-month period	26-75%
D	Unlikely	Could occur within 1–5-year timeframe	11-25%
E	Rare	May occur only in exceptional circumstances. Has rarely occurred in the industry and not expected in the life of the mine	<10% chance of occurrence

*NOTE THAT PROBABILITY AND FREQUENCY ARE NOT INTENDED TO CORRELATE, AN INDICATOR IS SELECTED WHICH BEST SUITS THE EVENT.

Table 6-5: Consequence assessment

Weighting	Description	Ecological	Environmental	Cultural	Social
1	Insignificant	Insignificant impact to flora and fauna. Minor local habitat modification and/or lifecycle disruption for listed species. No loss of individual or listed species.	Limited damage to minimal area of low significance.	Reparable damage to site or item of low – moderate cultural significance.	Little noticeable change experienced by people in the locality.
2	Minor	Local short-term decrease in abundance of some species with no lasting impacts on local population. Moderate local habitat modification and/or lifecycle disruption for a listed species. Minor increase in size of population(s) of listed species.	Minor effects on biological or physical environment.	Permanent damage to site or item of low-moderate cultural significance.	Mild deterioration / improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
3	Moderate	Local long-term decrease in abundance of some species resulting in some changes to ecological community infrastructure. Substantial local habitat modification and/or lifecycle disruption for a listed species. Moderate local decrease in size of population(s) of listed species.	Moderate short-term effects but not affecting ecosystem function.	Reparable damage to heritage site or item of national significance.	Noticeable deterioration / improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people.
4	Major	Regional decrease in abundance of some species resulting in changes to ecological community infrastructure. Moderate regional habitat modification and/or lifecycle disruption for a listed species. Substantial local decrease in size of population(s) of listed species.	Serious medium-term environmental effects.	Permanent damage to heritage site or item of national significance.	Substantial deterioration / improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area
5	Catastrophic	Regional loss of numerous species resulting in dominance of only a few species. Substantial regional habitat modification and/or lifecycle disruption for a listed species. Moderate or substantial regional decrease in size of population(s) of listed species.	Very serious long-term environmental impairment of ecosystem function.	Permanent damage to heritage site or item of international significance.	Substantial change experienced in community* wellbeing, livelihood, infrastructure, services or health; permanent displacement or addition of a least 20% of a community*.

* NOTE 'COMMUNITY' IS DEFINED AS THAT IN MG2A: A GROUP OF PEOPLE LIVING IN A PARTICULAR AREA OR REGION. IN MINING INDUSTRY TERMS, 'COMMUNITY' IS GENERALLY APPLIED TO THE INHABITANTS OF IMMEDIATE AND SURROUNDING AREAS WHO ARE AFFECTED BY ACTIVITIES ASSOCIATED WITH MINING OPERATIONS

Table 6-6: Risk matrix

		Consequence				
		1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
Likelihood	A Almost Certain	High	High	Very High	Very High	Very High
	B Likely	Moderate	High	High	Very High	Very High
	C Possible	Low	Moderate	High	Very High	Very High
	D Unlikely	Low	Low	Moderate	High	Very High
	E Rare	Low	Low	Moderate	Moderate	High

6.6. Proposed outcomes

Proposed outcomes are developed for the Project based on the outcomes of the impact assessment. Detailed outcomes are finalised as part of the collation and submission of the PEPR.

An outcome is a statement which reflects the 'acceptable' residual impact on the environment resulting from the Project. That is, an outcome is a statement of what is to be achieved when managing impacts on the environment. Outcomes are relevant to all stages of the operation (construction, operation, and closure).

Draft outcomes for the Project are proposed in Chapter 7.

6.7. Proposed outcome measurement criteria

Proposed outcome measurement criteria have been developed for all outcomes. The intent of the measurement criteria is to demonstrate the achievement of an outcome. Where possible, quantitative criteria have been developed, and recognised industry standards, codes of practice or legislative provisions from other Acts (where possible) are used as criteria. Following the approval of the PEPR (should the Project be granted a ML and associated MPLs), measurement criteria will be used as the key indicators of compliance with the Mining Act. These will be finalised in the PEPR submission.

Outcome measurement criteria are proposed in Chapter 7.

6.8. Proposed leading indicator criteria

Proposed leading indicator criteria were developed for all impact events that were significantly reliant on a management and/or control strategies to reduce the potential impact on the environment. The intent of a leading indicator is to provide an early warning to the proponent and to the government that a control measure or management strategy may fail, or is failing, and therefore the environmental outcome is potentially at risk of not being achieved, giving time to respond appropriately. Leading indicator criteria will be finalised in the PEPR submission.

Leading indicator criteria for the Project (where applicable) are proposed in Chapter 7.

Chapter 7

Assessment of Environmental and Social Effects and Impacts

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

Chapter 7 presents the environmental impact assessment for all relevant environmental matters resulting from the review of the existing environment (Chapter 3), and the stakeholder engagement (Chapter 5).

Each environmental factor is considered in turn, with a review and summary of the context and then a discussion of potential impacts resulting from the Project. The impact assessment framework (Chapter 6) is used to assess possible pathways for impacts, and an assessment of the likely impacts is completed for each. For each impact, a range of mitigation and management measures are recommended, with risk assessed both prior to and after the mitigation is applied. Risks, uncertainty and sensitivity relating to assumptions made, the effectiveness of the mitigation measures, and the effect on the likely outcomes is assessed.

For each environmental matter, one or more draft outcomes are proposed and the measurement criteria by which compliance to the outcome is measured are nominated.

7. Assessment of Environmental and Social Effects and Impacts

This Chapter considers potential changes to the baseline environment resulting from the Project. Pathways and linkages are determined for each potential source and assessed for significance and impacts on the identified receptors.

7.1. Views of affected parties

As outlined in Section 5, MGT has been actively engaging and consulting with relevant stakeholders regarding the Project since 2010; engagement activities material to this MLP commenced in 2021. A summary of stakeholder views in relation to environmental and social elements of the Project is provided in Table 7-1.

Table 7-1: Context and views of affected parties

Environmental Element	Views of Affected parties	Applicable government standards and non-legislated standards	Environmental receptor
Heritage (Aboriginal, European and geological)	<u>Aboriginal heritage</u> • Application of native title over different parts of the Project Area • Negotiation of native title agreement for native title land; FPIC principles • Management and protection of Aboriginal heritage sites, lines • Engagement with knowledge holders for lines, stories • Access to land before mining • Recording and visualisation of cultural landscape • Collaboration on the protection and management of the environment • Responsibility to protect fauna (e.g., cultural totem) • Post-mining land use type (as related to cultural heritage) • Management of tangible and intangible heritage post-mining (healing) • Ongoing access to land (as related to cultural heritage) <u>Community Heritage</u> • Maintenance of community heritage values, such as Peterborough's rail heritage	• *Native Title Act 1993 (Cth)* • *Aboriginal Heritage Act 1988 (SA)* • *Native Title Act 1994 (SA) and Native Title (SA) Regulations 2016* • *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* • *Heritage Places Act 1993 (SA).*	First Nations people Local communities (Yunta, Peterborough, Burra)
Flora, fauna and native vegetation	• Loss of native vegetation • Management of weeds, including working with local landcare initiatives • Management of listed ecological communities • Native and other fauna entrapment/deaths (roads, pits, TSF) • Management of pest species, including working with local landcare initiatives • Management of listed species	• *Environment Protection and Biodiversity Conservation Act 1999* (Cth) • *Native Vegetation Act 1991* • *Native Vegetation Regulations 2017* • *National Parks and Wildlife Act 1972* (SA) • *Public and Environmental Health Act 1987* (SA) • *Landscape SA Act 2019* (SA). • State and Commonwealth declared species lists.	Local communities (Yunta, Peterborough, Burra) Fauna in proximity to the Project Flora in proximity to the Project First Nations people
Soil and land quality / productivity	• Land productivity/carrying capacity changes due to groundwater availability variations • Land productivity/carrying capacity changes due to feed palatability variations • Mining and associated activities affecting stock movements and feeding behaviours • Permanent diminution of land value arising from pits, etc. • Stock losses due to vehicle strike	• *Environment Protection Act 1993* (SA) • *Mining Act 1971* (SA) • *Landscape SA Act 2019* (SA). • Australian standards relating to storage of flammable and combustible liquids • EPA Bunding and Spill Management 2016	Flora Landowners

Environmental Element	Views of Affected parties	Applicable government standards and non-legislated standards	Environmental receptor
Public health and safety	• Volume of traffic, and risks of individual drivers on road after shifts/swings • Traffic interfaces at key locations, including Barrier Highway • Unapproved use of public and private roads and tracks	• *Road Traffic Act 1961* (SA) • *Fire and Emergency Services Act 2005* (SA) • *Fire and Emergency Services Regulations 2021* (SA) • *Emergency Management Act 2004* (SA) • *State Emergency Management Plan 2022* • *Crown Land Management Act 2009* (SA) • *Work Health and Safety Act 2012* (SA). • Australian Standards for security fences and gates.	Local communities (Yunta, Peterborough, Burra) Landowners Road users
Waste	• Nature/fate of wastes stored in TSF • Loss of TSF containment events (breach / spill) • Non-tailings waste management strategies, including not relying on local government waste services	• *Environment Protection Act 1993* (SA) • *Public Health Act 2011* (SA) • *Public and Environmental Health (Waste Control) Regulations 1995.* • *Environment Protection (Waste to Resources) Policy 2010.*	Local communities (Yunta, Peterborough, Burra)
Groundwater (including quality and quantity)	• Change in groundwater levels (drawdown, mounding) • Change in water qualities, including scope of baseline studies • Prioritising use of other water sources other than groundwater	• *Landscape SA Act 2019* (SA) • *The Environment Protection Act 1993* (SA) • *Mining Act 1971* (SA). • *Environment Protection (Water Quality) Policy 2015* • EPA Bunding and spill management 2016 • Australian and New Zealand Guidelines for Fresh and Marine Water Quality ANZECC/ARMCANZ 2000 • Australian Standards Water Quality Sampling.	Third party users/landowners
Surface water (including quality and quantity)	• Changes to Vickery's Creek sub-catchment flow regime • Susceptibility of infrastructure to major flooding events • Surface water quality (especially sedimentation)	• *Mining Act 1971* (SA) • *Environment Protection Act 1993* (SA) • *Aboriginal Heritage Act 1988* (SA). • EPA Bunding and spill management 2016 • Australian and New Zealand Guidelines for Fresh and Marine Water Quality • *Environment Protection (Water Quality) Policy 2015* • Australian and New Zealand Guidelines for Fresh and Marine Water Quality	Landowners Fauna Flora Waterholes and drainage features

Environmental Element	Views of Affected parties	Applicable government standards and non-legislated standards	Environmental receptor
Noise and vibration	• Noise generation affecting nearby residents • Noise generation affecting stock movements	• Australian standards for acoustics, description, and measurement of environmental noise • *Environment Protection (Noise) Policy 2007* (SA).	Local communities (Yunta, Peterborough, Burra) Landowners
Air quality	• Dust generation and dispersion affecting vegetation, stock • Dust generation and dispersion affecting nearby residents	• *Mining Act 1971* (SA) • *Native Vegetation Act 1991* and *Native Vegetation Regulations 2017* • *The Environment Protection Act 1993* (SA) (EP Act) • *Climate Change and Greenhouse Emissions Reduction Act 2007* (SA) • *Environment Protection (Air Quality) Policy 2016* • *Civil Aviation Act 1988* (Cth) • *National Greenhouse and Energy Reporting Act 2007* (Cth) • Australian Standards relating to air quality	Local communities (Yunta, Peterborough, Burra) Landowners
Visual amenity	• Loss of landscape features through mining activities (i.e., Razorback Ridge) • Changes in microclimates arising from major changes in landforms • Light spill from mine pit • Visual impact of TL in undeveloped areas	• *Mining Act 1971* • *Environment Protection Act 1993* (SA) • Australian standards for the control of obtrusive effects of outdoor lighting	Local communities (Yunta, Peterborough, Burra) Landowners
Roads and traffic	• Additional heavy vehicle traffic in communities • Maintenance of public roads used by Project vehicles • Increased rail movements limiting vehicle movements within Peterborough (especially for emergency services) • Cost of road upgrades and maintenance	• *Road Traffic Act 1961*	Local communities (Yunta, Peterborough, Burra) Road users
Social	• Continued engagement with communities throughout the mine life • Change in community character and integration of new residents • Access to housing, infrastructure and services in regional communities • Better job opportunities close to communities • Segregation in communities arising between mine and non-mine workers (i.e., economic disparity) • Reduction in quality of life due to proximity to Project activities (direct, indirect) • Reversal of population decline	• *Mining Act 1971* (SA) • *Charter of Health and Community Services Rights Policy Directive 2019* (SA Health)	Local communities (Yunta, Peterborough)

Environmental Element	Views of Affected parties	Applicable government standards and non-legislated standards	Environmental receptor
Economic	• Training, development and employment opportunities for locals • Training, development and employment opportunities for Aboriginal community members • Competition for labour • Project content provisions for local and regional businesses • Improvements in access to business services for local residents • Community investment	• Nil	Local communities (Yunta, Peterborough, Burra) First Nations peoples
Closure	• Compatibility of final landforms, including stability • Surface water flows • Long-term and post-mining groundwater levels • Revegetation strategies and selection of species • Post-mining land use type (pastoral, conservation, other economic use) • Availability of land for pastoral activities, including progressive release	• Nil	Landowners First Nations peoples

7.2. Heritage (Aboriginal, European and geological)

This Section considers and describes how the Project may impact on heritage items and concepts, including Aboriginal, European and geological heritage, and outlines the measures that will be implemented to minimise those impacts.

Section 3.16 provides information on the known Aboriginal, European, and geological heritage of the Site and its surrounds.

7.2.1. Context

7.2.1.1. Aboriginal Heritage

The Project Area is situated within the Ngadjuri Nation #2 determination area and the First Peoples of the River Murray and Mallee Region #2 claim area. The ML, and HR is entirely within the Ngadjuri Nation #2 determination area. The TL sits within multiple areas:

- Ngadjuri Nation #2 (northern extent).
- First Peoples of the River Murray and Mallee Region #2 (southern extent).
- Area not subject to claim (centre) (previously included within the original Ngadjuri Nation #2 claim area).

A Cultural Heritage Impact Assessment (CHIA) has been prepared by Linking Futures (Linking Futures, 2024) to assess the likelihood of impact to the tangible and intangible cultural heritage across the Study Area. Previous heritage surveys and the Attorney-General's Department - Aboriginal Affairs and Reconciliation (AGD-AAR) Taa Wika Central Archives database have been used to assess the archeological, anthropological and ethnographic significance of the Project Area (latest search requested 7 March 2025). Known Aboriginal heritage sites across the Project Area include:

- artefact scatters and isolated artefacts
- campsites and hearths
- rockholes and engravings
- rocky outcrops
- culturally modified trees.

Sites that may have been used as burial sites have also been identified during a survey, however no direct evidence of burial sites has been recorded within the Project Area.

Intangible heritage values have also been recorded within the Project Area. Such ethnographic sites that may be interconnected with significant regional landforms.

When considering the whole Project Area, the Site is considered the most sensitive area, where the Project has the highest potential impact to Aboriginal heritage sites, objects and cultural values.

7.2.1.2. European Heritage

As discussed in Section 3.16.2, no European heritage places and items protected under the *Heritage Places Act 1993* (HP Act) or the PDI Act are present within the Razorback Project area. On this basis the Project is not considered to pose a risk to European heritage.

7.2.1.3. Geological heritage

As discussed in Section 3.16.3, the Project area includes the Razorback Ridge, which is considered a geological monument by the GSA.

The status of "geological monument" conferred on any site by the GSA does not give to that site any automatic protection. Within its assessment, the GSA (1981) proposes that future mining at Razorback Ridge should take into account the need to retain important geological exposures in rehabilitation.

7.2.2. Impact assessment

There are no expected impacts on European Heritage. An impact assessment has been undertaken considering the full range of potential impacts to aboriginal heritage resulting from the Project. The viability of the S-P-R linkage for each is then considered in more detail, with mitigation measures and potential outcomes proposed for those where an impact may occur. Detailed assessment of each potential impact is shown in Table 7-6.

7.2.2.1. Disturbance to physical cultural heritage sites and items

Physical cultural heritage sites and items including culturally modified trees, artefact scatters and isolated artefact finds, campsites and hearths, rockholes and engraving sites, and rocky outcrops have been recorded within the Project Area.

As the Project will involve clearance and excavation of land, disturbance to physical cultural heritage sites and items will occur. Diminishment of cultural value to Traditional Owner groups may also occur. Mitigation measures, coupled with extensive engagement, will be implemented to limit disturbance areas and protect sensitive sites of cultural value to Traditional Owners, where possible.

7.2.2.2. Disruption to Dreaming Stories

Dreaming Stories enable Aboriginal Peoples to traverse their country and reconnect with ancestors.

The Project Area traverses several intangible cultural heritage Dreaming stories / lines. Disruption to Dreaming Stories, intangible cultural heritage and associated landform markers may occur if mitigation measures are not implemented. Dreaming sites may be impacted both directly and indirectly by the Project, as modification of landforms due to land clearing or mining may impact the Dreaming Stories unless preserved through other means. Dreaming Stories may need to be documented for future generations using digital media, as well as locating the song lines over maps.

7.2.2.3. Potential exposure of Aboriginal burial sites

No burial sites have been identified within the Project Area, however, areas where burials may potentially occur have been identified; therefore, Aboriginal burial sites must be considered within the context of this impact assessment. MGT will follow the mitigation measures to comply with AGD-AAR Standard Operating Procedures (SOP) for the discovery and removal of Aboriginal remains, and will establish protocols in conjunction with relevant Traditional Owners and Elders if remains are found.

7.2.2.4. Potential impact events

The potential heritage impact events and respective areas (ML and MPLs) are listed in Table 7-2 and are further analysed within Table 7-6.

Table 7-2: Heritage potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI01	Disturbance to physical cultural heritage sites and items, including diminishment of cultural value to Traditional Owner groups	Yes	C, O, R	C, R	C, R
PI02	Disruption to Dreaming Stories, intangible cultural heritage and associated landform markers	Yes	C, O,	C, O,	C, O
PI63	Disturbance and potential exposure of Aboriginal Burial Sites	Yes	C, O, R	C, R	C, R

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some potential impacts on heritage are more appropriately discussed in other Sections of this report. Instances of cross-referenced impacts are shown in Table 7-3.

Table 7-3: Heritage impacts cross reference

Potential impact	Refer to	Cross reference
The post-mining landforms result in adverse impacts to visual amenity of the landscape	PI54	Section 7.10

7.2.3. Design, control and management strategies

Design, control and management strategies for the identified impact events are detailed in Table 7-4. These strategies are assigned to each potential impact event in Table 7-6.

Early engagement and communication with Traditional Owners and Elders have and will continue to be prioritised. Management of impacts on Aboriginal heritage will be an operational commitment for MGT. MGT is committed to a continued high standard of community engagement and social performance and looks to understand community and stakeholder views and management of cultural heritage. Due to the potential impact to matters of cultural significance, Ngadjuri Traditional Owners will co-develop a Cultural Heritage Management Plan (CHMP) that is proposed to support secondary regulatory approval processes.

Table 7-4: Heritage design, control and management measures

Reference ID	Design, control and management measure
MM01	Access to unauthorised areas is recorded in the Incident Management System (IMS)
MM02	Baseline cultural heritage surveys of areas proposed for disturbance in consultation with Traditional Owners as per CHMP
MM03	Site induction to include the requirements of the AH Act and the importance of maintaining heritage exclusion areas
MM04	A CHMP will be developed and implemented
MM05	Ongoing workforce cultural awareness and competency training
MM100	Survey and documentation of all physical cultural heritage sites and items will be undertaken as a record of their cultural significance
MM101	Recording both Men's and Women's Dreaming Stories across the Study Area, as at the reasonable request of the relevant Traditional Owner group(s)
MM102	Engagement with Traditional Owners to implement a SOP for identification of Aboriginal burial sites
MM103	Use of LIDAR and / or videography to assist in capturing and retaining the directions and connections that dreaming stories and line have across the modified landscape

7.2.4. Draft outcomes, measurement criteria and leading indicators

The draft heritage proposed outcomes are presented in Table 7-5. The proposed outcome, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-6.

Table 7-5: Heritage proposed outcomes

Reference ID	Proposed outcome
PO01	The Tenement Holder must ensure there is no damage, disturbance, or interference to Aboriginal heritage sites, items, objects and / or remains as a result of project activities outside of agreed traditional owner management practices and statutory authorisations

Table 7-6: Heritage detailed impact assessment

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI01</td><td colspan="2">Phase</td><td colspan="3">Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="9">Disturbance to physical cultural heritage sites and items, including diminishment of cultural value to Traditional Owner groups</td></tr>
<tr><td>Source</td><td colspan="9">Clearance, earthworks, mining operations, rehabilitation and other ground-disturbing activities</td></tr>
<tr><td>Pathway</td><td colspan="9">Land</td></tr>
<tr><td>Receptor</td><td colspan="9">Rockholes, rock outcrops, campsites and hearths, engraving sites, artefact sites and scatters, culturally modified / scar trees, isolated artefacts; Traditional Owners / groups</td></tr>
<tr><td>Inherent design controls</td><td colspan="9">Relocation of proposed infrastructure to avoid high-value physical cultural heritage site(s)</td></tr>
<tr><td rowspan="2">Uncertainty / knowledge gaps / assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="6">Extensive heritage surveys completed, and use of Taa Wika data; not all proposed disturbance areas have been surveyed with additional survey effort required.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="6">Utilisation of standard archaeological practices for recording and documenting physical cultural heritage sites and items. Significant engagement with Traditional Owner representatives for Site area.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="6">The presence of physical cultural heritage sites and items within and adjacent to the Project Area has been confirmed. Any identification of further physical cultural heritage sites and items will not affect the S-P-R assessment.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="7">Physical cultural heritage sites and items have been recorded within the Conceptual Footprint and will be directly impacted by the Project.</td></tr>
<tr><td colspan="10">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="9">Disturbance to physical cultural heritage sites and items, including diminishment of cultural value to Traditional Owner groups</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="3">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>A</td><td>High</td><td colspan="3">MM01: Access to unauthorised areas is recorded in the IMS
MM02: Baseline cultural heritage surveys of areas proposed for disturbance in consultation with Traditional Owners as per CHMP
MM03: Induction to include the requirements of the AH Act and the importance of maintaining heritage exclusion areas
MM04: A CHMP will be developed and implemented</td><td>2</td><td>C</td><td>Moderate</td></tr>
</table>

					MM05: Ongoing workforce cultural awareness and competency training MM100: Survey and documentation of all physical cultural heritage sites and items will need to be undertaken as a record of their cultural significance		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Details of CHMP and agreement are not yet known but are likely to be within standard framework		
	Sensitivity analysis	**Sensitivity**	C	**Justification**	There is some risk that changes to the CHMP may affect ability to meet proposed outcome		
Statement of proposed outcomes	**Legislative requirement**	AH Act (particularly Sections 12,13 and 23)					
	Proposed outcome	PO01: The Tenement Holder must ensure there is no damage, disturbance, or interference to Aboriginal heritage sites, items, objects and/or remains as a result of project activities outside of agreed traditional owner management practices and statutory authorisations					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM01	Incident records relating to Aboriginal heritage from IMS	Project Area	No unapproved disturbance to Aboriginal heritage sites, objects and / or remains	Annual	Baseline cultural heritage surveys / agreements CHMP IMS records
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI-11	Cultural awareness training is delivered to workforce. Measured by training records	N/A	Records show that all permanent employees or subcontractors have undertaken or are scheduled to undertake cultural awareness training	Annual	IMS records
		LI-12	On-ground monitoring of physical control measures	Project Area	Physical control measures such as fencing are monitored and maintained	Monthly during construction. Quarterly during operations	Map of physical control measures

	Impact ID	**PI02**			**Phase**	**Construction and operations**		
Potential impact event	**Potential impact description**	Disruption to Dreaming Stories, intangible cultural heritage and associated landform markers						
	Source	Clearance, earthworks, mining operations and other ground-disturbing activities						
	Pathway	Land						
	Receptor	Modification of landform impacting on Traditional Owners' connection to Country						
	Inherent design controls	None						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	On-ground surveys have been conducted across ML. However, not all proposed disturbance areas have been surveyed with additional survey effort required.			
		Method and model	C	**Justification**	No approved methodology.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Known impact on Dreaming Stories related to changes in landform (Razorback Ridge). Changes / disturbance of additional areas are unlikely to impact known S-P-R.			
	S--P-R linkage	Yes	**Justification**	Modifications to landforms will have direct consequences for Traditional Owners to navigate the Dreaming stories when crossing country.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Loss of visual landmarks for Ngadjuri Dreaming Story. Possible interruption of Dreaming Story						
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		4	A	Very High	MM01: Access to unauthorised areas is recorded in the IMS MM02: Baseline cultural heritage surveys of areas proposed for disturbance in consultation with Traditional Owners as per CHMP MM04: A CHMP will be developed and implemented MM05: Workforce cultural awareness and competency training MM101: Recording both Men's and Women's Dreaming Stories across the Study Area, as at the reasonable request of the relevant Traditional Owner group(s)	3	A	Very High

					MM103: Use of LIDAR and videography to assist in capturing and retaining the directions and connections that dreaming stories and line have across the modified landscape			
	Uncertainty	**Inputs, method and model**	C	**Justification**	Uncertainty regarding to what extent the mitigation measures will reduce impact			
	Sensitivity analysis	**Sensitivity**	C	**Justification**	Ability to meet outcome may be affected by uncertainty regarding mitigation measure effectiveness			
Statement of proposed outcomes	**Legislative requirement**	AH Act (particularly Sections 12,13 and 23)						
	Proposed outcome	PO01: The Tenement Holder must ensure there is no damage, disturbance, or interference to Aboriginal heritage sites, items, objects and/or remains as a result of project activities outside of agreed traditional owner management practices and statutory authorisations						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM01	Incident records relating to Aboriginal heritage from IMS		Project Area	No unapproved disturbance to Aboriginal heritage, sites, objects and / or remains	Annual	Baseline cultural heritage surveys / agreements. CHMP IMS records
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI-11	Cultural awareness training is delivered to workforce. Measured by training records		N/A	Records show that all permanent employees or subcontractors have undertaken or are scheduled to undertaken cultural awareness training	Annual	IMS records

	Impact ID	PI63			Phase	Construction, operations and closure		
Potential impact event	Potential impact description	Disturbance and potential exposure of possible Aboriginal Burial Sites						
	Source	Clearance, earthworks, mining operations and other ground-disturbing activities						
	Pathway	Land						
	Receptor	Surface and subsurface burial sites; Traditional Owners/groups						
	Inherent design controls	Relocation of proposed infrastructure to avoid high-value heritage site(s)						
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	Extensive heritage surveys completed, and use of Taa Wika data; not all proposed disturbance areas have been surveyed with and additional survey effort required.			
		Method and model	A	Justification	Utilisation of standard archaeological practices for recording and documenting physical cultural heritage sites and items. Significant engagement with Traditional Owner representatives for sensitive areas.			
	Sensitivity analysis	Sensitivity	A	Justification	The presence of potential burial sites within and adjacent to the Project Area has been confirmed. Any identification of confirmed burial sites and associated items will not affect the S-P-R assessment.			
	S--P-R linkage	Yes	Justification	Potential burial sites have been recorded within the disturbance area and may be directly or indirectly impacted by the Project.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Potential disturbance to Aboriginal burial sites						
Risk assessment and design/ management controls	Risk Assessment	Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	L	Risk		C	L	Risk
		2	A	High	MM01: Access to unauthorised areas is recorded in the IMS MM02: Baseline cultural heritage surveys of areas proposed for disturbance in consultation with Traditional Owners as per CHMP MM03: Induction to include the requirements of the AH Act and the importance of maintaining heritage exclusion areas MM04: A CHMP will be developed and implemented MM05: Ongoing workforce cultural awareness and competency trainingMM100: Survey and documentation of all physical cultural	2	B	High

					heritage sites and items will need to be undertaken as a record of their cultural significance MM102: Engagement with Traditional Owners to implement a SOP for identification of Aboriginal burial sites		
	Uncertainty	Inputs, method and model	B	Justification	Details of CHMP and agreement regarding burial sites, are not yet known but are likely to be within standard framework.		
	Sensitivity analysis	Sensitivity	C	Justification	There is some risk that changes to the CHMP may affect ability to meet outcome.		
Statement of proposed outcomes	Legislative requirement	AH Act (particularly Sections 12,13 and 23) *Coroners Act 2003* (SA)					
	Proposed outcome	PO01: The Tenement Holder must ensure there is no damage, disturbance, or interference to Aboriginal heritage sites, items, objects and/or remains as a result of project activities outside of agreed traditional owner management practices and statutory authorisations					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM01	Incident records relating to Aboriginal heritage from IMS	Project Area	No unapproved disturbance to Aboriginal heritage sites, objects and / or remains	Annual	Baseline cultural heritage surveys / agreements. CHMP IMS records
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI-11	Cultural awareness training is delivered to workforce. Measured by training records	N/A	Records show that all permanent employees or subcontractors have undertaken or are scheduled to undertaken cultural awareness training	Annual	IMS records
		LI-12	On-ground monitoring of physical control measures	Project Area	Physical control measures such as fencing are monitored and maintained	Monthly during construction. Quarterly during operations	Map of physical control measures

7.3. Flora, fauna and native vegetation

This Section describes how the Project may impact on flora, fauna and native vegetation values and sets out the measures that will be implemented to minimise impacts.

Sections 3.1 to 3.10 provide details on the existing ecological environment and Section 4 provides details of the proposed mining activity. Section 4.9.2 describes the proposed vegetation clearance including detail on the estimated quantum of SEB required under SA legislation to offset the proposed clearance, and how the SEB will be provided.

7.3.1. Context

As discussed in Section 3.8, there have been targeted flora and fauna studies completed within the Project Area between 2010-2024 (refer Table 3-25), providing sufficient baseline data for all seasons and a range of weather conditions (from drought to years with above average rainfall), and covering several generations for each species of concern.

Surveys identified seven broad VAs recorded across the Project Area (as shown in Figure 3-61). The area of each VA within the Project Area, and within the Conceptual Footprint (which is the maximum area likely to be cleared for the Project) is shown in Table 7-7.

Table 7-7: Area of VA within the Project Area

VA number	Description	Project Area		Conceptual Footprint	
		Area (ha)	% cover	Area (ha)	% cover
0	*Existing clearing*	1.45	0.011%	1.33	0.20%
1	*Maireana sedifolia +/- Maireana pyramidata low open grassy shrubland*	10,227.39	76%	5,412.79	82.83%
2	*Ridgeline - Xanthorrhoea quadrangulata very low open woodland with emergent Callitris glaucophylla +\- Eucalyptus gracilis*	44.79	0.33%	1.41	0.022%
3	*Myoporum platycarpum low open woodland*	21.85	0.16%	18.85	0.29%
4	*Casuarina pauper* low woodland	1,031.77	7.67%	384.51	5.88%
5	*Mixed Eucalyptus leptophylla +\- E. gracilis open mallee*	1,751.06	13.01%	443.61	6.79%
5 (b)	*Mixed Eucalyptus leptophylla +/- E. gracilis open mallee* (MBC TEC)	25.13	0.19%	14.39	0.22%
6	*Triodia scariosa very open mixed mallee*	24.45	0.18%	0	0%
7	*Eremophila sturtii tall open shrubland over Maireana pyramidata open chenopod shrubland*	328.25	2.44%	257.58	3.94%
	Total	**13,456.33**		**6,534.67**	

The vegetation within the Conceptual Footprint is of variable condition due to past and current grazing pressure. This has resulted in a significant reduction in the grass and shrub understory and associated herbaceous understory litter cover. However, baseline studies have shown that the Project Area is used by a variety of species, including some threatened fauna species (refer Table 7-9).

Baseline vegetation surveys were conducted in accordance with RAM and BAM methodologies, whilst targeted flora and fauna surveys were completed for species listed under NPW Act and/or EPBC Act that were considered likely to occur based on desktop assessment. A total of 341 flora species were identified within the Project Area (refer Appendix B5 and AppendixB6), of which 299 were native species, and 42 were introduced species. Of the 42 introduced species, eight species are listed as either WoNS, and/or declared under the LSA Act (refer Table 7-8).

There are no records or evidence of pathogens within the Project Area.

Table 7-8: WoNS and/or weeds declared under the LSA Act, within the Project Area

Scientific name	Common name	Recorded location within the Project area	WoNS	LSA Act
Enchium plantagineum	Salvation Jane	VA1		X
Lycium ferocissimum	African Boxthorn	Widespread throughout the study area, recorded within VA1, VA2 and VA4-VA7.	X	X
Marrubium vulgare	Horehound	VA1, VA2 and VA3		X
Optunia robusta	Wheel pear	VA1 and VA5	X	X
Optunia sp.	-	VA4 and VA5	X	X
Solanum elaeagnifolium	Silver-leaf nightshade	VA1	X	X
Tribulus terrestris	Caltrop	VA1 and VA5		X
Xanthium spinosum	Bathurst Burr	VA1, VA2 and VA7		X

There are 102 bird species, 21 mammal species, 13 reptile species and one amphibian that have been recorded within the Project Area. Of the fauna species recorded, five mammal species are recognised pests:

- Red Fox
- Sheep
- European Rabbit
- Brown Hare
- Goat.

All pest species recorded are common to the semi-arid region and do not represent unexpected records for the habitat within the Project Area.

7.3.1.1. Listed species

Table 7-9 shows the listed species recorded within the Project Area. Note that no flora species listed under State or Commonwealth legislation were recorded within the Project Area.

Table 7-9: Listed species within the Project Area

Scientific name	Common name	EPBC listing Status (as of February 2025)	NPW listing (as of February 2025)
TECs			
MBC of the MDDB		E	N/A
Fauna			
Aves			
Aphelocephala leucopsis	Southern Whiteface	V	Not listed
Melanodryas cucullata cucullata	South-eastern Hooded Robin	E	Not listed
Lophochroa leadbeateri leadbeateri	Eastern Major Mitchell's Cockatoo	E	Not listed
Myiagra inquieta	Restless Flycatcher	Not listed	R
Megalurus cruralis	Brown Quail	Not listed	V
Climacteris affinis	White-browed Treecreeper	Not listed	R
Corcorax melanorhamphos	White-winged Cough	Not listed	R
Falco peregrinus macropus	Peregrine Falcon	Not listed	R
Mammals			
Chalinolobus picatus	Little Pied Bat	Not listed	E
Saccolaimus flaviventris	Yellow-bellied Sheath-tailed Bat	Not listed	R

R = RARE, V = VULNERABLE, E = ENDANGERED

7.3.2. Impact assessment

A systematic impact assessment has been performed by considering the full range of potential impacts to flora and fauna resulting from the Project. The viability of the S-P-R linkage for each is then considered in more detail, with mitigation measures and potential outcomes proposed for those where an impact may occur. Detailed impact assessments for each potential impact are shown in Table 7-14.

7.3.2.1. Direct habitat loss impacts on flora and fauna

To enable the construction, operation and closure of the Project, a Conceptual Footprint area of up to 6,534.67 ha of native vegetation will be cleared as shown in Table 7-7. It should be noted that this Conceptual Footprint area includes a buffer area to allow for construction footprint and minor realignments (as described in the glossary). It should be noted that this area is not expected to be cleared in full, and hence the overall clearing area is likely to be less than 6,537.67 ha. All vegetation types (and hence all fauna habitat niches) within the Project Area are found in abundance in the surrounding area in similar or greater quality and quantity. Nonetheless, clearing of native vegetation will result in loss of flora within the Project Area and a corresponding reduction of fauna habitat.

7.3.2.2. Direct loss or injury of fauna individuals

The use of vehicles and machinery for construction and operation of the Project has the potential to result in collision with fauna species within the Project Area, resulting in injury or mortality to individuals. Fauna species most at risk during the construction phase are those that burrow into the soil, nest amongst shrubs and grasses, and / or are slow-moving. All listed species within the Project Area (refer Table 7-9) are highly mobile species which are able to move away from disturbance.

During the operation phase, the increase in vehicle movements on internal and external haul roads increases the potential for vehicle strike on fauna. After dark, when visibility is at the lowest, there is an increased risk of collision as many arid-land adapted species forage during cooler hours. Of the listed species recorded within the Project Area, only the two species of bats are nocturnal species, both of which are highly mobile.

There may also be increase in fauna interactions with infrastructure such as fence entanglements, entrapment in excavations and drowning in water storage facilities.

7.3.2.3. Fragmentation and edge effects

A side effect of habitat loss is habitat fragmentation. Fragmented populations in small remnants of habitat become vulnerable to further pressures (e.g., invasive predators, weeds), resulting in ongoing population declines (DCCEEW, 2021). The relevance, extent, and severity of potential impacts due to habitat fragmentation is different for each species and needs to be considered on a case-by-case basis. Flora and some fauna species found within arid and semi-arid ecosystems have evolved to traverse or disperse over large distances, and fragmented distribution is common. The scale of habitat fragmentation associated with the proposed mining operations is unlikely to result in a local extinction or decrease in population size of such species with large home ranges.

Fauna species that have a smaller home range are more likely to be affected by a localised habitat fragmentation, such as linear clearing for roads. These species are commonly smaller mammals, reptiles, and invertebrates. Vegetation clearing associated with construction of roads and other access tracks may interfere with individual’s movements around their home ranges through inhibiting movement patterns and result in a barrier to movement. This barrier effect has the potential to cause fragmentation of populations resulting in reductions in breeding and genetic diversity, dispersal and foraging opportunities. Overall, these factors further increase pressures on small or vulnerable populations and have the potential to result in a decline in population size. For all fauna species, movements across areas of cleared vegetation to reach suitable habitats for breeding, roosting and foraging can result in an increase of predation.

Habitat fragmentation can also result in an increase of ratio of the ‘edge’ of a habitat. The ‘edge effect’ associated with vegetation clearing and site disturbance can lead to increased opportunities for weeds and pest species to invade a native vegetation community, as well as changes to habitat such as increased light penetration and wind, which may affect native flora assemblages. This may result in a decrease in abundance and/or diversity of native flora species.

7.3.2.4. Weed species

Land disturbance associated with mining operations throughout the LOM creates habitats that are favourable for weed species to become established and proliferate. Weeds can lead to a decrease in habitat quality and out-compete native species. They can also degrade, alter or replace native vegetation communities which may result in loss of habitat niches for native fauna and flora species. There are a variety of different distribution vectors for weeds, including:

- wind
- vehicles, earthmoving and other mobile equipment
- fauna (native and introduced)
- surface water flows.

The most likely mechanism for weeds to be transported is via vehicles and equipment moving into and around the Project Area.

Table 7-8 shows the eight weed species that were recorded within the Study Area listed as either WoNS, and/or declared under the LSA Act. If not controlled, it is likely there will be an increase in diversity or abundance of weeds within the Project Area.

7.3.2.5. Pest fauna

Whilst five pest fauna species are already established within the Study Area (fox, sheep, rabbit, brown hare and goat (refer Section 3.9.7)), any sustained increase of diversity and / or abundance of fauna pest species through Project activities can result in the decline of native species through predation or competition.

Pest herbivores alter the structure and composition of native vegetation communities by exerting selective grazing pressure on native plants and removing large amounts of biomass. Their presence can degrade the quality of native vegetation niches used by many fauna species through resource competition, weed spread, over-grazing of flora species and habitat degradation. Small mammals, reptiles and ground-nesting birds are also at risk from predator pests such as foxes and cats.

There is an increased risk of increased pest presence during mining operations as they can be attracted to areas with human activity. Activities that may result in the increase in pest fauna include unmanaged waste collection areas, increase in roadkill, increase in human activity and accidental transport with machinery, equipment or supplies. Areas which have undergone vegetation clearance are known to attract predators as it exposes prey when they are traversing open areas. Predators also use roads which provide them with easy access corridors to new ranges.

7.3.2.6. Pathogens and disease

Pathogens are biological agents which can cause disease or illness to the host, including reducing their ability to reproduce. Within SA three species (Mundulla Yellows, *Austropuccinia psidii* (Myrtle rust) and *Phytophthora cinnamomi* (Phythophora)) are known to have the potential to impact native flora and fauna. However, there was no evidence of plant pathogens during field investigations and the Project Area is not located in a high-risk *Phytophthora cinnamomi* (root-rot fungus), or Mundulla Yellows area due to the low annual rainfall (root-rot fungus occurs in areas where average annual rainfall is greater than 400 mm) and minimal human disturbance.

Toxins are used as a method for pest control, including rabbit and rodent control through baiting and weed spraying. Through these methods some non-target species may be affected as native species may ingest the toxins or be affected through secondary poisoning (e.g., birds of prey which hunt the target pest species as a primary food resource).

Weed spraying targeted at reducing pest herbivores has the potential to kill native flora species within the area. It may also secondarily poison native herbivores and lead to soil contamination.

7.3.2.7. Bushfire

The introduction of human activity into an area can lead to a change in the natural fire regime. It may decrease the frequency and intensity of fires via control measures and / or increase accidental fires caused through the introduction of ignition points (i.e., vehicles and machinery). Species that are sensitive to fire may be impacted if Project-related activities lead to a change in frequency or intensity of fires due to repetitive loss of the dense shrub layer that forms critical habitat for some species. If this were to occur, it has potential to reduce the area of occupancy the species can inhabit in the region, fragment populations as fire isolates remaining suitable habitat; and, if it occurred on a sufficiently large scale, could disrupt the breeding cycle and / or impact habitat to the extent that the species is likely to decline and subsequently reduce the population size of the species.

Mallee vegetation communities (such as those within the Project Area) are fire-prone systems, where much of the vegetation is adapted to particular fire regimes, with many plants showing adaptations for recovery after fire. However, many fauna species have no adaptation to fire, other than to temporarily move to non-burnt areas (Boulton and Lau, 2015). The Project Area is within an area prone to bushfire with a sequence of fires collectively accounting for 89% of the Murray Mallee subregion being burnt between 1972 and 2007; however, no one fire has burned across the entire bioregion (DAWE, 2021).

7.3.2.8. Noise and vibration

Noise emissions arising from the construction and operation of the Project have the potential to disturb some fauna species in the Project Area.

Noise within the Project Area is expected to increase from current ambient noise levels during the construction and operation phases of the mine. During these phases, increased noise is likely to occur in short, intense pulses from mobile plant equipment and blasting activity as well as in the form of more prolonged noises with consistent vibration, pitch and volume due to generators, excavators, pumps and vehicles. Noise modelling has shown that worst-case scenarios show construction and operational noise levels significantly above pre-construction ambient levels (Resonate, 2024, refer Appendix C7 and Section 7.8). Whilst the majority of operational noise emissions are expected to be at frequencies below the spectral range where typical bird vocalisations occur, the increase in noise may potentially causing masking and behavioural impacts (refer Appendix C7).

Modelling of vibration and overpressure impacts from pit blasting has shown that there is potential for resulting behavioural (startle) impacts on the bird community associated with the MBC of the MDDB TEC due to the proximity of this TEC to the pit locations.

7.3.2.9. Dust

Dust modelling completed for the Project (refer Appendix C1) shows that prior to mitigation, there may be increased levels of dust deposition on vegetation within and adjacent to the Project Area.

Analysis of changes in air quality resulting from the Project shows that impacts may be recorded in some areas of the Study Area for short-term averaging periods (24-hour), while longer term averages (annual) are unlikely to be significant. This indicates that some short duration periods of elevated dust and particulates are predicted, however these will be infrequent as evidenced by lower annual averages (Katestone, 2024 (refer Appendix C1 or Section 7.9).

Modelled predicted changes in dust deposition within the Project Area were compared with published levels of dust deposition associated with a reduction in photosynthesis and plant productivity (Doley and Rossato, 2010). Prior to allowing for natural reductions in dust accumulation on flora by wind/rain/dew/plant movement, the predicted changes in dust deposition within the Project Area are below the published levels correlating with reduction in photosynthesis and plant productivity (Doley and Rossato, 2010). This, together with other studies examining dust impacts from mining on vegetation (NSW Minerals Council, 2000 and Lodge et al., 1981), suggests that there will be no significant difference in the fecundity of vegetation within the Project Area as a result of the Project (Katestone, 2024).

7.3.2.10. Light

During the operational phase at Razorback, operation may continue up to 24 hours per day, seven days a week and will require constant light sources within the Site. This may have impact on native fauna species through increased risk of predation, disruption of circadian rhythms, disorientation, attraction to light sources increasing injury and mortality risk, and may have negative impacts on breeding and migration. There is also the potential for changes to vegetation growth and flowering patterns.

7.3.2.11. Groundwater

The changes in groundwater potentially resulting from the Project are discussed in detail in Section 7.6. The discussion below focusses on the pathways by which changes in groundwater may affect native vegetation, flora and fauna.

There are three pathways by which changes in groundwater quantity and quality may affect terrestrial native vegetation, flora and fauna.

- Drawdown of groundwater results in a lower water table which may reduce the availability of water to vegetation that relies on groundwater as a water source (terrestrial GDEs). Reduction of groundwater can cause GDEs to experience stress, wilting, stunted growth leading to loss of individuals or areas of affected vegetation.
- Mounding of groundwater results in a higher water table. This can lead to water logging of plant roots, and / or salinisation of water resources. This may lead to loss of vigour, fecundity and ultimately loss of individuals or areas of affected vegetation.
- Change in water quality may interfere with plant uptake of nitrogen and cause toxicity of ions (such as chloride) leading to plant poisoning and loss of individuals or affected areas of vegetation.

7.3.2.12. Surface water

There are no significant watercourses within the Project Area, which is located within the Vickery's Creek sub-catchment of the Manunda Catchment. There are several drainage lines that pass through the Project Area, however these drainage lines are ephemeral and rarely hold water, only flowing immediately after periods of intense rainfall. Manunda Creek is the most significant watercourse within the Study Area (outside of the Project Area) and is described in detail in Section 3.7.2.

To prevent flow or collection of surface water around or within the mine infrastructure, surface water flows may be redirected. This has the potential to result in connections between previously discrete catchments or altered positioning of terminal catchments, secondarily leading to increased infiltration of surface water into the soil and heighted soil water retention which may impact the health (positively or negatively) of flora species.

Surface water flow modelling shows that the change in flow regime resulting from the Project is unlikely to be of significant magnitude to impact on existing vegetation, especially as available water from rainfall events is likely to be short lived with high evapotranspiration rates (refer Section 7.7). Hence the disruption of these flows due to infrastructure siting is unlikely to pose a significant risk to the abundance and diversity of flora and fauna.

Manunda Creek has a chain of small waterholes that are more permanent than other water sources in the catchment and may be of value to native fauna. Changes in water availability or quality in these waterholes may impact on the viability of local native fauna species that have limited mobility and/or small ranges and are hence incapable of relocating to utilise another water source.

7.3.2.13. Final landform / rehabilitation success

Rehabilitation activities at Razorback are expected to be undertaken progressively, in conjunction with mining activities where possible. For example, rehabilitation of the Iron Peak HR, pit and associated storage areas will be undertaken when the Iron Peak pit closes after approximately 12 years. This will see reserved topsoils (where available, or a suitable alternate growth medium) placed on the waste rock piles and other previously disturbed areas to provide a soil profile for regeneration of vegetation. Soil horizons may be ripped to prevent compaction and erosion of soils, and the depth profile will vary with the vegetation association to be reinstated (for more details refer to the Razorback Iron Ore Project Mine Closure Plan (Appendix L)).

The net extraction of material and soil movements will result in changes to the topography, compared to pre-mining conditions. The rehabilitated landforms will be shaped to blend with the surrounding landforms as far as practicable, however the changes in landform associated with the mining of Razorback Ridge and Iron Peak will remain. Safety bunds and / or fences will be installed to reduce fauna access to the permanent pit lakes resulting from the Project. While care is expected to be taken to replicate soil profiles, the changes to landforms can be expected to result in impacts or changes to vegetation associations that regenerate within the disturbed footprint areas in comparison to those present in pre-mining conditions.

7.3.2.14. Climate change

Climate change projections for the Study Area forecast higher temperatures, declining rainfall (especially in the cooler seasons) and harsher drought and fire weather (CSIRO and BOM, 2015). Such changes are likely to reduce the reproductive performance and survival of birds, and the growth and survival of many plant species consequently affecting food availability (DCCEEW, 2021a). These climate change issues are likely to compound existing impacts of habitat loss, fragmentation, invasive species and broadscale fires as discussed above.

7.3.2.15. Potential impact events

The potential impact events, and respective areas (ML and MPLs) in which they may occur are listed in Table 7-10 and further analysed in Table 7-14.

Table 7-10: Flora, fauna and native vegetation potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI03	Land clearance for construction of project infrastructure and/or rehabilitation causes a direct loss of native vegetation, flora, and fauna habitat	Yes	C, O, R	C, O, R	C, O, R
PI04	Injury or mortality of native fauna due to collision (strike) with Project vehicles/mobile plant, interaction with project infrastructure or entrapment in mining facilities (e.g. process plant, TSF, water dams)	Yes	C, O, R	C, O, R	C, O, R
PI05	Anthropogenic sources of light during hours of darkness cause interruption to foraging and circadian rhythms of native fauna	Yes	C, O	C, O	C
PI06	Project activities cause an increase in abundance / diversity of pest species which predate upon, or compete with native fauna, and indirectly impact native flora due to selective and/or increased grazing pressure on native flora	Yes	C, O, R	C	C
PI07	Project activities cause an increase in abundance/ diversity of weed species via transportation into site or enhancement of conditions	Yes	C, O, R	C, O, R	C, O, R

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
	for existing weeds causing a reduction in native flora and indirectly impacting on native fauna				
PI08	Project activities introduce pathogens or diseases leading to a reduction in the abundance and diversity of native flora and/or native fauna	No	C, O, R	C, O, R	C, O, R
PI09	Project related ignition sources result in accidental fires / change in local fire regime and a corresponding reduction in the abundance and diversity of native flora and fauna	Yes	C, O, R	C, O, R	C, O, R
PI10	Rehabilitation outcomes are impacted as a result of poor rehabilitation results, impacting the quality of rehabilitated land and/or causing delay to vegetation regrowth and re-establishment of fauna habitat	Yes	R	R	R
PI11	Increased salinity (due to dust suppression activities and/or saline water spills), hazardous substance / chemical spills, affect soils, vegetation health and surface waters	Yes	C, O, R	C, O, R	C

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some potential impacts on ecology are more appropriately discussed in other Sections of this report. Instances of cross-referenced impacts are shown in Table 7-11.

Table 7-11: Flora, fauna and native vegetation impacts cross reference

Potential impact	Refer to	Cross reference
Land clearance for the Project results in loss of topsoil / subsoil resources that would otherwise be used for rehabilitation	PI12	Section 7.4
Incorrect disposal of liquid waste causes soil and/or water contamination impacting on native flora	PI14	Section 7.5
Groundwater mounding impacting vegetation and reducing land productive capacity by causing waterlogging and/or land salinisation	PI15	Section 7.6
Reduction in groundwater levels at terrestrial vegetation GDEs leading to increased vegetation stress, loss of condition or mortality	PI16	Section 7.6
Reduction in groundwater levels adversely affecting ephemeral pools along drainage lines and native fauna that may utilise them	PI21	Section 7.6
Reduction in groundwater levels adversely affecting soils and (non-GDE) vegetation	PI23	Section 7.6
Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality and impact potential GDEs (terrestrial vegetation)	PI25	Section 7.6
Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of ephemeral pools along drainage lines and native fauna that may use them	PI29	Section 7.6
Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect vegetation	PI31	Section 7.6
Alteration of surface water flow resulting in changes in availability of surface water and associated impacts to vegetation and reliant fauna species	PI33	Section 7.7
Noise emissions from construction and operation potentially impacting native fauna through changes in behaviours and masking effects	PI39 & P141	Section 7.8

Potential impact	Refer to	Cross reference
Air blast overpressure and vibration from blasting potentially impacting native fauna through changes in behaviours and masking effects	PI43	Section 7.8
Impacts from emissions of dust and particulate matter during construction and operation on human and ecological sensitive receptors. These may include human health risks from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity	PI45 & PI49	Section 7.9
Mining activities causing emissions of dust and particulate matter which may migrate to locations containing ecologically sensitive flora or fauna	PI47	Section 7.9
Presence of mining in the region provides a new source of combustion pollutants including NOx, SOx, CO and particulates. Impacts would relate to excessive exposures to these combustion pollutants. Severity of impact will depend on the level and duration of exposure and the sensitivity of the subject, in this case, human receptors and flora and fauna	PI50	Section 7.9
Odour emissions from waste streams and vehicle exhaust/fuel fumes resulting in health and amenity impacts at locations of human sensitive receptors and impacts on native fauna	PI51	Section 7.9
Geotechnical failure of key mining facilities during operation and/or closure (TSF, WRDs and mine voids) resulting in damage to persons or property, and/or impacting land use	PI62	Section 7.5
Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect potential terrestrial GDEs (red gums)	PI65	Section 7.6
Tailings disposal leading to groundwater mounding (via seepage to groundwater) to alter water quantity of groundwater resources reducing land productive capacity by causing waterlogging and/or salinisation	PI71	Section 7.6

7.3.3. Design, control and management strategies

Design, control, and management strategies for the identified impact events are detailed in Table 7-12. These mitigation measures are assigned to each potential impact event in Table 7-14.

Table 7-12: Flora, fauna and native vegetation mitigation measures

Reference ID	Design, control and management measure
MM07	Minimisation of cleared areas through staged clearing
MM08	Use of pre-clearance surveys prior to vegetation clearing, where practicable
MM09	Provision of an SEB
MM10	Annual aerial photography of vegetation clearance
MM11	Design to minimise disturbance footprint including TSF which has a high storage efficiency factor
MM12	Site layout and micro-siting of infrastructure to minimise direct disturbance of important habitat and/or ecological communities
MM13	Use of MGT internal ground disturbance permit system
MM14	Dust suppression applications will be managed to minimise overwatering (e.g., flow restrictive designs and application rates)
MM15	Implementation of a RMP (including progressive rehabilitation, where possible)
MM16	Revegetation trials undertaken are used to guide rehabilitation methods
MM17	Progressive rehabilitation of post-mining landforms, where practicable
MM18	Use of approved access roads and tracks, and no authorised vehicle access to undisturbed and rehabilitating areas
MM19	Implementation of Pest and Weed sighting register

Reference ID	Design, control and management measure
MM20	Implement Pest & Weed Management Plan
MM21	Implement Fauna Management Plan
MM22	Fauna handling and euthanasia procedures
MM23	Fauna harm events associated with project traffic and infrastructure recorded in the IMS
MM24	Fencing of active mining areas and haul roads, use of stock grates and other controls to prevent uncontrolled livestock access
MM25	Weed hygiene / biosecurity protocols as per Pest & Weed Management Plan (incl. weed disposal methods)
MM26	Putrescible waste storage infrastructure is designed and maintained to prevent access by pest animal species
MM27	Coordination with relevant government agencies and landowners on the monitoring and control of declared weeds and priority pest animal species, as required
MM28	Site inductions and awareness training
MM29	Personnel not permitted to feed or interact with wildlife
MM30	Provision of an alternate breeding location for Peregrine Falcons
MM31	Hot works permitting system
MM32	Observation of fire ban rules
MM33	Appropriate fire suppression / response available onsite
MM34	Consultation with CFS, DEW, Peterborough Council and emergency service providers during fire danger periods
MM35	Maintenance of fire breaks, where required
MM36	Start with natural darkness and add light for specific purposes only
MM37	Lighting is targeted on intended locations and objects
MM38	Light spill is minimised through adaptive lighting, light intensity (luminosity) and placement suitable for the task/area, and use of shrouds/shielding
MM45	Waste management and monitoring accordance with the Waste Management Plan
MM53	Spills and uncontrolled release of hazardous materials managed in accordance with the Hazardous Materials Management Plan and spill response procedures

7.3.4. Draft outcomes, measurement criteria and leading indicators

The draft ecology proposed outcomes are presented in Table 7-13. The proposed outcome, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-14.

Table 7-13: Flora, fauna and native vegetation proposed outcomes

Reference ID	Proposed outcome
PO02	The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue
PO03	The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO04	The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities
PO05	The Tenement Holder must ensure there is no introduction of new priority weeds nor a sustained increase in the abundance of existing weed or pest animal species that can be attributed to project activities

Reference ID	Proposed outcome
PO06	The Tenement Holder will ensure there are no uncontrolled fires as a result of project activities that could have been reasonably prevented by the Tenement Holder

Table 7-14: Flora, fauna and native vegetation potential impacts

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI03</td><td>Phase</td><td>Construction, operations and closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="5">Land clearance for construction of project infrastructure, operation and/or rehabilitation causes a direct loss of native vegetation, flora, and fauna habitat</td></tr>
<tr><td>Source</td><td colspan="5">Project – vegetation clearing and ground disturbance</td></tr>
<tr><td>Pathway</td><td colspan="5">Land</td></tr>
<tr><td>Receptor</td><td colspan="5">Flora and native vegetation, fauna and habitat</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">Project footprint is minimised as much as practicable during design, for example the location of the accommodation camp was moved during detailed design phase, reducing the Project footprint.</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>A</td><td>Justification</td><td colspan="2">Extensive field verified data collected over the required seasons and multiple years.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Approved standards used including RAM vegetation survey method and guidelines for species surveys where practicable.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="2">The outcome may vary to some extent should the species recorded on site vary, however the mitigation and outcomes are unlikely to change significantly.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="3">Vegetation clearing and disturbance is required to undertake the Project.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="5">Land clearance for construction of project infrastructure and/or rehabilitation causes a direct loss of native flora / vegetation and impacts to fauna and habitat</td></tr>
</table>

Risk assessment and design/ management controls		Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	L	Risk		C	L	Risk
	Risk Assessment	3	A	Very High	MM07: Minimisation of cleared areas through staged clearing MM08: Use of pre-clearance surveys prior to vegetation clearing, where practicable MM09: Provision of an SEB MM10: Annual aerial photography of vegetation clearance MM11: Design to minimise disturbance footprint including TSF which has a high storage efficiency factor MM12: Site layout and micro-siting of infrastructure to minimise direct disturbance of important habitat and/or ecological communities MM13: Use of MGT internal ground disturbance permit system MM15: Implementation of a RMP (including progressive rehabilitation where possible) MM16: Revegetation trials undertaken are used to guide rehabilitation methods MM17: Progressive rehabilitation of post-mining landforms, where practicable MM18: Use of approved access roads and tracks, and no unauthorised vehicle access to undisturbed and rehabilitating areas. MM21: Implement Fauna Management Plan MM22: Fauna handling and euthanasia procedures MM28: Site inductions and awareness training MM29: Personnel not permitted to feed or interact with wildlife MM30: Provision of an alternate breeding location for Peregrine Falcons	2	A	High
	Uncertainty	Inputs, method and model	B	Justification	Plant growth response to reconstructed soil profiles. Soil seed bank response to disturbance and stockpiling. Change in vegetation communities due to changed final landform.			

<table>
<tr><td></td><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="3">The success of rehabilitation has not yet been tested; however, rehabilitation trials will be undertaken on site. There are alternate rehabilitation methods that can be used to ensure an appropriate habitat is regenerated within disturbed areas.</td></tr>
<tr><td rowspan="9">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="6">EPBC Act
NPW Act</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO02: The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue
PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation</td></tr>
<tr><td rowspan="4">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM04</td><td>Areas of cleared land, ground disturbance permit system and aerial mapping</td><td>Project Area</td><td>Annual review of the MGT internal ground disturbance permit system confirms clearance is within approved limits</td><td>Annual</td><td>Pre-clearing vegetation mapping</td></tr>
<tr><td>OM05</td><td>Vegetation health and mortality of vegetation retained within Site, ground-based surveys</td><td>Project Area</td><td>Annual vegetation health survey shows no appreciable difference in mortality when compared to control sites</td><td>Annual</td><td>Baseline flora surveys</td></tr>
<tr><td>OM08</td><td>Fauna diversity and abundance, ground-based surveys</td><td>Project Area</td><td>Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites</td><td>Annual</td><td>Baseline fauna surveys</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td colspan="6">None proposed</td></tr>
</table>

	Impact ID	**PI04**				**Phase**	**Construction, operations and closure**	
Potential impact event	**Potential impact description**	Injury or mortality of native fauna due to collision (strike) with Project vehicles/mobile plant, interaction with project infrastructure or entrapment in mining facilities (e.g. process plant, TSF, water dams)						
	Source	Project – vehicle, mobile plant and machinery movements, project infrastructure						
	Pathway	Land						
	Receptor	Fauna						
	Inherent design controls	N/A						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	Extensive field survey results, with some assumptions regarding increases in traffic.			
		Method and model	A	**Justification**	Recognised methods of fauna survey and traffic volumes.			
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Changes to known fauna community or traffic volumes are unlikely to significantly change the outcome.			
	S--P-R linkage	Yes	**Justification**	There is a predicted increase in traffic within the Project Area that may impact native fauna. Fauna mortality due to entrapment in mining facilities or interaction with infrastructure is a known risk of mining projects.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Use of machinery and vehicles during construction of the project, haulage of product and personnel movement during Project construction, operation and closure results in injury and mortality to fauna individuals. Fauna mortality through accidental capture in trenches / fencing / resulting from water storage facilities.						
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		1	B	Moderate	MM21: Implement Fauna Management Plan MM22: Fauna handling and euthanasia procedures MM23: Fauna harm events associated with project traffic and infrastructure recorded in the IMS MM24: Fencing of active mining and haulage areas road, use of stock grates and other controls to prevent uncontrolled livestock access MM28: Site inductions and awareness training	1	C	Possible

<table>
<tr><td rowspan="2"></td><td>Uncertainty</td><td>Inputs, method and model</td><td>A</td><td>Justification</td><td colspan="3">Industry standard mitigation measures. It is assumed that fencing of HR and ML will decrease vehicle / fauna interactions, however the type of fencing and agility of fauna species in proximity to road may affect outcome. Fauna within the ML will not be fenced away from internal haul roads / infrastructure. Degree of aversion to roads (due to noise / lights etc.) is species specific.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="3">Changes to the assumptions are unlikely to prevent achievement of the outcome.</td></tr>
<tr><td rowspan="9">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="6">EPBC Act
NPW Act
Animal Welfare Act 1985</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO04: The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities</td></tr>
<tr><td rowspan="4">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM08</td><td>Fauna diversity and abundance</td><td>Project Area</td><td>Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites</td><td>Annual</td><td>Data collected from baseline surveys and control sites</td></tr>
<tr><td>OM09</td><td>Animal incident records from IMS</td><td>Project Area</td><td>Annual review of incident records where an animal was harmed as a result of project activities, demonstrates that harm could not have reasonably been prevented</td><td>Annual</td><td>None</td></tr>
<tr><td>OM10</td><td>Fauna injuries records from IMS</td><td>Project Area</td><td>Annual review of fauna records, where an animal was found to be sick or injured as a result of project activities, demonstrates that MGT complied with the Animal Welfare Act 1985</td><td>Annual</td><td>None</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>LI01</td><td>Number of fauna related incidents</td><td>Project Area</td><td>Quarterly review of incident records demonstrates no sustained increase in fauna harm</td><td>Quarterly</td><td>None</td></tr>
</table>

	Impact ID	**PI05**				**Phase**	**Construction and operations**		
Potential impact event	**Potential impact description**	Anthropogenic sources of light during hours of darkness cause interruption to foraging and circadian rhythms of native fauna							
	Source	Project – artificial lighting due Project scheduling (up to 24hr operations)							
	Pathway	Air							
	Receptor	Fauna							
	Inherent design controls	Only areas that require lighting for safety or productivity will be lit.							
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	C	**Justification**	Unknown sensitivity of local species and populations to light sources				
		Method and model	C	**Justification**	No standard methodology – use of informal approach				
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Outcomes not sensitive to changes to fauna assemblage as precautionary principle has assumed phototrophic reactions by native fauna.				
	S--P-R linkage	Yes	**Justification**	Known increase in light level is likely to cause phototrophic behaviours to recorded local fauna community					
	If no S-P-R linkage then do not continue further								
	Description of likely impact	Anthropogenic sources of light during hours of darkness within the Project Area cause interruption to foraging and circadian rhythms of native fauna							
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**			
		C	**L**	**Risk**		**C**	**L**	**Risk**	
		3	B	High	MM36: Start with natural darkness and add light for specific purposes only MM37: Lighting is targeted on intended locations and objects MM38: Light spill is minimised through adaptive lighting, light intensity (luminosity) and placement suitable for the task/area, and use of shrouds/shielding	2	C	Moderate	
	Uncertainty	**Inputs, method and model**	B	**Justification**	Sensitivity of specific fauna species to lighting is unknown, hence some uncertainty relating to mitigation measure effectiveness				

<table>
<tr><td></td><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="3">Changes to the assumptions are unlikely to prevent achievement of the outcome</td></tr>
<tr><td rowspan="7">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="6">None</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO04: The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities</td></tr>
<tr><td rowspan="2">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM08</td><td>Fauna diversity and abundance</td><td>Project Area</td><td>Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites</td><td>Annual</td><td>Data collected from baseline surveys and control sites</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td colspan="6">None proposed</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI06</td><td>Phase</td><td colspan="3">Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="8">Management of waste during Project construction, mining activities and rehabilitation causes an increase in abundance / diversity of pest fauna species which predate upon, or compete with native fauna, and indirectly impact native flora due to selective and/or increased grazing pressure on native flora</td></tr>
<tr><td>Source</td><td colspan="8">Project – generation of waste and changed ground conditions (clearing may increase predation success due to lack of cover)</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Flora and native vegetation, fauna and habitat</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>C</td><td>Justification</td><td colspan="5">Current level of pest species known due to baseline surveys. Likelihood of pest attraction to area is assumed.</td></tr>
<tr><td>Method and model</td><td>C</td><td>Justification</td><td colspan="5">No industry standard approach, informal method used.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="5">Some invasive pests are more damaging than others, hence there is some sensitivity dependent on the pest species in the surrounding areas that may be attracted to the Project Area.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Pest species are known to occur on site and will react to changes resulting from the Project, hence impacting on known existing flora and fauna communities.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="8">Project activities cause an increase in abundance / diversity of pest species which predate upon or compete with native fauna, and indirectly impact on native flora due to selective and/or increased grazing pressure</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>B</td><td>Very High</td><td colspan="2">MM19: Implementation of Pest and Weed sighting register
MM20: Implement Pest & Weed Management Plan
MM26: Putrescible waste storage infrastructure is designed and maintained to prevent access by pest animal species
MM27: Coordination with relevant government agencies and landowners on the monitoring and control of declared weeds and priority pest animal species, as required
MM28: Site inductions and awareness training</td><td>2</td><td>C</td><td>Moderate</td></tr>
</table>

					MM29: Personnel not permitted to feed or interact with wildlife MM45: Waste management and monitoring accordance with the Waste Management Plan			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Methods used for pest and weed management are currently unknown, but assumed to be effective for pest species occurring within Project Area. Pest control in adjoining properties is unknown and may affect abundance of pests within Project Area.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to the assumptions may require changes to the Pest and Weed management plan, but are unlikely to prevent the outcome being achieved.			
Statement of proposed outcomes	**Legislative requirement**	LSA Act						
	Proposed outcome	PO05: The Tenement Holder must ensure there is no introduction of new priority weeds nor a sustained increase in the abundance of existing weed or pest animal species that can be attributed to Project activities						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		OM11	Fauna abundance and diversity in high-risk areas	Project Area	Annual fauna survey in high-risk locations indicated no significant increase in abundance or diversity of pest species when compared to baseline survey and control sites	Annual	Baseline data / control sites	
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		LI02	Quarterly review of pest animal & weed records	Project Area	No new (previously un-recorded) pest or weed species are identified, or records that indicate a statistically significant increase in existing pest or weed locations or population	Quarterly	Baseline data	

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI07</td><td>Phase</td><td colspan="3">Construction, operations and closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="7">Project activities cause an increase in abundance/ diversity of weed species via transportation into site or enhancement of conditions for existing weeds causing a reduction in native flora and indirectly impacting on native fauna</td></tr>
<tr><td>Source</td><td colspan="7">Project – weeds transported by vehicles, plant and equipment in soils by people</td></tr>
<tr><td>Pathway</td><td colspan="7">Land</td></tr>
<tr><td>Receptor</td><td colspan="7">Flora and native vegetation, fauna and habitat</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">Minimise clearing footprint</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>A</td><td>Justification</td><td colspan="4">Current level of weed incursion is known due to baseline surveys. Likelihood of weed movement into area is assumed.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Industry standard flora survey methods used.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Some weeds are more damaging than others, hence there is some sensitivity dependent on the weeds that may be brought into Project Area.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">Weed species including WoNS and LSA Act listed species have been recorded within the Project Area. Known increase in vehicle movements and land disturbance may increase weed diversity and/or abundance.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="7">Project activities cause an increase in abundance / diversity of weed species causing a reduction in native flora and indirectly impacting native fauna</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>A</td><td>Very High</td><td>MM18: Use of approved access roads and tracks, and no authorised vehicle access to undisturbed and rehabilitating areas
MM20: Implement Pest & Weed Management Plan
MM25: Weed hygiene / biosecurity protocols as per Pest & Weed Management Plan (incl. weed disposal methods)
MM27: Coordination with relevant government agencies and landowners on the monitoring and control of declared weeds and priority pest animal species, as required</td><td>2</td><td>C</td><td>Moderate</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="4">Methods used for pest and weed management are currently unknown, but assumed to be effective for weed species occurring within Project Area. Weed control in adjoining properties is unknown and may affect abundance of weeds within Project Area.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Changes to the assumptions may require changes to the Pest and Weed management plan, but are unlikely to prevent the outcome being achieved.</td></tr>
<tr><td rowspan="6">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="7">LSA Act</td></tr>
<tr><td>Proposed outcome</td><td colspan="7">PO05: The Tenement Holder must ensure there is no introduction of new priority weeds nor a sustained increase in the abundance of existing weed or pest animal species that can be attributed to project activities</td></tr>
<tr><td rowspan="2">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td colspan="2">What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM06</td><td colspan="2">Weed abundance and diversity</td><td>Project Area</td><td>Annual weed survey shows no increase in abundance or diversity of weed species above that recorded in control sites.</td><td>Annual</td><td>Baseline data/ control sites</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td colspan="2">What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>LI02</td><td colspan="2">Quarterly review of pest animal & weed records</td><td>Project Area</td><td>No new (previously un-recorded) pest or weed species are identified, or records that indicate a statistically significant increase in existing pest or weed locations or population</td><td>Quarterly</td><td>Baseline data</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI08</td><td>Phase</td><td>Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Human activity and/or increased pest species introduce pathogens or diseases leading to a reduction in the abundance and diversity of native flora and/or native fauna</td></tr>
<tr><td>Source</td><td colspan="5">Project – pathogens transported by vehicles, plant and equipment in soils by people</td></tr>
<tr><td>Pathway</td><td colspan="5">Land</td></tr>
<tr><td>Receptor</td><td colspan="5">Flora and native vegetation, fauna and habitat</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>A</td><td>Justification</td><td colspan="2">Site specific survey.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Industry standard survey methods and desktop resources used.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="2">Limited uncertainty, however if pathogens were recorded within the Project Area or surrounding area an S-P-R would be more likely.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">No records of pathogens or diseases within baseline ecology surveys and no records of pathogens or diseases in surrounding areas. Environmental conditions are unsuitable for pathogens hence no source exists.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI09</td><td colspan="2">Phase</td><td colspan="4">Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="9">Project related ignition sources result in accidental fires / change in local fire regime and a corresponding reduction in the abundance and diversity of native flora and fauna</td></tr>
<tr><td>Source</td><td colspan="9">Project – vehicles and other ignition sources</td></tr>
<tr><td>Pathway</td><td colspan="9">Land</td></tr>
<tr><td>Receptor</td><td colspan="9">Flora and native vegetation, fauna and habitat</td></tr>
<tr><td>Inherent design controls</td><td colspan="9">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="6">Link between fire and persistence of some species is unknown.</td></tr>
<tr><td>Method and model</td><td>B</td><td>Justification</td><td colspan="6">Standard method.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="6">Arid land species are likely to relatively tolerant to fire.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="7">Whilst local flora and fauna communities are likely to be adapted to fire, changes in frequency or intensity may damage mallee habitat and associated habitat niches.</td></tr>
<tr><td colspan="10">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="9">Project related ignition sources result in accidental fires / change in local fire regime and a corresponding reduction in the abundance and diversity of native flora and fauna</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="3">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>C</td><td>Very high</td><td colspan="3">MM31: Hot works permitting system
MM32: Observation of fire ban rules
MM33: Appropriate fire suppression / response available onsite
MM34: Consultation with CFS, DEW, Peterborough Council and emergency service providers during fire danger periods
MM35: Maintenance of fire breaks, where required</td><td>2</td><td>D</td><td>Low</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="3">Assumed that appropriate fire suppression / response equipment can be held on site. Assumed relationship with CFS / local council emergency service providers.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="3">Changes in assumptions may affect the ability to manage a fire, but the frequency of fires would not change.</td></tr>
<tr><td rowspan="7">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="6">None</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO06: The Tenement Holder will ensure there are no uncontrolled fires as a result of project activities that could have been reasonably prevented by the Tenement Holder</td></tr>
<tr><td rowspan="2">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM12</td><td>Records of fire incidents from mining operations in the IMS</td><td>Project Area</td><td>Annual review of incident records demonstrates that any fires associated with project activities could not have reasonably been prevented</td><td>Annual</td><td>None</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td colspan="6">None proposed</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI10</td><td>Phase</td><td colspan="4">Construction, operations and closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Rehabilitation outcomes are impacted as a result of poor rehabilitation results, impacting the quality of rehabilitated land and/or causing delay to vegetation regrowth and re-establishment of fauna habitat</td></tr>
<tr><td>Source</td><td colspan="8">Project – unsuccessful rehabilitation strategies and/or extreme weather</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Flora and native vegetation, fauna and habitat</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>C</td><td>Justification</td><td colspan="5">Detailed rehabilitation method not yet known.</td></tr>
<tr><td>Method and model</td><td>C</td><td>Justification</td><td colspan="5">Detailed rehabilitation method not yet known.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="5">The rehabilitation outcome is likely to be highly dependent on methods used.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Detailed rehabilitation methods are not yet known; hence the potential outcome is uncertain, and an S-P-R is assumed.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Rehabilitation trials will inform final detailed rehabilitation strategies for the site. Due to the current uncertainty, there is potential for rehabilitation outcomes to not be achieved.</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td><td></td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td><td></td></tr>
<tr><td>4</td><td>A</td><td>Very High</td><td>MM15: Implementation of a RMP (including progressive rehabilitation, where possible)
MM16: Revegetation trials undertaken are used to guide rehabilitation methods
MM17: Progressive rehabilitation of post-mining landforms, where practicable
MM18: Use of approved access roads and tracks, and no authorised vehicle access to undisturbed and rehabilitating areas</td><td>3</td><td>C</td><td>High</td><td></td></tr>
</table>

	Uncertainty	**Inputs, method and model**	C	**Justification**	Revegetation trials will be used to guide rehabilitation in an iterative process.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Use of revegetation trials will enable changes to RMP (if required) to increase likelihood of outcome being achieved.		
Statement of proposed outcomes	**Legislative requirement**	Mining Act					
	Proposed outcome	PO02: The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM07	Landscape Function Analysis (LFA)	Project Area	Biennial LFA monitoring of rehabilitation areas shows that landscape function is trending toward a landscape function comparable to control sites	Biennial	Baseline survey / control sites.
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI03	Rehabilitation success, as per Rehabilitation Plan.	All rehabilitated areas	Annual observations of areas subject to rehabilitation are trending towards outcomes being achieved	Annual	Previous survey results and approved rehabilitation strategy

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI11</td><td>Phase</td><td colspan="3">Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="8">Increased salinity (due to dust suppression activities and/or saline water spills), hazardous substance and/ or chemical spills affect soils, vegetation health and surface waters. Change in surface water quality affects flora and fauna.</td></tr>
<tr><td>Source</td><td colspan="8">Project – use of saline water for dust suppression activities and/or hazardous substances / chemicals from mining operations
Hydrocarbon and hazardous materials storage and use (e.g. unplanned leaks and spills, vehicle wash bay sediments)</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Soil, surface waters, vegetation</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">Storage facilities will meet:
• Australian standards for storage facilities
• EPA bunding requirements
• Industry best practice guidelines</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>A</td><td>Justification</td><td colspan="5">Storage facilities will be designed to meet Australian and SA standards for storage and bunding.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="5">Chemical handling practices or equipment failure may result in leaks.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="5">Moderate sensitivity to change.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Saline water will be used for dust suppression activities and stored on site, whilst hazardous chemicals will be used during mine operations - uncontrolled leaks and spills onto soil may impact the receiving environment (soil, water, vegetation).</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="8">Use of saline water at the Project, and storage of hazardous substances have the potential to impact soils, vegetation, public health and surface waters</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>B</td><td>Very High</td><td colspan="2">MM14: Dust suppression applications will be managed to minimise overwatering (e.g., flow restrictive designs and application rates)
MM53: Spills and uncontrolled release of hazardous materials managed in accordance with the Hazardous Materials Management Plan and spill response procedures</td><td>2</td><td>D</td><td>Low</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="4">The amount of saline water needed for dust suppression but to prevent overwatering may need to be adjusted dependent on weather conditions.
Location, type and volume of contamination events is unknown, hence ability to manage such spills is also uncertain.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="4">Changes to the assumptions may result in changes to Hazardous Materials Management Plan, spill response procedures and watering rates, but are unlikely to prevent the outcome being achieved.</td></tr>
<tr><td rowspan="8">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="7">EP Act & Australian Standards and EPA Bunding and Spill Management Guidelines (EPA 080/16)</td></tr>
<tr><td>Proposed outcome</td><td colspan="7">PO02: The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue
PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO11: The Tenement Holder must ensure no adverse impact on surface water quality as a result of mining operations</td></tr>
<tr><td rowspan="6">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td colspan="2">What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM05</td><td colspan="2">Vegetation health and mortality, ground-based surveys</td><td>Project Area</td><td>Annual vegetation health survey shows no appreciable difference in mortality when compared to control sites</td><td>Annual</td><td>Baseline flora surveys / control sites</td></tr>
<tr><td>OM16</td><td colspan="2">Underlying soil profiles</td><td>Fuel, oil and chemical storage and operational areas</td><td>At mine completion, the chemistry of underlying soils is consistent with that of local control samples</td><td>Prior to completion</td><td>Control sites</td></tr>
<tr><td>OM19</td><td colspan="2">Contaminated material management</td><td>Project Area</td><td>All contaminated material is managed in accordance with the EP Act requirements</td><td>As required</td><td>Environmental Protection Act 1993</td></tr>
<tr><td>OM20</td><td colspan="2">Hazardous material storage</td><td>Storage locations within Project Area</td><td>Fuel, oil and chemical inspection records confirm storage in accordance with SA EPA Liquid storage Guidelines - Bunding and Spill Management (EPA Publication 080/16)</td><td>Annual</td><td>Guidelines - Bunding and Spill Management (EPA Publication 080/16).</td></tr>
<tr><td>OM28</td><td colspan="2">Sediment quality downstream from culverts</td><td>HR</td><td>Data from sediment sampling must demonstrate that sediment quality downstream of the culverts is comparable with upstream sediment quality results</td><td>Annual</td><td>Upstream sediment quality</td></tr>
</table>

	Draft leading indicator criteria	Leading indicator ID	What will be measured and form (method) of measurement	Location	Outcome achievement	Frequency	Background and/or control data
		None proposed					

7.4. Soil and land quality

An overview of the soil and land quality assessment is described within this Section. For a more detailed discussion of topsoil and subsoils, refer to Section 3.3, and Appendix B2 *Soils Baseline Assessment Report* (ELA, 2023a).

This Section describes how the Project may impact soil and land quality and sets out the measures that will be implemented to minimise those impacts.

7.4.1. Context

Given the historical low intensity grazing land use within the Project Area, the baseline soil quality is classed as natural, as there have been no known weed management practices and no vegetation improvement activities undertaken. While no areas of likely elevated chemical concentration (i.e., permanent stockyards or dipping stations) have been identified, the presence of an historical stockyard associated with Tea Tree Dam homestead is acknowledged in the Site, and residual chemical contamination at this site is unknown. Due to the mineral-rich nature of the region, there has been a significant amount of historical exploration work undertaken within the areas of identified resources (e.g., Razorback, Iron Peak); however, this is not expected to materially affect soil quality across the Project Area.

Soils across the Project Area are dominated by shallow soil on rock, calcareous soils and hard red-brown texture contrast soils with alkaline sub soil, depending on landscape position. Soil depths range from very shallow (0 m to 0.5 m) on ridges grading to moderately deep soils (to 1 m) on lower rises, to deep (>1 m) on fans, flats, and drainage depressions. Soils depths along the HR are consistent with that identified on ML, however, soils are noted to be shallower at each end of the HR (east and west), and deeper in the central (lower relief) area. Soil depth along the TL is relatively consistent at >1.5 m, only becoming shallower at the northern end, nearest to the ML.

Some soil types on shallower slopes have hard setting soil surfaces, which reduces water infiltration, induces higher runoff rates and thus relatively high runoff potential. These are primarily located along the HR and TL.

Sodic sub-soils have been identified on the lower slopes (see Section 3.3, Table 3-6 and Figure 3-13) which, when disturbed, are likely to be susceptible to clay dispersion, accelerated erosion and gully formation.

7.4.2. Impact assessment

The characteristics of soils across the Project Area assist in determining the potential impact events that may be caused by the Project activities, the majority of which involve the disturbance of land through land clearance, and alteration of soil chemistry through the application of water for dust suppression activities, and other changes in water quality and quantity (such as via mounding resulting from seepage from the TSF). These changes, together with the potential loss of soil volume and productivity (viability of seed bank) through incorrect storage of soils and length of storage may impact on future use as rehabilitation substrates.

The potential impact events, and respective areas (ML and MPLs) are listed in Table 7-15 and are further analysed within Table 7-19.

Table 7-15: Soil and land quality potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area		
			ML	HR	TL
PI12	Land clearance for the Project results in reduced topsoil / subsoil quality / quantity which may impact on rehabilitation success.	Yes	C, O*	C, O	C

*(C) CONSTRUCTION, (O) OPERATION

Some potential impacts on soil are more appropriately discussed in other Sections of this report. Instances of cross-referenced impacts are shown in Table 7-16.

Table 7-16: Soil impacts cross reference

Potential impact	Refer to	Cross reference
Increased salinity (due to dust suppression activities and/or saline water spills), and/or hazardous substance / chemical spills, affect soils, vegetation health and surface waters	PI11	Section 7.3
Industrial waste and infrastructure left on-site post closure results in long-term contamination	PI13	Section 7.5
Incorrect disposal of liquid waste causes soil and/or water contamination	PI14	Section 7.5
Groundwater mounding impacting vegetation and reducing land productive capacity by causing waterlogging and/or land salinisation	PI15	Section 7.6
Reduction in groundwater levels adversely affecting soils and (non-GDE) vegetation	PI23	Section 7.6
Extraction and surface emplacement of PAF material results in AMD and/or ARD, with related adverse impacts on surface water	PI35	Section 7.7

7.4.3. Design, control and management strategies

The soil design, control and management strategies are listed in Table 7-17 and referenced against the identified impact events in Table 7-19.

Table 7-17: Soil and land quality mitigation measures

Reference ID	Design, control and management measure
MM39	Vegetate or otherwise stabilise surfaces susceptible to erosion
MM40	Minimise disturbed areas susceptible to erosion through staged clearing and progressive rehabilitation
MM41	Soil will be segregated and stockpiled in accordance with the RMP
MM42	Implementation of erosion controls in accordance with the Surface Water Management Plan (SWMP) and work-area specific ESCPs

7.4.4. Draft outcomes, measurement criteria and leading indicators

The draft soil and land quality proposed outcomes are presented in Table 7-18. The proposed outcome, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-19.

Table 7-18: Soil proposed outcome

Reference ID	Proposed outcome
PO02	The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue

Table 7-19 Soil and land quality potential impacts

<table>
<tr><td></td><th>Impact ID</th><td colspan="3">PI12</td><th>Phase</th><td colspan="3">Construction and operations</td></tr>
<tr><th rowspan="11">Potential impact event</th><th>Potential impact description</th><td colspan="7">Land clearance for the Project results in reduced topsoil / subsoil quality and / or quantity which may impact on rehabilitation success</td></tr>
<tr><th>Source</th><td colspan="7">Project - Vegetation clearing and ground disturbance</td></tr>
<tr><th>Pathway</th><td colspan="7">Land</td></tr>
<tr><th>Receptor</th><td colspan="7">Landscape function</td></tr>
<tr><th>Inherent design controls</th><td colspan="7">Project footprint is minimised as much as practicable during design phase</td></tr>
<tr><th rowspan="2">Uncertainty/ knowledge gaps/ assumptions</th><th>Inputs</th><td>C</td><th>Justification</th><td colspan="4">No site-specific erosion data available, except from basic soil sampling. Assumed presence of erodible soil / subsoil based on site observations.</td></tr>
<tr><th>Method and model</th><td>C</td><th>Justification</th><td colspan="4">Informal desktop research with some site sampling. Visual records of current erosion on site.</td></tr>
<tr><th>Sensitivity analysis</th><th>Sensitivity</th><td>A</td><th>Justification</th><td colspan="4">There will be some degree of soil loss associated with clearing, hence no change to S-P-R as a result of changes to assumptions.</td></tr>
<tr><th>S--P-R linkage</th><td>Yes</td><th>Justification</th><td colspan="5">Land clearance activities may result in the loss of subsoil and topsoil resources through erosion of stockpiles (wind and water), decline in soil physical and chemical function, and reduced seed bank viability due to long-term stockpiling.</td></tr>
<tr><th colspan="8">If no S-P-R linkage then do not continue further</th></tr>
<tr><th>Description of likely impact</th><td colspan="7">Land clearance for the Project results in loss of topsoil / subsoil that would otherwise be used for rehabilitation</td></tr>
<tr><th rowspan="3">Risk assessment and design/ management controls</th><th rowspan="3">Risk Assessment</th><th colspan="3">Raw risk (pre controls)</th><th rowspan="2">Physical controls and management controls</th><th colspan="3">Residual risk (post controls)</th></tr>
<tr><th>C</th><th>L</th><th>Risk</th><th>C</th><th>L</th><th>Risk</th></tr>
<tr><td>3</td><td>A</td><td>Very High</td><td>MM39: Vegetate or otherwise stabilise surfaces susceptible to erosion
MM40: Minimise disturbed areas susceptible to erosion through staged clearing and progressive rehabilitation
MM41: Soil will be segregated and stockpiled in accordance with the Stockpile Management Plan</td><td>2</td><td>C</td><td>Moderate</td></tr>
</table>

					MM42: Implementation of erosion controls in accordance with the SWMP and work-area specific ESCPs			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Success of revegetation / rehabilitation and the role in stabilising soils is unquantified. Extreme rainfall events could cause localised stockpile erosion. Assumed that surface water management infrastructure is adequately designed to a suitable ARI event.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to the assumptions may have a short-term impact on ability to achieve outcomes, but long-term outcomes are unlikely to be affected.			
Statement of proposed outcomes	**Legislative requirement**	EP Act						
	Proposed outcome	PO02: The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM14	Inspection and photographic records		Stockpiles	Records and inspections confirm that stockpiles are stable with no unacceptable rates of erosion	As set out in RMP	Records of previous inspections for comparison
		OM15	Soil balance and inventory based on site records		Vegetation clearance area and stockpiles	Annual soil balance completed from year 1 of vegetation clearance / stockpiling, and a soils balance and inventory is subject to annual documented reconciliation and audit	Annually	Records of previous audits
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI-04	Erosion control features, disturbed areas, stockpiles and embankments. Measured as set out in SWMP		Disturbed areas, stockpiles, embankments and other relevant features	Monthly inspections, and inspection after significant rain events (as defined in SWMP) demonstrates non-failure of surface water and erosion control infrastructure, and no erosional failure of disturbed areas, stockpiles, embankments and other relevant features (no active rills, gullies or tunnels)	Monthly inspections, and inspection after significant rain events	Records of previous inspections for comparison.

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI15</td><td>Phase</td><td>Construction, operations and closure</td></tr>
<tr><td rowspan="12">Potential impact event</td><td>Potential impact description</td><td colspan="5">Groundwater mounding impacting vegetation and reducing land productive capacity by causing waterlogging and/or land salinisation</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Soil, native vegetation</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">Design of TSF to minimise seepage</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Limited data available to estimate seepage rates therefore conservative assumptions made.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned and assumptions around tailings seepage, sensitivity is assessed by stochastic modelling. Conservative seepage rates utilised in model.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="3">Deposition of wet tailings into the TSF may result in localised, downstream increase in groundwater levels (groundwater mounding) through tailings seepage losses and infiltration.
Modelling indicates:
• There is no mounding that breaches the land surface outside the extent of the TSF.
• there is a low-to-moderate probability that the water table will rise to within 3 m of the land surface on the northern and western sides of the TSF
• there is a high probability that the water table will rise to within 5 m of the land surface on the northern and western sides of the TSF within the Site area,
• there is a very low probability that the water table will rise to within 10 m of the land surface outside the Site.
Based on these observations there is a possible likelihood for land salinisation to result in a limited area to the immediate north and west of the TSF.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="5">Vegetation impacted and land productive capacity reduction due to waterlogging and/or land salinisation caused by groundwater mounding</td></tr>
</table>

<table>
<tr><th rowspan="5">Risk assessment and design/ management controls</th><th rowspan="3">Risk Assessment</th><th colspan="3">Raw risk (pre controls)</th><th rowspan="2">Physical controls and management controls</th><th colspan="3">Residual risk (post controls)</th></tr>
<tr><th>C</th><th>L</th><th>Risk</th><th>C</th><th>L</th><th>Risk</th></tr>
<tr><td>3</td><td>B</td><td>High</td><td>MM06: Implementation of a NVMP (incl. monitoring of native vegetation condition)
MM10: Annual aerial photography of vegetation clearance
MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57: GMMP
MM59: Annual groundwater review
MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding</td><td>3</td><td>B</td><td>High</td></tr>
<tr><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="4">Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.</td></tr>
</table>

<table>
<tr><th rowspan="4">Statement of proposed outcomes</th><td>Legislative requirement</td><td colspan="6">Environmental Protection Act 1993</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO02: The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue
PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).
PO10: The tenement holder must ensure the maintenance of productive capacity of land outside of TSF footprint</td></tr>
<tr><td rowspan="2">Draft outcome measurement criteria</td><th>Outcome measurement criteria ID</th><th>What will be measured and form (method) of measurement</th><th>Location</th><th>Outcome achievement</th><th>Frequency</th><th>Background and/or control data</th></tr>
<tr><td>OM05</td><td>Vegetation health and mortality, ground-based surveys</td><td>ML</td><td>Annual vegetation health survey shows no appreciable difference in mortality when compared to control sites</td><td>Annually</td><td>Control sites</td></tr>
</table>

		OM24	Groundwater levels using standard methods as per GMMP	ML	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	As per GMMP	Baseline monitoring results. GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site-specific trigger level (SSTL) as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

7.5. Waste and hazardous materials

An overview of waste and hazardous materials, including mine waste storage such as TSF and WRD are described within this Section.

This Section describes how the Project generated waste and waste storage facilities may impact environmental values and sets out the measures that will be implemented to minimise those impacts.

7.5.1. Context

7.5.1.1. Mining wastes

Benign mining waste such as hard-rock overburden, low-grade ore will be preferentially used in construction, geotechnical and rehabilitation applications, with the balance being stores on at WRDs as discussed in Section 4.7.1. Further work including a geotechnical drilling and assessment program is planned to ensure mine pit design and / or WRD design accounts for specific surcharge loading given in situ geotechnical conditions and ensure the setback / repose angles and pit wall slopes / bench width designs are appropriately tested prior to construction. It is unlikely that substantive quantities of PAF waste rock will be generated (refer Section 3.5.4). Noting there is some uncertainty regarding the extent of PAF to be addressed via on-going test works, including inclusion of targeted drilling of Razorback Central / West faulted zone in mine geotechnical (core) and pit dewatering (R/C) drilling programs, baseline speciation of sulfur type and leach testing on fresh samples. If determined to present, PAF waste rock will be managed via an ARD management plan including likely placement within engineered PAF cells, minimising the potential for oxidation and ARD.

A significant amount of tailings material will be produced (1139 Mtpa) and will consists of both fine and coarse waste reject material (at 80:20 production ratio) generated through the crushing and processing of ore, which will be disposed via pipelines to a single TSF (refer Section 4.7.2). Key characteristics of the tailings include non-acid generation, low leaching of dissolved metals and absence of asbestos fibres, with a pH of 8.5-10.5. The final TSF dimensions will be approximately 5,000 m long (north-south) and 5,800 m wide (east-west), with a final embankment height of approximately 60 m.

Other processing wastes includes primary ball mill, secondary ball mill and fine grinding mill scats, some of which will ultimately rest in the TSF, with the remainder caught at the outlets of the mills and disposed of to an off-site EPA-licensed landfill, or beneficially re-used on site.

7.5.1.2. Commercial and industrial

Commercial and industrial waste will be produced at the mine site, accommodation village and the RS. Waste will include putrescible waste such as food scraps and other biodegradable materials along with non-biodegradable materials that may or may not be recyclable.

Mine operations will also produce waste such as heavy vehicle HV and LV tires, hydrocarbon contaminated materials and waste oils.

Waste generation types are profiled in Table 4-39. Waste streams will be segregated at a transfer station for recycling and offsite disposal. No waste will be disposed of on-site. All materials to be disposed of offsite will either be taken directly to a facility or collected by an appropriately licenced contractor.

7.5.1.3. Effluent and brine

An approved WWTP will be established at the mine site, adjacent to the accommodation camp, with sufficient capacity for the maximum expected staff levels. Water streams from the treated effluent process will be stored in a tank and used for dust suppression applications. Solids will be transported off-site.

Potable water on site will be sourced from a treatment facility suitably sized to meet the projects consumption requirements, utilising the desalinated process water stream. Solids produced from this process are expected to be negligible, and will be disposed of via an approved method set out in the Project Waste Management Plan.

The impact assessment for each of the potential impacts related to waste are recognised in Section 7.5 and presented in Table 7-24. Some potential impacts discussed within this Section are more appropriately discussed in other Sections of this report. These instances are shown in Table 7-20.

7.5.2. Impact assessment

7.5.2.1. Commercial and industrial

Commercial and industrial wastes will be generated on site throughout the construction and operation phases. Without appropriate management and disposal (on or off-site) there is a potential for environmental impacts through contamination of soils, surface water and/or groundwater.

7.5.2.2. Geotechnical failure

Mining waste including tailings and waste rock will be stored on site within the TSF and WRDs. Geotechnical failure of key waste storage facilities such as TSF, WRDs may cause loss of life, damage to infrastructure and/or impacts to future land use through exposure of wastes and unintended changes to landforms. Whilst studies have been completed to ensure the TSF construction and operation meets MPOL007 and ANCOLD requirements, further work is anticipated prior to PEPR submission, including geophysics survey of the initial embankment and subject to the interpretation of geophysics survey results, geotechnical drilling / test-pitting in the embankment area and further basement characterization program may be required. Further required test work programs have been proposed in several subSections in Section 4.7.2.

7.5.2.3. Effluent and brine

Inappropriate disposal of liquid waste may cause soil and/or water contamination, potentially harming local vegetation and wildlife communities.

The potential impact events, and respective areas (ML and MPLs) in which they may occur are listed in in Table 7-20 and further analysed in Table 7-24. Some potential impacts discussed within this Section are more appropriately discussed in other Sections of this report. These instances are shown in Table 7-21.

Table 7-20: Waste and hazardous materials potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI13	Industrial waste and infrastructure left on-site post closure results in long-term contamination	Yes	R	R	R
PI14	Incorrect disposal of liquid waste causes soil and/or water contamination	Yes	C, O		
PI61	Geotechnical failure of key mining waste facilities (TSF, WRDs and mine voids) resulting in loss of life to persons or property, and impacting land use	Yes	O		
PI62	Geotechnical failure of key mining facilities during operation and/or closure (TSF, WRDs and mine voids) resulting in damage to persons or property, and/or impacting land use	Yes	R		

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some impacts of waste are more appropriately discussed in other Sections of this report. Instances of cross-referenced impacts are shown in Table 7-21.

Table 7-21: Waste and hazardous materials impacts cross reference

Potential impact	Refer to	Cross reference
Management of waste during Project construction, mining activities and rehabilitation causes an increase in abundance / diversity of pest species which predate upon, or compete with native fauna, and indirectly impact native flora due to selective and/or increased grazing pressure on native flora	PI06	Section 7.3
Extraction and surface emplacement of PAF material results in AMD and/or ARD, with adverse impacts on surface water	PI35	Section 7.7
Odour emissions from waste streams and vehicle exhaust/fuel fumes resulting in health and amenity impacts at locations of human sensitive receptors, and impacts on native fauna	PI51	Section 7.9

7.5.3. Design, control and management strategies

The waste design, control and management strategies are listed in Table 7-22 and referenced against the identified impact in Table 7-24.

Table 7-22: Waste and hazardous materials mitigation measures

Reference ID	Design, control and management measure
MM43	Project layout is designed to provide operational areas suitable for the storage of waste and hazardous materials prior to offsite disposal
MM44	Wastes generated will be disposed in accordance with relevant statutory requirements
MM45	Waste management and monitoring accordance with the Waste Management Plan
MM46	Fuel and hazardous materials storage facilities designed in accordance with Australian Standards, Dangerous Goods Codes, and EPA Bunding and Spill Management Guidelines (EPA 080/16)
MM47	Use of approved WWTPs that meet required standards for re-use/discharge to the environment
MM48	Non-tailings process water streams will be captured, stored and re-used where applicable and subject to any required treatment
MM49	Treated wastewater from the WWTP may be recycled for dust suppression, rehabilitation irrigation and other purposes subject to relevant statutory requirements
MM50	Treated biosolids from the WWTP may be beneficially re-used through application to land subject to relevant statutory requirements
MM51	Monitoring water application rates/ limit flow for dust suppression so no runoff of brackish/saline water
MM52	Implementation of MCP
MM53	Spills and uncontrolled release of hazardous materials managed in accordance with the Hazardous Materials Management Plan and spill response procedures
MM62	Construction of the TSF to ANCOLD-based geotechnical design, and ongoing operation and management in accordance with the Tailings Management Plan
MM83	WRD will be constructed as designed as per design specifications

7.5.4. Draft outcomes, measurement criteria and leading indicators

The draft waste proposed outcomes are presented in Table 7-23. The proposed outcomes, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-24.

Table 7-23: Waste and hazardous materials proposed outcomes

Reference ID	Proposed outcome
PO03	The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO07	The Tenement Holder must ensure that the disposal of wastes and retention infrastructure on-site post-closure does not pose an unacceptable risk to the environment, is safe and compatible with the nominated post-mining land use, and has been authorised under relevant legislation
PO08	The Tenement Holder must ensure all on-site and off-site waste disposal is undertaken in accordance with relevant legislative requirements
PO09	The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).
PO10	The tenement holder must ensure the maintenance of productive capacity of land outside of TSF footprint
PO11	The Tenement Holder must ensure no adverse impact on surface water quality as a result of mining operations
PO23	The Tenement Holder must ensure that post-closure landforms are physically and chemically stable.
PO24	Post-mining landforms are safe, geotechnically stable, non-polluting and support the nominated post-mining land use

Table 7-24: Waste and hazardous materials potential impacts

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI13</td><td>Phase</td><td colspan="3">Closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Industrial waste and infrastructure left on-site post closure results in long-term contamination</td></tr>
<tr><td>Source</td><td colspan="8">Project - Industrial waste and infrastructure</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Local landowners, land use, soil, surface water, groundwater</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">Waste management/mitigation practices are well understood. However site-specific details are not confirmed.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="5">Waste management streams are identified and well understood.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="5">Low sensitivity to change, S-P-R unlikely to change.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Mining operations will generate waste and infrastructure which, if retained on-site post-closure, may contaminate the environment if incorrectly or inappropriately disposed/managed.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Industrial waste and infrastructure from the Project are left onsite post closure, resulting in long term contamination</td></tr>
<tr><td rowspan="4">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>3</td><td>C</td><td>High</td><td colspan="2">MM44: Wastes generated will be disposed in accordance with relevant statutory requirements
MM52: Implementation of MCP</td><td>3</td><td>D</td><td>Moderate</td></tr>
<tr><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="5">MCP is subject to change over LOM</td></tr>
</table>

	Sensitivity analysis	**Sensitivity**	A	**Justification**	Changes to assumptions will not affect ability to achieve outcomes as changes to MCP would be subject to approval		
Statement of proposed outcomes	**Legislative requirement**	*EP Act* Whilst a standalone Mine Closure Plan is not legislated, aspects of closure planning are required in the TOR under the Mining Act.					
	Proposed outcome	PO07: The Tenement Holder must ensure that the disposal of wastes and retention infrastructure on-site post-closure does not pose an unacceptable risk to the environment, is safe and compatible with the nominated post-mining land use and has been authorised under relevant legislation					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM36	Audit of mine site prior to approved closure.	Project Area	Independent audit to ensure rehabilitation and mine closure has been undertaken in accordance with the RMP and MCP, respectively	Prior to closure	MCP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		None proposed					

	Impact ID	PI14			Phase	Construction and operation		
Potential impact event	Potential impact description	Incorrect disposal of liquid waste causes soil and/or water contamination						
	Source	Project - Generation of industrial and other wastes						
	Pathway	Land						
	Receptor	Soil, surface water, groundwater, native flora						
	Inherent design controls	Site infrastructure is designed to ensure waste is managed effectively by providing adequate storage in the TSF						
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	Waste management practices are well understood. However site-specific details are not confirmed.			
		Method and model	A	Justification	The development of a tailings dam with suitable storage capacity to ANCOLD standards over LOM. Further work is planned to confirm the location and extent of PAF material. Planned works include targeted drilling of Razorback Central / West faulted zone in mine geotechnical (core) and pit dewatering (R/C) drilling programs. Baseline speciation of sulfur type and leachate testing on fresh samples will also be completed. Additional impact control including an ARD management plan with associated design and location of PAF cells will also be established (if required).			
	Sensitivity analysis	Sensitivity	B	Justification	Moderate sensitivity to change as tailings waste is well understood, however variability in waste may occur over LOM. Changes to waste generated will not change S-P-R.			
	S--P-R linkage	Yes	Justification	Mining operations will generate waste and infrastructure which may contaminate the environment if incorrectly or inappropriately disposed on site. Wastes with a beneficial re-use pathway (e.g. treated effluent, biosolids, timber wastes) may be disposed on-site subject to relevant authorisation.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Incorrect disposal of liquid waste, including through failure (breach) of the TSF, causes soil and/or water contamination						
Risk assessment and design/	Risk Assessment	Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	L	Risk		C	L	Risk
		3	B	High	MM61: TSF design and construction will be staged in line with mine operation requirements, and lifted as required.	3	D	Moderate

					MM62: Construction of the TSF to ANCOLD-based geotechnical design, and ongoing operation and management in accordance with the Tailings Management Plan MM43: Project layout is designed to provide operational areas suitable for the storage of waste and hazardous materials prior to offsite disposal MM44: Wastes generated will be disposed in accordance with relevant statutory requirements MM45: Waste management and monitoring accordance with the Waste Management Plan MM46: Fuel and hazardous materials storage facilities designed in accordance with Australian Standards, Dangerous Goods Codes, and EPA Bunding and Spill Management Guidelines (EPA 080/16) MM47: Use of approved WWTPs that meet required standards for re-use/discharge to the environment MM48: Non-tailings process water streams will be captured, stored and re-used where applicable and subject to any required treatment MM49: Treated wastewater from the WWTP may be recycled for dust suppression, rehabilitation irrigation and other purposes subject to relevant statutory requirements MM50: Treated biosolids from the WWTP may be beneficially re-used through application to land subject to relevant statutory requirements MM51: Monitoring water application rates/ limit flow for dust suppression so no runoff of brackish/saline water MM53: Spills and uncontrolled release of hazardous materials managed in accordance with the Hazardous Materials Management Plan and spill response procedures			
	Uncertainty	**Inputs, method and model**	B	**Justification**	It is assumed that TSF can be constructed to ANCOLD guidelines based on the materials available. Detailed wastewater plans are yet to be finalised			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions may affect ability to achieve outcomes			
Statement of	**Legislative requirement**	EP Act						

	Proposed outcome	PO08: The Tenement Holder must ensure all on-site and off-site waste disposal is undertaken in accordance with relevant legislation. PO09: The Tenement Holder must ensure that project activities do not result in adverse change to groundwater (quality and quantity) PO10: The tenement holder must ensure the maintenance of productive capacity of land outside of TSF footprint. PO11: The Tenement Holder must ensure no adverse impact on surface water quality as a result of mining operations. PO23: The Tenement holder must ensure that all post-closure landforms and physically and chemically stable.					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM18	Annual audit of records	Project Area	Annual audit of records indicated all waste has been stored and disposed of in accordance with the WMP and any statutory authorisations where applicable	Annual	Waste disposal records
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		None proposed					

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI61</td><td>Phase</td><td>Operation</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="5">Geotechnical failure of key mining facilities (TSF, WRDs and mine voids) resulting in damage to persons or property, and impacting land use</td></tr>
<tr><td>Source</td><td colspan="5">Project - TSF embankment failure, WRD failure, mine void wall collapse
Stochastic events - extreme weather (e.g. extreme rainfall, flooding)</td></tr>
<tr><td>Pathway</td><td colspan="5">Land</td></tr>
<tr><td>Receptor</td><td colspan="5">Local landowners, traditional landowners, land use</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">Construction of the TSF to ANCOLD standards</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">Some assumptions in geotechnical design. Further works to strengthen the key inputs will be commissioned by MGT to be completed prior to PEPR production. These include a geotechnical drilling and assessment program to ensure mine pit design and/ or WRD design accounts for specific surcharge loading given in situ geotechnical conditions. Additional geophysics testing will be undertaken of the initial embankment and subject to results, a geotechnical drilling / test pitting in the embankment area and basement characterization program will be completed.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Industry standard approach undertaken by appropriately qualified professionals.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="2">Changes to understanding of geotechnical aspects of design would change likelihood of impact, however worst-case scenario (geotechnical failure) has been used in assessment.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="3">Based on mining industry precedent, and without geotechnical design and operational controls, potential exists for a geotechnical (mass failure) of the TSF embankment and downstream mass release of tailings/water.
Potential for mine wall collapse, and collapse/failure of WRDs is considered unlikely based on the hardness and competency of the rock within the ore body, and hence competency of the rock emplaced in WRDs.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="5">Loss of life or property and land use impact due to geotechnical failure of the key mining facilities such as TSF, WRDs and mine voids</td></tr>
</table>

Risk assessment and design/ management controls	Risk Assessment	Raw risk (pre controls)			Physical controls and management controls		Residual risk (post controls)		
		C	L	Risk			C	L	Risk
		5	D	Very High	MM62: Construction of the TSF to ANCOLD-based geotechnical design, and ongoing operation and management in accordance with the Tailings Management Plan MM83: WRD will be constructed as designed as per design specifications		5	E	High
	Uncertainty	Inputs, method and model	B	Justification	Assumed that TSF can be constructed to ANCOLD guidelines based on the materials available.				
	Sensitivity analysis	Sensitivity	A	Justification	Change in assumptions would affect ability to achieve outcomes.				
Statement of proposed outcomes	Legislative requirement	None							
	Proposed outcome	PO23: The Tenement Holder must ensure that all post-closure landforms are physically and chemically stable.							
	Draft outcome measurement criteria	Outcome measurement criteria ID	What will be measured and form (method) of measurement		Location	Outcome achievement	Frequency	Background and/or control data	
		OM37	Geotechnical stability of the TSF, void walls and WRDs through an independent audit		ML	Independent audit by a suitably-qualified geotechnical engineer prior to mine closure demonstrates that the TSF, void walls and WRDs are geotechnically stable and do not pose an unacceptable ongoing risk to persons, property or environment	Prior to mine closure	ANCOLD guidelines	
	Draft leading indicator criteria	Leading indicator ID	What will be measured and form (method) of measurement		Location	Outcome achievement	Frequency	Background and/or control data	
		LI05	Condition and stability inspections of key infrastructure		ML	Routine geotechnical integrity inspections by mine personnel Periodic geotechnical surveillance audits by a suitably qualified / geotechnical engineer, during the mine operations phase	Daily Annually	Approved design	

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI62</td><td>Phase</td><td>Closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="6">Geotechnical failure of key mining facilities during operation and/or closure (TSF, WRDs and mine voids) resulting in damage to persons or property, and/or impacting land use</td></tr>
<tr><td>Source</td><td colspan="6">Project - TSF subsidence/differential settlement, WRD failure, mine void wall collapse (surrounding land lost to void)</td></tr>
<tr><td>Pathway</td><td colspan="6">Land</td></tr>
<tr><td>Receptor</td><td colspan="6">Local landowners, traditional landowners, land use</td></tr>
<tr><td>Inherent design controls</td><td colspan="6">Construction of the TSF to ANCOLD standards</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="3">Some assumptions in geotechnical design. Further works to strengthen the key inputs will be commissioned by MGT to be completed prior to PEPR production. These include a geotechnical drilling and assessment program to ensure mine pit design and/ or WRD design accounts for specific surcharge loading given in situ geotechnical conditions. Additional geophysics testing will be undertaken of the initial embankment and subject to results, a geotechnical drilling / test pitting in the embankment area and basement characterization program will be completed.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="3">Industry standard approach undertaken by appropriately qualified professionals.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="3">Changes to understanding of geotechnical aspects of design would affect likely impact.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="4">Based on mining industry precedent, potential exists for ongoing subsidence/differential settlement of closed TSF landform (e.g. due to delayed consolidation of deposited tailings).
Potential for mine wall collapse, and collapse/failure of WRDs is considered unlikely based on the competency of the rock within the ore body and hence competency of the emplaced rock.</td></tr>
<tr><td colspan="7">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="6">Failed rehabilitation and inability to achieve closure requirements related to post-mining land use due to geotechnical failure of the key mining facilities such as TSF, WRDs and mine voids</td></tr>
</table>

Risk assessment and design/ management controls		Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	**L**	**Risk**		**C**	**L**	**Risk**
	Risk Assessment	5	C	Very High	MM62: Construction of the TSF to ANCOLD-based geotechnical design, and ongoing operation and management in accordance with the Tailings Management Plan MM83: WRD will be constructed as designed as per design specifications	5	E	High
	Uncertainty	**Inputs, method and model**	B	**Justification**	It is assumed that the design specifications are appropriate to enable closure requirements to be meet.			
	Sensitivity analysis	**Sensitivity**	C	**Justification**	Should rehabilitation fail then the outcome will not be achieved.			

Statement of proposed outcomes							
	Legislative requirement	Mining Act and Mining Regulations					
	Proposed outcome	PO24: Post-mining landforms are safe, geotechnically stable, non-polluting and support the nominated post-mining land use					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM37	Geotechnical stability of the TSF, void walls and WRDs through an independent audit	ML	Independent audit by a suitably-qualified geotechnical engineer prior to mine closure demonstrates that the TSF, void walls and WRDs are geotechnically stable and do not pose an unacceptable ongoing risk to persons, property or environment	Prior to mine closure	None
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI05	Condition and stability of key infrastructure through inspections WRDs by inspections	ML	Routine geotechnical integrity inspections by mine personnel Periodic geotechnical surveillance audits by a suitably qualified / geotechnical engineer, during the mine operations phase	Daily Annually	Approved design

7.6. Groundwater, including quality and quantity

An overview of the groundwater impact assessment (GIA) is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B4 *Surface Water and Groundwater Baseline Assessment* (ELA, 2024), and for detailed groundwater impact assessment please refer to Appendix C2 *Groundwater Impact Assessment* (CDM Smith, 2024).

This Section describes how the Project may impact on the existing groundwater environment and presents measures that will, when implemented, minimise those impacts.

7.6.1. Context

The Project is situated within an arid climate, with limited surface water availability and therefore groundwater resources characterised by low yields and brackish-to-saline water quality, are the primary water supply option for stock and domestic users in the area. The hydrogeological conceptualisation shows a fractured rock setting in which most groundwater is hosted in fractures (as secondary porosity), with primary porosity restricted to the thin surficial cover of Cenozoic sediments and some permeable members (e.g., tillite) of the folded Neoproterozoic units that are present underneath the site and surrounding region.

The groundwater system underlying Razorback has generally low rates of recharge, occurring in areas of rock outcrop and along ephemeral drainage lines. Groundwater flow is compartmentalised by ridge lines and geological structures with discharge occurring as localised evapotranspiration along major drainage lines from shallow sediments or rock outcrop, and regional outflow to the south towards the more productive sedimentary aquifers of the Murray Basin.

Groundwater receptors have been identified as third-party bores used for stock and domestic purposes (primarily stock water), potential GDEs (terrestrial vegetation and stygofauna), local groundwater resources (Olary Ranges) and Murray Basin groundwater resources (which occur at considerable distance from the site). Other receptors (related to surface environments) considered by the GIA are ephemeral pools along the drainage lines (which are supported by surface water flow only), farm dams, soils, and vegetation.

7.6.1.1. Project related groundwater affecting activities

This Section details the project activities likely to affect the existing groundwater environment.

CONSTRUCTION WATER SUPPLY

Construction water demand is around 1 GL over a two-year period. The bulk of this water (approximately 900 ML) is to be sourced from local groundwater. Assuming bore yields of 1–2 L/s, approximately 10–12 bores are required. Separately, minor quantities of groundwater (about 0.5–1 L/s per bore) will be sourced from bores along the HR and TL for the LOM. A groundwater evaluation program is proposed at several representative sites in the Site, HR and TL consisting of installation of monitoring bores followed by pumping tests to provide recommended pumping rates (note: some of the proposed bores are already operational, located within the ML, and are used for pastoral applications).

Whilst there is likely to be a temporary period of groundwater drawdown in areas local to construction water bores, on account of the low recharge environment, the activity with the predominant impact to local groundwater will be mining during operations because most of the construction bores are located within or adjacent to the mining pits, drawdown effects associated with the relatively small amount of construction water supply abstraction will be masked by drawdown from subsequent pit dewatering.

MINING AND ASSOCIATED DEWATERING

A traditional open pit mining method will be employed for the Razorback Project. Two pits will be excavated to mine the Razorback and Iron Peak deposits, with sufficient resources identified to support a 38-year mine life with the potential to extend to a 56-year mine life with additional approvals. The Razorback pit will extend from the current natural surface (which ranges in elevation from 150 to 420 m AHD) to final pit floor elevations ranging between 10 and 260 m AHD. The Iron Peak pit will extend from the current natural surface (290–300 m AHD) to final pit floor elevations of between -30 to 90 m AHD. Both pits will extend below the water table.

At Razorback, the water table is expected to be encountered at a depth of approximately 30-100 m below natural surface. At Iron Peak, which is to be mined earlier in the mining schedule, the water table is expected to be encountered at around 50-100 m below the natural surface. Depth to groundwater at the two mining areas is dependent on position in the landscape, with shallower groundwater encountered in more low-lying areas. A dry pit will be maintained by in-pit sump pumping and (only if necessary) by the use of designated dewatering bores.

There will be a temporary period of groundwater drawdown during pumping (including from in-pit sumps or dewatering bores) as per Figure 7-1, followed by a recovery in groundwater levels post-mining.

The mining and associated dewatering will cause groundwater level drawdown centered on the two mining pits (Figure 7-1).

MINERAL PROCESSING AND TAILINGS DISPOSAL

The magnetite ore will be fed to a processing plant and tailings deposition will occur to a single TSF using a CTD method (Hatch, 2024b). The TSF will comprise an embankment wall that will be progressively raised, and tailings will be deposited via single pipeline located in the centre of the TSF which will have an ultimate footprint of ~2,500 ha. Water in the tailings slurry will be deposited at a rate of approximately 9.7 GL/y of which ~3 GL/y will be recycled by pumping from decant ponds at the edge of the TSF. The remaining 6.7 GL/y will be entrained in the deposited tails. A portion of the entrained water will remain within the pore spaces of the tailings material. A large portion will be lost via evaporation (evaporation rates up to ~2,000 mm/y in the area). The remaining portion is likely to migrate downwards to groundwater as seepage. The seepage rate from the tailings will depend on the hydraulic properties of the tailings material and the underlying geology.

The effect of the TSF on groundwater will be seepage that causes increased groundwater recharge. This will result in a pressure response (mounding that will propagate through the groundwater system) and a solute transport process involving the mixing of tailings seepage with ambient groundwater. The pressure response will occur more rapidly and over a larger area compared to the solute transport process which will be much slower and more contained.

MINE CLOSURE

Mine closure will involve rehabilitating the TSF, WRDs and associated landforms, with the mine pit shells to remain as a feature of the landscape. As the pit shells will extend below the natural water table elevation, they will continue to receive groundwater and limited surface water inflows and it is likely that a pit lake will form (Figure 7-1). The water level in the pit lake will rise until inflows are, on average, balanced by evaporation. The pit lake will be below the surrounding water table elevation, and the lake will form a permanent groundwater discharge feature. The deposition of salt to the lake (via groundwater) and evaporation will cause the lake to become increasingly saline.

The effect of mine closure on groundwater will be the creation of a drawdown cone, centered on the mine pits.

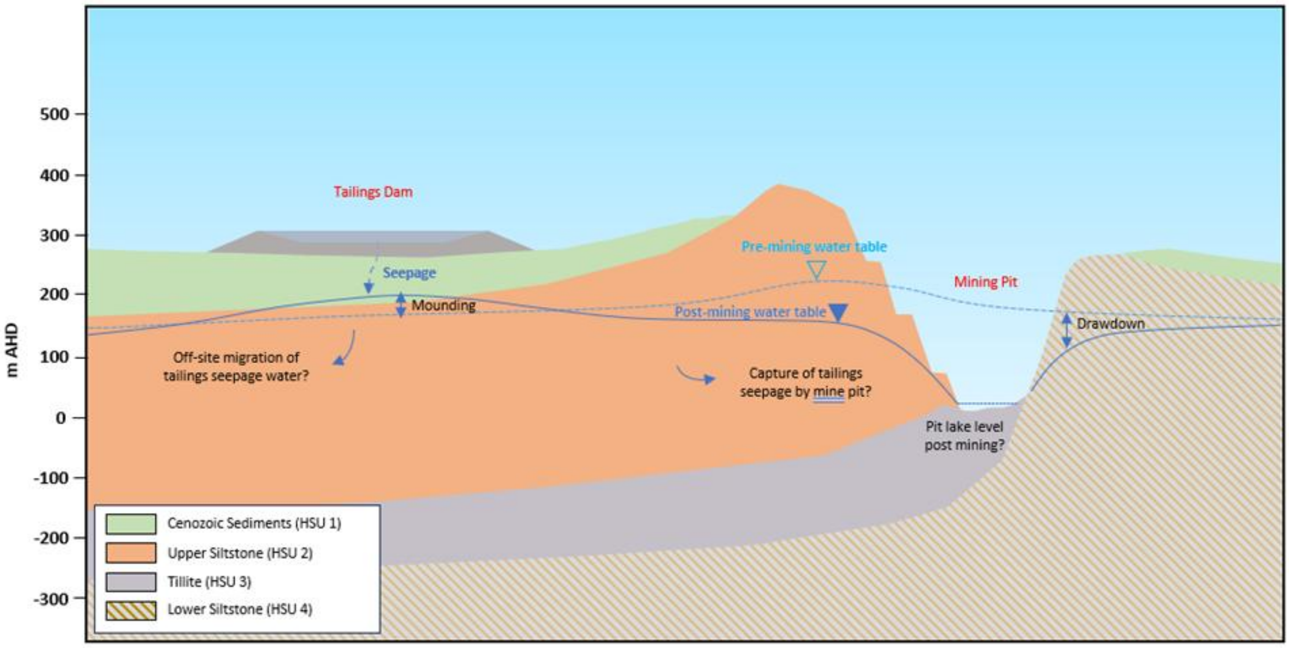


Figure 7-1: Effects of mining on Groundwater (CDM Smith, 2024)

7.6.2. Potential impact events

7.6.2.1. Groundwater modelling

A groundwater modelling assessment has been performed to inform the GIA. It has assessed the extent of mounding and the flow paths of tailings seepage water. The modelling incorporates a numerical groundwater flow model (developed in Modflow) to simulate the effects of the project on the regional groundwater system, and a pit lake model (developed in GoldSim) to simulate the development of a pit lake post-mining. The modelling utilises a stochastic approach in which multiple (105) calibrated models have been developed to address uncertainty. A sensitivity assessment, incorporating climate change projections, has also been performed. The model has been reviewed independently and deemed to be fit for purpose (Middlemis, 2024).

For a detailed analysis of the groundwater modelling calibration methods, refer to Section 4 of the Groundwater Impact Assessment, prepared by CDM Smith (2024).

7.6.2.2. Groundwater impacts

A systematic impact assessment has been performed using a S-P-R approach, supported by the outputs from the hydrogeological conceptualisation and the modelling assessment. The GIA analysed potential groundwater impacts related to each of the following categories of change:

1. drawdown
2. mounding
3. tailings disposal/seepage affecting water quality.

These impacts are described further below.

DRAWDOWN

One of the primary effects of the Project on the groundwater system concerns drawdown caused by groundwater pumping for construction demand, mining, and associated dewatering. At mine closure the mine pits will remain as a feature of the landscape and create a groundwater sink. A program of further works will be undertaken to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid. The program will include pump tests and hydrogeological modelling will be used to confirm the dewatering regime.

This impact of drawdown on the existing groundwater system may affect a variety of receptors. This includes a reduction of groundwater at third party bores reducing the bore yield or preventing access to water, potential impacts to terrestrial GDEs and stygofauna, and a reduction in groundwater effecting the productive base and limiting potential future use of the Murray Basin and Olary Ranges groundwater resources. The mining activity impact to regional groundwater was modelled as part of the GIA, and the resultant areas of groundwater drawdown are evident in Figure 7-2.

The potential impacts to various receptors from groundwater drawdown are identified as PI16 to PI23 and are summarised in Table 7-25.

MOUNDING

The modelling undertaken indicates that mounding is likely to occur around the TSF within the proposed ML and to the north and west outside of the proposed ML, evident in Figure 7-1. Further work will be completed including the installation of test / monitoring bores (where existing bores are not accessible or suitable) in the TSF footprint to improve definition of the underlying geology and associated hydraulic properties. This may include use of pumping tests to better characterise the underlying receiving layers / aquifers and geological logging during drilling to design soil / unsaturated zone core drilling to better characterise lithology and hydraulic properties directly underlying the TSF.

Similar to groundwater drawdown, mounding may impact multiple receptors. Potential impacts from mounding include groundwater flux to ephemeral pools, breaches of the water table affecting farm dams and mounding impacting third-party bores, however these potential impacts are considered unlikely when based on groundwater modelling. Other potential impacts include impact of mounding on terrestrial GDE (River Red Gums) in Sections of Manunda Creek, potentially causing waterlogging and salinisation issues.

The potential impacts to receptors from groundwater mounding are identified as PI64 to PI71 and are summarised in Table 7-25.

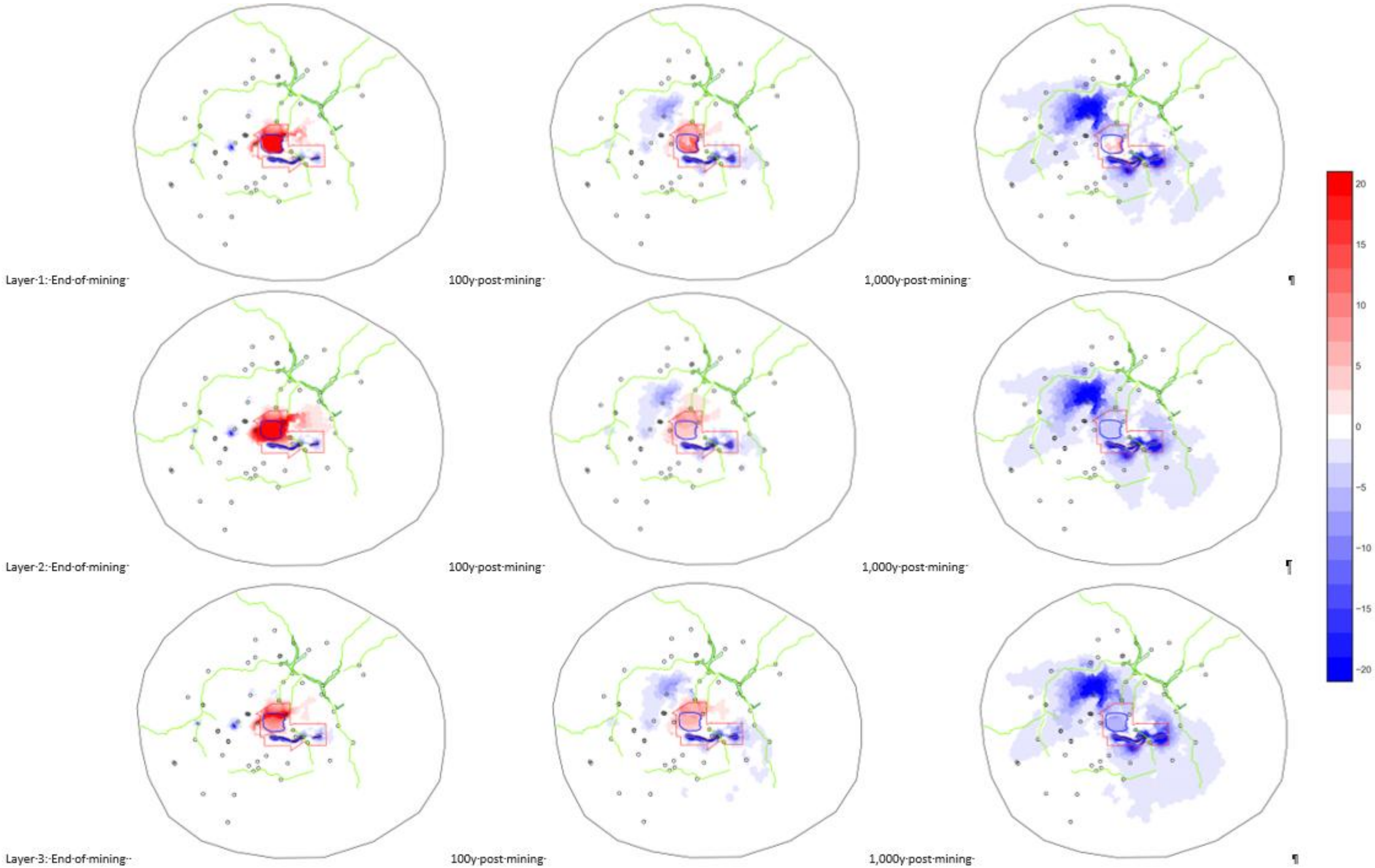
TAILINGS SEEPAGE

Initial testing conducted by MGT, trialling various options of source water for mine processing indicated the tailings water will be non-saline and relatively benign (i.e. free of contaminants in elevated concentrations). However given uncertainties related to the tailings water quality, the precautionary principle has been adopted within the GIA. Potential impacts have therefore been assessed on the basis of any interaction between seepage water and receptors.

The potential impacts associated with the fate and transport of TSF seepage water can be assessed using particle tracking simulations which identify the exposure of any receptors to this water. There is, however, uncertainty related to preferential fracture pathways (not able to be examined by the equivalent porous media approach taken in the modelling assessment) that enables seepage to be transmitted more rapidly along more restricted pathways. However, the assessment of particle tracking outputs from the model provides general indication of likely flow directions and timescale of any potential contaminants released from TSF seepage.

Using the particle tracking results of the modelling identifies potential impacts including; TSF seepage interacting with the groundwater resources and altering groundwater quality of the Murray Basin, Olary Ranges, ephemeral pools along drainage lines and farm dams, however these impacts are considered unlikely. Impacts from altered groundwater salinity to soils and vegetation are also considered unlikely as there is no interaction with changes to groundwater quality and soils and vegetation, outside of the instances where mounding intersects land. Potential GDEs and stygofauna are also considered unlikely to be impacted as they are dependent on local (fresh) recharge from surface water flows, such that any increase in regional groundwater salinity would be very unlikely to impact their condition. Comparatively, the receptors most likely to be exposed to TSF seepage are third-party bore users immediately downgradient of the TSF were, applying the precautionary principle, groundwater quality could be altered.

The potential impacts to receptors from tailings seepage affecting groundwater quantity and quality are identified as PI24 to PI31 and are summarised in Table 7-25.



*NOTE: RED SHADES INDICATIVE OF MOUNDING. BLUE SHADES INDICATIVE OF DRAWDOWN. COLOUR SHADING IS LIMITED TO +/-20 M TO HIGHLIGHT SPATIAL VARIABILITY NOTING THAT DRAWDOWN AND MOUNDING MAY EXCEED 20 M WITHIN THE AREAS OF THE DARKEST SHADES (CDM SMITH, 2024)

Figure 7-2: Simulated change in groundwater level (m) by model layer at selected times

7.6.2.3. Potential impact events

The potential groundwater impact events, and respective areas (ML and MPLs) are listed in Table 7-25 and are further analysed within Table 7-29.

Table 7-25: Groundwater potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
Groundwater drawdown					
PI16	Reduction in groundwater levels at terrestrial vegetation GDEs leading to increased vegetation stress, loss of condition or mortality	Yes	C, O, R		
PI17	Reduction in groundwater levels leading to a reduction in stygofauna species diversity and/or abundance	Yes	C, O, R		
PI18	Reduction in groundwater levels leading to reduced groundwater availability and quantity (bore yield) in third-party groundwater bores	Yes	C, O, R		
PI19	Reduction in groundwater levels impacting third party use of Murray Basin groundwater resources	No	C, O, R		
PI20	Reduction in groundwater levels impacting third party use of Olary Ranges groundwater resources	Yes	C, O, R		
PI21	Reduction in groundwater levels adversely affecting ephemeral pools along drainage lines	No	C, O, R		
PI22	Reduction in groundwater levels adversely affecting water levels in farm dams	No	C, O, R		
PI23	Reduction in groundwater levels adversely affecting soils and (non GDE) vegetation	No	C, O, R		
Tailings seepage fate and transport					
PI24	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality in third-party bores	Yes	O, R		
PI25	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality and impact potential GDEs (terrestrial vegetation)	Yes	O, R		
PI26	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality and impact potential stygofauna	Yes	O, R		
PI27	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of Murray Basin groundwater resources	No	O, R		
PI28	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of Olary Ranges groundwater resources	Yes	O, R		
PI29	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of ephemeral pools along drainage lines	No	O, R		
PI30	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of farm dams	No	O, R		

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI31	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect vegetation	No	O, R		
Groundwater mounding					
PI64	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to alter (increase) water quantity in third-party bores	Yes	O, R		
PI65	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect potential terrestrial GDEs (Red gums).	Yes	O, R		
PI66	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect potential stygofauna	Yes	O, R		
PI67	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect water quantity of Murray Basin groundwater resources	No	O, R		
PI68	Tailings disposal leading to groundwater mounding (via seepage to groundwater) alter (increase) water quantity in Olary Ranges groundwater resources	Yes	O, R		
PI69	Tailings disposal leading to groundwater mounding (via seepage and groundwater) to adversely affect water quantity in ephemeral pools along drainage lines (Manunda Creek)	No	O, R		
PI70	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect water quantity in farm dams	No	O, R		
PI71	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to alter water quantity of groundwater resources reducing land productive capacity by causing waterlogging and/or salinisation.	Yes	O, R		

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some impacts discussed on groundwater are more appropriately discussed in other Sections of this report (i.e., waste). Instances of cross-referenced impacts are shown in Table 7-26.

Table 7-26: Groundwater impacts cross reference

Potential impact	Refer to	Cross reference
Industrial waste and infrastructure left on-site post closure results in long-term contamination	PI13	Section 7.5
Incorrect disposal of liquid waste causes soil and/or water contamination	PI14	Section 7.5
Groundwater mounding impacting vegetation and reducing land productive capacity by causing waterlogging and/or land salinisation	PI15	Section 7.4
Changed rates of subsurface infiltration due to alteration of surface water regime due to mining operations results in changes to groundwater level affecting groundwater users	PI36	Section 7.7

7.6.3. Design, control, and management strategies

Design, control, and management strategies for the identified impact events are detailed in Table 7-29. These mitigation measures are assigned to each potential impact event in Table 7-29.

Table 7-27: Groundwater mitigation measures

Reference ID	Design, control and management measure
MM06	Implementation of a Native Vegetation Management Plan (NVMP) (incl. monitoring of native vegetation condition)
MM10	Annual aerial photography of vegetation clearance
MM54	Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable
MM55	Monitoring of water quality in tails and groundwater
MM56	Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57	Groundwater Management and Monitoring Plan (GMMP)
MM58	Implement and maintain a site water balance to track groundwater seepage rates and other water loss
MM59	Annual groundwater review
MM60	Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering

7.6.4. Draft outcomes, measurement criteria and leading indicators

The draft groundwater proposed outcomes are presented in Table 7-28. The proposed outcome, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-29.

Table 7-28: Groundwater proposed outcomes

Reference ID	Proposed outcome
PO02	The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue
PO03	The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO09	The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).
PO10	The tenement holder must ensure the maintenance of productive capacity of land outside of TSF footprint

Table 7-29: Groundwater potential impacts

	Impact ID	**PI16**			**Phase**	**Construction, operations and closure**			
Potential impact event	**Potential impact description**	Reduction in groundwater levels at terrestrial vegetation GDEs leading to increased vegetation stress, loss of condition or mortality							
	Source	Project - Mine dewatering							
	Pathway	Water							
	Receptor	Terrestrial vegetation GDEs							
	Inherent design controls	None							
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Remote sensing analysis. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.				
		Method and model	A	**Justification**	Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.				
	Sensitivity analysis	**Sensitivity**	C	**Justification**	Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. Vegetation relatively insensitive to regional groundwater levels given they are supported predominately by surface water flows.				
	S--P-R linkage	Yes	**Justification**	Mine dewatering will lower groundwater level, therefore terrestrial GDEs (River Red Gum communities) could be adversely impacted.					
	If no S-P-R linkage then do not continue further								
	Description of likely impact	Mine dewatering will lower groundwater level, therefore terrestrial GDEs (River Red Gum communities) could be adversely impacted							
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**			
		C	**L**	**Risk**		**C**	**L**	**Risk**	
		2	C	Moderate	MM06: Implementation of a NVMP (incl. monitoring of native vegetation condition) MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges MM57: GMMP	2	D	Low	

					MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.			
Statement of proposed outcomes	**Legislative requirement**	*Environmental Protection Act 1993* *National Parks and Wildlife Act 1972*						
	Proposed outcome	PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM21	Vegetation health and condition		Terrestrial GDEs (River Red Gum communities)	Vegetation index assessment of Terrestrial GDEs (River Red Gum communities) demonstrates that vegetation health and condition is comparable to historical baseline, or is otherwise comparable to control sites	Annually	Vegetation baseline studies
		OM24	Groundwater level stability through groundwater level monitoring		Project Area	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	Bi-annually	GMMP Monitoring data
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP		ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI17</td><td>Phase</td><td colspan="3">Construction, operations and closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="7">Reduction in groundwater levels leading to a reduction in stygofauna species diversity and/or abundance.</td></tr>
<tr><td>Source</td><td colspan="7">Project - Mine dewatering</td></tr>
<tr><td>Pathway</td><td colspan="7">Water</td></tr>
<tr><td>Receptor</td><td colspan="7">Subsurface GDEs (Stygofauna)</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.
Stygofauna relatively insensitive to regional groundwater levels given they are supported predominately by recharge from surface water flows.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">Sources/activities listed will lower the groundwater level, therefore stygofauna GDEs could be adversely affected.
The modelling undertaken indicates minimal drawdown along Manunda Creek where stygofauna have been recorded. These ecosystems in these locations are supported predominantly via surface water flows along the drainage channel.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="7">Reduction in groundwater levels leading to a reduction in stygofauna species diversity and/or abundance</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>D</td><td>Low</td><td>MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57: GMMP</td><td>1</td><td>E</td><td>Low</td></tr>
</table>

					MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.		
Statement of proposed outcomes	**Legislative requirement**	EP Act					
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM24	Groundwater level stability through groundwater level monitoring	Project Area	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	Bi-annually	GMMP Monitoring data
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

	Impact ID	**PI18**			**Phase**	**Construction, operations and closure**		
Potential impact event	**Potential impact description**	Reduction in groundwater levels leading to reduced groundwater availability and quantity (bore yield) in third-party groundwater bores						
	Source	Project - Mine dewatering						
	Pathway	Water						
	Receptor	Third-party bores						
	Inherent design controls	None						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.			
		Method and model	A	**Justification**	Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.			
	Sensitivity analysis	**Sensitivity**	C	**Justification**	Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.			
	S--P-R linkage	Yes	**Justification**	Sources/activities listed will lower the groundwater level, therefore users of third-party bores could be affected.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Reduction in groundwater levels leading to reduced groundwater availability and quantity (bore yield) in third-party groundwater bores.						
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		3	C	High	MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges MM57: GMMP MM59: Annual groundwater review	3	C	High

					MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.			
Statement of proposed outcomes	**Legislative requirement**	EP Act						
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		OM24	Groundwater level stability through groundwater level monitoring	Project Area	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	Bi-annually	GMMP Monitoring data	
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP	

	Impact ID	**PI19**		**Phase**	**Construction, operations and closure**
Potential impact event	**Potential impact description**	Reduction in groundwater levels impacting third party use of Murray Basin groundwater resources			
	Source	Project - Mine dewatering			
	Pathway	Water			
	Receptor	Third party uses of the Murray Basin groundwater resources			
	Inherent design controls	None			
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.
		Method and model	A	**Justification**	Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.
	S--P-R linkage	No	**Justification**	While sources/activities listed will lower the groundwater level in the vicinity of the mine, modelling has shown that this effect does not propagate to Murray Basin groundwater resources.	
	If no S-P-R linkage then do not continue further				

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI20</td><td>Phase</td><td colspan="3">Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="7">Reduction in groundwater levels impacting third party use of Olary Ranges groundwater resources</td></tr>
<tr><td>Source</td><td colspan="7">Project - Mine dewatering</td></tr>
<tr><td>Pathway</td><td colspan="7">Water</td></tr>
<tr><td>Receptor</td><td colspan="7">Third party uses of the Olary Ranges groundwater resources</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">Sources/activities listed will lower the groundwater level in the Olary Ranges region.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="7">Reduction in groundwater levels impacting third party use of Olary Ranges groundwater resources</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>A</td><td>High</td><td>MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57: GMMP
MM59: Annual groundwater review</td><td>2</td><td>A</td><td>High</td></tr>
</table>

					MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.		
Statement of proposed outcomes	**Legislative requirement**	*Environmental Protection Act 1993*					
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity). PO10: The tenement holder must ensure the maintenance of productive capacity of land outside of TSF footprint					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM24	Groundwater level stability through groundwater level monitoring	Project Area	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	Bi-annually	GMMP Monitoring data
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

<table>
<tr><td></td><td>Impact ID</td><td>PI21</td><td colspan="2">Phase</td><td colspan="2">Construction, operations and closure</td></tr>
<tr><td rowspan="9">Potential impact event</td><td>Potential impact description</td><td colspan="5">Reduction in groundwater levels adversely affecting ephemeral pools along drainage lines</td></tr>
<tr><td>Source</td><td colspan="5">Project - Mine dewatering</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Native fauna</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census, Baseline monitoring, remote sensing and geochemical analysis. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review, hydrogeological conceptualisation and stochastic groundwater modelling. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. Ephemeral pools are shown to be dependent on surface water therefore changes in assumptions are unlikely to change potential impacts.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Geochemical analysis, groundwater levels, surface water levels, remote sensing and trend analysis with rainfall shows ephemeral pools to be surface water features and there to be no evidence of groundwater discharge supporting these pools. They will therefore be unaffected by any drawdown in regional groundwater levels from project activities.</td></tr>
<tr><td></td><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI22</td><td>Phase</td><td>Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Reduction in groundwater levels adversely affecting water levels in farm dams</td></tr>
<tr><td>Source</td><td colspan="5">Project - Mine dewatering</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Farm dams</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Baseline groundwater and surface water assessment has shown farm dams to be above the water table, with the exception of Spring Dam which is supported by a perched groundwater flow system after rainfall. In all cases, there is no interaction between farm dams and the regional water table.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

	Impact ID	PI23			Phase	Construction, operations and closure
Potential impact event	Potential impact description	Reduction in groundwater levels adversely affecting soils and (non-GDE) vegetation				
	Source	Project - Mine dewatering				
	Pathway	Water				
	Receptor	Soils and non-GDE vegetation				
	Inherent design controls	None				
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.	
		Method and model	A	Justification	Data review and hydrogeological conceptualisation using industry standard methods. A pit dewatering program has been planned to affirm pit dewatering plans and ensure strategies for in-pit dewatering remain valid.	
	Sensitivity analysis	Sensitivity	A	Justification	Groundwater does not interact with soils and non-GDE vegetation as they exist above the water table. Changes to modelling are unlikely to affect the lack of S-P-R.	
	S--P-R linkage	No	Justification	Soils and non-GDE vegetation occur above the water table. They will therefore be unaffected by any drawdown of the water table.		
	If no S-P-R linkage then do not continue further					

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI24</td><td>Phase</td><td colspan="3">Operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality in third-party bores</td></tr>
<tr><td>Source</td><td colspan="8">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="8">Water</td></tr>
<tr><td>Receptor</td><td colspan="8">Third-party bores</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Uncertainty as to mobilisation processes/ attenuation processes that may occur with naturally occurring elements. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="5">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="5">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Tailings seepage water could alter groundwater quality in third-party bores immediately downstream of the TSF as some are within the modelled particle transport paths.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Tailings disposal leading to migration of tailings water (via seepage and groundwater) that may alter water quality in some third-party bores immediately downstream of the TSF.</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>3</td><td>C</td><td>High</td><td>MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable</td><td>3</td><td>D</td><td>Moderate</td></tr>
</table>

					MM55: Monitoring of water quality in tails and groundwater MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges MM57: GMMP MM58: Implement and maintain a site water balance to track groundwater seepage rates and other water loss MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater / particle tracking that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model / particle tracking model and/ or as a result of water quality monitoring may affect the ability to achieve outcomes.		
Statement of proposed outcomes	**Legislative requirement**	EP Act					
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM22	Groundwater quality through groundwater sampling	ML	Groundwater sampling demonstrates that groundwater quality is consistent with baseline groundwater quality dataset, and where a decline in quality has occurred that can be attributed to project activities, the groundwater quality is still within the relevant beneficial use class	Bi-annually	GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive	As per GMMP	Baseline monitoring results.

					groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities		GMMP
		LI07	Groundwater quality trends through groundwater sampling	ML	Where groundwater sampling demonstrates a statistically significant adverse trend in groundwater quality for one or more key water quality indicators, an investigation will be initiated to assess the potential association with project activities and to inform management response if required	As required	GMMP Monitoring data

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI25</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality and impact potential GDEs (red gums).</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Terrestrial vegetation GDEs</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring.
Uncertainty as to mobilisation processes/ attenuation processes that may occur with naturally occurring elements. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. Vegetation relatively insensitive to regional groundwater levels given they are supported predominately by surface water flows.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="3">Conservative particle tracking undertaken as part of the numerical modelling shows flow paths moving towards the area of potential terrestrial GDEs (red gums) over a timeframe of 400-500 years. Whilst freshwater recharge is a much more significant proportion of water recharge in the area where the potential terrestrial GDEs (red gums) occur, an S-P-R occurring hundreds of years into the future cannot be ruled out.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="5">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to change water quality and impact potential GDEs (Red Gums) over a timeframe of several hundred years.</td></tr>
</table>

<table>
<tr><td rowspan="5">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>E</td><td>Low</td><td>MM06: Implementation of a NVMP (incl. monitoring of native vegetation condition)
MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable
MM55: levels to ensure they are in line with model predictions and historical Monitoring of water quality in tails and groundwater
MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater ranges
MM57: GMMP
MM58: Implement and maintain a site water balance to track groundwater seepage rates and other water loss
MM59: Annual groundwater review
MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering</td><td>2</td><td>E</td><td>Low</td></tr>
<tr><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="4">Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Changes to assumptions within the groundwater model / as a result of water quality monitoring may affect the ability to achieve outcomes.</td></tr>
<tr><td rowspan="2">Statement of proposed</td><td>Legislative requirement</td><td colspan="7">EP Act</td></tr>
<tr><td>Proposed outcome</td><td colspan="7">PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).</td></tr>
</table>

	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM22	Groundwater quality through groundwater sampling	ML	Groundwater sampling demonstrates that groundwater quality is consistent with baseline groundwater quality dataset, and where a decline in quality has occurred that can be attributed to project activities, the groundwater quality is still within the relevant beneficial use class	Bi-annually	GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI07	Groundwater quality trends through groundwater sampling	ML	Where groundwater sampling demonstrates a statistically significant adverse trend in groundwater quality for one or more key water quality indicators, an investigation will be initiated to assess the potential association with project activities and to inform management response if required	As required	GMMP Monitoring data

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI26</td><td>Phase</td><td colspan="4">Operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality and impact potential stygofauna</td></tr>
<tr><td>Source</td><td colspan="8">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="8">Water</td></tr>
<tr><td>Receptor</td><td colspan="8">Subsurface GDEs (Stygofauna)</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring.
Uncertainty as to mobilisation processes/ attenuation processes that may occur with naturally occurring elements.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="5">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="5">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.
Stygofauna relatively insensitive to groundwater quality changes given they are supported predominately by recharge from surface water flows.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Tailings seepage water could cause changes to groundwater quality for potential GDE (stygofauna) habitat, noting recharge from surface water (which is unaffected by project activities) is a much more significant source of water and nutrients for stygofauna GDEs.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to alter water quality. However, recharge to groundwater is via surface water, which is unaffected, hence impacts to potential stygofauna are not anticipated</td></tr>
<tr><td rowspan="3">Risk assessment and design/</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>E</td><td>Low</td><td colspan="2">MM55: Monitoring of water quality in tailings and groundwater</td><td>2</td><td>E</td><td>Low</td></tr>
</table>

					MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges MM57: GMMP MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.		
Statement of proposed outcomes	**Legislative requirement**	*Environmental Protection Act 1993*					
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM22	Groundwater quality through groundwater sampling	ML	Groundwater sampling demonstrates that groundwater quality is consistent with baseline groundwater quality dataset, and where a decline in quality has occurred that can be attributed to project activities, the groundwater quality is still within the relevant beneficial use class	Bi-annually	GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI07	Groundwater quality trends through groundwater sampling	ML	Where groundwater sampling demonstrates a statistically significant adverse trend in groundwater quality for one or more key water quality indicators, an investigation will be initiated to assess the potential association with project activities and to inform management response if required	As required	GMMP Monitoring data

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI27</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of Murray Basin groundwater resources</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Third party uses of the Murray Basin groundwater resources</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Uncertainty as to mobilisation processes/ attenuation processes that may occur with naturally occurring elements. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. However Murray Basin groundwater resources are well outside the zone of influence based on current modelling.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">While it is acknowledged some amount of throughflow to the Murray Basin aquifers is likely (based on regional conceptualisation), modelling indicates Murray Basin groundwater resources are well outside zone of influence of tailings seepage water</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI28</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of Olary Ranges groundwater resources</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Third party uses of the Olary Ranges groundwater resources</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned and assumptions around tailings seepage, sensitivity is assessed by stochastic modelling</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="3">Using the precautionary principle, it is likely that groundwater resources within a designated area around the TSF (i.e. groundwater resources of the Olary Ranges) will experience a change in water quality.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="5">Tailings disposal leading to migration of tailings water (via seepage and groundwater) may alter water quality of Olary Ranges groundwater resources in a localised area immediately around the TSF.</td></tr>
</table>

<table>
<tr><td rowspan="5">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><th colspan="3">Raw risk (pre controls)</th><th colspan="3" rowspan="2">Physical controls and management controls</th><th colspan="3">Residual risk (post controls)</th></tr>
<tr><th>C</th><th>L</th><th>Risk</th><th>C</th><th>L</th><th>Risk</th></tr>
<tr><td>2</td><td>B</td><td>High</td><td colspan="3">MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable
MM55: Monitoring of water quality in tails and groundwater
MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57: GMMP
MM59: Annual groundwater review
MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering</td><td>1</td><td>B</td><td>Moderate</td></tr>
<tr><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="6">Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="6">Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.</td></tr>
<tr><td rowspan="4">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="9">Environmental Protection Act 1993</td></tr>
<tr><td>Proposed outcome</td><td colspan="9">PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).</td></tr>
<tr><td rowspan="2">Draft outcome measurement criteria</td><th>Outcome measurement criteria ID</th><th colspan="2">What will be measured and form (method) of measurement</th><th>Location</th><th colspan="2">Outcome achievement</th><th colspan="2">Frequency</th><th>Background and/or control data</th></tr>
<tr><td>OM22</td><td colspan="2">Groundwater quality through groundwater sampling</td><td>ML</td><td colspan="2">Groundwater sampling demonstrates that groundwater quality is consistent with baseline groundwater quality dataset, and where a decline in quality has occurred that can be attributed to project activities, the groundwater quality is still within the relevant beneficial use class</td><td colspan="2">Bi-annually</td><td>GMMP</td></tr>
</table>

		Leading indicator ID	What will be measured and form (method) of measurement	Location	Outcome achievement	Frequency	Background and/or control data
	Draft leading indicator criteria	LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site-specific trigger level (SSTL) as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP
		LI07	Groundwater quality trends through groundwater sampling	ML	Where groundwater sampling demonstrates a statistically significant adverse trend in groundwater quality for one or more key water quality indicators, an investigation will be initiated to assess the potential association with project activities and to inform management response if required	As required	GMMP Monitoring data

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI29</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of ephemeral pools along the Manunda Creek drainage line.</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Native fauna</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census, Baseline monitoring, remote sensing and geochemical analysis.
Uncertainty as to mobilisation processes/ attenuation processes that may occur with naturally occurring elements.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review, hydrogeological conceptualisation and stochastic groundwater modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage. Limited information available to estimate the solubility / transport of reagents in seepage.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. Ephemeral pools are shown to be dependent on surface water therefore changes in assumptions are unlikely to change potential impacts.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Modelling indicates no groundwater discharge to ephemeral pools.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

	Impact ID	**PI30**		**Phase**	**Operations**
Potential impact event	**Potential impact description**	Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect water quality of farm dams			
	Source	Project - Tailings disposal to TSF			
	Pathway	Water			
	Receptor	Farm dams			
	Inherent design controls	TSF design and construction			
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Uncertainty as to mobilisation processes/ attenuation processes that may occur with naturally occurring elements Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.
		Method and model	A	**Justification**	Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage.
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.
	S--P-R linkage	No	**Justification**	Modelling indicates no groundwater discharge to surface, therefore farm dams will not be affected.	
	If no S-P-R linkage then do not continue further				

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI31</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="9">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to migration of tailings water (via seepage and groundwater) to adversely affect vegetation</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Vegetation</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring.
Uncertainty as to mobilisation processes/ attenuation processes that may occur with naturally occurring elements.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Basal seepage rate has been estimated based on the interaction between the tailings and the underlying foundation, however these parameters are currently not well defined and may vary between laboratory scale and field scale. A sensitivity analysis undertaken by Hatch (2025) has been undertaken to assess the likely upper and lower bound of basal seepage. Limited information available to estimate the solubility / transport of reagents in seepage.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="2">Groundwater does not interact with soils and non-GDE vegetation as they exist above the water table. Changes to modelling are unlikely to affect the lack of S-P-R.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Non-GDE terrestrial vegetation does not interact with groundwater, hence any changes to groundwater quality in the absence of mounding will not affect terrestrial non-GDE vegetation.</td></tr>
<tr><td></td><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI64</td><td>Phase</td><td colspan="3">Operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Tailings disposal leading to groundwater mounding (via seepage to groundwater) to alter (increase) water quantity in third-party bores</td></tr>
<tr><td>Source</td><td colspan="8">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="8">Water</td></tr>
<tr><td>Receptor</td><td colspan="8">Third-party bores</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="5">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="5">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">There are likely to be changes (increase) to groundwater quantity at some third-party bores.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">While groundwater mounding is projected at several third-party bores, this is unlikely to limit the access of water from these bores as water levels are projected to increase rather than decrease. Given the modelling indicates the water table remaining at least 1 m below the surface outside of the TSF (and so is not modelled to become artesian), the likelihood of this causing an adverse impact is rated as unlikely.</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>3</td><td>D</td><td>Moderate</td><td>MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable
MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57: Groundwater Management and Monitoring Plan</td><td>3</td><td>E</td><td>Moderate</td></tr>
</table>

					MM58: Implement and maintain a site water balance to track groundwater seepage rates and other water loss MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model / as a result of water quality monitoring may affect the ability to achieve outcomes			
Statement of proposed outcomes	**Legislative requirement**	EP Act						
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		OM24	Groundwater levels using standard methods as per GMMP	ML	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	As per GMMP	Baseline monitoring results. GMMP	
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP	

	Impact ID	PI65			Phase	Operations
Potential impact event	Potential impact description	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect potential terrestrial GDEs (Red gums).				
	Source	Project - Tailings disposal to TSF				
	Pathway	Water				
	Receptor	Terrestrial vegetation GDEs				
	Inherent design controls	TSF design and construction				
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.	
		Method and model	A	Justification	Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling. Limited information available to estimate seepage rates.	
	Sensitivity analysis	Sensitivity	C	Justification	Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. Vegetation relatively insensitive to regional groundwater levels given they are supported predominately by surface water flows.	
	S--P-R linkage	Yes	Justification	The modelling indicates mounding will not cause the water table to rise within 1 m of the land surface at any locations along the main drainage line (Manunda Creek). In a few model realisations (<5%), the mounding may cause an already shallow water table to rise to within 3 m of the land surface in a small area along Manunda Creek. These results indicate a low likelihood of mounding causing waterlogging and salinisation, however long-term water logging may be detrimental to GDE root systems.		
	If no S-P-R linkage then do not continue further					
	Description of likely impact	Tailings disposal leading to groundwater mounding (via seepage to groundwater) has a low likelihood of adversely affecting potential terrestrial GDEs (Red gums).				

		Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
Risk assessment and design/ management controls		**C**	**L**	**Risk**		**C**	**L**	**Risk**
	Risk Assessment	3	D	Moderate	MM06: Implementation of a Native Vegetation Management Plan (incl. monitoring of native vegetation condition) MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges MM57: GMMP MM58: Implement and maintain a site water balance to track groundwater seepage rates and other water loss MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering	2	E	Low
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model / as a result of water quality monitoring may affect the ability to achieve outcomes.			
Statement of proposed outcomes	**Legislative requirement**	EP Act						
	Proposed outcome	PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation. PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		OM05	Vegetation health through surveys	ML	Annual vegetation health survey shows no appreciable difference in mortality when compared to control sites	Annually	Control sites	

		OM24	Groundwater levels using standard methods as per GMMP	ML	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	As per GMMP	Baseline monitoring results. GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI66</td><td>Phase</td><td colspan="3">Operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="7">Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect potential stygofauna</td></tr>
<tr><td>Source</td><td colspan="7">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="7">Water</td></tr>
<tr><td>Receptor</td><td colspan="7">Subsurface GDEs (Stygofauna)</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.
Stygofauna relatively insensitive to groundwater quality changes given they are supported predominately by recharge from surface water flows.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">Groundwater mounding resulting from tailings seepage could increase water availability to potential GDEs (stygofauna). Noting recharge from surface water (which is unaffected by project activities) is a much more significant source of water for stygofauna GDEs.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="7">Groundwater mounding may increase the level of groundwater at locations supporting stygofauna, hence an SPR is recognised. However, groundwater mounding will have no adverse impact on stygofauna communities given that mounding would result in an increase to stygofauna habitat. Hence there is no adverse effect predicted.</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>E</td><td>Low</td><td>MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable
MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57: GMMP</td><td>2</td><td>E</td><td>Low</td></tr>
</table>

					MM58: Implement and maintain a site water balance to track groundwater seepage rates and other water loss MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model / as a result of water quality monitoring may affect the ability to achieve outcomes			

Statement of proposed outcomes	**Legislative requirement**	EP Act					
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM24	Groundwater levels using standard methods as per GMMP	ML	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	As per GMMP	Baseline monitoring results. GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI67</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="9">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect water quantity of Murray Basin groundwater resources</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Third party uses of the Murray Basin groundwater resources</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. However Murray Basin groundwater resources are well outside the zone of influence based on current modelling.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">While it is acknowledged some amount of throughflow to the Murray Basin aquifers is likely (based on regional conceptualisation), modelling indicates Murray Basin groundwater resources are well outside zone of influence of mounding affect from the Project.</td></tr>
<tr><td></td><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

	Impact ID	PI68			Phase	Operations		
Potential impact event	Potential impact description	Tailings disposal leading to groundwater mounding (via seepage to groundwater) alter (increase) water quantity in Olary Ranges groundwater resources.						
	Source	Project - Tailings disposal to TSF						
	Pathway	Water						
	Receptor	Third party uses of the Olary Ranges groundwater resources						
	Inherent design controls	TSF design and construction						
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.			
		Method and model	A	Justification	Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling.			
	Sensitivity analysis	Sensitivity	B	Justification	Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.			
	S--P-R linkage	Yes	Justification	It is likely that groundwater resources within a designated area around the TSF (i.e. groundwater resources of the Olary Ranges) will be subject to mounding, increasing water storage.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	A potential increase in groundwater storage in the Olary Ranges area is not an adverse impact.						
Risk assessment and design/ management controls	Risk Assessment	Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	L	Risk		C	L	Risk
		1	E	Low	MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges MM57: GMMP MM58: Implement and maintain a site water balance to track groundwater seepage rates and other water loss	1	E	Low

					MM59: Annual groundwater review MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding or dewatering		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions within the groundwater model / as a result of water quality monitoring may affect the ability to achieve outcomes		
Statement of proposed outcomes	**Legislative requirement**	EP Act					
	Proposed outcome	PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM24	Groundwater levels using standard methods as per GMMP	ML	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	As per GMMP	Baseline monitoring results. GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI69</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to groundwater mounding (via seepage and groundwater) to adversely affect water quantity in ephemeral pools along Manunda Creek drainage line.</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Native fauna</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census, Baseline monitoring, remote sensing and geochemical analysis.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review, hydrogeological conceptualisation and stochastic groundwater modelling.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling. Ephemeral pools are shown to be dependent on surface water therefore changes in assumptions are unlikely to change potential impacts.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Modelling indicates no groundwater discharge to ephemeral pools.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

	Impact ID	PI70			Phase	Operations
Potential impact event	Potential impact description	Tailings disposal leading to groundwater mounding (via seepage to groundwater) to adversely affect water quantity in farm dams				
	Source	Project - Tailings disposal to TSF				
	Pathway	Water				
	Receptor	Farm dams				
	Inherent design controls	TSF design and construction				
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring. Uncertainty regarding potential chemical changes resulting from mounding / interaction with naturally occurring elements in the unsaturated zone. Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.	
		Method and model	A	Justification	Data review and hydrogeological conceptualisation using industry standard methods. Groundwater modelling with uncertainty assessment inherent in stochastic modelling.	
	Sensitivity analysis	Sensitivity	B	Justification	Model sensitive to hydraulic parameters assigned, sensitivity is assessed by stochastic modelling.	
	S--P-R linkage	No	Justification	Modelling indicates no groundwater discharge to surface, therefore farm dams will not be affected.		
	If no S-P-R linkage then do not continue further					

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI71</td><td>Phase</td><td>Operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Tailings disposal leading to groundwater mounding (via seepage to groundwater) to alter water quantity of groundwater resources reducing land productive capacity by causing waterlogging and/or salinisation.</td></tr>
<tr><td>Source</td><td colspan="5">Project - Tailings disposal to TSF</td></tr>
<tr><td>Pathway</td><td colspan="5">Water</td></tr>
<tr><td>Receptor</td><td colspan="5">Soil, native (non-GDE) vegetation</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">SARIG, WaterConnect, Bore Census and over two years of site-specific baseline monitoring.
Uncertainty regarding potential chemical changes resulting from mounding / interaction with naturally occurring elements in the unsaturated zone.
Additional works to better conceptualise the knowledge of underlying geology and associated hydraulic properties will be completed prior to PEPR submission.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Data review and hydrogeological conceptualisation using industry standard methods</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>C</td><td>Justification</td><td colspan="2">Model sensitive to hydraulic parameters assigned and assumptions around tailings seepage, sensitivity is assessed by stochastic modelling. Conservative seepage rates utilised in model</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="3">Deposition of wet tailings into the TSF may result in localised, downstream increase in groundwater levels (groundwater mounding) through tailings seepage losses and infiltration. This mounding may lead to waterlogging and salinisation (due to naturally brackish to saline groundwater quality).
Modelling indicates:
• There is no mounding that breaches the land surface outside the extent of the TSF.
• there is a low-to-moderate probability that the water table will rise to within 3 m of the land surface on the northern and western sides of the TSF
• there is a high probability that the water table will rise to within 5 m of the land surface on the northern and western sides of the TSF within the Site area,
• there is a very low probability that the water table will rise to within 10 m of the land surface outside the Site.
Based on these observations it is possible for waterlogging and land salinisation to result in a limited area to the immediate north and west of the TSF.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

<table>
<tr><td></td><td>Description of likely impact</td><td colspan="7">Modelling shows there are no areas outside the TSF where mounding would cause groundwater to become artesian. There is a low to moderate probability that water will rise to within 3 m of the surface in limited areas to the north and west of the TSF, which may impact terrestrial vegetation, if rootzones extend to this depth.</td></tr>
<tr><td rowspan="5">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>3</td><td>B</td><td>High</td><td>MM06: Implementation of a Native Vegetation Management Plan (incl. monitoring of native vegetation condition)
MM10: Annual aerial photography of vegetation clearance
MM54: Implement water return efficiency measures within the mining and process circuit to reduce seepage losses and improve on-site water recovery, where practicable
MM56: Monitoring of groundwater abstraction rates, mining rates and groundwater levels to ensure they are in line with model predictions and historical ranges
MM57: Groundwater Management and Monitoring Plan
MM59: Annual groundwater review
MM60: Installation of groundwater monitoring wells to monitor water table elevation and development of trigger response framework with respect to mounding</td><td>2</td><td>B</td><td>Moderate</td></tr>
<tr><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="4">Several control measures are reliant on the groundwater modelling that has numerous inherent uncertainties. This uncertainty will decrease as the model is updated with data from additional groundwater monitoring.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Changes to assumptions within the groundwater model may affect the ability to achieve outcomes.</td></tr>
<tr><td rowspan="3">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="7">EP Act</td></tr>
<tr><td>Proposed outcome</td><td colspan="7">PO02: The Tenement Holder must ensure that the landscape function of native vegetation post-mining ecosystems (where proposed) has achieved, or is trending toward, a landscape function comparable to the surrounding landscape or other appropriate analogue
PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO09: The Tenement Holder must ensure that project activities do not result in adverse unauthorised change to groundwater (quality and quantity).
PO10: The tenement holder must ensure the maintenance of productive capacity of land outside of TSF footprint</td></tr>
<tr><td>Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td colspan="2">What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
</table>

		OM05	Vegetation health through surveys	ML	Annual vegetation health survey shows no appreciable difference in mortality when compared to control sites	Annually	Control sites
		OM24	Groundwater levels using standard methods as per GMMP	ML	Groundwater monitoring demonstrates that groundwater levels are stable, or are trending in accordance with modelled predictions, and there is no exceedance of the maximum predicted drawdown or mounding	As per GMMP	Baseline monitoring results. GMMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI06	Groundwater levels using standard methods as per GMMP	ML	Where groundwater sampling demonstrates exceedance of a 'precautionary-level' site SSTL as defined in the GMMP over three (3) consecutive groundwater monitoring events, or exceedance of a 'warning level' SSTL over two (2) consecutive groundwater monitoring events, an investigation will be initiated to assess the potential association with project activities	As per GMMP	Baseline monitoring results. GMMP

7.7. Surface water including quality and quantity

An overview of the surface water impact assessment is described within this Section. For a more detailed discussion on baseline information please refer to B4 *Surface Water and Groundwater Baseline Assessment* (ELA, 2024). For detailed impact assessment, please refer to C3 *Surface Water Impact Assessment* (RPS, 2024).

This Section describes how the Project may impact on the existing surface water environment (quantity and quality) and presents measures that will, when implemented, minimise those impacts.

7.7.1. Context

The Project wholly resides within the Murray-Darling Basin drainage division, and within the Lower Murray River and Lower Mallee catchment regions. Numerous drainage channels serve as conduits for runoff originating from the Razorback Ridge and adjacent high-elevation ridgelines, ultimately coalescing with Manunda Creek as tributaries. While the Project is situated within the geographical confines of the Lower Murray River and Lower Mallee catchment areas, it is noteworthy that the drainage pattern ceases its continuity once it extends past the southern extremities of Manunda Creek. Instead, it concludes at an array of unmarked shallow lakes situated westward of the Danggali Conservation Park and Wilderness Protection Area. As such, it is exceedingly improbable that surface water originating within the Manunda Creek catchment would ever traverse a course leading it to the River Murray channel, approximately 100 km to the south of the most clearly defined Section of Manunda Creek (ELA, 2024).

Located in an arid/semi-arid area, all watercourses within the Study Area are ephemeral, which means they experience long dry periods of no flow and the presence of surface water in the catchment is primarily reliant on the spatial and temporal distribution of infrequent storm events. These storms can lead to localised flooding but often result in rapid runoff. Based on observations during field surveys and engagement with landholders there is only a small Section of Manunda Creek to the south of the confluence with Ocalia Creek where semi-permanent in-stream pools and waterholes are known to exist.

There are no streamflow monitoring stations or historical data in the Project local catchment to enable characterisation of overland flows. Whilst this lack of historic observations limits the detailed elucidation of baseline surface water conditions, from an impact assessment perspective appropriate conservative modelling assumptions can be included to allow appropriate prediction of impacts.

7.7.2. Impact assessment

The Surface Water Impact Assessment serves the purpose of identifying and evaluating the potential impacts stemming from development associated with the Project on surface water resources. The assessment assesses the likelihood and significance of the impacts on the local surface water regime, through examination of how the Project may affect existing hydrologic characteristics on the catchment of which the Project lies. It should be noted the TL was excluded from the numerical model domain based on the consideration that its footprint, limited to the towers, has a negligible impact on overland flow conditions.

7.7.2.1. Impacts on catchment yield

The total area of the catchment that will be intercepted by the Stage 3 (final) TSF wall is approximately 5,000 ha, about 1% of the total Manunda Creek catchment area (Figure 3-50, Section 3.7.2.1). Owing to the presence of waterholes downstream of the Project and farm dams that may opportunistically collect runoff following flood events, abstraction of surface runoff in the TSF may impact these downstream receptors.

While the lack of historic data has not allowed quantified assessment of potential impacts on catchment yield, considering the small fraction of the intercepted catchment and the ephemeral nature of the local waterways, it is expected that impacts on long-term yield on the catchment as a result of the Project will be insignificant.

7.7.2.2. Impacts on flood dynamics

CONSTRUCTION

Some construction activities can potentially impact flooding conditions. These include:

- any temporary earthworks as part of the construction activities (e.g., stockpiles)
- temporary facilities and site sheds
- construction plant or storage facilities that are located within flow paths and have the potential to impact flooding conditions by altering flow depths, velocities, or flow paths

Temporary structures, if located within the floodplain, have the potential to alter surface water flows and/or be dislodged during flood conditions causing obstructions and flow impacts further downstream.

Construction activities are temporary, highly dynamic and can be designed to accommodate local flood risk. Some indicative locations were identified for placement of construction compounds of the Site, HR and the TL during the indicative 2-year construction phase. The proposed locations of the construction facilities are at topographically high areas and while they may be subject to some local flooding, there are no significant catchments upstream of those locations. With their risk of flooding being minor, general precautionary and preventive measures will adequately minimise flood impacts.

OPERATION

As part of the surface water impact assessment, hydrology and hydraulic modelling for the post-development conditions was undertaken. The results of this modelling were used to identify the locations, extents, and level of the flood impacts on the existing flooding conditions across the Project Area, resulting from the permanent infrastructure required for the Project. Peak water levels, velocities and hazard for the modelled design events were determined from the flood modelling results and used to identify the afflux.

The flood modelling showed that while the interception of surface runoff by TSF and diversion of natural flow paths by its western wall changes the baseline flooding conditions, with use of properly-sized cross-drainage structures at water way crossings, the development of the Site and HR would not have significant effects on the pattern of flood flows or on flood levels for a range of modelled flows, including the 5%, 2% and 1% AEP events. An example of the flood modelling under pre- and post-development cases are provided in Figure 7-3 and Figure 7-4.

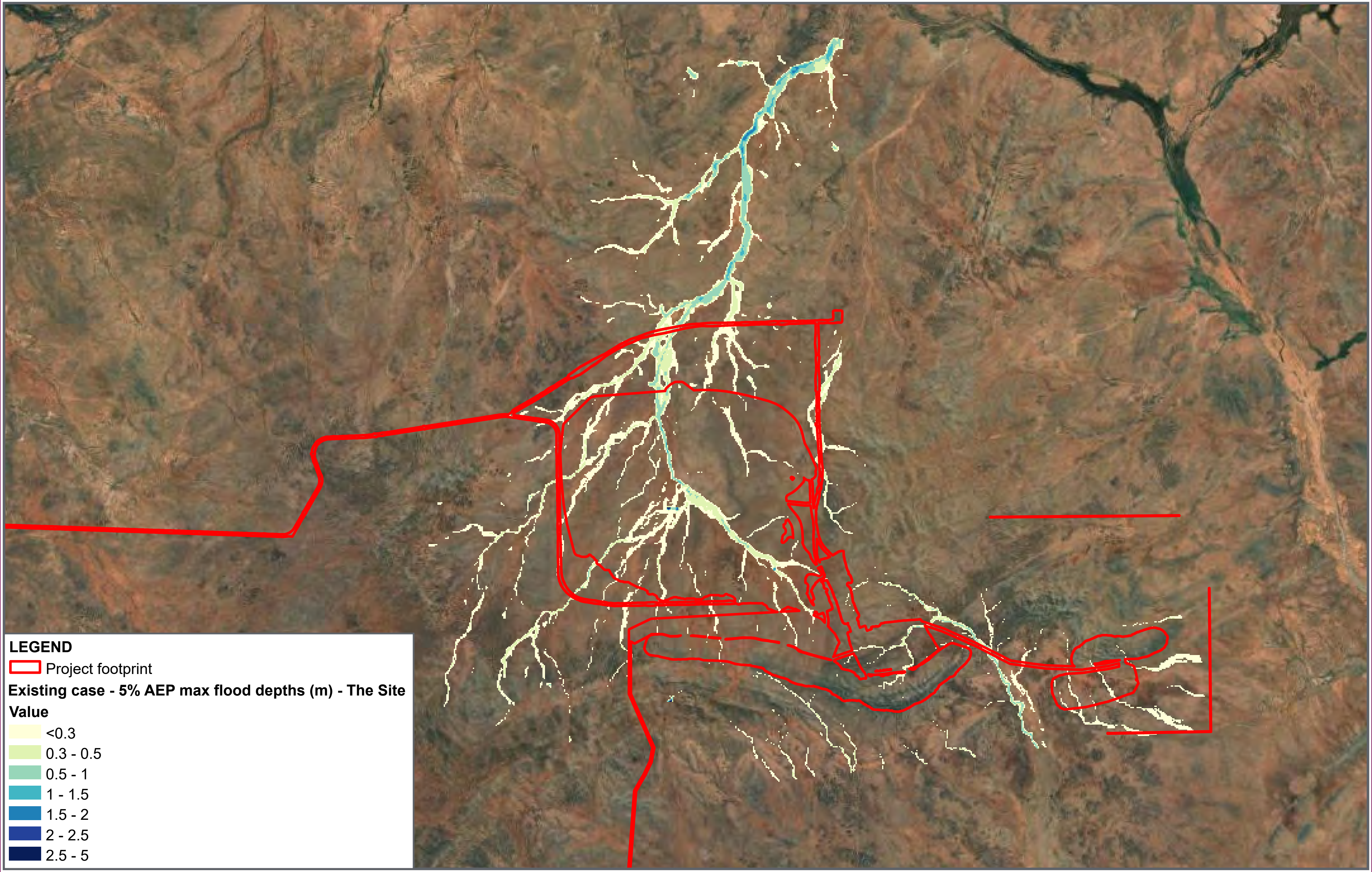


Figure 7-3:
Pre-development case 5% AEP maximum flood depths

GDA 1994 MGA Zone 54

0 1.25 2.5 5 km

Job Number: AU213012380
Doc Number: 001
Date: 12/01/2024
Scale: Map 1:120,000 @ A4
Created by: Jackie.Chan
Source: Orthophoto - ESRI 2023

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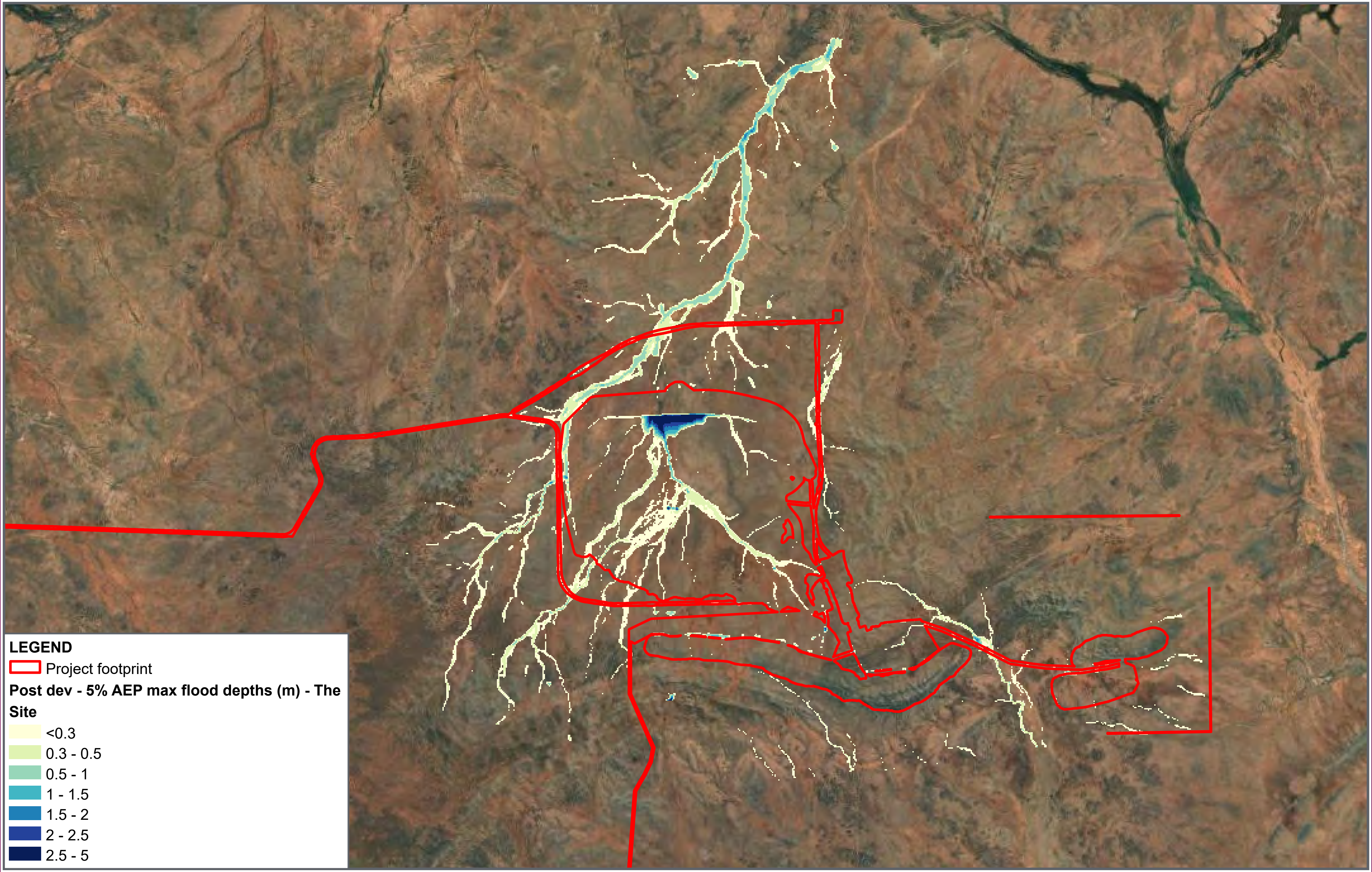

Figure 7-4:
Post development case 5% AEP maximum flood depths

GDA 1994 MGA Zone 54

0 1.25 2.5 5 km

Job Number: AU213012380
Doc Number: 001
Date: 20/12/2023
Scale: Map 1:120,000 @ A4
Created by: Jackie.Chan
Source: Orthophoto - ESRI 2023

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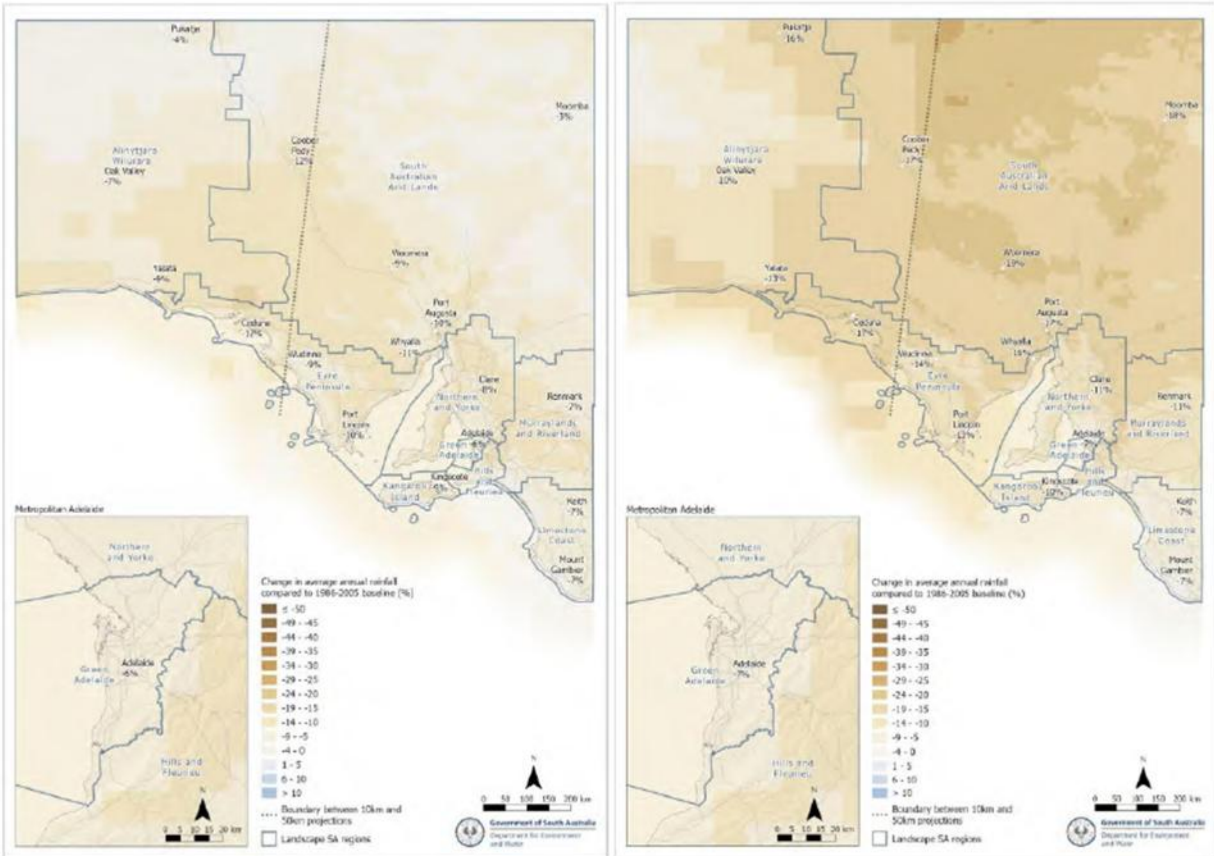
Document Path: C:\Users\Jackie.Chan\RPS Group\AAP Geospatial Community - GIS\ProjectFiles\EcoLogical\Razorback_Mine\Projects\AU213012380_001_Set1_GDA94Z54\AU213012380_001_Set2_post_GDA94Z54\AU213012380_001_Set2_post_GDA94Z54.aprx

7.7.2.3. Impacts of climate change

Average annual rainfall across all SA regions is projected to decline to 2030 and further to years 2050 and 2090. However, the amount of rain falling in extreme rainfall events will increase in all SA regions and the frequency of extreme rainfall events will increase (RPS, 2024) (Figure 7-5).



(RCP4.5 SCENARIO EQUIVALENT TO 1.4-DEGREE INCREASE +/- 0.3 DEGREES BY 2050) (LEFT 2020-2039, RIGHT 2080-2099) (DEW, 2022)

Figure 7-5: Change in average annual rainfall for RCP4.5 scenario

Based on the post-development flood mapping conducted under the climate change scenarios, the anticipated repercussions on water levels and flood coverage at the ML and HR suggest a negligible impact, contingent upon the proper sizing of cross-drainage structures (e.g., culverts) to effectively channel flood flows downstream. An example of the climate change scenario mapping is provided in Figure 7-6.

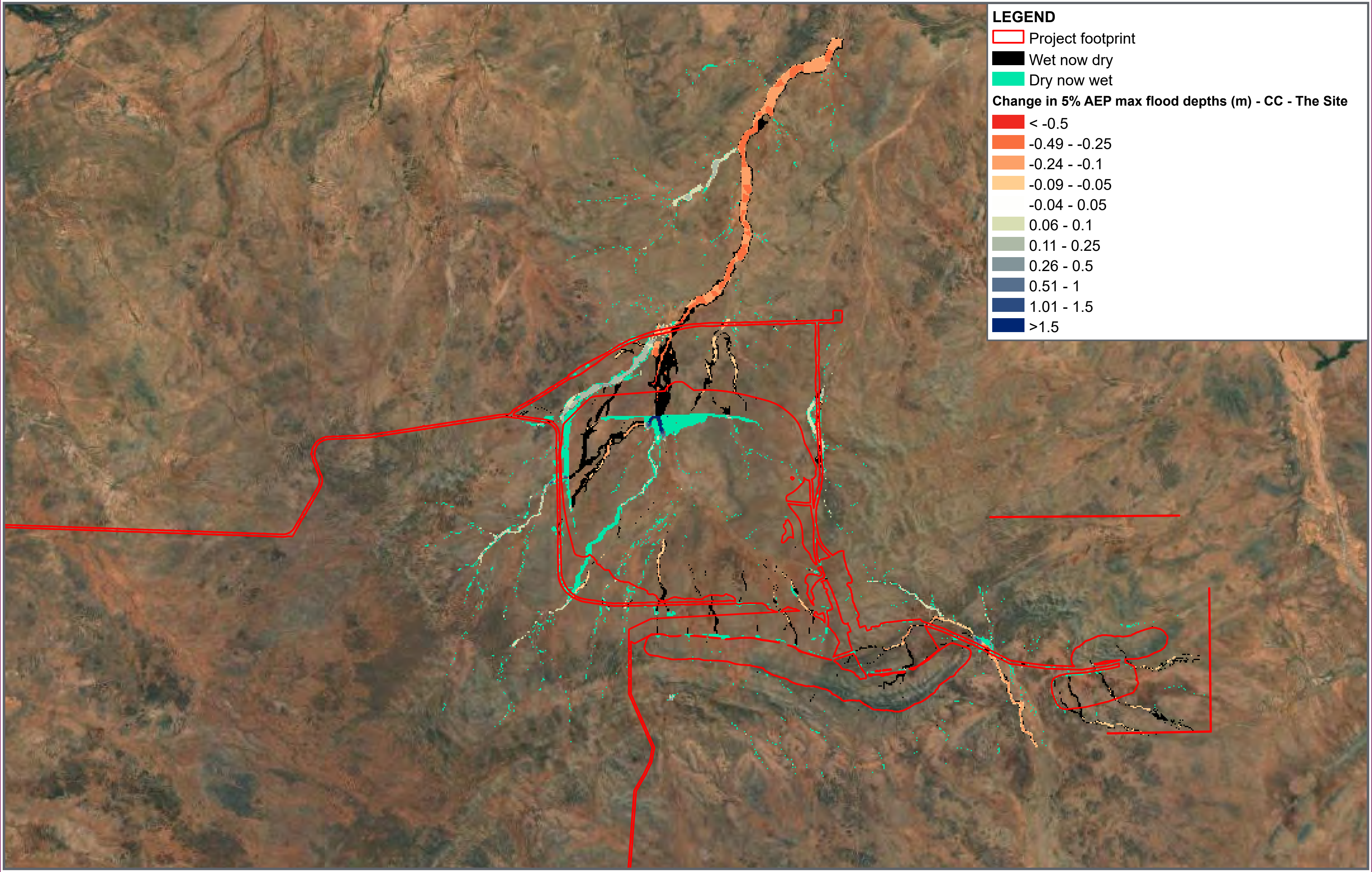


Figure 7-6:
Change in 5% AEP maximum flood depths – Climate Change Scenario

Job Number: AU213012380
Doc Number: 001
Date: 20/12/2023
Scale: Map 1:120,000 @ A4
Created by: Jackie.Chan
Source: Orthophoto - ESRI 2023

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Document Path: C:\Users\Jackie.Chan\RPS Group\AAP Geospatial Community - GIS\ProjectFiles\EcoLogical\Razorback_Mine\Projects\AU213012380_001_Set1_GDA94Z54\AU213012380_001_Set4_Afflux_GDA94Z54.aprx

7.7.2.4. Impacts to surface water quality

Baseline surface water quality conditions are summarised in Section 3.7.3. Potential impacts from the Project may include changes to surface water quality, salinity, acidity and the location and severity of erosion and sedimentation (altering turbidity of flows). These potential impact events are summarised below.

As part of the mining operations, dust suppression of exposed areas will be required. It is likely that the water utilised for dust suppression will be brackish to saline in nature, and when applied to land, saline runoff may increase the salinity of soil, potentially causing decline in vegetation condition or mortality.

Hazardous chemicals will be used during mine operations and stored onsite when not in use. The spill of hazardous chemicals is likely to impact the receiving environment, including surface waters.

Consequences of mining activities, such as ARD and infrastructure such as WRDs have the potential to cause adverse impacts on native vegetation and surface water quality via contaminated runoff. Testing has shown elevated sulphur concentration in a discrete subset of core samples associated with the fault zone in Razorback deposit. Further analysis is required to confirm whether these lithologies may be PAF. Due to the high acid-neutralising capacity of the carbonates in the tailings and waste rock material, the risk of AMD from tailings is anticipated to be low, whilst low average rainfall and high evaporation indicates that rain events causing run off are likely to be infrequent. However, in the absence of mitigation, contaminated runoff may be produced.

Similarly, although infrequent due to high evaporation and low rainfall, alterations in drainage line flow regimes, and erosion and runoff from stockpiles and disturbed surfaces during construction and operation have the potential to increase sedimentation with a corresponding decrease in surface water quality.

The potential surface water impact events, and respective areas (ML and MPLs) are listed in Table 7-30 and are further analysed within Table 7-34.

7.7.2.5. Potential impact events

The potential impact events, and respective areas (ML and MPLs) are listed in Table 7-30 and are further analysed within Table 7-34.

Table 7-30: Surface water potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area		
			ML	HR	TL
PI32	Changed drainage line flow regime and potential for increased erosion and sedimentation causing changes to surface water quality due to construction and operation of HR	Yes		C, O*	
PI33	Alteration of surface water flow resulting in changes in availability of surface water and associated impacts to vegetation and reliant fauna species	Yes	C, O, R	C, O, R	
PI34	Alteration of surface water flow resulting in changes in surface water availability for farm dams, and changes in flood levels, affecting downstream local landowners	Yes	C, O, R	C, O, R	
PI35	Extraction and surface emplacement of PAF material results in AMD and/or ARD, with adverse impacts on surface water	Yes	C, O, R		
PI36	Changed rates of subsurface infiltration due to alteration of surface water regime due to mining operations results in changes to groundwater level affecting groundwater users	Yes	C, O, R	C, O, R	

ID	Impact description	S-P-R Linkage?	Applicable area		
			ML	HR	TL
PI37	Excessive surface water inflow during peak rainfall / storm events, or cumulative events, results an exceedance of the TSF maximum water (overflow) level and an as-designed release of water, impacting downstream surface water quality	Yes	O		

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some potential impacts discussed within this Section are more appropriately discussed in other Sections of this report. These instances are shown in Table 7-31.

Table 7-31: Surface water impacts cross reference

Potential impact	Refer to	Cross reference
Increased salinity (due to dust suppression activities and/or saline water spills), and/or hazardous substance / chemical spills, affect soils, vegetation health and surface waters	PI11	Section 7.3
Industrial waste and infrastructure left on-site post closure results in long-term contamination	PI13	Section 7.5
Incorrect disposal of liquid waste causes soil and/or water contamination	PI14	Section 7.5

7.7.3. Design, control and management strategies

Design, control, and management strategies for the identified impact events are detailed in Table 7-32. These mitigation measures are assigned to each potential impact event in Table 7-34.

Table 7-32: Surface water mitigation measures

Reference ID	Design, control and management measure
MM42	Implementation of erosion controls in accordance with the SWMP and work-area specific ESCPs
MM53	Spills and uncontrolled release of hazardous materials managed in accordance with the Hazardous Materials Management Plan and spill response procedures
MM61	TSF design and construction will be staged in line with mine operation requirements, and lifted as required
MM62	Construction of the TSF to ANCOLD-based geotechnical design, and ongoing operation and management in accordance with the Tailings Management Plan
MM97	Appropriately sized PAF cells will be incorporated into the design of the WRDs to ensure storage of PAF material is controlled, if required
MM98	Should PAF be recorded within tailings, lime dosing will be used to neutralise potential acid formation
MM99	PAF material will be managed in accordance with the PAF Management Plan

7.7.4. Draft outcomes, measurement criteria and leading indicators

The draft surface water proposed outcomes are presented in Table 7-33. The proposed outcome, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-34.

Table 7-33: Surface water proposed outcomes

Reference ID	Proposed outcome
PO03	The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation
PO04	The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities
PO11	The Tenement Holder must ensure no adverse impact on surface water quality as a result of mining operations
PO12	The Tenement holder must ensure that there is no adverse and permanent reduction in surface water availability for downstream surface-water dependent ecosystems, reliant fauna, or existing local third-party users (unless approved under prior agreement)
PO13	The Tenement Holder must ensure that there is no reduction in surface water quality downstream of the Site, attributed to project activities, that would prevent existing (pre-mining) beneficial uses of those surface waters

Table 7-34: Surface water potential impacts

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI32</td><td>Phase</td><td colspan="3">Construction, operations and closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="7">Changed drainage line flow regime and potential for increased erosion and sedimentation causing changes to surface water quality due to construction and operation of HR</td></tr>
<tr><td>Source</td><td colspan="7">Project - Construction and operation of haul road causes changes to catchment hydrologic regime</td></tr>
<tr><td>Pathway</td><td colspan="7">Land</td></tr>
<tr><td>Receptor</td><td colspan="7">Surface water / sediment quality</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">Installation of cross-drainage structures (i.e. culverts) at waterway crossings</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">Uncertain rainfall data and loss parameters due to the Project being located in the Arid Zone of Australia.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Utilisation of the 2D hydraulic model (TUFLOW) and the Ensemble approach recommended in the ARR 2019 Guidelines are industry standard.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Modelled flow hydraulics is highly sensitive to rainfall loss parameters and to a lesser extent sensitive to Manning's parameter.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">The haul road and associated culverts may alter short-term hydrologic regime (flooding) by altering natural flow paths.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="7">The construction and operation of the haul road may change (concentrate) the drainage line flow regime, potentially increasing erosion and sedimentation, causing changes to surface water quality</td></tr>
<tr><td rowspan="5">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>B</td><td>High</td><td>MM42: Implementation of erosion controls in accordance with the SWMP and work-area specific ESCPs</td><td>2</td><td>D</td><td>Low</td></tr>
<tr><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="4">Potential underestimation of flow rates may result in underperformance of control measures.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Whilst the performance of the erosion controls is sensitive to input data, they are still regarded as effective controls.</td></tr>
</table>

<table>
<tr><td rowspan="9">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="6">LSA Act
Environment Protection (Water Quality) Policy 2015</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO11: The Tenement Holder must ensure no adverse impact on surface water quality as a result of mining operations</td></tr>
<tr><td rowspan="4">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM25</td><td>Erosion and sedimentation through photo/drone point monitoring and inspection</td><td>HR</td><td>Annual photo/drone point monitoring and inspection records to demonstrate there is no significant increase in erosion /sedimentation when compared to control sites</td><td>Annually</td><td>Control sites
Initial inspection and photographic records.
ESCP</td></tr>
<tr><td>OM28</td><td>Sediment quality through chemical analysis at locations as per SWMP</td><td>Downstream of HR</td><td>Annual chemical analysis of downstream drainage line sediments demonstrates that sediment quality is consistent with the baseline surface water sediment quality dataset, or is otherwise comparable to control sites</td><td>Annually</td><td>Control sites and baseline surface water sediment quality dataset</td></tr>
<tr><td>OM29</td><td>Sediment quality through sediment sampling and analysis at locations as per SWMP at mine completion.</td><td>downstream or HR</td><td>At mine completion, analysis of downstream drainage line sediments demonstrates that sediment quality is consistent with the baseline surface water sediment quality dataset, or is otherwise comparable to control sites</td><td>Prior to mine closure</td><td>Baseline surface water and/or control sites sediment quality dataset</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>LI04</td><td>Erosional failure through inspections</td><td>HR</td><td>Monthly inspections, and inspection after significant rain events (as defined in SWMP) demonstrates non-failure of surface water and erosion control infrastructure, and no erosional failure of disturbed areas, stockpiles, embankments and other relevant features (no active rills, gullies or tunnels)</td><td>Monthly and after significant rain events</td><td>Baseline and ongoing monthly records</td></tr>
</table>

	Impact ID	**PI33**			**Phase**	**Construction, operations and closure**		
Potential impact event	**Potential impact description**	Alteration of surface water flow resulting in changes in availability of surface water and associated impacts to vegetation and reliant fauna species						
	Source	Project - Project construction and operation causes changes to catchment hydrologic regime						
	Pathway	Land						
	Receptor	Flora and fauna						
	Inherent design controls	None						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	Uncertain understanding of local hydrology and local surface water dependent ecosystems.			
		Method and model	A	**Justification**	Utilisation of the 2D hydraulic model (TUFLOW) and the Ensemble approach recommended in the ARR 2019 Guidelines are industry standard.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Local water-dependent species are deemed to be affected by changes to catchment hydrologic regime.			
	S--P-R linkage	Yes	**Justification**	The degree to which local flora and fauna communities are dependent on surface water flow regime has not been confirmed due to the lack of persistent surface water within the Study Area. Vegetation communities present within flood zones are not reliant on flows or flooding because these events occur at such infrequent intervals that they cannot sustain vegetation. However, there is likely to be some degree of reliance on surface water and hence there may be adverse impacts on surface water dependent species due to change in surface water hydrologic regime.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Alteration of surface water flow caused by the Project results in changes in availability of surface water, impacting vegetation and reliant fauna species						
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		3	B	High	MM06: Implementation of a Native Vegetation Management Plan (incl. monitoring of native vegetation condition) MM42: Implementation of erosion controls in accordance with the SWMP and work-area specific ESCPs	3	D	Moderate
	Uncertainty	**Inputs, method and model**	B	**Justification**	There is lack of comprehensive understanding of the catchment yield and consistency of flow in local surface water features and potential impacts on species dependent on these waters.			

	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions may affect ability to meet outcomes.		
Statement of proposed outcomes	**Legislative requirement**	Mining Act LSA Act EP Act					
	Proposed outcome	PO03: The Tenement Holder must ensure that all clearance of native vegetation is authorised under appropriate legislation PO04: The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities PO12: The Tenement holder must ensure that there is no adverse and permanent reduction in surface water availability for downstream surface-water dependent ecosystems, reliant fauna, or existing local third-party users (unless approved under prior agreement)					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM05	Vegetation health through surveys	ML & HR	Annual vegetation health survey shows no appreciable difference in mortality when compared to control sites	Annually	Control sites
		OM08	Diversity and abundance of native fauna species in project areas and control sites through surveys	ML & HR	Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites	Annually	Control sites and baseline surveys
		OM26	Surface water availability through photo/drone point monitoring and visual assessment	ML & HR	Annual photo point monitoring/ visual assessment shows no significant changes to surface water availability, when compared to climate related changes recorded in control sites	Annually	Control sites and initial photo/drone point monitoring and visual assessment data
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI04	Erosional failure through inspections	HR	Monthly inspections, and inspection after significant rain events (as defined in SWMP) demonstrates non-failure of surface water and erosion control infrastructure, and no erosional failure of disturbed areas, stockpiles, embankments and other relevant features (no active rills, gullies or tunnels)	Monthly and after significant rain events	Baseline and ongoing monthly records

	Impact ID	**PI34**			**Phase**	**Construction, operations and closure**		
Potential impact event	**Potential impact description**	Alteration of surface water flow resulting in changes in surface water availability for farm dams, and changes in flood levels, affecting downstream local landowners						
	Source	Project - Project construction and operation causes changes to catchment hydrologic regime						
	Pathway	Land						
	Receptor	Surface waters and local surface water users						
	Inherent design controls	None						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	Uncertain understanding of local hydrology.			
		Method and model	A	**Justification**	Utilisation of the 2D hydraulic model (TUFLOW) and the Ensemble approach recommended in the ARR 2019 Guidelines are industry standard.			
	Sensitivity analysis	**Sensitivity**	C	**Justification**	Modelled flow hydraulics is highly sensitive to rainfall loss parameters and to a lesser extent sensitive to Manning's parameter.			
	S--P-R linkage	Yes	**Justification**	A TSF is required for the operation of the Project and will capture some of the natural surface water from its upstream catchment. Based on a review of nearby dams only one set of farm dams directly north of the ML may be impacted. Hydrology and hydraulic modelling demonstrates insignificant impacts on baseline flooding conditions as a result of the Project.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Alteration of surface water flow caused by the Project resulting in changes in the availability of surface water for one group of farm dams directly north of the TSF, potentially impacting local landowners downstream.						
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		3	C	High	MM42: Implementation of erosion controls in accordance with the SWMP and work-area specific ESCPs	3	C	High
	Uncertainty	**Inputs, method and model**	C	**Justification**	We lack a comprehensive understanding of the catchment yield and consistency of flow in local surface water features and potential impact of the Project on these flows.			
	Sensitivity analysis	**Sensitivity**	C	**Justification**	Changes to assumptions may affect ability to meet outcomes.			

<table>
<tr><td rowspan="6">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="6">Mining Act
LSA Act
EP Act</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO12: The Tenement holder must ensure that there is no adverse and permanent reduction in surface water availability for downstream surface-water dependent ecosystems, reliant fauna, or existing local third-party users (unless approved under prior agreement)</td></tr>
<tr><td rowspan="2">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM13</td><td>Resolution of complaints recorded in an IMS</td><td>ML & HL</td><td>All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner</td><td>Annual</td><td>IMS</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>LI08</td><td>Review of IMS shows progress of complaint investigation</td><td>ML & HL</td><td>Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days</td><td>Within 7 days of complaint</td><td>IMS</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI35</td><td>Phase</td><td colspan="2">Construction, operations and closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="7">Extraction and surface emplacement of PAF material results in AMD and/or ARD, with adverse impacts on surface water</td></tr>
<tr><td>Source</td><td colspan="7">Project - Surface emplacement of PAF mine wastes and by-products (e.g. waste rock and tailings)</td></tr>
<tr><td>Pathway</td><td colspan="7">Water</td></tr>
<tr><td>Receptor</td><td colspan="7">Surface waters, local surface water users</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">Further testing relating to identification and quantification of PAF is ongoing.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Industry standard approaches used, however full testing regime not completed.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Assumption of worst-case scenario that PAF is present, hence reducing sensitivity to testing results affecting S-P-R.</td></tr>
<tr><td>S--P-R linkage</td><td>Uncertain</td><td>Justification</td><td colspan="5">Testing has shown elevated sulphur concentration in a subset of core samples associated with the fault zone in Razorback deposit. Further analysis is required to confirm whether these lithologies may be PAF.
Due to the high acid neutralising capacity of the carbonates in the tailing and waste rock material, the risk of AMD from tailings is anticipated to be low. However due to uncertainty, this S-P-R will be considered further.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="7">Extraction and surface emplacement of PAF material required for the Project results in AMD and/or ARD, with adverse impacts on surface water.</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>3</td><td>C</td><td>High</td><td>MM97: Appropriately sized PAF cells will be incorporated into the design of the WRDs to ensure storage of PAF material is controlled, if required
MM98: Should PAF be recorded within tailings, lime dosing will be used to neutralise potential acid formation
MM99: PAF material will be managed in accordance with the PAF Management Plan</td><td>2</td><td>E</td><td>Low</td></tr>
</table>

	Uncertainty	**Inputs, method and model**	B	**Justification**	Standard control measures used, however testing for quantity and location of PAF has not been finalised.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Assumption of worst-case scenario that PAF is present, hence changes to uncertainty is unlikely to impact on likelihood of achieving outcome.		
Statement of proposed outcomes	**Legislative requirement**	Mining Act LSA Act EP Act					
	Proposed outcome	PO13: The Tenement Holder must ensure that there is no reduction in surface water quality downstream of the Site (mining lease area), attributed to project activities, that would prevent beneficial uses of those surface waters					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM28	Sediment quality through sampling and chemical analysis at locations as per SWMP	ML	Annual chemical analysis of downstream drainage line sediments demonstrates that sediment quality is consistent with the baseline surface water sediment quality dataset, or is otherwise comparable to control sites	Annually	Control sites and baseline surface water sediment quality dataset
		OM29	Sediment quality through analysis at locations as per SWMP	ML	At mine completion, analysis of downstream drainage line sediments demonstrates that sediment quality is consistent with the baseline surface water sediment quality dataset, or is otherwise comparable to control sites	Prior to mine closure	Baseline surface water and/or control sites sediment quality dataset
		OM38	PAF material management through annual audit	ML	An annual audit of material movement records demonstrates that all PAF material is managed in accordance with the PAF Management Plan	Annually	PAF Management Plan
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI04	Erosional failure through inspections	ML	Monthly inspections, and inspection after significant rain events (as defined in SWMP) demonstrates non-failure of surface water and erosion control infrastructure, and no erosional failure of disturbed areas, stockpiles, embankments and other relevant features (no active rills, gullies or tunnels)	Monthly and after significant rain events	Inspection data

	Impact ID	**PI36**		**Phase**	**Construction, operations and closure**
Potential impact event	**Potential impact description**	Changed rates of subsurface infiltration due to alteration of surface water regime due to mining operations results in changes to groundwater level, affecting groundwater users			
	Source	Project -changed topography and surface water flow regimes			
	Pathway	Land			
	Receptor	Groundwater Local groundwater users			
	Inherent design controls	None			
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	Uncertain rainfall data and loss parameters due to being located in the Arid Zone of Australia. Groundwater level monitoring indicates local recharge episodically occurs near drainage lines.
		Method and model	A	**Justification**	Utilisation of the 2D hydraulic model (TUFLOW) and the Ensemble approach recommended in the ARR 2019 Guidelines are industry standard.
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Modelled flow hydraulics is highly sensitive to rainfall loss parameters and to a lesser extent sensitive to Manning's parameter. Dependent on accuracy of groundwater model.
	S--P-R linkage	No	**Justification**	Whilst there is evidence that localised areas of the fractured rock aquifer near major drainage lines receives episodic recharge, flood modelling predicts the Project to have negligible impacts on flooding at the major drainage lines.	
	If no S-P-R linkage then do not continue further				

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI37</td><td>Phase</td><td colspan="3">Operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Excessive surface water inflow during peak rainfall / storm events, or cumulative events, results an exceedance of the TSF maximum water (overflow) level and an as-designed release of water, impacting downstream surface water quality</td></tr>
<tr><td>Source</td><td colspan="8">Project - Use and operation of TSF</td></tr>
<tr><td>Pathway</td><td colspan="8">Water</td></tr>
<tr><td>Receptor</td><td colspan="8">Surface water and surface water users</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">TSF design and construction</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">Extreme storm events are inherently unpredictable. Design of TSF and release mechanism to appropriate ARI.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="5">TSF and associated water release mechanisms designed by appropriately qualified engineer to ANCOLD standards.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="5">Industry standard design used reduce risk – unlikely to affect S-P-R.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Mining operations will generate tailings (solids and water) to be disposed to a TSF. This TSF will be designed and operated to shed and recover water for re-use in the processing circuit.
Large volumes of water will be stored within TSF which, if released through an as-designed high-level release, may impact on downstream receptors.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Excessive surface water inflow during peak rainfall or storm events, as well as cumulative rainfall events, leading to exceedance of the maximum water level in the TSF, which then results in the planned release of water, adversely affecting the downstream surface water quality</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>B</td><td>Very High</td><td>MM53: Spills and uncontrolled release of hazardous materials managed in accordance with the Hazardous Materials Management Plan and spill response procedures
MM61: TSF design and construction will be staged in line with mine operation requirements, and lifted as required
MM62: Construction of the TSF to ANCOLD-based geotechnical design, and ongoing operation and management in accordance with the Tailings Management Plan</td><td>4</td><td>D</td><td>High</td></tr>
</table>

	Uncertainty	**Inputs, method and model**	B	**Justification**	Industry standard mitigation measures recommended. Assumes sufficient input information available to ensure sufficient mitigation.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes to assumptions unlikely to affect ability to meet outcomes.		
Statement of proposed outcomes	**Legislative requirement**	LSA Act *Environment Protection (Water Quality) Policy 2015*					
	Proposed outcome	PO13: The Tenement Holder must ensure that there is no reduction in surface water quality downstream of the Site , attributed to project activities, that would prevent beneficial uses of those surface waters					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM27	Uncontrolled discharges or controlled emergency releases of water from the TSF recorded in IMS	ML	Annual review demonstrates there were no uncontrolled discharges or controlled emergency releases of water from the TSF to the downstream environment that could have been reasonably prevented	Annually	Tailings Management Plan and IMS
		OM28	Sediment quality through chemical analysis at locations as per SWMP	ML	Annual chemical analysis of downstream drainage line sediments demonstrates that sediment quality is consistent with the baseline surface water sediment quality dataset, or is otherwise comparable to control sites	Annually	Control sites and baseline surface water sediment quality dataset
		OM29	Sediment quality through analysis at locations as per SWMP	ML	At mine completion, analysis of downstream drainage line sediments demonstrates that sediment quality is consistent with the baseline surface water sediment quality dataset, or is otherwise comparable to control sites	Once prior to mine closure	Baseline surface water and/or control sites sediment quality dataset
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI04	Erosional failure through inspections	ML	Monthly inspections, and inspection after significant rain events (as defined in SWMP) demonstrates non-failure of surface water and erosion control infrastructure, and no erosional failure of disturbed areas, stockpiles, embankments and other relevant features (no active rills, gullies or tunnels)	Monthly and after significant rain events	Inspection data

		LI08	Review of IMS shows progress of complaint investigation	ML	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS

7.8. Noise and vibration

An overview of the noise impact assessment is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B9 *Razorback Iron Ore Project Existing Noise Environment Baseline Assessment* (Sonus, 2022). For detailed impact assessment, please refer to Appendix C7 *Noise and Vibration Assessment* (Resonate, 2024).

This Section describes how the Project may impact on existing noise and vibration levels and presents measures that will, when implemented, minimise those impacts.

7.8.1. Context

Baseline noise monitoring was undertaken within the Project Area in February 2022 (Sonus, 2022), with additional monitoring undertaken in October 2023 (Resonate, 2024). The existing acoustic environment is dominated by natural sounds, such as wind in nearby trees, birds and insects. Background noise levels reached 48 dB(A) at the baseline monitoring locations, recorded during periods of higher wind, early morning (bird activity) and during the evening (insect activity), with lowest noise levels measured at 18 dB(A).

A detailed summary of the baseline noise and vibration conditions at the Site can be found in Appendix B9 *Razorback Iron Ore Project Existing Noise Environment Baseline Assessment* (Sonus, 2022) and in Section 3.15.

7.8.2. Impact assessment

7.8.2.1. Modelling parameters

Noise emissions from site were modelled in SoundPLAN Environmental Software v9.0 program, using the Conservation of Clean Air and Water in Europe (CONCAWE) algorithms. The model takes into consideration the following parameters:

- attenuation of noise source due to distance
- barrier effects from buildings, topography, and the like
- air absorption
- ground effects
- weather conditions (wind speed, wind direction, time of day, and cloud cover).

In accordance with the Guidelines for the use of the *Environment Protection (Commercial and Industrial Noise) Policy 2023,* predictions of the source noise levels for distances over 100 m should be made using default weather conditions that are equivalent to CONCAWE meteorological category 6 at night, and CONCAWE meteorological category 5 for the day period.

As it is proposed the Project will operate on an up to 24-hour basis, conservatively CONCAWE meteorological category 6 has been used to model noise emissions. Further detail is provided in Appendix C7 *Noise and Vibration Assessment* (Resonate, 2024).

7.8.2.2. Modelling scenarios

Two scenarios, construction (S1) and operation (S2), have been modelled within the noise impact assessment.

For both scenarios, a nominal worst-case situation has been adopted, assuming all noise sources are operating simultaneously. The intensity and location of construction and operation are expected to vary over time, such that actual noise levels are expected to be significantly less than the 'worst-case' predicted levels.

In Scenario S2, mining plant has also been modelled near to the existing ground level, i.e., representing the initial phase of operation in each pit (immediately following overburden removal, approximately 1-2 years of Iron Peak mining). This presents a worst-case scenario as noise emissions from mining plant items located within pits will decrease over time with pit development since the pit geometry will partially interrupt the path of noise transmission to the nearest noise sensitive receptors.

7.8.2.3. Noise impacts

Potential receptor sites and their occupancy status are shown in Figure 3-64 and Table 3-37.

The modelled scenarios indicated noise would be greatest during operations (as opposed to construction) and the modelled operational noise outputs in relation to receptors are presented in Table 7-35 and Figure 7-7.

Table 7-35: Predicted noise levels

Location details		Predicted noise level, dB(A)[(1)]	
ID (refer Figure 3-69)	Name	Scenario S1	Scenario S2
6	Eurovale Outstation	**65**	**55**
22	Old Manunda	42	**53**
14	Tiverton Outstation[2]	44	53
2	Forshaw's	**51**	50
1	Pualco	43	39
57	Kia Ora	45	35
8	Private residence	35	35
84	Oak Park	29	34
50	Manunda homestead[1]	20	31
4	N Mosey	41	31
50	Manunda homestead[2]	20	30
66	Hillgrange	38	30
86	Braemar	37	28
97	Murkaby	38	28
25	Woolamba	37	27
62	Mafeking Outstation	20	27
24	Faraway Hill Outstation	18	27
21	Bullyaninnie	33	26
53	Tiverton	16	26
86	Braemar	34	26
55	Pitcairn	28	25
54	Glenora	33	23
34	Eurovale	31	21
3	Old Nackara School House	23	21
27	Loch Winnoch	20	21

[1] A 5 DB(A) PENALTY FOR TO ACCOUNT FOR THE POTENTIAL MODULATING/INTERMITTENT CHARACTER OF MOBILE PLANT ITEMS, OR TONALITY (FROM CORONA DISCHARGE NOISE) HAS BEEN APPLIED TO PREDICTED NOISE LEVELS. NOTE THAT NOISE CONTOUR FIGURES IN APPENDIX C OF APPENDIX C7 SHOW THE RAW PREDICTED NOISE LEVELS PRIOR TO THE APPLICATION OF CHARACTER PENALTIES.
[2] RECEIVERS LOCATED WITHIN ML AND WILL BE ACQUIRED BY THE PROJECT. LEVELS SHOWN FOR INFORMATION ONLY.
[3] BOLDED NOISE LEVELS ARE PREDICTED TO EXCEED THE DAY AND/OR NIGHT-TIME CRITERIA.

7.8.2.4. Construction noise

There are two locations (Eurovale Outstation and Forshaw's) where the conservatively applied worst-case construction noise levels based on Scenario S1 modelling exceed the Noise Policy nighttime criteria of 50 dB(A) (noting that the Noise Policy is not strictly applicable to construction noise and is presented as guidance only). Both locations are not permanently occupied and receive only occasional overnight visitation.

7.8.2.5. Operational noise

There are two locations (Eurovale Outstation (adjacent to the TL) and Old Manunda (north-east of Iron Peak), (excluding Dry Dam which will be acquired by MGT) where worst-case operational noise levels are predicted to exceed the nighttime criteria by up to 5 dB(A) (refer Figure 7-7). Both of these locations are not permanently occupied with only occasional overnight visitation.

Eurovale Outstation is located approximately 30 m from the TL alignment and is potentially affected by corona discharge noise during periods of high humidity or light rain (noise emitted from high-voltage power lines). Corona discharge noise predictions are based on limited information and are thus subject to a degree of uncertainty. Predicted noise levels have been based on significantly higher voltage lines (i.e., Project EnergyConnect) and are expected to over-predict actual noise levels. Corona discharge is typically highest at towers and as such, micro-siting of towers away from dwellings (by at least 100 m) will assist in minimising corona discharge impacts to sensitive receivers.

Old Manunda is located approximately 3 km from the edge of Iron Peak pit and based on noise modelling is affected by noise emissions from mining activities at Iron Peak. As noted, predictions are based on the initial 1-2 years of Iron Peak mining, with equipment at or near to the existing ground level. Noise levels at this receptor will decrease over time with pit development. Operational noise levels are expected to comply with daytime and nighttime noise criteria once the pit is at least 5 m below the existing ground level.

7.8.2.6. Blasting vibration and air blast overpressure

Standard blasting procedures will be adhered to throughout the Project, in accordance with *AS 2187.2:2006 'Explosives—Storage and use-Part 2: Use of explosives'* which address the potential impacts of vibration, overpressure and noise on the environment, personnel and surrounding land and facilities.

All blasting operations would be designed and undertaken to be supervised by qualified, trained and experienced personnel.

At this stage, there is limited information known on the details of blasting operations (i.e., charge weights) for the Project, however given the distances of 3 km (at a minimum) to nearest sensitive receivers, compliance with relevant limits and *AS 2187.2:2006* can be expected.

7.8.2.7. Impacts to protected fauna

Predicted worst-case noise construction and operational levels are less than the threshold levels for permanent or temporary hearing injury in bird species in all areas other than the directly impacted ground disturbance areas within mining pit, processing plant and HR footprints.

CONSTRUCTION

Worst-case noise levels of 54 to 75 dB LAeq during construction are predicted within the VA5(b) TEC area, within the ML. Noise at these levels is significantly higher than existing ambient noise levels and has the potential for disruption to birds (e.g., masking call signals or causing behavioural changes). The degree of impact is likely to vary between species and is likely to depend on the species' sensitivity to noise and ability to employ short-term and long-term adaptation strategies.

The majority of acoustic energy from mining equipment and haul trucks is at low frequencies, particularly at distance, as atmospheric and ground absorption of sound increases with spectral frequency. Noise levels within the 2 kHz to 4 kHz range are relatively low (albeit still higher than background levels), limiting the potential for significant masking impacts.

Noise levels of 55 to 75 dB LAeq are also expected within the VA5(b) TEC area in the TL corridor during construction. The potential for significant masking and behavioral effects from TL construction activities is limited due to the relatively short duration of works in each area.

OPERATION

Worst case noise levels of 64 to 85 dB LAeq during operation are predicted within the VA5(b) TEC area within the ML. Noise at these levels is significantly higher than existing ambient noise levels and has the potential for masking and behavioral impacts in birds. The degree of impact is likely to vary between species and is likely to depend on the species sensitivity to noise and ability to employ long-term adaptation strategies.

Operation of the TL may result in corona noise levels of up to 53 dB LAeq during periods of high humidity or light rain. Noise at this level is not expected to have a significant impact since it is likely to occur infrequently and is within the range of existing ambient noise levels. The majority of acoustic energy from corona discharge is at lower frequencies than most bird vocalisation, reducing the potential for masking impacts.

BLASTING

Limiting blasting vibration and overpressure to within AS 2187.2:2006 guideline limits is expected to avoid potential for hearing or other injury to bird species, although behavioral (startle) impacts may still occur due to noise (overpressure) and vibration from blasting. Studies of bird communities in proximity to airport and rocket launch facilities indicate that birds exposed to high noise events exhibit a startle response but typically resume normal behaviour within minutes of the event (Brown and Root Environmental, 1996).

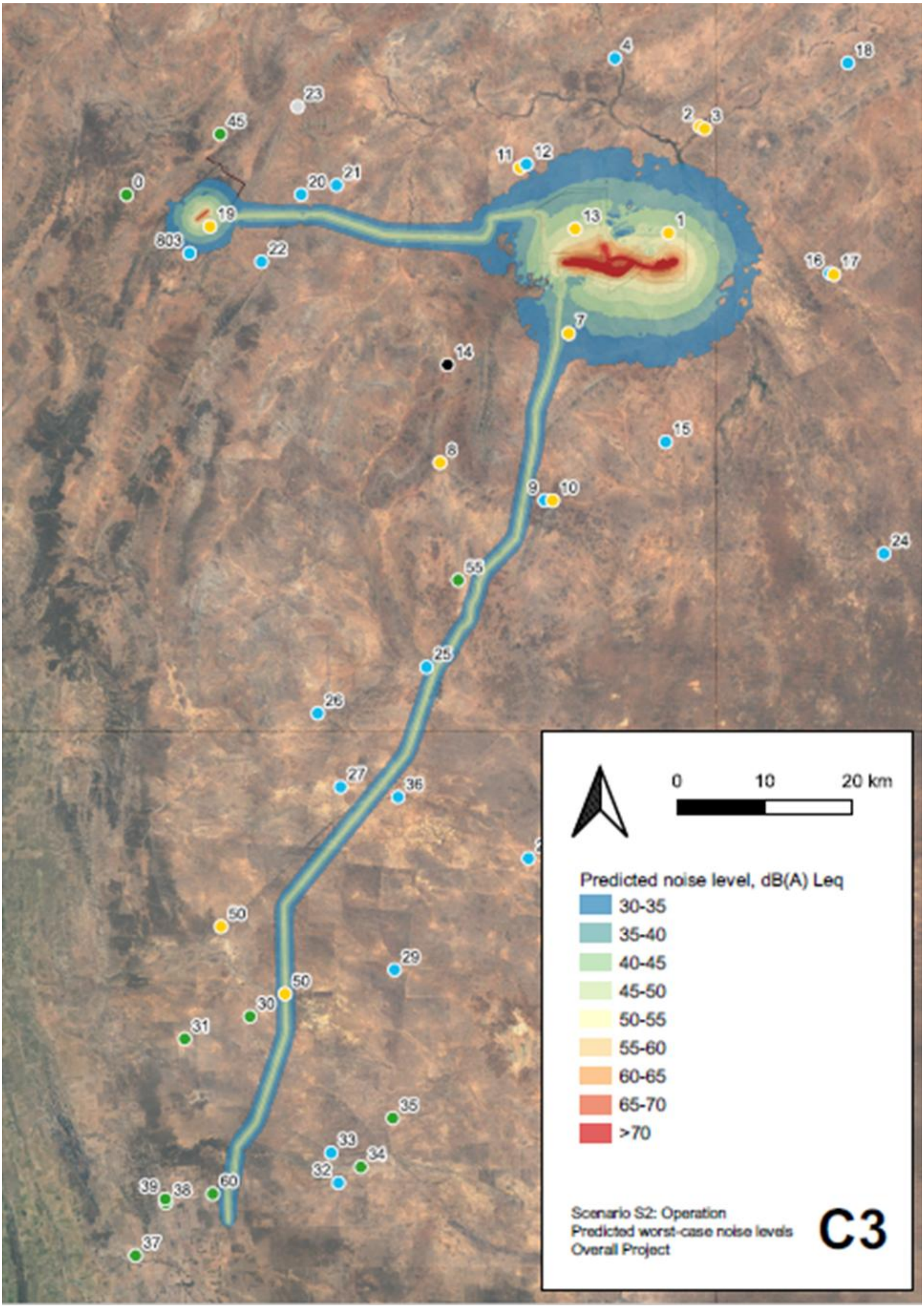

Figure 7-7: Potential receptors and noise contours predicted for operations

7.8.2.8. Potential impact events

An environmental noise and vibration assessment has been undertaken for the Project. The potential impact events, and respective areas (ML and MPLs) are listed in Table 7-36 and are further analysed within Table 7-47.

Table 7-36: Noise and vibration potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI38	Noise emissions from construction potentially impacting on (human, public) noise sensitive receivers	Yes	C	C	C
PI39	Noise emissions from construction potentially impacting native fauna through changes in behaviours and masking effects	Yes	C	C	C
PI40	Noise emissions from mining operations potentially impacting on (human, public) noise sensitive receivers	Yes	O	O	
PI41	Noise emissions from operation potentially impacting native fauna through changes in behaviours and masking effects	Yes	O	O	
PI42	Air blast overpressure and vibration from blasting potentially impacting on (human, public) noise sensitive receivers	Yes	O		
PI43	Air blast overpressure and vibration from blasting potentially impacting native fauna through changes in behaviours and masking effects	Yes	O		
PI44	Corona discharge noise potentially impacting on (human) noise sensitive receivers	Yes			O

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some noise and vibration impacts are more appropriately discussed in other Sections of this report (i.e., potential impacts of traffic noise). Instances of cross-referenced impacts are shown in Table 7-37.

Table 7-37: Noise and vibration impacts cross reference

Potential impact	Refer to	Cross reference
Increased noise within local townships due to additional vehicle movements resulting in amenity impacts for local communities	PI57	Section 7.11

7.8.3. Design, control and management strategies

The noise and vibration design, control and management strategies are listed in Table 7-38 and are referenced against the potential impact events in Table 7-40.

Table 7-38: Noise and vibration mitigation measures

Reference ID	Design, control and management measure
MM63	Adopt standard construction noise mitigation measures within Construction Environmental Management Plans (CEMPs)
MM64	Implementation of Noise and Vibration Management Plan (including adoption of noise abatement plan)
MM65	Locate high-noise construction equipment away from known fauna habitat, where practicable
MM66	Undertake high noise activities outside times when species are most sensitive to noise (if relevant information is available and it is practicable to do so)
MM67	Undertake blasts during daytime hours only

Reference ID	Design, control and management measure
MM68	Undertake high noise works in the vicinity of sensitive receptors during daytime only
MM69	Notify owners/ occupants in advance of high noise works in vicinity of sensitive receptors
MM71	Follow procedures in AS 2187.2:2006. These limits may be revised where appropriate based on observation of the relevant species during blasts
MM72	Undertake ground vibration (GVL) and/or peak sound pressure level (PSPL) monitoring at noise affected premises as per AS 2817.2:2006
MM73	Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions
MM74	Use of WRD and overburden stockpiles as noise attenuation barriers to the north Iron Peak pits
MM75	Selection of low noise options for mobile plant and processing equipment, where practicable
MM76	Micro-siting TL towers away from permanently occupied buildings (minimum 100 m separation, where practicable and agreed by landowner)
MM77	Maintenance of equipment and vehicles in accordance with manufacturer specifications

7.8.4. Draft outcomes, measurement criteria and leading indicators

The draft noise and vibration proposed outcomes are presented in Table 7-39. The proposed outcomes, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-40.

Table 7-39: Noise and vibration proposed outcomes

Reference ID	Proposed outcome
PO04	The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities
PO14	The Tenement Holder must ensure that there are no nuisance impacts on sensitive receptors from noise or vibration (from blasting) generated by the Project

Table 7-40: Noise and vibration potential impacts

<table>
<tr><td></td><th>Impact ID</th><th colspan="4">PI38</th><th>Phase</th><th colspan="4">Construction</th></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="9">Noise emissions from construction potentially impacting on (human, public) noise sensitive receivers</td></tr>
<tr><td>Source</td><td colspan="9">Clearing, ground disturbance and actions of project personnel</td></tr>
<tr><td>Pathway</td><td colspan="9">Air</td></tr>
<tr><td>Receptor</td><td colspan="9">Noise affected premises as defined by the Noise Policy within the study area</td></tr>
<tr><td>Inherent design controls</td><td colspan="9">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="6">List of noise sources/equipment is indicative. Some (worst-case) assumptions made relating to the duty factor, quantity and locations of equipment.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="6">Industry-standard model and methodology.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="6">Some sensitivity to inputs. Generally where assumptions have been made they are worst-case (i.e. result in the highest noise emissions). The outcome is therefore only sensitive to the extent that variation in inputs is expected to reduce (not increase) impacts.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="7">Noise modelling has established that worst-case construction noise levels (prior to controls) are above recommended nighttime guideline levels for prevention of sleep disturbance at two locations that are not permanently occupied. Construction noise may also be noticeable in the context of low background noise levels at other locations and has the potential to cause nuisance, although at levels below guideline criteria.</td></tr>
<tr><td colspan="10">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="9">Noise emissions during construction potentially may impact on (human, public) noise sensitive receivers, potentially causing sleep disturbance at two locations that are not permanently occupied.</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td colspan="3" rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>A</td><td>High</td><td colspan="3">MM63: Adopt standard construction noise mitigation measures within CEMPs
MM64: Implementation of Noise and Vibration Management Plan (including adoption of noise abatement plan)</td><td>1</td><td>B</td><td>Moderate</td></tr>
</table>

					MM67: Undertake blasts during daytime hours only MM68: Undertake high noise works in the vicinity of sensitive receptors during daytime only MM69: Notify owners/ occupants in advance of high noise works in vicinity of sensitive receptors MM73: Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions MM74: Use of WRD and overburden stockpiles as noise attenuation barriers to the north of Iron Peak pit MM75: Selection of low noise options for mobile plant and processing equipment, where practicable MM77: Maintenance of equipment and vehicles in accordance with manufacturer specifications			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Detailed construction methodology information not available at this stage so there is some uncertainty with respect to the exact nature of noise management and mitigation measures that can be reasonably and practicably implemented.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Low level of sensitivity, depending on the details of mitigation and management controls that are adopted.			
Statement of proposed outcomes	**Legislative requirement**	EP Act - Section 25 General Environmental Duty. Note there are no quantitative noise limits for construction activities						
	Proposed outcome	PO14: The Tenement Holder must ensure that there are no nuisance impacts on sensitive receptors from noise or vibration (from blasting) generated by the Project						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM13	Number of noise complaints recorded in an IMS		Project Area	All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner	As required (based on complaints)	Baseline noise data.

		Leading indicator ID	What will be measured and form (method) of measurement	Location	Outcome achievement	Frequency	Background and/or control data
	Draft leading indicator criteria	LI08	Review of IMS shows progress of complaint investigation	Project Area	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS data

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI39</td><td>Phase</td><td colspan="3">Construction</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="7">Noise - fauna - change in behaviours
Noise emissions from construction potentially impacting native fauna through changes in behaviours and masking effects</td></tr>
<tr><td>Source</td><td colspan="7">Project - Site establishment and construction activities</td></tr>
<tr><td>Pathway</td><td colspan="7">Air</td></tr>
<tr><td>Receptor</td><td colspan="7">Native fauna</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>C</td><td>Justification</td><td colspan="4">List of noise sources/equipment is indicative. Some (worst-case) assumptions made relating to the duty factor, quantity and locations of equipment.
There is a high degree of uncertainty with respect to the levels of construction noise that may result in significant masking or behavioural impacts in the relevant bird species, since the only available data (other than observations of Southern Whiteface near a similar mine site) is generalised to all birds.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Industry-standard model and methodology.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Some sensitivity to inputs; generally conservative assumptions have been made in relation to noise sources, (i.e. result in the highest noise emissions). In the absence of species-specific information, it has been assumed that Project noise levels above average ambient levels could cause masking and/or behavioural impacts. The outcome is therefore only sensitive to the extent that variation in inputs/assumptions is expected to reduce (not increase) impacts.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">Noise modelling has established that worst-case construction noise levels are above existing ambient levels in habitat within the ML, HR and TL corridor. There is therefore the potential for masking and behavioural impacts to occur, albeit on a temporary basis during construction.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="7">Noise emissions from construction potentially impacting native fauna through changes in behaviour and masking effects</td></tr>
<tr><td rowspan="3">Risk assessment and design/</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>3</td><td>B</td><td>High</td><td>MM63: Adopt standard construction noise mitigation measures within CEMPs</td><td>2</td><td>C</td><td>Moderate</td></tr>
</table>

					MM64: Implementation of Noise and Vibration Management Plan (including adoption of noise abatement plan) MM65: Locate high-noise construction equipment away from known habitat, where practicable MM66: Undertake high noise activities outside times when species are most sensitive to noise (if relevant information is available and it is practicable to do so) MM73: Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions MM75: Selection of low noise options for mobile plant and processing equipment, where practicable		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Detailed construction methodology information not available at this stage so there is some uncertainty with respect to the exact nature of noise management and mitigation measures that can be reasonably and practicably implemented.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Low level of sensitivity, depending on the details of mitigation and management controls that are adopted.		
Statement of proposed outcomes	**Legislative requirement**	EPBC Act NPW Act					
	Proposed outcome	PO04: The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM08	Diversity and abundance of native fauna species in project areas and control sites through surveys	Project Area	Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites	Annually	Control sites and baseline surveys
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		None proposed					

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI40</td><td>Phase</td><td colspan="3">Operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="7">Noise emissions from mining operations potentially impacting on (human, public) noise sensitive receivers</td></tr>
<tr><td>Source</td><td colspan="7">Project - Operation of plant and machinery, and blasting activities</td></tr>
<tr><td>Pathway</td><td colspan="7">Air</td></tr>
<tr><td>Receptor</td><td colspan="7">Noise affected premises as defined by the Noise Policy within the study area</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">Mine pits (once established) will provide inherent noise mitigation since the pit geometry will partially block the noise propagation pathway for some sources. Note that this will only occur after the initial phase of operation in each pit and has therefore not been relied on in (nominally worst-case) noise predictions</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">List of noise sources/equipment and sound power level data is indicative to some extent. Some (worst-case) assumptions made relating to the duty factor, quantity and locations of equipment.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="4">Industry-standard model and methodology.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="4">Some sensitivity to inputs, generally where assumptions have been made, they are worst-case (i.e. result in the highest noise emissions). The outcome is therefore only sensitive to the extent that variation in inputs is expected to reduce (not increase) impacts.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">Noise modelling has established that worst-case noise levels are above Noise Policy nighttime criteria at two locations (Old Manunda (north-east of Iron Peak) and Eurovale Outstation (adjacent to the TL)) prior to controls. Noise may also be noticeable in the context of low background noise levels at other noise sensitive locations and has the potential to cause nuisance although at levels below criteria.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="7">Noise emissions from mining operations potentially impacting on (human, public) noise sensitive receivers</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>C</td><td>Moderate</td><td>MM64: Implementation of Noise and Vibration Management Plan (including adoption of noise abatement plan)
MM67: Undertake blasts during daytime hours only
MM68: Undertake high noise works in the vicinity of sensitive receptors during daytime only</td><td>2</td><td>D</td><td>Low</td></tr>
</table>

					MM69: Notify owners/ occupants in advance of high noise works in vicinity of sensitive receptors MM72: Undertake GVL and/or PSPL monitoring at noise affected premises as per AS 2817.2:2006 MM73: Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions MM74: Use of WRD and overburden stockpiles as noise attenuation barriers to the north Iron Peak pits MM75: Selection of low noise options for mobile plant and processing equipment, where practicable			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Control measures subject to consideration of cost and other potential (non-acoustic) environmental impacts.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Low level of sensitivity, depending on the details of mitigation and management controls that are adopted.			
Statement of proposed outcomes	**Legislative requirement**	*Environment Protection (Commercial and Industrial Noise) Policy 2023* (SA)						
	Proposed outcome	PO14: The Tenement Holder must ensure that there are no nuisance impacts on sensitive receptors from noise or vibration (from blasting) generated by the Project						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		OM13	Number of noise complaints recorded in an IMS	ML/HR	All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner	As required (based on complaints)	IMS	
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		LI08	Review of IMS shows progress of complaint investigation	Project Area	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS	

	Impact ID	**PI41**			**Phase**	**Operations**		
Potential impact event	**Potential impact description**	Noise emissions from operation potentially impacting native fauna through changes in behaviours and masking effects						
	Source	Project - Operation of plant and machinery, and blasting activities						
	Pathway	Air						
	Receptor	Native fauna						
	Inherent design controls	Mine pits (once established) will provide inherent noise mitigation since the pit geometry will partially block the noise propagation pathway for some sources. Note that this will only occur after the initial phase of operation in each pit and has therefore not been relied on in (nominally worst-case) noise predictions						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	C	**Justification**	List of noise sources/equipment is indicative to some extent. Some (worst-case) assumptions made relating to the duty factor, quantity and locations of equipment. There is a high degree of uncertainty with respect to the levels of noise that may result in significant masking or behavioural impacts in the relevant bird species, since the only available data (other than observations of Southern Whiteface near a similar mine site) is generalised to all birds.			
		Method and model	A	**Justification**	Industry-standard model and methodology.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Some sensitivity to inputs; generally conservative assumptions have been made in relation to noise sources, (i.e. result in the highest noise emissions). In the absence of species-specific information, it has been assumed that Project noise levels above average ambient levels could cause masking and/or behavioural impacts. The outcome is therefore only sensitive to the extent that variation in inputs/assumptions is expected to reduce (not increase) impacts.			
	S--P-R linkage	Yes	**Justification**	Noise modelling has established that worst-case operational noise levels are significantly above existing ambient levels in habitat within the ML and HR. There is therefore the potential for masking and behavioural impacts to occur, albeit the potential is lessened to some extent because the majority of operational noise emissions are expected to be at frequencies below the spectral range where typical bird vocalisations occur.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Operational noise may impact fauna by causing behavioural changes such as avoidance or disruption in foraging. Construction noise may also mask fauna communication signals						
Risk assessment and design/	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		3	C	High	MM64: Implementation of Noise and Vibration Management Plan (including adoption of noise abatement plan)	2	C	Moderate

					MM65: Locate high-noise construction equipment away from known habitat, where practicable MM73: Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions MM75: Selection of low noise options for mobile plant and processing equipment, where practicable		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Control measures subject to consideration of cost and other potential (non-acoustic) environmental impacts Some uncertainty with respect to the appropriate metrics to property quantify potential impacts on bird species		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Low level of sensitivity, depending on the details of mitigation and management controls that are adopted		
Statement of proposed outcomes	**Legislative requirement**	EPBC Act NPW Act					
	Proposed outcome	PO04: The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM08	Diversity and abundance of native fauna species in project areas and control sites through surveys	ML/HR	Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites	Annually	Control sites and baseline surveys
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		None proposed					

	Impact ID	PI42			Phase	Operations		
Potential impact event	Potential impact description	Air blast overpressure and vibration from blasting potentially impacting on (human, public) noise sensitive receivers						
	Source	Project - Air blast overpressure and vibration from blasting within mine pits						
	Pathway	Air						
	Receptor	Noise affected premises as defined by the Noise Policy within the study area						
	Inherent design controls	There are safety considerations (e.g. avoiding flyrock) in blast design that also provide some degree of incidental overpressure and vibration control						
	Uncertainty/ knowledge gaps/ assumptions	Inputs	A	Justification	Inputs based on study by a leading blasting services provider.			
		Method and model	A	Justification	Standard calculation methodology.			
	Sensitivity analysis	Sensitivity	A	Justification	Due to inherent design controls, the risk is unlikely to change with different or more detailed input information.			
	S--P-R linkage	Yes	Justification	There is potential for air blast overpressure and vibration to exceed relevant criteria without appropriate controls, albeit there is a low risk of this occurring given separation distances of at least 3 km between mine pits and the nearest sensitive receivers, and blasting controls resulting from applicable Australian standard.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Air blast overpressure and vibration from blasting potentially impacting on (human, public) noise sensitive receivers						
Risk assessment and design/ management controls	Risk Assessment	Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	L	Risk		C	L	Risk
		2	C	Moderate	MM67: Undertake blasts during daytime hours only MM69: Notify owners/ occupants in advance of high noise works in vicinity of sensitive receptors MM71: Follow procedures in AS 2187.2:2006 MM72: Undertake GVL and/or PSPL monitoring at noise affected premises as per AS 2817.2:2006	2	D	Low

					MM73: Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Control measures subject to change during operation but no significant issues with implementation are expected.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Low level of sensitivity.		
Statement of proposed outcomes	**Legislative requirement**	Australian Standard AS 2187.2:2006 'Explosives—Storage and use-Part 2: Use of explosives'					
	Proposed outcome	PO14: The Tenement Holder must ensure that there are no nuisance impacts on sensitive receptors from noise or vibration (from blasting) generated by the Project					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM13	Number of noise complaints recorded in an IMS	ML/HR	All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner	As required (based on complaints)	Background noise levels
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI08	Review of IMS shows progress of complaint investigation	Project Area	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS

	Impact ID	**PI43**			**Phase**	**Operations**		
Potential impact event	**Potential impact description**	Air blast overpressure and vibration from blasting potentially impacting native fauna through changes in behaviours and masking effects						
	Source	Project - Air blast overpressure and vibration from blasting within mine pits						
	Pathway	Air						
	Receptor	Native fauna						
	Inherent design controls	There are safety considerations (e.g. avoiding fly rock) in blast design that also provide some degree of incidental overpressure and vibration control						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	Inputs based on study by a leading blasting services provider. There is a high degree of uncertainty with respect to the levels of overpressure and vibration that may result in significant masking or behavioural impacts in the relevant bird species, since (apart from observations of Southern Whiteface near a similar mine site) no quantitative data is available for vibration and most available data for noise/overpressure is generalised to all birds.			
		Method and model	A	**Justification**	Standard calculation methodology.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Due to inherent design controls, there is a low risk of significant noise and vibration impacts from blasting, which is unlikely to change with different or more detailed input information.			
	S--P-R linkage	Yes	**Justification**	There is potential for air blast overpressure and vibration to result in changes to fauna behaviours (masking effects, fauna fright and movement away from habitat areas), albeit the risk is low due to proposed inherent design controls and infrequent blasting operations.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Air blast overpressure and vibration from blasting may impact fauna by causing behavioural changes such as avoidance or disruption in foraging. Construction noise may also mask fauna communication signals						
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		2	C	Moderate	MM67: Undertake blasts during daytime hours only MM71: Follow procedures in AS 2187.2:2006. These limits may be revised where appropriate based on observation of the relevant species during blasts MM72: Undertake GVL and/or PSPL monitoring at noise affected premises as per AS 2817.2:2006	2	D	Low

					MM73: Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions			
	Uncertainty	**Inputs, method and model**	B	**Justification**	Control measures subject to consideration during operation but no significant issues with implementation are expected. Standard calculation methodology used in mitigation measures.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Low level of sensitivity.			
Statement of proposed outcomes	**Legislative requirement**	*Environment Protection and Biodiversity Conservation Act 1999* *National Parks and Wildlife Act 1972* Australian Standard AS 2187.2:2006 'Explosives—Storage and use-Part 2: Use of explosives'						
	Proposed outcome	PO04: The Tenement Holder must ensure that there is no adverse and permanent loss of native fauna diversity and abundance that can be attributed to project activities						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		OM08	Diversity and abundance of native fauna species in project areas and control sites through surveys	ML	Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites	Annually	Control sites and baseline surveys	
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		None proposed						

	Impact ID	PI44				Phase	Operations	
Potential impact event	Potential impact description	Corona discharge noise potentially impacting on (human) noise sensitive receivers						
	Source	Project - Corona discharge noise from TL, generated during humid and/or rain conditions						
	Pathway	Air						
	Receptor	Noise affected premises as defined by the Noise Policy within the study area						
	Inherent design controls	Transmission lines are generally designed to minimise steep voltage gradients which lead to corona discharge						
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	Noise levels will depend on final line design, voltage and meteorological conditions. Noise levels are based on a significantly higher voltage line (project EnergyConnect) and are expected to over-predict actual noise levels.			
		Method and model	A	Justification	Industry-standard model and methodology.			
	Sensitivity analysis	Sensitivity	B	Justification	Some sensitivity to inputs, generally where assumptions have been made, they are worst-case (i.e. result in the highest noise emissions). The outcome is therefore only sensitive to the extent that variation in inputs is expected to reduce (not increase) impacts			
	S--P-R linkage	Yes	Justification	Noise modelling has indicated that worst-case noise levels may be above Noise Policy nighttime criteria at one location (Eurovale Outstation) prior to controls. Noise may also be noticeable in the context of low background noise levels at other noise sensitive locations and has the potential to cause nuisance although at levels below criteria. Eurovale Outstation is not permanently occupied and is only occasionally used overnight.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Corona discharge noise potentially impacting on noise sensitive individuals by causing annoyance, sleep disturbance and other related issues						
Risk assessment and design/ management controls	Risk Assessment	Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	L	Risk		C	L	Risk
		2	C	Moderate	MM64: Implementation of Noise and Vibration Management Plan (including adoption of noise abatement plan) MM73: Undertake updated noise and vibrating modelling, calibrated to actual noise and vibration measurements obtained during operations, to re-evaluate pre-mining predictions	2	D	Low

					MM76: Micro-siting transmission line towers away from permanently occupied buildings (minimum 100 m separation, where practicable and agreed by landowner)		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Details of proposed noise and vibration modelling subject to change.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Low level of sensitivity, depending on the details of mitigation and management controls that are adopted.		
Statement of proposed outcomes	**Legislative requirement**	*Environment Protection (Commercial and Industrial Noise) Policy 2023* (SA)					
	Proposed outcome	PO14: The Tenement Holder must ensure that there are no nuisance impacts on sensitive receptors from noise or vibration (from blasting) generated by the Project					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM13	Number of noise complaints recorded in an IMS	TL	All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner	As required (based on complaints)	IMS
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI08	Review of IMS shows progress of complaint investigation	TL	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days after complaint	IMS

7.9. Air quality

An overview of air quality impact assessment including Greenhouse Gas emissions is described within this Section. For a more detailed discussion on baseline information please refer to Appendix B1 *Air Quality Baseline Assessment* (Lathwida, 2022). For detailed impact assessment, please refer to Appendix C1 *Air Quality Impact Assessment* (Katestone, 2024), and Appendix C8 *Greenhouse Gas Impact Assessment* (Greenbase, 2024).

This Section describes how the Project may impact on air quality values and presents measures that will, when implemented, minimise those impacts. It will also describe Greenhouse Gas emissions and associated reporting requirements.

7.9.1. Context

7.9.1.1. Air Quality

The existing ambient air quality of the Project area is typical of an arid environment, where evaporation greatly exceeds rainfall across all months, with hot summers and cool winters, in addition to dust storms and wildfires potentially occurring within the area, impacting air quality in the surroundings.

The scoping assessment tool (DEM, 2024) was used to determine the potential for adverse air quality impacts associated with the Project. The results showed the Project was assessed as Grade 1 with a potential high level of impact due to the scale of the clearing and the volume of material to be mined. As a result, an air quality impact assessment (AQIA) including dispersion modelling has been undertaken by Katestone (2024) on behalf of MGT (refer Appendix C1).

There is a lack of human emissions sources within proximity to the Project Area, with no industrial activities (with the exception of minor emissions from the proponent's occasional exploration activities such as drilling, stockpiling, vehicle movements and unpaved roads) in the vicinity of the Project. Local pastoral activities, including associated road travel are the main source of local anthropogenic emissions with minor combustion product emissions from vehicle and stationary energy, all of which are considered negligible. Additionally, traffic along existing roads near the HR and TL will also be a source of anthropogenic emissions, albeit on a small scale.

The only pollutants likely to have baseline concentrations or deposition rates greater than zero in the Project Area are the ones related to particulate matter. All other baseline pollutant concentrations can be assumed to be not present due to a lack of emissions sources.

For a detailed discussion of the existing air quality for the Project Area, refer to Section 3.14.

7.9.1.2. Greenhouse Gas

The National Greenhouse and Energy Reporting (NGER) scheme is a Commonwealth initiative to provide data and accounting in relation to Greenhouse Gas (GHG) emissions and energy consumption and production. Under the NGER scheme, corporations that exceed the corporate or facility thresholds need to report annually to the Clean Energy Regulator (CER). The controlling corporation (as defined in the NGER Act) of the Project is likely to be Razorback Iron and it is expected this company will have to include the GHG emissions, energy consumption and energy production from this project in the NGER report.

Safeguard mechanisms have been in place since 2016, introduced by the Australian Government under Section 22XS of the NGER Act. Responsible emitters for facilities that emit 100,000 tCO_2-e or more of scope 1 GHG are required to meet the Safeguard requirements. Greenhouse gases may be released resulting from the Project through land clearing, fuel consumption and electricity purchased. An assessment to estimate the GHG emissions from the Project was undertaken by Greenbase (2024).

7.9.2. Impact assessment

7.9.2.1. Air quality objectives

The primary pollutants of concern for the Project include TSP, PM_{10}, $PM_{2.5}$, and dust deposition. The ground level concentration criteria for each pollutant, as used in the air quality impact assessment, are those specified in the *Environment Protection (Air Quality) Policy 2016* (SA) (SA Air EPP), the *Environment Protection (Air) Policy 2019* (QLD), and DEM's Air quality assessment and monitoring guideline (2024) as detailed in Table 7-41.

Table 7-41: Ground level concentration criteria specified in the Air EPP, adopted for the Air Quality Impact Assessment

Pollutant	Classification	Averaging Time	Maximum concentration (µg/m³)	Source
PM_{10}	Toxicity	24 hours	50	SA Air EPP
		Annual	25	*National Environment Protection Council (NEPC) National Environmental Protection (Air Quality) Measure 2021* (AAQ NEPM)
$PM_{2.5}$	Toxicity	24 hours	25 (50)	SA Air EPP (AAQ NEMP)
		Annual	8 (7)	SA Air EPP (AAQ NEMP)
TSP	Health and wellbeing	1-year	90	QLD EPP Air[1]
Dust deposition[2]	Amenity guideline	Monthly	4g/m²/month and/or no greater than 2g/m²/month	DEM Guideline: Air quality assessment and monitoring

[1] IN THE ABSENCE OF LOCAL OR NATIONAL GUIDANCE THE QUEENSLAND CRITERIA FOR TSP IS REFERENCED
[2] FOR TOTAL INSOLUBLE SOLIDS

7.9.2.2. Modelling methodology

The AQIA (Katestone, 2024) assessed potential impacts of primary pollutants during construction, operation and decommissioning of the Project, by modelling predicted changes in air quality under different construction and operational scenarios resulting from the Project. The modelling utilised the CALPUFF (Version 7.2.1) advanced non-steady state air quality dispersion model, the industry standard and regulated model developed by Earth Tech, Inc.

The meteorological data generated by TAPM/CALMET models (refer to Section 3.14) was used as input for CALPUFF to include all weather conditions likely to be experienced in the region during a typical year. This system has been used to predict ground-level particulate concentrations and dust deposition rates at sensitive receptor locations (including residences and ecological receptors) near the Project, and across a cartesian grid representing the Study Area.

The dispersion model has been configured with conservative assumptions and, therefore, the assessment is likely to overpredict potential impacts of the Project.

7.9.2.3. Emission sources

Emissions sources considered within modelled scenarios included:

- Mining: Pit activities such as drilling, blasting, bulldozing of waste and ore, excavating, truck loading and truck dumping.
- Processing plant activities including grinding, crushing, screening and transferring materials.

    - Hauling of materials within the Site.
    - Wind erosion from TSF, stockpiles and exposed areas.
- Hillgrange haul and access road corridor vehicle movements.
- Hillgrange Siding Area train loadout activities primarily relating to stockpiling materials, wind erosion, and material transfers.

7.9.2.4. Operational scenarios

Four operational mining scenarios were selected to provide a representative range of possible impacts for sensitive receptors at different stages of the mine's progression. The scenarios were selected based on the highest annual snapshots of overburden and ore extraction volumes for each mine stage. The mine is generally split into the Iron Peak pit in the east, followed by the Razorback pit split into three stages (central, west, and east/east extension). Although certain years were selected to represent the worst-case from a specific pit Section, these scenarios also invariably include contributions from other areas of the mine occurring alongside the worst-case Section:

- year 5: reflects worst-case contributions from mining of the Iron Peak pit. Emissions from this scenario are from operations exclusively occurring in the Iron Peak pit.
- year 30: reflects worst-case contributions from mining of the central Razorback pit. Emissions from this scenario also include some contribution from activities in the east pit.
- year 53: reflects worst-case contributions from mining of the western Razorback pit. Emissions from this scenario also include some contribution from activities in the east extension pit.
- year 55: reflects worst-case contributions from mining of the eastern Razorback pit. Emissions from this scenario also include some contribution from activities in the east extension pit.

Year 5 and year 30 scenarios represent the current anticipated LOM, while year 53 and year 55 scenarios represent the feasible mine plan of 56 years.

Additionally, the following scenarios were selected to assess the air quality impacts of the RS along the HR corridor:

- one scenario for train loadout (Hillgrange Siding area)
- four scenarios corresponding to the selected worst-case mining year scenarios for the external haul from the ML to the train loadout siding (Hillgrange HR corridor). These scenarios provide a worst-case indication of possible impacts arising from hauling along the Hillgrange HR corridor.

7.9.2.5. Construction dust

The Institute of Air Quality Management (IAQM) has published a risk assessment methodology titled *Guidance on the assessment of dust from demolition and construction* (IAQM Methodology) (Holman et al, 2014). The potential impacts of dust emissions during construction of the TL and the new train load-out siding and mine infrastructure have been addressed using this IAQM Methodology. This is appropriate due to the temporary nature of the proposed construction activities, and well-established mitigation measures that can be applied to minimise potential dust emissions.

The construction phase air quality risk assessment concluded that after application of identified mitigation measures, the residual risk of dust emissions from the Project's construction phase will be 'not significant' for sensitive receptors and ecologically sensitive areas (Katestone, 2024).

7.9.2.6. Operational dust

The results for operational predicted ground-level concentrations and dust deposition inclusive of mitigation measures indicates that all mining scenarios (year 5, year 20, year 53 and year 55) comply with all criteria, with the exception of a single receptor (Old Manunda Homestead), where ground-level concentrations of PM_{10} are predicted to show minor exceedances at year 5 (Refer Figure 7-8). Analysis of the exceedances indicated that:

- Exceedances are predicted for nine nights in the year which coincide with lower than average wind speeds predominantly blowing from the south towards Old Manunda Homestead.
- The primary source contributing to ground-level concentrations of PM_{10} are from the Iron Peak overburden haulage from the Iron Peak pit to the Iron Peak waste dump.
- Application of additional mitigation involving application of chemical suppressants alongside standard watering to the over burden route during these nine night is predicted to result in compliance at the Old Manunda receptor.

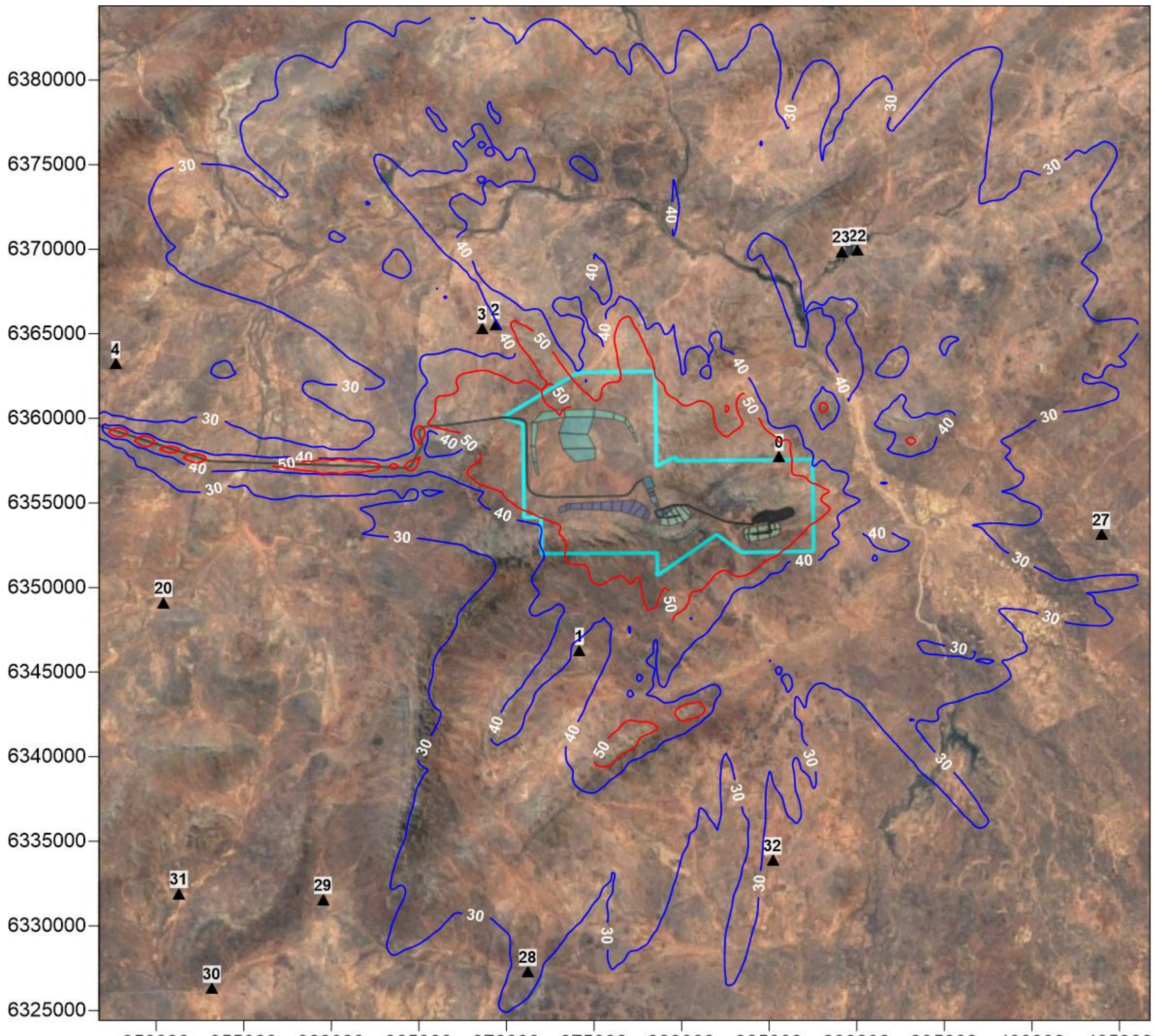

Plate 11 Predicted cumulative 24-hour maximum ground-level concentrations of PM10 – Year 5 (blue contours)

Location: SA	**Averaging period:** 24-hour	**Data source:** CALPUFF	**Units:** µg/m^3
Type: Contour plot	**Objective:** 50 µg/m^3 (red contour)	**Prepared by:** Daniel Gallagher	**Date:** 7 December 2023

Figure 7-8: Air quality contour plot showing exceedance of objective at Old Manunda Station (prior to mitigation)

7.9.2.7. Ecological Impacts

The development and operation of the Project will result in an increase in dust due to land clearing, topsoil stockpiling, mining operations in open pits and vehicle movements. Increases in dust in the atmosphere has the potential to result in adverse effects on vegetation through smothering the plant and inhibiting their ability to photosynthesize which may result in reduced plant growth or causing death to existing vegetation.

The Project is not expected to result in significant impacts on flora and fauna in the context of possible air quality impacts arising from emissions of dust and particulate matter. The modelling shows that dust deposition is not sufficient to result in significant impacts including at the most sensitive receptors (e.g., adjacent to the edge of the HR in the TEC, and at the boundary of Site and Pualco Range CP). Before allowing for natural reductions in dust accumulation on flora by wind/rain/dew/plant movement, the model predicted change in dust deposition was below levels assessed by Doley and Rossato (2010) which resulted in <7% reduction in photosynthesis and <1% reduction in plant productivity. This, together with other studies examining dust impacts from mining on vegetation (NSW Minerals Council, 2000 and Lodge et al., 1981), suggests that there will be no significant difference in the fecundity of vegetation within the MBC TEC or Pualco Range CP. The same outcome can be extended to agricultural grass land surrounding the Project Area with impacts likely to be even less given greater separation distances from mining than either the MBC TEC or Pualco Range CP.

Before allowing for natural reductions in dust accumulation on flora by wind/rain/dew/plant movement, the model predicted change in dust deposition was below levels assessed by UWS (Connell Hatch, 2008) when examining the effects of coal dust on cattle productivity and palatability of feed. This indicates that a decrease in palatability of the surrounding farmland for grazing animals and flora within the MBC TEC and Pualco Range CP for other fauna is unlikely.

MNES and the Pualco Range CP are expected to be sufficiently resilient to recover from any air quality related impacts due to the Project. Meanwhile, impacts on useability of surrounding grazing land are expected to be low.

7.9.2.8. Greenhouse gasses

Greenhouse gas emissions will initially be generated during the construction of the site infrastructure, roads, accommodation camps, TSF, and electricity transmission infrastructure. During the operational phase, emissions will result from the mining, onsite processing and transportation via HR and rail to the seaport. Greenhouse gas emissions will also occur during the closure and rehabilitation phase as part of the site decommissioning and rehabilitation.

Scope 1 emissions are direct emissions from sources within the boundary of the facility or organisation, e.g. fuel combusted on site. The significant sources of scope 1 emissions resulting from the activities identified from the project are as follows:

- Diesel combustion by the construction fleet, mining fleet, and rehabilitation fleet. This includes diesel combustion for electricity purposes during the construction and rehabilitation phases.
- Land clearing (loss of sequestration potential).

Scope 2 GHG emissions are indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation. The scope 2 emissions at the project are comprised of emissions associated with the purchasing of electricity from the SA grid.

FUEL CONSUMPTION (SCOPE 1 EMISSIONS)

Fuel consumption for electricity purposes was estimated based on the assumption that the electricity requirement for the construction phase was 10,000 MWh per year, and 5,000 MWh per year for the rehabilitation phase. For the operational phase, it has been assumed that diesel consumption would increase gradually during the first two years of the mining phase to account for the ramp-up of mining activities. For simplicity, it was assumed that no equipment would be road-registered and therefore non-transport emission factors were used. Diesel was estimated at reaching 1,068,518 tCO_2-e in emissions over the LOM.

LAND CLEARING (SCOPE 1 EMISSIONS)

Emissions associated with land clearing were calculated using the Full Carbon Accounting Model (FullCAM) guidelines produced by the DCCEEW. Emissions were calculated by determining the carbon mass (tonnes of carbon per hectare) of the cleared vegetation, multiplying it by the cleared area (ha), and converting the resulting carbon mass (tonnes of carbon) to CO_2-e emissions. The ‘cleared area’ was calculated using a project footprint that was subsequently reduced by approximately 270 ha, and which also assumed complete clearing of a 20 m buffer (for construction works) around the project footprint. The actual area of land to be cleared will hence be less than that used for this calculation of emissions associated with land clearing. Hence the calculations are likely to overestimate the emissions. The carbon mass (tonnes of carbon per hectare) was calculated using the project location (latitude/longitude coordinates) and taking consideration of the vegetation type of the area. The maximum carbon mass of vegetation per hectare and the associated forest debris carbon mass per hectare have been utilised in the calculations. Other baseline settings used in the FullCAM calculations were set up in accordance with the FullCAM Guidelines (Greenbase, 2024).

ELECTRICITY (SCOPE 2 EMISSIONS)

Greenhouse gas emission estimates from grid electricity have been prepared using methods from the *National Greenhouse and Energy Reporting (Measurement) Determination 2008 (*NGER Determination).

It was assumed that all electricity required for processing would be sourced from the SA grid, and these emissions estimates were therefore based on the SA grid factor using the location-based methodology. It was also assumed that the electricity purchased would increase gradually during the first two years of the mining phase to account for the ramp-up of mining activities.

The GHG emissions summary for the Project is shown in Table 7-42. With forecast Scope 1 GHG emissions of 34,186 tCO_2-e, the Project is not likely to exceed the default baseline of 100,000 tCO_2-e.

Table 7-42: GHG emissions summary

Scope	Total GHG Emissions (tCO_2-e)
Scope 1 (Fuel usage)	1,068,518
Scope 1 (Land clearing)	401,484
Scope 2	5,556,620
Total Scope 1 and Scope 2 emissions	**7,026,622**

7.9.2.9. Potential Impact events

An air quality impact assessment has been undertaken for the proposed Razorback Iron Ore Project. The potential impact events, and respective areas (ML and MPLs) are listed in Table 7-43 and are further analysed within Table 7-47.

Table 7-43: Air quality potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI45	Impacts from emissions of dust and particulate matter *during construction* on human and ecological sensitive receptors. These may include human health risks from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity	No	C	C	C
PI46	Operational project activities causing emissions of airborne dust and particulate matter, which may migrate to locations of human sensitive receptors resulting in nuisance (amenity) impacts, and health impacts due to inhalable/respirable particulates	Yes	O	O	
PI47	Mining activities causing emissions of dust and particulate matter which may migrate to locations containing ecologically sensitive flora or fauna	Yes	O	O	O
PI48	Mining activities causing emissions of dust and particulate matter which may migrate to locations containing livestock, causing feed deterrence	Yes	O	O	O
PI49	Impacts from emissions of dust and particulate matter *during closure* on human and ecological sensitive receptors. These may include human health risks (public) from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity	No	R	R	R
PI50	Presence of mining in the region provides a new source of combustion pollutants including NOx, SOx, CO and particulates. Impacts would relate to excessive exposures to these combustion pollutants. Severity of impact will depend on the level and duration of exposure and the sensitivity of the subject, in this case, human receptors and flora and fauna	No	C, O, R	C, O, R	C, O, R
PI51	Odour emissions from waste streams and vehicle exhaust/fuel fumes resulting in health and amenity impacts at locations of human sensitive receptors, and impacts on native fauna	No	C, O, R	C, O, R	C, O, R
PI52	Combustion of fossil fuels releases GHG to the atmosphere that contribute to GHG emissions impacting the ability to achieve National greenhouse gas targets	No	C, O, R	C, O, R	C, O, R

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some air quality impacts are more appropriately discussed in other Sections of this report. Instances of cross-referenced impacts are shown in Table 7-44.

Table 7-44: Air quality impacts cross reference

Potential impact	Refer to	Cross reference
Land clearance for the Project results in loss of topsoil / subsoil resources that would otherwise be used for rehabilitation	PI12	Section 7.4

7.9.3. Design, control, and management strategies

Air quality design, control, and management strategies are listed in Table 7-45 and referenced against the potential impact events in Table 7-47. The Project will endeavour to minimise air quality impacts on human and ecologically sensitive areas through the implementation of air quality management and mitigation practices, and by placing an emphasis on avoiding direct impacts on ecologically significant areas where possible.

Table 7-45: Air quality mitigation measures

Reference ID	Design, control and management measure
MM49	Treated wastewater from the WWTP may be recycled for dust suppression (roads and other surfaces), rehabilitation irrigation and other purposes subject to relevant statutory requirements
MM78	Engineered dust control solutions (e.g. suppression systems, enclosed shuts, bag filters and other) at dry material loading, transfer and handling locations, where practicable
MM79	Cover and/or appropriately store materials prone to erosion, including dust-prone transport bulk cargo
MM80	Implementation of a Dust Management Plan and CEMPs
MM81	Minimise material drop heights from earthmoving equipment, loading shovels and other equipment in open air settings
MM100	Use of water carts on unpaved roads to minimise wheel-generated dust. Use of chemical dust-suppressants considered on an as needs basis.

7.9.4. Draft outcomes, measurement criteria and leading indicators

The draft air quality proposed outcomes are presented in Table 7-46. The proposed outcome, measurement criteria and leading indicators are presented in the context of the impact assessment for potential impact events within Table 7-47.

Table 7-46: Air quality proposed outcomes

Reference ID	Proposed outcome
PO15	The Tenement Holder must ensure dust and particulate emissions do not adversely affect public health, amenity or land use
PO16	The Tenement Holder must ensure there are no sustained, adverse impacts from dust at ecologically sensitive locations

Table 7-47: Air quality potential impacts

	Impact ID	PI45			Phase	Construction
Potential impact event	Potential impact description	Impacts from emissions of dust and particulate matter on human and ecological sensitive receptors. These may include human health risks from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity				
	Source	Project - Dust from construction activities (e.g. land clearing, excavation, materials handling and wind erosion of cleared areas)				
	Pathway	Air				
	Receptor	Public - health and amenity, flora and fauna				
	Inherent design controls	The IAQM Guideline utilised in the assessment exclusively considers potential impacts with industry standard mitigation measures being implemented. These mitigation measures are considered to be industry standards and so are considered to be inherent design controls for the purpose of this risk assessment				
	Uncertainty/ knowledge gaps/ assumptions	Inputs	B	Justification	Specific dispersion modelling for construction phase has not been conducted, therefore, characterisation of impacts rely on standardised expectations of emissions intensities based on the IAQM methodology and professional expectations. Values used to determine these emissions impacts within the IAQM methodology rely on whole product totals (all material moved, total building sizes etc.) and so do not consider temporal changes in impacts of spatial variation as construction activities move within a total construction area. This relies on the expertise of the person performing the risk assessment to appropriately consider.	
		Method and model	A	Justification	The IAQM is an industry standard methodology for construction dust risk assessments and is suitable for the types of construction involved in preparing a mine site (e.g. construction of roads, worker accommodation, processing plants). As part of the risk assessment existing ambient air quality for PM_{10} is considered to provide an account of potential cumulative impacts. All nearby sensitive receptors were also considered regarding their separation distance to areas of construction and how this may influence their sensitivity.	
	Sensitivity analysis	Sensitivity	A	Justification	Given the separation distances between construction activities and sensitive receptors changes to construction intensities are not likely to change the analysis outcomes.	
	S--P-R linkage	No	Justification	Assessment against IAQM Guideline showed insufficient risk of air quality impacts relating to construction activities.		
	If no S-P-R linkage then do not continue further					

	Impact ID	**PI46**		**Phase**	**Operations**
Potential impact event	**Potential impact description**	Project activities causing emissions of airborne dust and particulate matter, which may migrate to locations of human sensitive receptors resulting in nuisance (amenity) impacts, and health impacts due to inhalable/respirable particulates			
	Source	Project - Dust from mining activities, e.g. blasting and excavation, materials handling and processing, haulage and erosion of cleared areas.			
	Pathway	Air			
	Receptor	Public - health and amenity			
	Inherent design controls	Factory standard dust control features of processing equipment, enclosures, material moisture contents, and separation distances between sources and receptors			
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	List of dust sources / equipment is indicative. Some (worst-case) assumptions made relating to quantity and location of equipment/operations.
		Method and model	A	**Justification**	The methodology adopted by the air quality impact assessment is in accordance with all industry standard procedures and meets the requirements of relevant SA legislation and guidelines relating to air quality assessments. The knowledge is robust regarding human health impacts.
	Sensitivity analysis	**Sensitivity**	B	**Justification**	The results at sensitive receptors may vary dependent on the input data such as baseline levels of air quality, meteorology and dust generation by the Project. Inputs utilised in dispersion modelling to determine the impacts of the Project's operation have been deliberately selected to represent conservative worst-case impacts. Demonstration of compliance under these circumstances provides a robust indication of compliance under all likely mining scenarios for the Project. Assuming worst-case operations will likely result in overpredicted impacts and account for inherent uncertainties with computational dispersion modelling. The outcome is only sensitive to the extent that variation inputs is expected to reduce (not increase) potential impacts.
	S--P-R linkage	Yes	**Justification**	Air quality modelling shows an expected increase in airborne dust and particulates at some receptor sites as a result of the Project.	
	If no S-P-R linkage then do not continue further				
	Description of likely impact	Mining activities causing emissions of dust and particulate matter which may migrate to locations of human sensitive receptors. Impacts may include human health risks from inhalable/respirable particulates and amenity concerns from deposited dust			

		Raw risk (pre controls)			Physical controls and management controls	Residual risk (post controls)		
		C	**L**	**Risk**		**C**	**L**	**Risk**
Risk assessment and design/ management controls	**Risk Assessment**	2	A	High	MM49: Treated wastewater from the WWTP may be recycled for dust suppression, rehabilitation irrigation and other purposes subject to relevant statutory requirements MM78: Engineered dust control solutions (e.g. suppression systems, enclosed shuts, bag filters and other) at dry material loading, transfer and handling locations, where practicable MM79: Cover and/or appropriately store materials prone to erosion, including dust-prone transport bulk cargo MM80: Implementation of a Dust Management Plan and CEMPs MM81: Minimise material drop heights from earthmoving equipment, loading shovels and other equipment in open air settings MM100: Use of water carts on unpaved roads to minimise wheel-generated dust. Use of chemical dust-suppressants considered on an as needs basis	1	D	Low
	Uncertainty	**Inputs, method and model**	B	**Justification**	Mitigation measures are derived from industry standard publications for air quality as they relate to mining. The degree to which dust emissions will be controlled by the mitigation measures cannot be accurately determined due to site-specific considerations.			
	Sensitivity analysis	**Sensitivity**	B	**Justification**	The amount of dust experienced by sensitive receptors will vary dependent on the effectiveness of the mitigation measures and variations in actual site ambient air pollutant background concentrations.			
Statement of proposed outcomes	**Legislative requirement**	*Environment Protection (Air Quality) Policy 2016 (SA)* *National Environment Protection Council (NEPC) National Environmental Protection (Air Quality) Measure 2021* MG42: Air quality assessment and monitoring						
	Proposed outcome	PO15: The Tenement Holder must ensure dust and particulate emissions do not adversely affect public health, amenity or land use						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**	
		OM30	Resolution of dust complaints via IMS	ML/HR	No un-resolved non-vexatious complaints from local landholder regarding dust	Annual	Air Quality Management Plan	

		OM31	Measured through dust deposition monitoring	ML/HR	Dust deposition monitoring shows dust deposition does not exceed best-practice guidance limits (as per AS/NZS 3580.10.1:2003) where the increase can be attributed wholly or partly to project activities	As per Air Quality Management Plan	Air Quality Management Plan Control sites
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI08	Review of IMS shows progress of complaint investigation	ML/HR	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI47</td><td>Phase</td><td colspan="3">Operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="8">Mining activities causing emissions of dust and particulate matter which may migrate to locations containing ecologically sensitive flora or fauna</td></tr>
<tr><td>Source</td><td colspan="8">Project - Dust from mining activities, e.g. blasting and excavation, materials handling and processing, haulage and erosion of cleared areas.</td></tr>
<tr><td>Pathway</td><td colspan="8">Air</td></tr>
<tr><td>Receptor</td><td colspan="8">Protected flora and fauna (TEC under EPBC Act and protected areas (such as Pualco Range CP))</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">Factory standard dust control features of processing equipment, enclosures, material moisture contents, and separation distances between sources and receptors</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">List of dust sources / equipment is indicative. Some (worst-case) assumptions made relating to quantity and location of equipment/operations.</td></tr>
<tr><td>Method and model</td><td>B</td><td>Justification</td><td colspan="5">There is no standard methodology for determining impacts on flora and fauna from air emissions. Multiple resources were considered including academic and industry publications, the EPBC Act and Mining Act. Knowledge regarding ecological impacts from dust and particulate emissions is not definitive.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="5">Existing knowledge presented within the report supports that predicted impacts are unlikely to be sensitive to change given the worst-case assumptions adopted by the assessment and apparent resilience of ecological communities to dust.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Air quality modelling shows an expected increase in airborne dust and particulates at some ecologically sensitive areas.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td rowspan="4">Risk assessment and design/ management controls</td><td>Description of likely impact</td><td colspan="8">Mining activities causing emissions of dust and particulate matter which may migrate to locations containing ecologically sensitive flora or fauna</td></tr>
<tr><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td><td></td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td><td></td></tr>
<tr><td>1</td><td>A</td><td>High</td><td>MM78: Engineered dust control solutions (e.g. suppression systems, enclosed shuts, bag filters and other) at dry material loading, transfer and handling locations, where practicable
MM79: Cover and/or appropriately store materials prone to erosion, including dust-prone transport bulk cargo
MM80: Implementation of a Dust Management Plan and CEMPs
MM81: Minimise material drop heights from earthmoving equipment, loading shovels and other equipment in open air settings</td><td>1</td><td>B</td><td>Moderate</td><td></td></tr>
</table>

					MM100: Use of water carts on unpaved roads to minimise wheel-generated dust. Use of chemical dust-suppressants considered on an as needs basis		
	Uncertainty	**Inputs, method and model**	B	**Justification**	The degree to which dust emissions will be controlled by the mitigation measures cannot be accurately determined due to site-specific considerations. Reaction of fauna species to mitigation measures is unknown		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	The amount of dust experienced by ecological receptors will vary dependent on the effectiveness of the mitigation measures and variations in actual site ambient air pollutant background concentrations		
Statement of proposed outcomes	**Legislative requirement**	EPBC Act NPW Act					
	Proposed outcome	PO16: The Tenement Holder must ensure there are no sustained, adverse impacts from dust at ecologically sensitive locations					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM05	Vegetation health survey (including aspects such as plant mortality and fecundity)	Project Area	Annual vegetation health survey shows no appreciable difference in mortality when compared to a control site	Annually	Control sites
		OM08	Fauna surveys (including aspects such as diversity and abundance)	Project Area	Annual fauna surveys demonstrate there is no sustained decrease in native fauna diversity or abundance when compared to control sites	Annually	Control sites
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI09	Dust accumulation in ecologically sensitive areas and apparent floral health through dust monitoring (as per AQMP)	Project Area	Routine dust monitoring shows dust deposition is consistent with that at control sites	As per Air Quality Management Plan	Control sites

	Impact ID	**PI48**				**Phase**	**Operations**	
Potential impact event	**Potential impact description**	Mining activities causing emissions of dust and particulate matter which may migrate to locations containing livestock, causing feed deterrence						
	Source	Project - Dust from mining activities, e.g. blasting and excavation, materials handling and processing, haulage and erosion of cleared areas						
	Pathway	Air						
	Receptor	Livestock						
	Inherent design controls	Factory standard dust control features of processing equipment, enclosures, material moisture contents, and separation distances between sources and receptors						
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	List of dust sources / equipment is indicative. Some (worst-case) assumptions made relating to quantity and location of equipment/operations.			
		Method and model	B	**Justification**	There is no standard methodology for determining impacts on livestock from air emissions. Multiple resources were considered including academic and industry publications. Knowledge regarding impacts from dust and particulate emissions on livestock is not definitive.			
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Existing knowledge presented within the report supports that predicted impacts are unlikely to be sensitive to change given the worst-case assumptions adopted by the assessment and apparent resilience of ecological communities to dust.			
	S--P-R linkage	Yes	**Justification**	Air quality modelling shows an expected increase in airborne dust and particulates in areas where livestock are present that will persist throughout operation.				
	If no S-P-R linkage then do not continue further							
	Description of likely impact	Mining activities causing emissions of dust and particulate matter which may migrate to locations containing livestock. Impacts may include dust soiling of groundcover and feed deterrence for livestock						
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		1	A	High	MM78: Engineered dust control solutions (e.g. suppression systems, enclosed shuts, bag filters and other) at dry material loading, transfer and handling locations, where practicable MM79: Cover and/or appropriately store materials prone to erosion, including dust-prone transport bulk cargo MM80: Implementation of a Dust Management Plan and CEMPs	1	B	Moderate

					MM81: Minimise material drop heights from earthmoving equipment, loading shovels and other equipment in open air settings MM100: Use of water carts on unpaved roads to minimise wheel-generated dust. Use of chemical dust-suppressants considered on an as needs basis		
	Uncertainty	**Inputs, method and model**	B	**Justification**	Mitigation measures are derived from industry standard publications for air quality as they relate to mining. The degree to which dust emissions will be controlled by the mitigation measures cannot be accurately determined due to site-specific considerations.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	The amount of dust experienced by livestock receptors will vary dependent on the effectiveness of the mitigation measures and variations in actual site ambient air pollutant background concentrations.		
Statement of proposed outcomes	**Legislative requirement**	EP Act					
	Proposed outcome	PO15: The Tenement Holder must ensure dust and particulate emissions do not adversely affect public health, amenity or land use					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM32	Number of dust complaints recorded in an IMS	Project Area	Complaints related to dust impacts on stock feed are investigated and found to be unrelated to mining activities	As required (based on complaints)	IMS
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI09	Dust accumulation in ecologically sensitive areas and apparent floral health through dust monitoring, as per AQMP	Project Area	Routine dust monitoring shows dust deposition is consistent with modelling predictions	As per Air Quality Management Plan	Control sites

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI49</td><td>Phase</td><td>Closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Impacts from emissions of dust and particulate matter on human and ecological sensitive receptors. These may include human health risks (public) from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity</td></tr>
<tr><td>Source</td><td colspan="5">Project - Dust emissions during rehabilitation earthworks and infrastructure removal</td></tr>
<tr><td>Pathway</td><td colspan="5">Air</td></tr>
<tr><td>Receptor</td><td colspan="5">Public - health and amenity, flora and fauna</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">Factory standard dust control features of processing equipment, enclosures, material moisture contents and separation distances between sources and receptors</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">List of dust sources / equipment is indicative. Some (worst-case) assumptions made relating to quantity and location of equipment/operations.</td></tr>
<tr><td>Method and model</td><td>B</td><td>Justification</td><td colspan="2">There is no standard methodology for determining impacts on flora and fauna from air emissions. Multiple resources were considered including academic and industry publications, the EPBC Act and Mining Act. Knowledge regarding ecological impacts from dust and particulate emissions is not definitive.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="2">Existing knowledge presented within the report supports that predicted impacts are unlikely to be sensitive to change given the worst-case assumptions adopted by the assessment and apparent resilience of ecological communities to dust.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Ground-level concentrations of dust and particulates during decommissioning will comply with air quality criteria.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

	Impact ID	**PI50**		**Phase**	**Construction, operations and closure**
Potential impact event	**Potential impact description**	Presence of mining in the region provides a new source of combustion pollutants including NOx, SOx, CO and particulates. Impacts would relate to excessive exposures to these combustion pollutants. Severity of impact will depend on the level and duration of exposure and the sensitivity of the subject, in this case, human receptors and flora and fauna			
	Source	Project - Combustion emissions sources (e.g. fixed and mobile plant, vehicles, machinery and generators)			
	Pathway	Air			
	Receptor	Humans (public), flora and fauna			
	Inherent design controls	Combustion engine design standards			
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	C	**Justification**	Emissions are assumed to be small and localised mainly to individual vehicles and their operational routes. Emissions will be fleeting in nature and emitted to large open areas with good potential for dispersion. There are no other significant sources of these pollutants within the Project region and so there is no potential for cumulative impacts.
		Method and model	C	**Justification**	The impact has been assumed based on compliance with air quality for significantly more intensive operations. In Katestone's experience emissions from combustion during mining are not normally considered and are typically negligible in cases when they have been considered.
	Sensitivity analysis	**Sensitivity**	A	**Justification**	No impact is expected with a high degree of confidence.
	S--P-R linkage	No	**Justification**	Due to the large area of operations and the small, localised nature of emission sources (dilution effect) no impact is expected.	
	If no S-P-R linkage then do not continue further				

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI51</td><td>Phase</td><td>Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Odour emissions from waste streams and vehicle exhaust/fuel fumes resulting in health and amenity impacts at locations of human sensitive receptors, and impacts on native fauna</td></tr>
<tr><td>Source</td><td colspan="5">Project Combustion emissions, fuel storage, waste streams</td></tr>
<tr><td>Pathway</td><td colspan="5">Air</td></tr>
<tr><td>Receptor</td><td colspan="5">Humans (public), fauna</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">Separation distances between sources and receptors</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>C</td><td>Justification</td><td colspan="2">Odour is highly subjective with population density often being a factor in determining whether impacts will be likely. It is assumed given the large separation distances and sparsely populated areas that the small odour sources will be sufficiently dispersed to avoid impacts. Odour impacts for fauna is unknown. It is expected that standard hygiene practices, good waste management, and mitigation measures to be implemented during construction and operation, that any odorous sources would be effectively controlled.</td></tr>
<tr><td>Method and model</td><td>C</td><td>Justification</td><td colspan="2">The impact has been assumed based on compliance with air quality for significantly more intensive operations. Odours during mining are not normally considered and are typically negligible if considered.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="2">No impact is expected with a high degree of confidence.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Odour is unlikely to be a relevant concern for the Project due to dilution effect and distance to sensitive receptors.</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI52</td><td>Phase</td><td>Construction, operations and closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="5">Combustion of fossil fuels releases GHG to the atmosphere that contribute to GHG emissions impacting the ability to achieve National greenhouse gas targets</td></tr>
<tr><td>Source</td><td colspan="5">Project - Combustion emissions sources (e.g. fixed and mobile plant, vehicles, machinery and generators)</td></tr>
<tr><td>Pathway</td><td colspan="5">Air</td></tr>
<tr><td>Receptor</td><td colspan="5">National</td></tr>
<tr><td>Inherent design controls</td><td colspan="5">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="2">Some assumptions have been made regarding emission sources across LOM. Conservative estimates have been used.</td></tr>
<tr><td>Method and model</td><td>A</td><td>Justification</td><td colspan="2">Industry standard methods used.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="2">Whilst changes to assumptions may change the calculated annual scope of emissions, the current use of conservative estimates, and the significant gap between forecast GHG emissions and the Safeguard Mechanism threshold suggests there is unlikely to be a change to the S-P-R.</td></tr>
<tr><td>S--P-R linkage</td><td>No</td><td>Justification</td><td colspan="3">Forecast annual scope 1 GHG emissions (34,186 tCO2-e) are well below the Safeguard Mechanism threshold (100,000 tCO2-e).</td></tr>
<tr><td colspan="6">If no S-P-R linkage then do not continue further</td></tr>
</table>

7.10. Visual amenity

An overview of visual amenity impact assessment is described within this Section. For a more detailed discussion on the visual amenity values of the Project please refer to Section 3.13.

This Section describes how the Project may impact on visual amenity values and presents measures that will, when implemented, minimise those impacts.

7.10.1. Context

The Project is isolated from town and population centers, with the closest being Yunta (37 km north of the Site), with a population of 60 (Tetra Tech Coffey, 2024). Peterborough, with a population of 1,490, is located 85 km west of the Project and is considered the main town and administrative center in the Peterborough LGA (see Figure 1-1). The areas around the Project are sparsely populated and mainly include people living on rural properties, such as pastoral stations and farms.

Due to the remote location, and lack of recognised tourist attractions in proximity to the Site, the recreational use of the region surrounding the Project is likely to be very low. Whilst adjacent to Pualco Range CP, this park is closed to the public and hence it is not a sensitive receptor for visual amenity considerations. There is no visual connection between the Site and road users on the Barrier Highway, whilst the southern face of Razorback Ridge can be seen from Lilydale Road. The HR interfaces with rarely used public roads. The RS will be visible from the ARTC rail route; which is primarily a freight route, however it is also the route of the Indian Pacific train journey which is popular with tourists. With the exception of the Indian Pacific train, rail traffic is limited to cross country freight traffic with regional loading and off-loading points for minerals and other freight. As such, the occurrence of the RS and stockpiling will not be out of place or unexpected for the tourist train. It should be assumed that key visual amenity loss relating to the Site will only affect those residing or working on pastoral stations (particularly Old Manunda homestead due to it's proximity to the Project Area), or those members of the community who venture out into the region on smaller access tracks including Aboriginal community members, infrequent tourists and some local residents.

The length and location of the TL, i.e. within relatively flat countryside and amongst public roads, will result in changes in visual amenity for some regional residential inhabitants. The area of highest visibility, and potentially higher impact, will be confined to within 1 km of the TL, which includes 2 residences (Eurovale Outstation and Kia Ora).

7.10.2. Impact assessment

The Project will result in some key changes to the local landscape, primarily the removal of Razorback Ridge, the creation of two large open pits that will eventually become pit lakes, three waste rock landforms that will be battered and revegetated and a large TSF. Figure 7-9 and Figure 7-10 are indicative of how the Site will look at Mining Year 12 (end of Iron Peak mining) and Mining Year 38 (end of Razorback mining), respectively. Figure 4-74 represents how the Site will look at the completion of the closure phase.

Figure 4-65 shows how the RS will sit within the landscape. The development of the HR and TL will also result in visual changes on a landscape scale.

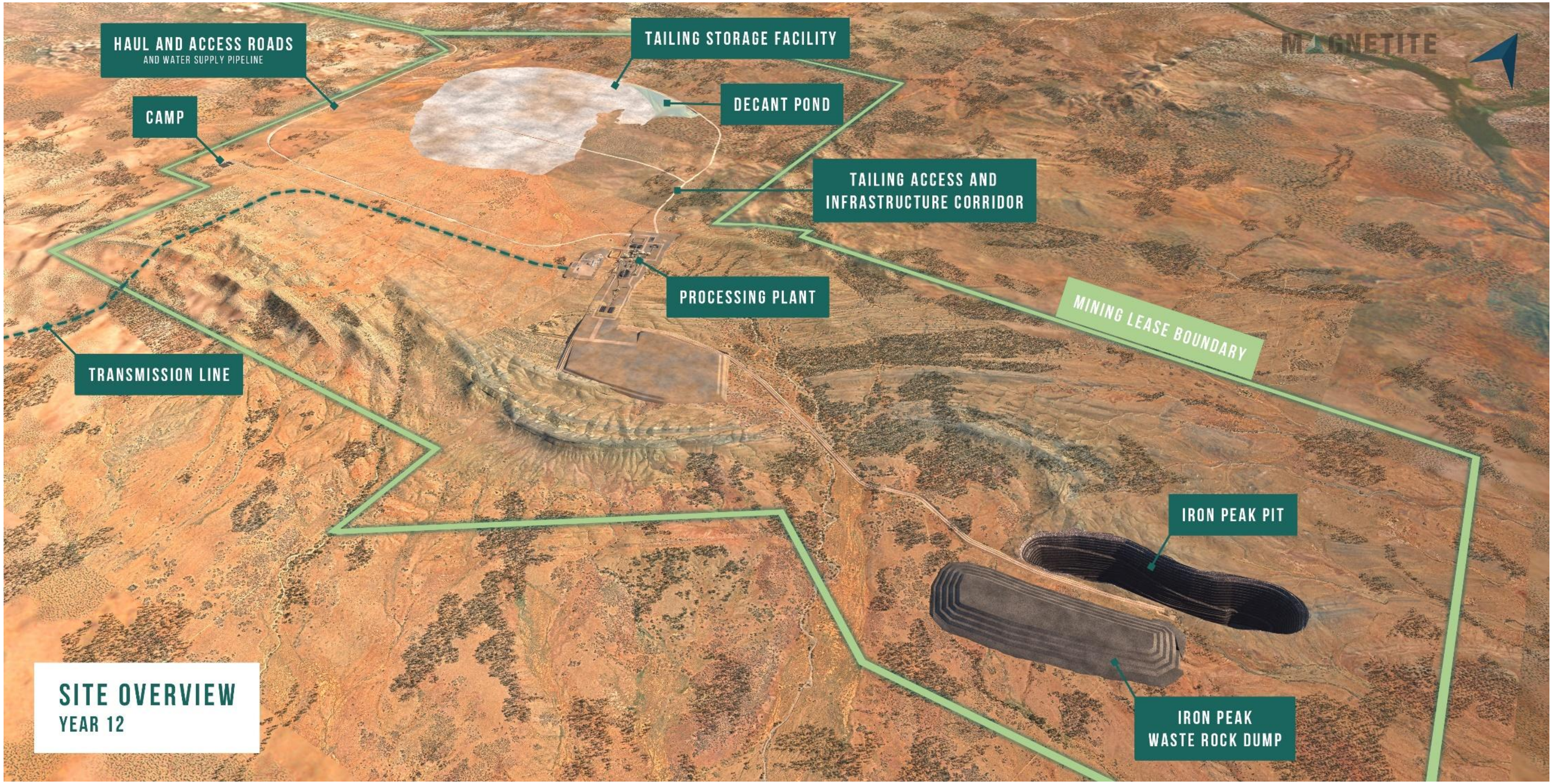

Figure 7-9: Site overview at Mining Year 12 (end of Iron Peak mining operations))

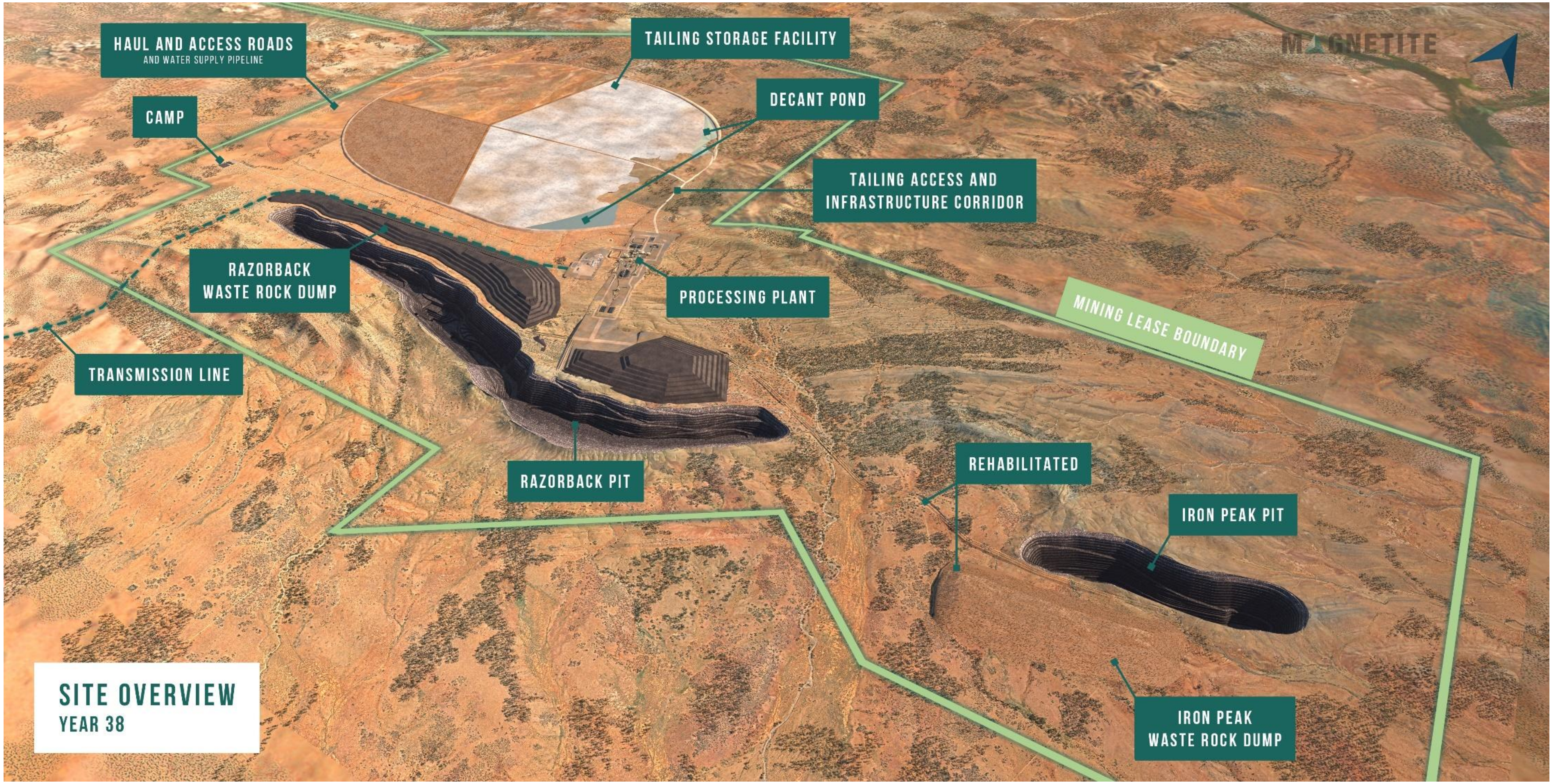

Figure 7-10: Site overview at Mining Year 38 (end of Razorback mining operations)

There are 21 properties in proximity to the Project Area that may have visual connection with the Project (i.e. within 5 km of the Project Area). Of the 26 properties identified, it is estimated that there are approximately 19 buildings with residential uses including:

- One homestead and one outstation on pastoral properties located near the Site (Tiverton Outstation / Dry Dam Hut and Old Manunda), both of which are not permanently occupied and are only occasionally occupied overnight. A further two homesteads within 5 km of the Stie, that have an unknown level of occupancy.
- Six residential use buildings that are located near the haulage access and rail loading facility, of which three are permanently occupied, one occasionally occupied overnight, and a further two have unknown levels of occupancy
- Nine residential use buildings located along the TL corridor, of which five are (or are assumed to be) permanently occupied, two occasionally used for overnight visitation, and a further two have unknown levels of occupancy

Potential impacts associated with the Project include loss of visual amenity to local landowners, road network users and Traditional owners through construction, operation and post closure due to mine infrastructure and altered landform. A summary of potential impact events is provided in Table 7-48 and further analysed in Table 7-51.

Table 7-48: Visual amenity potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI53	Installation of mining infrastructure, and active mining operations, results in adverse impacts to visual amenity	Yes	C, O	C, O	C, O
PI54	The post-mining landforms result in adverse impacts to visual amenity of the landscape	Yes	R	R	

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

There are no impacts discussed within other Sections of the report that relate to visual amenity.

7.10.3. Design, control and management strategies

The visual amenity design, control and management strategies are listed in Table 7-49 and referenced against potential impact events in Table 7-51.

Table 7-49: Visual amenity mitigation measures

Reference ID	Design, control and management measure
MM17	Progressive rehabilitation of post-mining landforms, where practicable
MM82	Mine infrastructure, form, contrasting and reflective aspects will be visually softened to blend into the surrounding landscape through the use of suitable colours and construction materials, where practicable
MM83	WRD will be constructed as designed as per design specifications
MM84	Design and siting of infrastructure to minimise visual impact, where practicable
MM85	Rehabilitation trials to inform strategy and method for rehabilitation of post-mining landforms
MM86	Design of post mining landform is consistent with that of the non-disturbed landscape where possible, e.g. gradient of TSF at closure will be similar to non-disturbed surrounding natural landform

7.10.4. Draft outcomes, measurement criteria and leading indicators

The draft visual amenity proposed outcome is presented in Table 7-50. The proposed outcome, measurement criteria and leading indicators (where applicable) are presented in the context of the impact assessment for potential impact events within Table 7-51.

Table 7-50: Visual amenity proposed outcomes

Reference ID	Proposed outcome
PO17	The Tenement Holder must ensure that during mining operations, landforms are integrated with surrounding landscape as far as reasonably practicable
PO18	The Tenement Holder must ensure that rehabilitated landforms are visually compatible with the surrounding landscape, as far as reasonably practicable and considerate of geotechnical stability requirements

Table 7-51: Visual amenity potential impacts

	Impact ID	**PI53**			**Phase**	**Construction and operations**	
Potential impact event	**Potential impact description**	Installation of mining infrastructure, and active mining operations, results in adverse impacts to visual amenity					
	Source	Project - Mine operations and infrastructure					
	Pathway	Land					
	Receptor	Local landowners, local road users, users of Pualco Range CP, traditional landowners					
	Inherent design controls	None					
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	Some assumptions on level of visual connectivity.		
		Method and model	A	**Justification**	Industry standard approach for remote locations with few sensitive receptors.		
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Low sensitivity to change due to remote location.		
	S--P-R linkage	Yes	**Justification**	The Project Area, and associated changes resulting from the Project will be visible for a select few nearby locations. Third-party sightlines to these locations are infrequent and transient.			
	If no S-P-R linkage then do not continue further						
	Description of likely impact	Loss of visual amenity to local landowners, road network users, users of Pualco Range CP and TOs due to the installation of mining infrastructure					
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		3	A	Very High	MM82: Mine infrastructure, form, contrasting and reflective aspects will be visually softened to blend into the surrounding landscape through the use of suitable colours and construction materials, where practicable MM83: WRD will be constructed as designed as per design specifications MM84: Design and siting of infrastructure to minimise visual impact	2	C	Moderate

	Uncertainty	**Inputs, method and model**	B	**Justification**	The extent to which the mine can be visually softened is unclear.		
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Low sensitivity to change due to small population size.		
Statement of proposed outcomes	**Legislative requirement**	None					
	Proposed outcome	PO17: The Tenement Holder must ensure that during mining operations, landforms are integrated with surrounding landscape as far as practicably possible					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM13	Number of complaints. Measured through IMS	Project Area	All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner	As required (based on complaints)	IMS
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI08	Review of IMS shows progress of complaint investigation	ML/HR	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI54</td><td>Phase</td><td colspan="3">Closure</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="7">The post-mining landforms result in adverse impacts to visual amenity of the landscape</td></tr>
<tr><td>Source</td><td colspan="7">Project - Altered landforms post-mining</td></tr>
<tr><td>Pathway</td><td colspan="7">Land</td></tr>
<tr><td>Receptor</td><td colspan="7">Local landowners, local road users, users of Pualco Range CP, traditional landowners</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">The final landform may change during LOM.</td></tr>
<tr><td>Method and model</td><td>C</td><td>Justification</td><td colspan="4">Informal approach.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="4">Low sensitivity to change as assumed permanent impact on visual amenity.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">The Project will result in permanent changes in visual amenity resulting from changes in landform including the loss of Razorback Ridge and Iron Peak, and presence of new post-mining landform features including the TSF, WRD and final void(s).</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="7">Altered landforms post mining cause a loss of visual amenity</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>A</td><td>Very High</td><td>MM17: Progressive rehabilitation of post-mining landforms, where practicable
MM85: Rehabilitation trials to inform strategy and method for rehabilitation of post-mining landforms
MM86: Design of post mining landform is consistent with that of the non-disturbed landscape where possible, e.g. gradient of TSF at closure will be similar to surrounding natural landforms.</td><td>2</td><td>C</td><td>Moderate</td></tr>
</table>

	Uncertainty	**Inputs, method and model**	B	**Justification**	Success of rehabilitation is uncertain. Final design of post mining landform is likely to change through LOM.			
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Low sensitivity to change.			
Statement of proposed outcomes	**Legislative requirement**	None						
	Proposed outcome	PO18: The Tenement Holder must ensure that rehabilitated landforms are visually compatible with the surrounding landscape, as far as reasonably practicable and considerate of geotechnical stability requirements						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM33	Implementation of visual amenity considerations in accordance with the RMP and MCP through an independent audit prior to mine closure		Project Area	Independent audit prior to mine closure demonstrates that visual amenity considerations for final landform design and rehabilitation have been implemented in accordance with the RMP	Once prior to mine closure	RMP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		None proposed						

7.11. Traffic

An overview of the traffic impact assessment is described within this Section. For a more detailed discussion on baseline information please refer to C6 *Traffic Impact Assessment* (CIRQA, 2024).

This Section describes how the Project may impact on existing traffic, and presents measures that will, when implemented, minimise those impacts.

7.11.1. Context

The Study Area of the traffic impact assessment incorporates the external traffic (road) catchment associated with the construction and operation of the mine, defined as Razorback to Port Augusta/Whyalla (via Barrier Highway, Horrocks Highway, Port Augusta Highway and Lincoln Highway) and Adelaide to the southeast (via the Barrier Highway and Horrocks Highway) (refer Section 3.12 and Figure 3-66).

Traffic volumes (both LV and HV) will be higher during the construction phase, with a decrease (compared to construction phase) during the operation e. The resulting increases in traffic generation and distribution are expected to generally be accommodated with minimal (and typically) negligible effects on the majority of the road network.

A HR will be constructed from the Site boundary to the west, to allow movement of product from the mine to a new train load-out siding adjacent the existing Hillgrange RS (located on the Crystal Brook Broken Hill railway line), where product will be moved from trucks to rail. The new HR will also provide connection to the Barrier Highway via Crocker and Rucioch Roads (both under the control and management of the DC of Peterborough) to provide a site access corridor for construction, personnel, and goods, noting that no product will be hauled beyond the RS or on the public road network.

7.11.1.1. Sensitive receptors

Sensitive receptors in context of the traffic impact assessment are those persons and communities who may be impacted by the additional traffic activity generated during the construction and/or operation of the project.

In addition to users of the subject road network, there may also be amenity impacts for local communities associated with townships located along the access routes.

CONSTRUCTION

The importation of plant, equipment and construction goods to the site will be via road freight. Current access provisions for the site are inadequate to accommodate the anticipated types and volumes of vehicles associated with construction. The construction phase will therefore commence from the Barrier Highway with the upgrade of Rucioch Road and Crocker Road, followed by (or concurrent to) construction of the dual purpose (private) haulage and access road. The intersection of Barrier Highway and Rucioch Road will be upgraded to provide separate left and right turn lanes on Barrier Highway, and Rucioch Road will be sealed on approach to the intersection. The Sections of Rucioch Road and Crocker Road required for access to/from the HR will also be regraded and widened to accommodate the additional movements. Note these upgrades do not require approval under the Mining Act, and are outside of the referred Project Area, but are included here for completeness.

During the early stages of construction (prior to completion of the HR), additional access is proposed to be provided between the Project Area and Yunta via Sturt Vale Road. The use of Sturt Vale Road will allow initial access as well as provide a secondary, emergency access for the site during operation.

Construction works are anticipated to be typically undertaken during the daytime. However, at times, '24/7' arrangements may be adopted where required for specific activities (such as concrete pours) or to mitigate schedule delays (if experienced).

OPERATION

Transport related activities (on the external road network) will generally result from the movement of staff, deliveries/supplies for the mine facility (including the accommodation camp) and maintenance requirements. Processed product from the Project will be transported 'internally' via the HR to the RS and then loaded into wagons for transport via rail. There will be no external transport of processed product via the public road network, albeit it is acknowledged that the HR will cross low volume, local roads (Crocker Road and Sawers Road), as well as existing access tracks on private property.

7.11.1.2. Traffic generation

Traffic generated throughout the construction and operation of the Project will vary, with periods of higher activity (i.e., during equipment mobilisation) and lower activity (i.e., during general operations). A summary of HV and LV traffic movement on an AADT basis is provided in Table 7-52.

Table 7-52: Average annual daily traffic volumes resulting from Project

Project Phase	Description	AADT volumes
Construction	Heavy equipment mobilisations to/from site	5
	Construction supply (HV)	50
	Bus coach (Peterborough/Razorback) (HV)	4
	Private vehicle access (LV)	13
OTL Construction	Heavy vehicle and light vehicle	20 (HV) and 15 (LV)
Operation	Supplies, deliveries and occasional maintenance (HV)	10
	Bus coach (Peterborough/Razorback) (HV)	3
	Private vehicles (LV)	7

7.11.2. Impact assessment

The Project will result in some key changes to the local traffic. A traffic impact assessment was undertaken to evaluate the road network associated with the Project during both the construction and operational phases. While some segments may experience significant percentage increase in traffic during construction, this is primarily due to the very low existing volumes on these roads.

Forecast operational traffic volumes are very low and will not significantly affect existing road conditions.

A discussion of the potential impacts is provided below.

7.11.2.1. Increased delays to local road users

The primary impacts will be associated with vehicles being driven to/from the construction and operational sites. Existing road users associated with this road network could potentially experience increased traffic volumes and increased delays/congestion.

7.11.2.2. Increased conflict risk

Higher traffic volumes increase conflict risks such as those related to overtaking, impacting road safety and leading to an increased likelihood of injuries.

7.11.2.3. Increased noise due to increase in traffic

In addition to affecting road users, traffic may also cause noise and amenity impacts on local communities located along the access routes.

A summary of potential traffic impact events is provided in Table 7-53 and further analysed in Table 7-57.

Table 7-53: Traffic potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI55	Increased delays to local road users during construction and operation	Yes	C, O	C, O	C, O
PI56	Increased conflict risk on the local road network due to additional traffic volumes (including heavy vehicle movements and increased exposure during overtaking)	Yes	C, O	C, O	C, O
PI57	Increased noise within local townships due to additional vehicle movements resulting in amenity impacts for local communities	Yes	C	C	C

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some traffic impacts are more appropriately discussed in other Sections of this report (i.e., ecology (relating to fauna strike risk)). Instances of cross-referenced impacts are shown in Table 7-54.

Table 7-54: Traffic impacts cross reference

Potential impact	Refer to	Cross reference
Injury or mortality of native fauna due to collision (strike) with Project vehicles/mobile plant, interaction with project infrastructure or entrapment in mining facilities (e.g. process plant, TSF, water dams)	PI04	Section 7.3
Presence of mining in the region provides a new source of combustion pollutants including NOx, SOx, CO and particulates. Impacts would relate to excessive exposures to these combustion pollutants. Severity of impact will depend on the level and duration of exposure and the sensitivity of the subject, in this case, human receptors and flora and fauna	PI50	Section 7.9
Combustion of fossil fuels releases GHG to the atmosphere that contribute to GHG emissions impacting the ability to achieve National greenhouse gas targets	PI52	Section 7.9

7.11.3. Design, control and management strategies

The traffic design, control and management strategies are listed in Table 7-55 and referenced to potential impact events in Table 7-57.

Table 7-55: Traffic mitigation measures

Reference ID	Design, control and management measure
MM70	Heavy vehicle movements at night through local townships during operations is minimised, as far as reasonably practicable
MM87	Where possible, avoid movement of over-size/over-mass vehicles during peak traffic periods to minimise delays to the public
MM88	Use of pilot vehicles for oversize vehicles
MM89	Road use expectations (i.e. adhere to road rules and conditions) included in personnel site inductions
MM90	Employee and contractor engagement procedures (including appropriately licenced drivers)

7.11.4. Draft outcomes, measurement criteria and leading indicators

The proposed traffic outcomes are presented in Table 7-56. The proposed outcome, measurement criteria and leading indicators (where applicable) are presented in the context of the impact assessment for potential impact events within Table 7-57.

Table 7-56: Traffic proposed outcomes

Reference ID	Proposed outcome
PO19	The Tenement Holder must ensure delays to local road users due to construction and operations traffic are minimised
PO20	The Tenement Holder must ensure there are no traffic accidents involving members of the public and mine-related traffic on local roads and at mine access points that could have been reasonably prevented by the tenement holder
PO21	The Tenement Holder must ensure that there are no nuisance impacts on sensitive receptors from noise or vibration generated by the Project

Table 7-57: Traffic potential impacts

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI55</td><td>Phase</td><td colspan="4">Construction and operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Increased delays to local road users during construction and operation</td></tr>
<tr><td>Source</td><td colspan="8">Project - Construction and operational traffic</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Local road users</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">Existing traffic data (volume, crash, road cross-section etc.) based on recorded / measured input sources. Forecast HV movements are based on assumed values (specific details of vehicle movements for the construction methodology and schedule was not available).</td></tr>
<tr><td>Method and model</td><td>B</td><td>Justification</td><td colspan="5">Some assumptions made in respect to the distribution of movements via key access routes.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="5">Sensitivity analysis assuming 50% less or 50% more (LV and HV) vehicle movements has negligible effect on the findings.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">There is a forecast local increase in heavy vehicles and light vehicles during construction and operation, and increased train movements during operation of the Project which may affect travel times in key locations.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Increased travel times to road users using the subject local road network</td></tr>
<tr><td rowspan="4">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td colspan="2" rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>2</td><td>C</td><td>Moderate</td><td colspan="2">MM87: Where possible, avoid movement of over-size/over-mass vehicles during peak traffic periods to minimise delays to the public
MM88: Use of pilot vehicles for oversize vehicles</td><td>1</td><td>C</td><td>Low</td></tr>
<tr><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="5">Uncertainty regarding flexibility to avoid movement of HV during peak periods</td></tr>
</table>

	Sensitivity analysis	**Sensitivity**	B	**Justification**	If HV movements during peak traffic is unavoidable it is still likely that there will be minimal effect on ability to achieve the outcome		
Statement of proposed outcomes	**Legislative requirement**	None					
	Proposed outcome	PO19: The Tenement Holder must ensure delays to local road users due to construction and operations traffic are minimised					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM13	Number of complaints. Measured through IMS	Project Area	All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner	As required (based on complaints)	IMS
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI08	Review of IMS shows progress of complaint investigation	Project Area	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI56</td><td>Phase</td><td colspan="3">Construction and operations</td></tr>
<tr><td rowspan="10">Potential impact event</td><td>Potential impact description</td><td colspan="8">Increased conflict risk on the local road network due to additional traffic volumes (including heavy vehicle movements and increased exposure during overtaking)</td></tr>
<tr><td>Source</td><td colspan="8">Project - Construction and operational traffic</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Local road users</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">Road/intersection and pavement design guidelines for new works</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">Existing traffic data (volume, crash, road cross-section etc.) based on recorded / measured input sources. Forecast future movements based on anticipated operational details.</td></tr>
<tr><td>Method and model</td><td>B</td><td>Justification</td><td colspan="5">Some assumptions made in respect to the distribution of movements via key access routes.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="5">Sensitivity analysis assuming 50% less or 50% more (LV and HV) vehicle movements has negligible effect on the findings.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">There is a forecast local increase in heavy vehicles and light vehicles during construction and operation, and increased train movements during operation of the Project which may affect conflict risk in key locations.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td></td><td>Description of likely impact</td><td colspan="8">Increased conflict risk on local road network increasing possibility of accidents</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>D</td><td>High</td><td colspan="2">MM87: Where possible, avoid movement of over-size/over-mass vehicles during peak traffic periods to minimise delays to the public
MM88: Use of pilot vehicles for oversize vehicles
MM89: Road use expectations (i.e. adhere to road rules and conditions) included in personnel site inductions
MM90: Employee and contractor engagement procedures (including appropriately licenced drivers)</td><td>4</td><td>E</td><td>Moderate</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>Uncertainty</td><td>Inputs, method and model</td><td>B</td><td>Justification</td><td colspan="3">Uncertainty regarding flexibility to avoid movement of HV during peak periods.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="3">If HV movements during peak traffic is unavoidable it is still likely that there will be minimal effect on ability to achieve the outcome.</td></tr>
<tr><td rowspan="9">Statement of proposed outcomes</td><td>Legislative requirement</td><td colspan="6">Staff/contractors to adhere to the Australian Road Rules</td></tr>
<tr><td>Proposed outcome</td><td colspan="6">PO20: The Tenement Holder must ensure there are no traffic accidents involving members of the public and mine-related traffic on local roads and at mine access points that could have been reasonably prevented by the tenement holder</td></tr>
<tr><td rowspan="3">Draft outcome measurement criteria</td><td>Outcome measurement criteria ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>OM13</td><td>Number of traffic complaints recorded in an IMS</td><td>Project Area</td><td>All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner</td><td>Annually</td><td>IMS</td></tr>
<tr><td>OM34</td><td>Number of vehicle incidents</td><td>Project Area</td><td>No vehicle incidents identified as a result of the Project that could have reasonably been prevented</td><td>As required (case-by-case should an incident related to the project be identified)</td><td>DIT Annual Crash Data / SAPOL report</td></tr>
<tr><td rowspan="2">Draft leading indicator criteria</td><td>Leading indicator ID</td><td>What will be measured and form (method) of measurement</td><td>Location</td><td>Outcome achievement</td><td>Frequency</td><td>Background and/or control data</td></tr>
<tr><td>LI08</td><td>Review of IMS shows progress of complaint investigation</td><td>Project Area</td><td>Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days</td><td>Within 7 days of complaint</td><td>IMS</td></tr>
</table>

	Impact ID	**PI57**			**Phase**	**Construction**	
Potential impact event	**Potential impact description**	Increased noise within local townships due to additional vehicle movements resulting in amenity impacts for local communities					
	Source	Project - Construction and operational traffic					
	Pathway	Land					
	Receptor	Public, local community					
	Inherent design controls	Standard noise reduction mechanisms on vehicles					
	Uncertainty/ knowledge gaps/ assumptions	**Inputs**	B	**Justification**	Existing traffic data (volume, crash, road cross-section etc.) based on recorded / measured input sources. Forecast future movements based on anticipated operational details.		
		Method and model	B	**Justification**	Some assumptions made in respect to the distribution of movements via key access routes.		
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Sensitivity analysis assuming 50% less or 50% more (LV and HV) vehicle movements has negligible effect on the findings.		
	S--P-R linkage	Yes	**Justification**	There is a forecast local increase in heavy vehicles and light vehicles during construction and operation of the Project which may affect noise levels in local communities.			
	If no S-P-R linkage then do not continue further						
	Description of likely impact	Increased noise within local townships due to additional vehicle movements resulting in impact on human sensitive receivers generating potential loss of amenity, annoyance and sleep disturbance increasing complaints from sensitive receptors					
Risk assessment and design/ management controls	**Risk Assessment**	**Raw risk (pre controls)**			**Physical controls and management controls**	**Residual risk (post controls)**		
		C	**L**	**Risk**		**C**	**L**	**Risk**
		1	B	Moderate	MM70: Heavy vehicle movements at night through local townships during operations is minimised, as far as reasonably practicable MM89: Road use expectations (i.e. adhered to road rules and conditions) included in personnel site inductions	1	C	Low
	Uncertainty	**Inputs, method and model**	B	**Justification**	Uncertainty regarding flexibility to avoid movement of HV at night.			

	Sensitivity analysis	**Sensitivity**	B	**Justification**	If HV movements during night is unavoidable it is still likely that there will be minimal affect on ability to achieve the outcome.		
Statement of proposed outcomes	**Legislative requirement**	None					
	Proposed outcome	PO21: The Tenement Holder must ensure that there are no nuisance impacts on sensitive receptors from noise or vibration generated by the Project					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM13	Number of traffic complaints recorded in an IMS	Project Area	All complaints and feedback from public are recorded in an IMS, and addressed in a timely manner	Annually	IMS
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI08	Review of IMS shows progress of complaint investigation	Project Area	Complaints are acknowledged and recorded within the IMS, and an investigation has commenced within 7 days	Within 7 days of complaint	IMS

7.12. Public health and safety

This Section describes how the Project may impact public health and safety and sets out the measures that will be implemented to minimise those impacts.

Chapter 3 of the MLP provides detail on the local community and landowners and land use, whilst Sections 7.5, 7.9 and 7.11 provide detail on impacts related to waste, air quality and traffic; all of which are relevant in the context of public health and safety. .

7.12.1. Context

7.12.1.1. Homesteads and townships

The Project Area is located approximately 240 km north-east of Adelaide, and areas in vicinity of the Project are generally sparsely populated. Given the small number of properties local to the Project Area and limited occupancy at these locations (Section 3.11.5), it is unlikely that occupiers will experience health or safety impacts nor access the Site.

Tourists and visitors are unlikely to be present within, or in vicinity of the Project Area due to the remote location and lack of access roads. However, the possibility of unauthorised access cannot be disregarded, and the associated risks remain.

7.12.1.2. Access routes

The primary access routes associated with the Project all comprise DIT controlled roads. A limited number of Council controlled roads will also be required for access. Refer to Section 7.11 for detailed traffic baseline information. Although used for Project access, these access routes will also be open for public use, however access from these roads to the Project will be limited, with security, signage and Project fencing utilised to restrict access.

The Pualco Range CP is adjacent to the south-western boundary of the Project Area, and as there are gates between Pualco Range CP and the Project area, this is a potential access route. Pualco Range CP is currently not open to visitation by the general public (DEW, pers. comms., 2023a) and hence public access between Pualco Range CP and the Project Area is unlikely. However, this potential access route has been considered within the impact assessment to follow.

7.12.1.3. Local Aboriginal Groups

Local Aboriginal groups are likely to be present in the wider region as described in Section 3.11.1.3. The Project Area, HR and parts of the TL corridor are situated on the lands of Traditional Owners. As detailed in Section 3.16.1, the determination of native title confers rights to the Aboriginal groups to their land, therefore they can access areas of the tenement for cultural purposes. As discussed in 1.7.4ILUAs will be used to resolve native title rights and access.

7.12.2. Impact assessment

The public health and safety impact assessment is presented in Table 7-62. Other impacts already discussed in previous Sections related to public health and safety are listed in Table 7-59.

7.12.2.1. Injury or death due to unauthorised access

Mine sites are associated with potential dangers having the potential to result in injury or death to individuals within the Project Area. Unauthorised access to the Project Area by the public during the construction and operational phases of the Project is unlikely due to the remoteness of the Project but cannot be discounted, and may result in injury or death.

7.12.2.2. Increased bushfire risk

As discussed in Section 7.3.2.7, the introduction of human activity into an area often leads to a change in the natural fire regime. Either it can decrease the frequency and intensity of fires due to control measures or increase through accidental fires caused through ignition points. This alteration of fire regimes can lead to increase risk to the safety of the local community (i.e., increased intensity and frequency of fires) and, as such, has been considered in Table 7-58 and further analysed in Table 7-62.

Table 7-58: Public health and safety potential impact events and associated areas

ID	Impact description	S-P-R Linkage?	Applicable area*		
			ML	HR	TL
PI58	Unauthorised access to active mining site during construction and operation by general public results in injury or death	Yes	C, O	C, O	C, O
PI59	Unauthorised access to mining site by general public post closure results in injury or death	Yes	R	R	R
PI60	Project related ignition sources result in accidental fires / change in local fire regime and a corresponding risk of injury to individuals and impacts on community infrastructure	Yes	C, O, R	C, O, R	C, O, R

*(C) CONSTRUCTION, (O) OPERATION, (R) CLOSURE

Some impacts discussed within this Section are more appropriately discussed in other Sections of this report (i.e., air quality). Instances of cross-referenced impacts are shown in Table 7-59.

Table 7-59: Public health and safety impacts cross reference

Potential impact	Refer to	Cross reference
Impacts from emissions of dust and particulate matter on human and ecological sensitive receptors. These may include human health risks from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity	PI45	Section 7.9
Project activities causing emissions of airborne dust and particulate matter, which may migrate to locations of human sensitive receptors resulting in nuisance (amenity) impacts, and health impacts due to inhalable/respirable particulates	PI46	Section 7.9
Impacts from emissions of dust and particulate matter on human and ecological sensitive receptors. These may include human health risks (public) from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity	PI49	Section 7.9
Presence of mining in the region provides a new source of combustion pollutants including NOx, SOx, CO and particulates. Impacts would relate to excessive exposures to these combustion pollutants. Severity of impact will depend on the level and duration of exposure and the sensitivity of the subject, in this case, human receptors and flora and fauna	PI50	Section 7.9
Increased conflict risk on the local road network due to additional traffic volumes (including heavy vehicle movements and increased exposure during overtaking)	PI56	Section 7.11
Geotechnical failure of key mining facilities (TSF, WRDs and mine voids) resulting in loss of life to persons or property, and impacting land use	PI61	Section 7.5

7.12.3. Design, control and management strategies

The public health and safety draft design, control and management strategies for the identified impact events are listed in Table 7-60 and referenced to potential impact events in Table 7-62.

Table 7-60: Public health and safety mitigation measures

Reference ID	Design, control and management measure
MM31	Hot works permitting system
MM32	Observation of fire ban rules
MM33	Appropriate fire suppression / response available onsite
MM34	Consultation with CFS, DEW, Peterborough Council and emergency service providers during fire danger periods
MM35	Maintenance of fire breaks, where required
MM52	Implementation of MCP
MM91	Safety bunds and/or security fencing installed at the crest of mine voids where practicable to provide an engineered barrier for vehicles, fauna and livestock
MM92	Access to Site through one point of access with the remainder of the perimeter secured (emergency access from South required for emergency egress if required)
MM93	Signage erected to identify project boundaries and operations and post-closure safety hazards
MM94	Visitor and third-party site access request (SAR) process, with unauthorised access events recorded in the IMS
MM95	Emergency response team including assets and equipment are onsite to address emergencies as required
MM96	Implement Emergency Response Plan

7.12.4. Draft outcomes, measurement criteria and leading indicators

The proposed health and safety outcomes are presented in Table 7-61. The proposed outcome, measurement criteria and leading indicators (where applicable) are presented in the context of the impact assessment for potential impact events within Table 7-62.

Table 7-61: Public health and safety proposed outcomes

Reference ID	Proposed outcome
PO06	The Tenement Holder will ensure there are no uncontrolled fires as a result of project activities that could have been reasonably prevented by the Tenement Holder
PO22	The tenement holder must ensure that no unauthorised entry to the Project Area results in public injury or death that could have been reasonably prevented

Table 7-62: Public health and safety potential impacts

<table>
<tr><td></td><td>Impact ID</td><td colspan="4">PI58</td><td>Phase</td><td colspan="3">Construction and operations</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Unauthorised access to active mining site during construction and operation by general public results in injury or death</td></tr>
<tr><td>Source</td><td colspan="8">Project - Project activities creating a safety hazard - e.g. mining (voids), use of machinery, blasting activities</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Public, local community</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">Census data regarding populations in proximity to mine site.</td></tr>
<tr><td>Method and model</td><td>C</td><td>Justification</td><td colspan="5">Informal approach.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="5">Due to distance from population centres, changes in population are likely to be very small, and unlikely to affect the S-P-R.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">Unauthorised access to the Project Area during construction and operation is considered unlikely to occur, though not impossible and cannot be discounted. Due to the remoteness of the Project and isolation from main townships, it is unlikely that visitors, residents, and local community members will be in the Project Area. However, the possibility of unwanted visitors cannot be discounted. Therefore, a S-P-R linkage is confirmed.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Injury or death to members of the public due to unauthorised access to the mine site during construction and operation</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td colspan="2" rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>5</td><td>D</td><td>Very High</td><td colspan="2">MM92: Access to Site through one point of access with the remainder of the perimeter secured (emergency access from South required for emergency egress if required)
MM94: Visitor and third-party SAR process, with unauthorised access events recorded in the IMS</td><td>5</td><td>E</td><td>High</td></tr>
</table>

					MM95: Emergency response team including assets and equipment are onsite to address emergencies as required MM96: Implement Emergency Response Plan			
	Uncertainty	**Inputs, method and model**	A	**Justification**	Mitigation measures are industry standard with few uncertainties.			
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Changes to assumptions unlikely to affect ability to meet outcomes.			
Statement of proposed outcomes	**Legislative requirement**	*Work Health and Safety Act* 2012 (SA), Australian Standards for security fences and gates						
	Proposed outcome	PO22: The tenement holder must ensure that no unauthorised entry to the Project Area results in public injury or death that could have been reasonably prevented						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM35	Investigation and review of incident reports		Project Area	No public H&S incidents during construction, operation or closure that could have been reasonably prevented	As required	IMS
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		LI10	Inspection of access controls (fences / gates)		Project Area	Monthly inspections demonstrate non failure of site access controls (fencing, gates, signage and other measures) that have or could result in uncontrolled and unauthorised access to operational areas	Monthly	IMS

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI59</td><td>Phase</td><td colspan="3">Closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="7">Unauthorised access to mining site by general public post-closure results in injury or death</td></tr>
<tr><td>Source</td><td colspan="7">Project - Safety hazards associated with changed post-mining landforms (e.g. voids)</td></tr>
<tr><td>Pathway</td><td colspan="7">Land</td></tr>
<tr><td>Receptor</td><td colspan="7">Public, local community</td></tr>
<tr><td>Inherent design controls</td><td colspan="7">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="4">Census data regarding populations in proximity to mine site.</td></tr>
<tr><td>Method and model</td><td>C</td><td>Justification</td><td colspan="4">Informal approach.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>A</td><td>Justification</td><td colspan="4">Due to distance from population centres, changes in population are unlikely to affect the S-P-R.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="5">Unauthorised access to the Project Area post closure is considered unlikely to occur, due to remoteness of the Site, and proximity to sensitive receptors. To enter the Project Area post-closure, a person(s) must enter through security measures (i.e. appropriate closure safety signage and remaining fencing). It is unlikely that that visitors, residents or local community members would access the site post-closure, however the possibility of unauthorised access cannot be discounted. S-P-R linkage is confirmed.</td></tr>
<tr><td colspan="8">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="7">Injury or death to members of the public due to unauthorised access to the mine site post-closure</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>D</td><td>High</td><td>MM52: Implementation of MCP
MM91: Safety bunds and/or security fencing installed at the crest of mine voids where practicable to provide an engineered barrier for vehicles, pedestrians fauna and livestock
MM93: Signage erected to identify project boundaries and operations and post-closure safety hazards</td><td>4</td><td>E</td><td>Moderate</td></tr>
</table>

	Uncertainty	**Inputs, method and model**	A	**Justification**	Mitigation measures are industry standard with few uncertainties. MCP is subject to change over LOM, however will meet required guidelines.			
	Sensitivity analysis	**Sensitivity**	A	**Justification**	Changes to assumptions unlikely to affect ability to meet outcomes.			
Statement of proposed outcomes	**Legislative requirement**	Australian Standards for security fences and gates						
	Proposed outcome	PO22: The tenement holder must ensure that no unauthorised entry to the Project Area results in public injury or death that could have been reasonably prevented						
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM35	Investigation and review of incident reports		Project Area	No public H&S incidents during construction, operation or closure that could have been reasonably prevented	Quarterly	IMS
		OM36	Ensure that requirements of MCP have been met through an independent audit		Project Area	Independent audit to ensure rehabilitation and mine closure has been undertaken in accordance with the RMP and MCP, respectively	Prior to mine closure	MCP
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**		**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		None proposed						

<table>
<tr><td></td><td>Impact ID</td><td colspan="3">PI60</td><td>Phase</td><td colspan="4">Construction, operations and closure</td></tr>
<tr><td rowspan="11">Potential impact event</td><td>Potential impact description</td><td colspan="8">Project related ignition sources result in accidental fires / change in local fire regime and a corresponding risk of injury to individuals and impacts on community infrastructure</td></tr>
<tr><td>Source</td><td colspan="8">Project - Vehicles and other ignition sources</td></tr>
<tr><td>Pathway</td><td colspan="8">Land</td></tr>
<tr><td>Receptor</td><td colspan="8">Public, third party infrastructure</td></tr>
<tr><td>Inherent design controls</td><td colspan="8">None</td></tr>
<tr><td rowspan="2">Uncertainty/ knowledge gaps/ assumptions</td><td>Inputs</td><td>B</td><td>Justification</td><td colspan="5">Benchmarked fire data used.</td></tr>
<tr><td>Method and model</td><td>B</td><td>Justification</td><td colspan="5">Standard method.</td></tr>
<tr><td>Sensitivity analysis</td><td>Sensitivity</td><td>B</td><td>Justification</td><td colspan="5">Arid land communities are well prepared for fire risk.</td></tr>
<tr><td>S--P-R linkage</td><td>Yes</td><td>Justification</td><td colspan="6">The introduction of human activity into an area often leads to a change in the natural fire regime. Either it can decrease the frequency and intensity of fires due to control measures or increase through accidental fires caused through ignition points. The actual risk of fires due to Project related ignition sources is expected to be low. However, with increasing evidence of climate change impacts, the possibility of fires cannot be discounted.</td></tr>
<tr><td colspan="9">If no S-P-R linkage then do not continue further</td></tr>
<tr><td>Description of likely impact</td><td colspan="8">Injury or death by fire caused by mining operations, impacts on properties or communities</td></tr>
<tr><td rowspan="3">Risk assessment and design/ management controls</td><td rowspan="3">Risk Assessment</td><td colspan="3">Raw risk (pre controls)</td><td rowspan="2" colspan="2">Physical controls and management controls</td><td colspan="3">Residual risk (post controls)</td></tr>
<tr><td>C</td><td>L</td><td>Risk</td><td>C</td><td>L</td><td>Risk</td></tr>
<tr><td>4</td><td>C</td><td>Very High</td><td colspan="2">MM31: Hot works permitting system
MM32: Observation of fire ban rules
MM33: Appropriate fire suppression / response available onsite
MM34: Consultation with CFS, DEW, Peterborough Council and emergency service providers during fire danger periods
MM35: Maintenance of fire breaks, where required</td><td>2</td><td>D</td><td>Low</td></tr>
</table>

	Uncertainty	**Inputs, method and model**	B	**Justification**	Assumed that appropriate fire suppression / response equipment can be held on site. Assumed relationship with CFS / local council emergency service providers.		
	Sensitivity analysis	**Sensitivity**	B	**Justification**	Changes in assumptions may affect the ability to manage a fire, but the frequency of fires would not change.		
Statement of proposed outcomes	**Legislative requirement**	*Work Health and Safety Act 2012* (SA)					
	Proposed outcome	PO06: The Tenement Holder will ensure there are no uncontrolled fires as a result of project activities that could have been reasonably prevented by the Tenement Holder					
	Draft outcome measurement criteria	**Outcome measurement criteria ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		OM12	Records of fire incidents from mining operations in the IMS	Project Area.	Annual review of incident records demonstrates that fires associated with project activities could not have reasonably been prevented	Annually	IMS
	Draft leading indicator criteria	**Leading indicator ID**	**What will be measured and form (method) of measurement**	**Location**	**Outcome achievement**	**Frequency**	**Background and/or control data**
		None proposed					

7.13. Social

This Section describes how the Project may impact on social values and sets out the measures that will be implemented to minimise those impacts. Mining Regulatory Guideline MG45: An introduction to social impact assessment, was referenced to ensure good practice SIA methodology was followed. For a more detailed discussion on baseline information please refer to Appendix C4 *Social Impact Assessment* (Tetra Tech Coffey, 2024).

Section 3.11 of the MLP provides detail on the baseline social conditions of the areas in proximity to the Project Area, including the primary and secondary study areas for the SIA and the wider context of SA.

Impacts related to heritage, biodiversity, waste, noise and vibration, air quality, visual amenity, traffic and public health and safety, all of which are relevant in context of the social impact assessment, are discussed in other Sections of this report as shown in Table 7-63.

Table 7-63: Social impacts cross references

Potential impact	Refer to	Cross reference
Industrial waste and infrastructure left on-site post closure results in long-term contamination	PI13	Section 7.5
Reduction in groundwater levels (drawdown) leading to reduced groundwater availability and quantity of groundwater in third party groundwater bores, farm dams and Murray and Olary Ranges groundwater resources.	PI18 & PI19 & PI20 & PI22	Section 7.6
Tailings disposal leading to migration of tailings water (via seepage and groundwater) adversely affecting groundwater quality, impacting on third-party bores, farm dams, and Murray and Olary Ranges groundwater resources	PI24 & PI27 & PI28 & PI30	Section 7.6
Tailings disposal leading to groundwater mounding (via seepage to groundwater) altering (increasing) water quantity, impact on third-party bores, farm dams, and Murray and Olary Ranges groundwater resources.	PI64 & PI67 & PI70	Section 7.6
Alteration of surface water flow resulting in changes in surface water availability for farm dams, and changes in flood levels affecting downstream local landowners	PI34	Section 7.7
Changed rates of subsurface infiltration due to alteration of surface water regime due to mining operations results in changes to groundwater level affecting groundwater users	PI36	Section 7.7
Noise emissions from construction and operation potentially impacting on (human, public) noise sensitive receptors	PI38 & PI40	Section 7.8
Air blast overpressure and vibration from blasting potentially impacting on (human, public) noise sensitive receptors	PI42	Section 7.8
Transmission line corona discharge noise potentially impacting on (human, public) noise sensitive receptors	PI44	Section 7.8
Impacts from emissions of dust and particulate matter during construction, operation and closure on human and ecological sensitive receptors. These may include human health risks from inhalable/respirable particulates, amenity concerns from deposited dust, or degradation of ecological integrity.	PI45, PI46 & PI49	Section 7.9
Mining activities causing emissions of dust and particulate matter which may migrate to locations containing livestock, causing feed deterrence.	PI48	Section 7.9
Presence of mining in the region provides a new source of combustion pollutants including NOx, SOx, CO and particulates. Impacts would relate to excessive exposures to these combustion pollutants. Severity of impact will depend on the level and duration of exposure and the sensitivity of the subject, in this case, human receptors and flora and fauna.	PI50	Section 7.9

Potential impact	Refer to	Cross reference
Odour emissions from waste streams and vehicle exhaust/fuel fumes resulting in health and amenity impacts at locations of human sensitive receptors, and impacts on native fauna.	PI51	Section 7.9
Combustion of fossil fuels releases GHG to the atmosphere that contribute to GHG emissions impacting the ability to achieve National greenhouse gas targets.	PI52	Section 7.9
Installation of mining infrastructure, active mining operations and post closure landforms results in adverse impacts to visual amenity.	PI53 & PI54	Section 7.10
Increased traffic delays, traffic conflict risk and traffic noise due to increased traffic during construction and operation	PI55, PI56 & PI57	Section 7.11
Unauthorised access to mine site during construction, operation or after closure results in injury or death	PI58 & PI59	Section 7.12
Project related ignition sources result in accidental fires / change in local fire regime and a corresponding risk of injury to individuals and impacts on community infrastructure	PI60	Section 7.12
Geotechnical failure of key mining facilities (TSF, WRDs and mine voids) resulting in damage to persons or property, and impacting land use	PI61	Section 7.5

7.13.1. Context

The Project Area is located within the Unincorporated Area of SA, DC Peterborough LGA, and RC Goyder LGA. Localities within or surrounding the Project Area include Nackara, Hardy, Parnaroo, Grampus, Mutooroo, Sturt Vale, Warnes, Burra Eastern Districts, Bundey. The land surrounding the Project Area is sparsely populated and mainly include people living on rural properties, such as pastoral stations and farms. Based on available data from the 2021 Census, the combined population of localities within and surrounding the Project Area is estimated to be about 50 to 100 people. The towns of Yunta, Peterborough and Burra are the closest towns to the Project Area.

7.13.2. Impact assessment

A SIA is the process of analysing, monitoring, and managing the intended and unintended social consequences, both positive and negative, of planned interventions and any social change processes invoked by those interventions (Vanclay et al., 2015).

The SIA differs from the impact assessment framework used for other technical impact assessment reports (as outlined in Section 6) to most appropriately address requirements under Regulation 47 and 48 of the Mining Regulations. MG45 was used to inform an alternative method using best practise social impact assessment techniques to enabling community perspective to be better captured. The impact assessment method and tables used in the preceding Sections of this MLP are not suited to capture of the complex and interwoven outcomes of the SIA. Instead, best practice SIA-specific methods were used based on principles outlined in: Social Impact Assessment: Guidance for assessing and managing the social impacts of projects (Vanclay et al., 2015).

The SIA involved identification, analysis, and evaluation of potential impacts on, and changes to, social conditions from the Project's construction, operation, and closure. This included assessment of both positive and negative impacts, direct and indirect impacts, and cumulative impacts with consideration of other projects. The assessment considered issues raised in the initial scoping phase and additional impacts identified based on outcomes of the social baseline analysis, and community and stakeholder feedback. The identification, analysis, and evaluation of impacts in the SIA also considered the outcomes of other technical assessments as they relate to impacts on or changes to social values.

The SIA was informed by the outcomes of targeted SIA engagement with community members and stakeholders, and community and stakeholder engagement undertaken by MGT (refer Chapter 5). Community and stakeholder engagement for this SIA was undertaken independently through face-to-face meetings in Burra, Peterborough, Yunta and Port Augusta in October 2023, and through telephone interviews carried out between in October and November 2023. Engagement with the Ngadjuri community has also been undertaken and is discussed in further detail in Section 7.2. The purpose of this engagement was to understand:

- **Existing values, characteristics, and conditions in the primary and secondary Study Area** (i.e., existing communities, business, and industries; places, features and areas important to communities; existing services, facilities, and organisations; and current challenges and opportunities).
- **Community concerns and perceptions about the Project and its impacts** (i.e., what positive or negative impacts the project would have on place, people and community identity, economy and livelihoods, community infrastructure, services and networks, and peoples' productive capacities).
- **Community and stakeholder thoughts and ideas on strategies to manage potential negative impacts and maximise positive impacts for local and regional communities** (i.e., what should be done to manage negative impacts and maximise positive impacts).

The social impact events are detailed in Table 7-66.

7.13.3. Design, control, and management strategies

Control measures have been identified to avoid, minimise, or mitigate the likelihood or consequences of negative social impacts and maximise or enhance positive social impacts. These were informed by control measures identified in other impact assessments, management measures used on other similar projects in regional communities, and feedback from community members and stakeholders received for the SIA.

The draft mitigation strategies are listed in Table 7-64 and referenced against potential impact events inTable 7-65 Table 7-66.

Table 7-64: Social mitigation measures

Reference ID	Design, control and management measure
MM68	Develop and implement local employment program, training strategy and local procurement strategy to maximise opportunities for local residents and businesses over interstate residents. Engage with local communities regarding extent of opportunities. Engage with local schools to support school-based employment pathways and work experience opportunities
MM69	Maintain Peterborough Council Memorandum of Understanding (MOU) to consider and maximise mutually beneficial opportunities
MM70	Identify incentives for long term Project staff to relocate to nearby local and regional communities, and to spread out across towns to minimise impacts on one town
MM71	Develop and implement worker code of conduct
MM72	Implement Complaints Management Procedure
MM73	Implement Stakeholder Engagement Procedure (including ongoing consultation and communication with residents closest to construction regarding timing, duration, potential impact and management of construction impacts)
MM74	Develop and implement Social Development and Community Investment Strategy
MM75	Negotiation and implementation of land access agreements with affected property owners
MM76	Early establishment of onsite construction worker accommodation

Reference ID	Design, control and management measure
MM77	Engage with State Government in regard to housing supply
MM78	Implement on site workplace health and safety measures and engage with emergency service providers to develop an Emergency Response Plan for the Project. Consider opportunities through social development and investment initiatives to support provision of local health and medical services

7.13.4. Draft social objectives

The proposed social objectives are presented in Table 7-65. The proposed social objectives are presented in the context of the impact assessment for potential impact events within Table 7-66.

Table 7-65: Proposed social objectives

Reference ID	Proposed outcome
SO1	MGT actively engages and contributes positively to the local community
SO2	MGT ensures the Project workforce includes residents of localities surrounding the Project Area, where practicable
SO3	MGT ensures companies within local communities are provided opportunities to participate in the Project
SO4	MGT supports the positive integration of the non-resident workforce into the local community

Table 7-66: Potential social impacts

Potential impact event	Description of likely impact	Impact driver	Extent of impact	Phase	Likelihood	Consequence	Significance	Mitigation and control measures	Residual likelihood	Residual Consequence	Residual significance	Nature of impact	Social objective reference
Local community													
Direct employment opportunities generated by the Project's construction over the 2.5-year construction period.	Reversal of population decline and ageing population in local towns, due to population growth and demographic changes to younger populations due to increase in residents moving to the area to pursue direct and indirect business and employment opportunities or attracting younger people to remain in the area.	Project employment opportunities and procurement spending	Towns in the primary and secondary study area	Construction	C	2	Mod	Develop and implement local employment programs to maximise employment for local residents, including youth. Identify incentives for long-term Project staff to relocate to local and regional communities.	B	2	High	Positive	SO2, SO3
				Operation	B	2	Mod		A	2	High		
	Resentment and tensions between community members that benefit from the Project and others who do not, and if community members expectations about opportunities are not realised.	Project employment opportunities and procurement spending, landholder compensation	Directly affected properties, localities within and surrounding the Project Area, towns in the primary study area	Construction	C	2	Mod	Develop and implement Local Employment and Training Strategy and Local Procurement Strategy to maximise opportunities for local residents and businesses. Implement engagement with local and regional communities about extent of employment and business opportunities.	D	2	Low	Negative	SO2, SO3
				Operation	D	2	Low		D	1	Low		
Presence of construction and mining workforces and temporary population changes due to due to influx of non-resident workforce	Potential conflict or tension between construction and mine workers and local residents.	Influx of Project workers	Directly affected properties, localities within and surrounding the Project Area, towns in the primary study area	Construction	C	3	High	Develop and implement worker code of conduct. Implementation of community grievance mechanism that outlines a process for receiving, managing and responding to community concerns and queries about the Project.	D	2	Low	Negative	SO4, SO1
				Operation	C	2	Mod		D	2	Low		
Increase in residents moving to the area to pursue direct and indirect employment and business opportunities from the Project.	Potential to increase community participation in community activities and events and increase the pool of volunteers available to support local activities.	Project employment opportunities and procurement spending	Towns in primary and secondary study area	Construction	D	2	Low	Encourage and support Project staff to volunteer for and get involved in local community organisations and events.	C	2	Mod	Positive	SO2, SO3
				Operation	C	2	Mod		B	3	High		
Implementation of social development and community investment initiatives by MGT.	Increased development and employment opportunities for vulnerable population groups, and support and sponsorship for community organisations and events, leading to improved social and economic outcomes, increased community participation, and improved viability of community events.	Project employment opportunities	Towns in primary and secondary study area	Construction	C	3	High	Develop and implement Social Development and Community Investment Strategy for the Project.	B	3	High	Positive	SO2
				Operation	A	3	High		A	4	Very high		
Noise, dust, lighting and traffic from construction and operation of the mine, haulage and loading facilities	Decline in local amenity affecting peoples' use and enjoyment of their property and detracting from their sense of isolation and solitude.	Vegetation clearing, construction activities, use of local road network by Project traffic, Project infrastructure	Directly affected properties, localities within and surrounding the Project Area	Construction, Operation	C	2	Mod	Implementation of environmental management measures as described in the impact assessments for traffic, noise and vibration, visual amenity and air quality (Sections 7.11, 7.8, 7.10 and 7.9 respectively). Ongoing consultation and communication with residents closest to construction about the timing, duration, potential impacts and management of construction impacts. Implementation of community grievance mechanism that outlines a process for receiving, managing and responding to community concerns and queries about the Project.	D	2	Low	Negative	Refer Sections 7.8, 7.9, 7.10 and 7.11

Potential impact event	Description of likely impact	Impact driver	Extent of impact	Phase	Likelihood	Consequence	Significance	Mitigation and control measures	Residual likelihood	Residual Consequence	Residual significance	Nature of impact	Social objective reference
Noise, dust, visual impacts, and traffic from construction activities for the TL.	Decline in visual environment and local amenity affecting peoples' use and enjoyment of their property.	Vegetation clearing, construction activities, use of local road network by Project traffic, Project infrastructure	Directly affected properties, localities within and surrounding the Project Area	Construction	C	2	Mod	Implementation of environmental management measures as described in the impact assessments for traffic, noise and vibration, visual amenity and air quality (Sections 7.11, 7.8, 7.10 and 7.9 respectively). Ongoing consultation and communication with residents closest to construction about the timing, duration, potential impacts and management of construction impacts. Implementation of community grievance mechanism that outlines a process for receiving, managing and responding to community concerns and queries about the Project.	C	1	Low	Negative	SO1
Construction, mining, haulage and loading activities in localities and towns near the Project.	Decline in peoples' perceptions of safety relating to road safety.	Use of local road network by Project traffic	Directly affected properties, localities within and surrounding the Project Area, towns in the primary study area	Construction	C	2	Mod	Implement traffic management measures, including ongoing consultation and communication with communities and motorists about changes in road conditions and major haulage movements.	D	2	Low	Negative	Refer S.7.11
				Operation	C	1	Low		D	1	Low		
Influx of non-resident workers and increased disposable incomes of workers employed on the Project.	Decline in peoples' perceptions of safety relating to incidences of anti-social behaviour (e.g., alcohol and drug use).	Influx of Project workers, Project employment	Directly affected properties, localities within and surrounding the Project Area, towns in the primary study area	Construction, operation	C	2	Mod	Develop and implement worker code of conduct. Implementation of community grievance mechanism that outlines a process for receiving, managing and responding to community concerns and queries about the Project.	D	2	Low	Negative	SO4
Establishment of the easement and access road along the TL, and use of local and private roads by construction and operation traffic.	Decline in perceptions of safety and security for directly affected property owners due to easier access provided by access roads along the TL easement and HR.	Establishment of Project access roads	Directly affected properties	Construction, operation	D	2	Low	Implementation of land access agreements with affected property owners, which address property security issues. Implementation of community grievance mechanism that outlines a process for receiving, managing and responding to community concerns and queries about the Project.	E	1	Low	Negative	SO1
Economy and employment													
Creation of direct and indirect jobs during construction and operation.	Increased labour force participation and reduced unemployment levels, and support for improved social and economic outcomes for workers and their families (e.g., improved personal and household incomes, skills development, improved opportunities for future employment).	Project employment opportunities	Towns in the primary and secondary study areas	Construction	C	2	Mod	Develop and implement Local Employment and Training Strategy to maximise employment for local residents in the primary and secondary study area. Implement engagement with local and regional communities about extent of employment.	B	3	High	Positive	SO2, SO3
				Operation	B	3	High		A	3	Very high		
			State	Construction	C	1	Low	Include strategies in the Local Employment and Training Strategy that prioritises SA residents over interstate residents.	C	2	Mod		SO2
				Operation	C	2	Low		C	3	High		
	Demand for local workers and higher salaries offered by the Project increasing competition for local workers impacting on availability of workers to support other local industries.	Project employment opportunities	Towns in the primary and secondary study areas	Construction	C	3	High	Implement Local Employment and Training Strategy aimed increase participation by long-term unemployed and residents not in the labour force. Develop and implement training programs focussing on youth and long-term unemployed.	D	3	Mod	Negative	SO2
				Operation	B	3	High		C	2	Mod		

Potential impact event	Description of likely impact	Impact driver	Extent of impact	Phase	Likelihood	Consequence	Significance	Mitigation and control measures	Residual likelihood	Residual Consequence	Residual significance	Nature of impact	Social objective reference
Procurement spending on goods and services by the Project.	Opportunities for business growth and development and improved incomes for business owners and employees.	Project procurement spending	Towns in the primary and secondary study area	Construction	C	3	High	Develop and implement Local Procurement Strategy to maximise opportunities for local and regional businesses. Implement engagement with local and regional communities about extent of employment and business opportunities.	C	4	Very high	Positive	SO3
				Operation	C	3	High		B	4	Very high		
Spending by workers, including existing residents and non-resident workers	Increased spending by workers in local and regional businesses (e.g., retailers, accommodation and hospitality, personal services) leading to increased business growth and income, and opportunities for investment in long-term business improvements.	Project employment, wages	Towns in the primary and secondary study area	Construction	C	2	Mod	Engage with local businesses about the timing of construction, including peak workforce periods.	B	2	High	Positive	SO3
				Operation	B	3	High	No mitigation identified	C	3	High		
Demand for local accommodation by mine workers	Challenges for tourists and overnight visitors in securing accommodation may lead to decline in overnight tourists in the local study area (e.g., Burra and Peterborough) with flow-on effects of other related businesses (i.e., cafes, retail stores).	Influx of Project workers	Towns in the primary and secondary study area	Construction, operation	C	2	Mod	Early establishment of on-site construction worker accommodation. Engagement with local tourism representatives and businesses about the timing of construction, including peak workforce periods. Provide accommodation for contractors and temporary workers within the on-site worker accommodation camp.	D	2	Low	Negative	SO3
Construction of the TL towers and stringing of the TL across agricultural and pastoral properties.	Disruptions to existing agricultural and pastoral operations of properties impacted by the TL and construction activities, e.g., due to changes to stock handling.	Siting of Project infrastructure	Directly affected properties	Construction	C	3	High	Ongoing consultation and communication with owners of properties affected by construction of the TL about the timing, duration, potential impacts and management of construction impacts. Implementation of land access agreements with affected property owners. Payment of compensation to directly affected landowners.	D	2	Low	Negative	SO1
Demand for housing by non-resident workers and new residents attracted to the area due to direct and indirect employment opportunities offered by the Project.	Declining in housing availability and affordability leading to reduced affordability and increased financial stress for fixed- and low- income households, potentially leading to increased risk of homelessness and people moving away from towns near the Project.	Employment opportunities	Towns in the primary study area	Construction	C	3	High	Early establishment of on-site construction worker accommodation. Encourage new residents to live in in towns across the primary and secondary study areas to minimise risk of impacts on one town. Collaborate with local and State government about housing supply.	D	3	Mod	Negative	SO4
				Operation	B	3	High		C	3	High		
	Increased rental income for owners of rental housing.		Towns in the primary study area	Construction	C	2	High	No mitigation identified	C	2	High	Positive	SO1
				Operation	B	2	High		B	2	High		
Clearing of native vegetation and construction traffic interactions with native fauna	Increased concern by local and regional communities about impacts on flora and fauna adversely affecting community values relating to the environment.	Establishment of Project infrastructure	Directly affected properties, localities within and surrounding the Project Area	Construction	D	3	Mod	Implementation of environmental management measures outlined in the Biodiversity Impact Assessment.	E	2	Low	Negative	Refer S. 7.3

Potential impact event	Description of likely impact	Impact driver	Extent of impact	Phase	Likelihood	Consequence	Significance	Mitigation and control measures	Residual likelihood	Residual Consequence	Residual significance	Nature of impact	Social objective reference
Construction of the TL towers and stringing of the TL across agricultural and pastoral properties.	Temporary restrictions on landowner access to or use of land within the construction footprint for the TL disrupting wider use and operation of individual properties.	Siting of Project infrastructure, construction activities	Directly affected properties	Construction	C	3	High	Ongoing consultation and communication with owners of properties affected by construction of the TL about the timing, duration, potential impacts and management of construction impacts. Implementation of land access agreements with affected property owners.	D	2	Low	Negative	SO1
Infrastructure													
Construction and operational related safety incidents	Reduced ability for emergency services to respond to local incidents due to increased demand from the Project.	Influx of Project workers, construction and operation activities	Primary and secondary study area	Construction, operation	C	2	Mod	Implement on-site workplace health and safety measures, including training of workers around safe work practices. Engage with emergency service providers in the development of emergency response procedures for the Project.	E	2	Low	Negative	SO1
Demand for community infrastructure and services by temporary influx of construction workers and new residents attracted to the area due to direct and indirect employment opportunities offered by the Project.	Increased participation and membership of sporting clubs and community groups, and increased school enrolments, improving viability of some schools and providing opportunities to expand the range of subjects and programs offered to students.	Employment opportunities, influx of Project workers	Towns in the primary and secondary study area	Construction	C	2	Mod	Encourage Project staff to volunteer for and get involved in local community organisations and events.	C	3	High	Positive	SO2
				Operation	B	2	High		B	3	High		
	Increased pressure on existing essential services such as health and medical facilities, leading to longer wait times for people to see GPs or need for people to travel further to access treatment.		Towns in the primary and secondary study area	Construction	C	3	High	Implement on-site workplace health and safety measures, including training of workers around safe work practices. Consider opportunities through social development and investment initiatives to support provision of local health and medical services, in consultation with Local Council and SA Health.	D	3	Mod	Negative	SO1
				Operation	C	4	Very high		D	3	Mod		
Increased use of local and regional roads by construction and operation traffic for the Project.	Use of State roads and Local Council and private roads by construction traffic leading to decline in quality of roads and road safety impacts, including perceptions of road safety for local residents and motorists.	Use of local road network by Project traffic	Primary and secondary study area	Construction, operation	D	1	Low	Implement traffic management measures outlined in the Traffic and Parking Report. Ongoing consultation and communication with communities and motorists about changes in road conditions and major haulage movements.	E	1	Low	Negative	Refer S. 7.11
People's productive capacity													
Uncertainty about the Project and potential impacts of construction activities for the mine, haulage, loading facilities and TL.	Decline in emotional and mental health and wellbeing for some individuals directly affected by the Project (e.g., feelings of depression and sense of loss relating to their property, family heritage and lifestyle).	Siting of Project infrastructure, construction and operation activities	Directly affected properties, localities within and surrounding the Project Area	Construction	A	2	High	Early and ongoing consultation with directly affected property owners and communities closest to the Project about the Project and timing, duration, potential impacts and management of construction impacts. Implementation of land access agreements with affected property owners. Implementation of community grievance mechanism that outlines a process for receiving, managing and responding to community concerns and queries about the Project.	B	2	High	Negative	SO1
				Operation	C	2	Mod		D	2	Low		

Potential impact event	Description of likely impact	Impact driver	Extent of impact	Phase	Likelihood	Consequence	Significance	Mitigation and control measures	Residual likelihood	Residual Consequence	Residual significance	Nature of impact	Social objective reference
Opportunities for training and apprenticeships on the Project	Enhanced social and economic outcomes for individuals, including groups such as youth, long-term unemployed and Indigenous people.	Project employment and training	Towns in the primary study area	Construction	C	2	Mod	Develop and implement local education and training programs to maximise participation in the Project for local residents in the primary and secondary study area (e.g., work readiness, apprenticeships, and traineeships.	C	3	High	Positive	SO2
				Operation	B	3	High	Engage with Peterborough High School and other schools in the primary and secondary study area to support school-based employment pathways and work experience opportunities.	B	4	Very high		

7.14. Geotechnical

Impacts relating to potential geotechnical failure of structures such as TSF, WRD and mine voids require consideration and assessment. As the TSF and WRD are structures for the containment of waste products from mining (tailings and waste rock respectively), the impacts resulting from failure of these structures, and the mine voids are considered within Section 7.5.

Chapter 8

Matters of National Environmental Significance

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter reviews how the EPBC Act requirements have been applied to the Project, including the referral of the Project under the EPBC Act, the decision on 'accredited assessment' methodology, and the application of the resulting TOR requirements from DCCEEW.

This Chapter then addresses Razorback Iron Ore Project TOR Sections 9-17 as they apply to the requirements of the EPBC Act, including identification of MNES within the Project Area, potential impacts on those matters, avoidance and mitigation of potential impacts, an assessment of whether there are any residual impacts to MNES and consideration of whether offsets are required.

8. Matters of National Environmental Significance

8.1. Background

A valid referral under the EPBC Act was accepted by DCCEEW on 13 April 2024 [ref: EPBC 2024/09787]. An RFI was received by MGT on 24 April 2024, and the response to the RFI was determined by DCCEEW as sufficient on 9 July 2024. A decision was received on 1 August 2024 that the referral for the Project was accepted under Section 24A which allows the Minister for the Environment to accept a referral that does not include all components of a larger action, noting the water supply pipeline and desalination plant linked to the action were not included in the referral. The decision was also made that the Project is a controlled action, and further assessment was required.

The Minister for Environment and Water (Cth) decided the Proposed Action was likely to have a significant impact on listed threatened species and communities (under Section 18 & 18A of the EPBC Act), specifically including (but not limited to) the MBC of the MDDB TEC (Endangered).

The decision by the Minister for Environment and Water (Cth) also determined that DEM should use this MLP to complete an accredited assessment on behalf of the Commonwealth under Section 87 of the EPBC Act. This assessment provides for a single environmental assessment process conducted by the State, with DCCEEW providing comment on the MLP during the public commentary period and reviewing the Response to Submissions. A Project-specific TOR was produced by DEM and DCCEEW on 15 October 2024 to ensure all relevant information required under both the EPBC Act and Mining Act is included in this MLP. The Razorback Iron Ore Project Terms of Reference was published in the SA Government Gazette on 28 November 2024 (SA Government, 2024).

Due to minor layout changes identified during Project development, the footprint of the final Project will be, in part, outside of the area referred to under the EPBC Act. A formal request for variation to change the assessed footprint was submitted to DCCEEW on 31 December 2024 with a decision received on 31 January 2025 in which the Minister for Environment and Water (Cth) accepted the variation.

At the completion of the assessment, DEM's Assessment Report will be provided to DCCEEW, assessing the likely impacts of the Project on MNES. The Minister for the Environment and Water (Cth) will then make an approval decision. On approval, a Decision Notice will be issued, including implementation conditions to be applied to the Project under Federal legislation.

Construction and operation of the Project must not commence until the Minister for Environment and Water has made an approval decision.

This Chapter addresses Sections 9 to17 of the Razorback TOR (Terms of Reference for the Razorback Iron Ore Mining lease application in accordance with EPBC Act Accredited Assessment under Mining Act *)* by including:

- background description of the EPBC Act action and MNES (Sections 8.1- 8.3)
- assessment of potential impacts on MNES (Sections 8.5- 8.8)
- discussion of avoidance, alternatives, mitigation and safeguards (Section 8.4)
- discussion of offsets (if required) (Section 8.10)
- social and economic matters (Section 9)
- ecologically sustainable development (Section 8.12)
- environmental record of persons proposing to take the action (Section 8.11)
- information relating to information sources (Section 8.14)
- MNES conclusion (Section 8.13).

8.1.1. Relevant policy and guidelines

The following policies, guidance and advisories have been considered in undertaking the impact assessment of significance on MNES from the Proposed Action:

- Matters of National Environmental Significance - Significant Impact Guidelines 1.1 (DoE, 2013) (the Guidelines)
- *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy (DoE, 2012).

8.1.2. Conservation advice, threat abatement and recovery plans

The Approved Conservation Advice for the MBC of the MDDB (DAWE, 2021) (Appendix G) has been considered in undertaking assessment of the significance on MNES from the Proposed Action. There are no recovery plans or threat abatement plans for this TEC.

8.1.3. Significant impact guidelines

The Guidelines (DoE, 2013) assist in determining whether an action is likely to have a significant impact on a threatened species and / or community. In accordance with these Guidelines, the impact assessment of the MBC of the MDDB (an endangered TEC) is to address the following key concepts when assessing potential impacts:

An action is likely to have a significant impact if there is a real chance or possibility that it will:

- reduce the extent of an ecological community
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
- adversely affect habitat critical to the survival of an ecological community
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    - assisting invasive species, that are harmful to the listed ecological community, to become established, or
    - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
- interfere with the recovery of an ecological community.

8.2. MNES values of the Project Area

8.2.1. Surveys and survey effort

A series of surveys has been undertaken within the Study Area between 2010 and 2013 (Rural Solutions, 2010 & 2013), and 2020 – 2024 (summarised in ELA, 2024 (Appendices B5 and B6)). Table 3-25 in Chapter 3 details the survey effort completed. All surveys were undertaken by suitably qualified and experienced scientists and were compliant with the following guidance where practicable:

- Survey Guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2010a).
- Survey Guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act (DEWHA, 2011).
- Survey Guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act (DEWHA, 2010b).

It is noted that several newly listed species are not detailed in the survey guidelines, however given the similarity of their habitat and lifecycle to other listed species, the survey effort completed under the Guidelines for other similar species is considered sufficient. It is noted that in some cases, the survey effort recommended by the Guidelines is impractical given the size of the Study Area. For example, for *Pedionomus torquatus* (Plains Wanderer), the survey effort for areas less than 50 ha is 12 hours across three days, however there is no guidance for areas larger than 50 ha. In these circumstances, experienced ecologists planned and completed surveys in stratified survey areas, across multiple locations, multiple seasons / years and using multiple survey methods to ensure that the presence of listed species was determined to the greatest extent practicable.

Whilst the age of some of the surveys (2010-2013) is acknowledged, the condition of the vegetation assemblages within the Project Area has not changed significantly with no changes to land use or significant environmental events (such as bushfire across the whole landscape, or significant flooding) during this time. During each survey the condition of the Project Area was assessed and compared with that reported in previous surveys. Whilst any significant results from the initial 2010-2013 surveys have been included where relevant, the summary of survey results below is based on the more recent surveys (2020-2024) to ensure currency of results.

8.2.2. MNES communities and species

A Protected Matters Search Tool (PMST) search dated 18 August 2023, returned MNES communities and species that may occur within the Project Area. A combination of desktop research, and baseline surveys enabled the likely presence or absence of each listed species to be determined as detailed in the ecology baseline report (ELA, 2024a (included as Appendix B5)).

An additional PMST search dated 28 February 2025 (for the Project Area plus 50 km buffer) updated the original search to ensure currency and to ensure that all potential MNES (including newly listed species) were considered. The combined searches returned five TECs, 29 fauna species, 20 flora species and 13 additional migratory species listed as MNES for further consideration. The PMST search results are included as Appendix H. A combination of desktop research and baseline surveys enabled the likely presence or absence of each listed species to be updated as detailed in the 'Likelihood of occurrence (LoO)' table included as Appendix I, and summarised in Table 8-1.

Table 8-1 shows seven MNES (one TEC, four fauna species and two flora species) are considered known, or likely to occur within the Project Area. The Guidelines were used to complete an assessment of the potential impacts of the Proposed Action for each species known or likely to occur within the Study Area, with the results detailed in the 'Significant Residual Impact' assessment in Appendix J. The assessment shows no significant impacts are expected for any threatened species, with only the MBC of the MDDB TEC requiring further consideration.

Table 8-1: Summary of likelihood of occurrence and significant residual impact assessments

Species	Common name	EPBC Listing	Likelihood of occurrence	Likelihood of SRI
TEC				
Mallee Bird Community of the Murray Darling Depression Bioregion		Endangered	Known	Likely
Threatened fauna				
Aphelocephala *leucopsis*	Southern Whiteface	Vulnerable	Known	Unlikely
Melanodryas cucullata cucullata	South-eastern Hooded Robin	Endangered	Known	Unlikely
Lophochroa leadbeateri leadbeateri	Major Mitchell's Cockatoo	Endangered	Known	Unlikely
Falco hypoleucos	Grey Falcon	Vulnerable	Likely	Unlikely
Threatened flora				
Acacia carneorum	Needle Wattle	Vulnerable	Likely	Unlikely
Codonocarpus pyramidalis	Slender Bell-fruit	Vulnerable	Likely	Unlikely

8.2.3. Other matters under EPBC Act

Two other matters require consideration under the EPBC Act, namely the interaction of the Project Area with Commonwealth Lands, and the nuclear trigger. Both of these matters have been considered in detail in a 'whole of environment' assessment (refer Appendix K). It is concluded that the Proposed Action does not significantly impact on the attributes of the Commonwealth Land, and that the Proposed Action does not constitute a Nuclear Action.

8.3. MBC of the MDDB

The MBC of the MDDB TEC is a type of fauna community found in the MDDB. It is an assemblage of bird species that are dependent on the mallee vegetation that characterises this bioregion. The term 'mallee' refers to "the distinctive growth form of dominant trees, characterised by multiple stems arising from a woody subterranean regenerative organ or lignotuber". Such trees are typically eucalypt species from the Sections *Bisectaria* and *Dumaria*. Mallee also refers more widely to the vegetation systems and biome dominated by plants with this growth form and is a characteristic feature of the bioregion where the ecological community occurs" (DAWE, 2021).

The Mallee Bird Community is an assemblage of 20 bird species that rely on mallee habitats for their continued persistence within the MDD bioregion. The assemblage represents 11 families, the most common being the honeyeaters (*Meliphagidae*; six species) and wrens (*Maluridae*; three species) (DAWE, 2021). Two groupings of species (specialists and dependents) are broadly recognised within the assemblage, based on species' reliance on mallee habitats as determined by available biological information and metrics on observations collated by Birdlife Australia (2015) and the Atlas of Living Australia (DAWE, 2021).

Mallee specialists: Bird species found almost exclusively in mallee habitats, especially within the MDD bioregion. The loss of suitable mallee habitats for these birds can potentially lead to their extinction, certainly at a local or regional scale. These species are uncommon, with low reporting rates, and difficult to detect without extensive or specialist survey knowledge (DAWE, 2021).

Mallee dependents: Bird species that are dependent on mallee where it is present but have a wider range extending into non-mallee woodland and shrubland habitats that intergrade with mallee vegetation. The loss of all suitable mallee habitats for these species may not necessarily lead to extinction but could result in substantial declines in abundance in the MDDB, as well as loss of ecological diversity in the assemblage. This group comprises twelve bird species (DAWE, 2021).

The MBC of the MDDB was listed as endangered on 7 December 2021 under three eligibility Criteria:

- criterion 3: loss or decline of functionally important species (*Leipoa acellata* (Malleefowl))
- criterion 4: reduction in community integrity and
- criterion 5: rate of continuing detrimental change.

8.3.1. Verified presence of MBC of the MDDB

The mallee habitat within the Project Area has been identified as the MBC of the MDDB TEC as defined in the Approved Conservation Advice (DAWE, 2021) and as detailed below.

The diagnostic criteria that must be met for vegetation to be MBC of the MDDB TEC are as follows:

Criteria 1: The site is located within the following IBRA bioregions and subregions:

- MDD: all seven subregions
- Riverina (RIV) subregions where the Murray River intrudes into the MDD: Murray Fans (RIV03, west of Swan Hill), Robinvale Plains (RIV05), and Murray Scroll Belt (RIV06) and
- Darling Riverine Plains (DRP) subregions where the Darling River anabranches intrude into the MDD: Great Darling Anabranch (DRP08); and Pooncarie-Darling (DRP09).

The Project Area occurs in both FLB and MDD IBRA regions. FLB is not listed as an IBRA region in which the TEC occurs, hence any occurrence of the TEC is limited to the southern section of the proposed ML, within the MDD region, and within the southern section of the TL.

Note that advice has been received from DCCEEW Protected Species and Ecological Communities team, that only the area of mallee habitat within the MDDB meets the locality requirements related to the IBRA bioregions set out in the Approved Conservation advice, and hence the remainder of the patch of mallee habitat within the FLB is not the MBC of the MDDB TEC (pers. comms. M Weiss, 3 Nov 2023).

Criteria 2: Mallee habitats are present on the site:

- There must be a patch of native vegetation of at least 10 ha present (either wholly or partially within the site).
- The patch of native vegetation must contain an area or areas of at least 5 ha dominated by mallee.

The National Vegetation Information System (NVIS) mapping accessed through the NatureMaps online web portal shows that *Eucalyptus* mallee forest and mallee woodland does occur in the study area, within the MDD region. Specifically, this patch of vegetation is described as:

> *Eucalyptus socialis ssp., Eucalyptus gracilis, +/-Myoporum platycarpum ssp., +/-Callitris glaucophylla mid mallee woodland over Rhagodia spinescens, Sida petrophila, Dodonaea viscosa ssp. angustissima, Ptilotus obovatus var. mid sparse shrubland over Triodia irritans, Sclerolaena obliquicuspis, Sclerolaena diacantha, Austrostipa sp. low sparse hummock grassland*.
>
> (NVIS, 2023)

Previous floristic surveys were undertaken by ELA in December 2020 (ELA, 2021), August 2021 (ELA, 2021), August 2023 (ELA, 2024a) and February 2024 (ELA, 2024b). These investigations recorded large areas of *Eucalyptus* mid mallee woodland, which were used to ground-truth NVIS mapping within the region (Mallee woodlands and shrublands). This vegetation association features a developed tree canopy, dominated by mallee with a projective foliage cover of 10 to 30% and is described as the following:

> *Eucalyptus gracilis (Yorrell) and Eucalyptus socialis (Beaked Red Mallee) mid mallee woodland over Maireana sedifolia (Bluebush), Rhagodia ulicina, Austrostipa scabra, Roepera ovata (Dwarf Twinleaf), Atriplex vesicaria, Sisymbrium erysimoides (Smooth Mustard), Sclerolaena patenticuspis and Maireana erioclada (Rosy Bluebush) shrubland*.
>
> (NVIS, 2023)

<u>Criteria 3:</u> The terrestrial bird species recorded must contain at least three MBC species within current bird surveys and/or from existing bird observation records within 20 km of the site and within the last ten years.

Table 8-2 shows the MBC component bird species observed within the Study Area between 2020 – 2023. A search of the Biological Database of SA (BDBSA) via NatureMaps did not provide any additional MBC species recorded within 20 km of the Project Area in the last ten years.

As there are greater than three MBC species present, and other diagnostic criteria are met, the MBC of the MDDB TEC occurs in two locations within the study area (refer Figure 8-1).

Table 8-2: MBC species records

Common name	Species name	EPBC Act status	NPW Act status	Bioregion	Location of record within the PA
Mallee specialists					
Black-eared Miner	*Manorina melanotis*	E	E		
Chestnut Quail-thrush	*Cinclosoma castanotum*		R	MDD FLB	ML
Mallee Emu-wren	*Stipiturus mallee*	E	E		
Malleefowl	*Leipoa ocellata*	V	V		
Red-lored Whistler	*Pachycephala rufogularis*	V	R		
Scarlet-chested Parrot	*Neophema splendida*		R		
Striated Grasswren	*Amytornis striatus*		R		
Mallee Western Whipbird	*Psophodes nigrogularis*	V	E		

Common name	Species name	EPBC Act status	NPW Act status	Bioregion	Location of record within the PA
Mallee dependants					
Crested Bellbird	*Oreoica gutturalis*			MDD	ML
Grey-fronted Honeyeater	*Ptilotula plumula*			FLB	ML
Jacky Winter	*Microeca fascinans*			FLB	ML
Purple-gaped Honeyeater	*Lichenostomus cratitius*			FLB	ML
Regent Parrot	*Polytelis anthopeplus*	V	E		
Shy Heathwren	*Calamanthus cautus*		R		
Southern Scrub-robin	*Drymodes brunneopygia*				
Splendid Fairy-wren	*Malurus splendens*			FLB	ML
Spotted Pardalote	*Pardalotus punctatus*				
White-eared Honeyeater	*Nesoptilotis leucotis*				
White-fronted Honeyeater	*Purnella albifrons*				
Yellow-plumed Honeyeater	*Ptilotula ornata*			FLB	HR

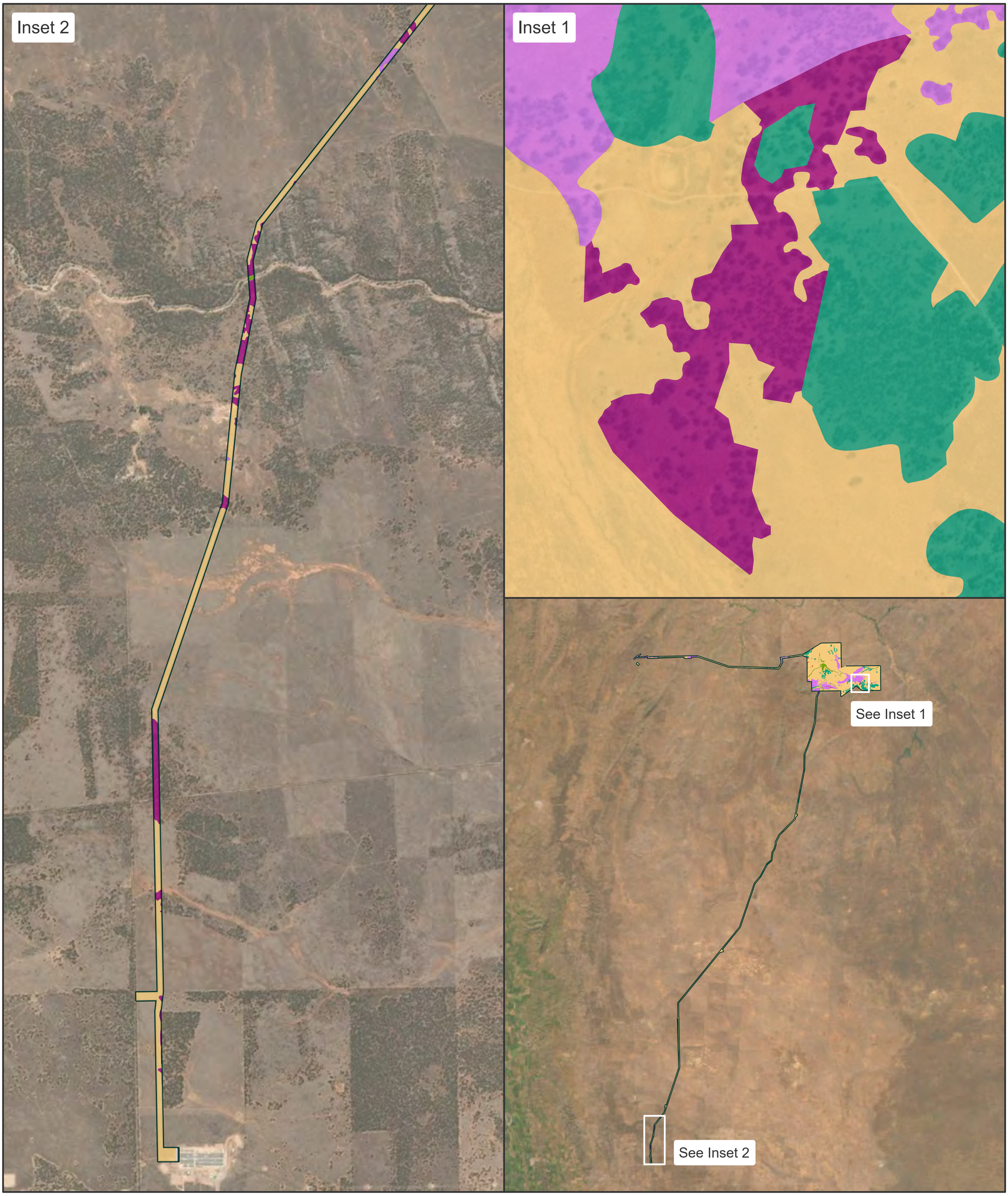

Figure 8-1: Threatened Ecological Community (TEC) within the Project Area

Project Area

Vegetation associations

VA1: *Maireana sedifolia* +/- *Maireana pyramidata* low open grassy shrubland

VA4: *Casaurina pauper* low woodland

VA5: Mixed *Eucalyptus leptophylla* +\- *E. gracillis* open mallee

VA5(b): Mixed *Eucalyptus leptophylla* +\- *E. gracillis* open mallee / TEC

VA7: *Eremophila sturtii* tall open shrubland over *M. pyamidata* open chenopod shrubland

0 20 40
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 54

23ADL5719-OK Date: 27/02/2025

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The Approved Conservation Advice for the MBC of the MDDB (DAWE, 2021) describes the MBC of the MDDB TEC as potentially occurring in four different condition categories. Table 8-3 is taken from the approved listing advice and includes a description of the MBC of the MDDB TEC condition classes and criteria.

Table 8-3: TEC category and criteria

Category	Thresholds *Bird species recorded from current bird surveys or collated existing records within 20 km of the site and within the past ten years.*
Category A: High number of MBC species	At least 5 MBC species, any mix of mallee specialist and dependent species
Category B: Moderate number of MBC species including a mallee specialist species	3 to 4 MBC species Including at least one mallee specialist species
Category C: Moderate number of MBC species as well as mallee associated species	3 to 4 MBC species PLUS at least 5 mallee associated species
Category D: Moderate number of MBC species as well as terrestrial bird species	PLUS at least 20 or more terrestrial bird species, as defined in the survey guidelines at Section 8.2.1 (DAWE, 2021)

Given that seven MBC species, including a singular mallee specialist species, were recorded within the Study area, the MBC TEC is classed as Condition Category A.

Within the Project Area the distinction between general mallee habitat and the MBC of the MDDB TEC has been delineated during ground surveys. Site specific surveys have identified 1,776 ha of mallee habitat (VA5 & VA5b), of which only 25.13 ha meets the definition of the MBC of the MDDB (refer Table 3-26 and Figure 3-61).

The MBC of MDDB TEC has been identified within the ML and the TL only. There is no MBC of the MDDB TEC recorded within the HR or within the RS area.

8.3.2. Presence of S-P-R pathway for MBC of the MDDB

As appropriate for the accredited assessment process, the State assessment methodology (S-P-R) is used initially, and then the Commonwealth significance assessment methodology is applied.

The S-P-R for the Project impacting on the MBC of the MDDB TEC is shown below:

- **Source:** Mining activities will require the removal of vegetation for construction and operational activities.
- **Pathway:** Clearing of vegetation.
- **Receptor:** MBC of the MDDB has been identified as occurring within the Conceptual Footprint.

As an S-P-R is confirmed, all potential direct and indirect impacts on the TEC as a result of the Project are considered (Sections 8.5 and 8.6) and avoidance and mitigation measures are proposed (Section 8.4), before the potential significance of any confirmed impacts are examined (Section 8.8).

8.4. Avoidance, minimisation and alternatives

The Conservation Advice for the MBC of the MDDB TEC states that projects should be planned to avoid the need to offset by avoiding significant impacts on the ecological community from development. The priority is to avoid loss of bird populations or critical / important habitats. The efforts to avoid and minimise impacts of the Project on the MBC of the MDDB are described in this Section.

8.4.1. Avoidance

The Conservation Advice for the MBC of the MDDB states that projects should be planned to avoid the need to offset, by avoiding significant impacts to the ecological community.

Due to the nature of the disturbance from construction and operation of a TL, it is very likely that micro-siting of infrastructure components could be used to avoid all direct impacts on the TEC within the proposed alignment as the habitat often has large open spaces between stands of mallee. The area of MBC of the MDDB TEC within the Site lies directly between Iron Peak deposit to the east and all other mining infrastructure to the west. A HR is required to take ore mined at Iron Peak to the processing plant for processing and transportation off site (Iron Peak HR). Whilst alternative routes were considered, including an option that avoided the TEC (refer Section 8.4.3), complete avoidance of mallee habitats is not feasible.

8.4.2. Minimisation

The HR corridor included within the referred Project Area had a nominal width of 40 m, with an additional 20 m buffer either side for temporary disturbance / laydown during construction, giving a required width of vegetation clearing for construction, operation and closure, of up to 80 m. A further 50 m ecological buffer was included in the Conceptual Footprint for potential indirect impacts.

Within the area where the proposed HR intersects with the TEC, the HR has been planned to the minimal width required for safe construction, operation and closure of the road. There will be no construction laydown areas within the TEC, and there will be no permanent structures that could be located elsewhere along the HR. As a result, the target impact width of the HR within the patch of TEC will be less than 80 m (40 m road width plus 20 m buffer on either side).

The MBC of the MDDB approved conservation advice (Appendix G) includes the following definition of ‘patches’ of TEC habitat:

> *When it comes to defining a patch of habitat, allowances are made for “breaks” up to 100 m between areas that meet the habitat description. The 100 m gap or less allows for the ability of many birds in the community to traverse this distance. Such breaks may be the result of watercourses or drainage lines, water bodies e.g. farm dams, tracks, paths, roads, gaps made by exposed areas of soil or litter, and areas of localised variation in vegetation that do not meet the description. For example, a single patch could include two areas that are separated by a narrow strip of different vegetation along a drainage line or by areas locally dominated by weeds. Such limited breaks do not significantly alter the overall functionality of the habitat and form a part of the patch. Wider areas, especially due to human-made disturbances, should be excluded from the calculation of patch size and condition. Where there is a break in mallee habitats of 100 m or more then the gap indicates that separate patches are present. Human made structures, gardens and commercial crops may occur within a patch, but are not part of the habitat for the ecological community and can be the cause of gaps >100 m that create separate patches.*

Detailed aerial analysis, followed by ground-truthing has determined there are currently no gaps greater than 100 m wide between mallee vegetation associated with the current vehicle track through the TEC or for any other reason, hence the area of TEC is considered to be a single patch.

8.4.3. Alternatives

The Conservation Advice for the MBC of the MDDB states that roads and other infrastructure should be planned to avoid known bird populations of high-quality areas of native habitats wherever possible (DAWE, 2021).

8.4.3.1. Take no action

The 'take no action' alternative relates to not building a HR between Iron Peak and Razorback. This option would mean the Iron Peak deposit could not be mined effectively and efficiently and would result in the Project only consisting of the Razorback deposit, which is economically unviable.

8.4.3.2. Iron Peak haul road options analysis

Primary analysis was undertaken prior to referring the Project under the EPBC Act; during this process three alternative locations for the Iron Peak HR (central [the referred option], northern and southern options) were assessed to determine the optimal route selection to minimise potential direct and indirect impacts on the TEC. During post-assessment discussions with DCCEEW representatives, an additional option (Central V2) was added expressly to address concerns that the central HR location may result in a fragment of TEC smaller than the minimum patch size of 10 ha. For ease of comparison, all four options will be considered together in the following MCA, which resulted in the selection of Central V2 option.

Summary descriptions of the HR options are provided in Table 8-4 and are mapped in Figure 8-2.

Table 8-4: MCA options

Northern	Central V1 (original central concept alignment)	Central V2 (revised central concept alignment, slightly more north than Central V1)	Southern
Description			
Northern-most alignment option that bypasses and avoids the mapped extent of the TEC. • Intersects the un-named watercourse that runs in an approximately north-south orientation between the Iron Peak and Razorback deposits, at a location ~100 m upstream of the Central V1 and V2 crossing point. • Intersects two smaller drainage lines upstream of Hideaway Dam. • Traverses higher terrain east of the un-named creek.	Generally straightest HR alignment between Iron Peak and Razorback, and was the alignment used in the original EPBC Act referral. • Intersects the un-named watercourse that runs in an approximately north-south orientation between the Iron Peak and Razorback deposits, at the same location as Central V2 crossing point and ~100 m downstream of the Northern option crossing point. • Partly overlaps an existing pastoral track to the east of the un-named watercourse in the vicinity of the TEC. • Traverses Hideaway Dam.	Alternative option to Central V1 with additional objective to intersect TEC further north; was the alignment used in proposed variation of EPBC Act Project Area in December 2024. • Intersects the un-named watercourse that runs in an approximately north-south orientation between the Iron Peak Razorback deposits, though at a higher elevation and reach than other alignments. • Partly overlaps an existing pastoral track to the east of the un-named watercourse.	Southern-most alignment option that bypasses and avoids the mapped extent of the TEC. • Intersects an un-named watercourse that runs in an approximately north-south direction between the Iron Peak Razorback deposits, though at a lower elevation and reach than other alignments. This watercourse, at the point of intersection with this HR alignment, is characterised by a broad area of unconsolidated alluvial material up to ~200 m wide with a deeply incised main channel which is approximately ~3 m lower than the alluvium.
Footprint			
• Linear distance (between Points A and A_1) approximately 4,350 m. • Total disturbance footprint (between Points A and A_1) approximately 78.19 ha.	• Linear distance (between Points A and A_1) approximately 4,320 m. • Total disturbance footprint (between Points A and A_1) approximately 77.58 ha.	• Linear distance (between Points A and A1) approximately 4,370 m. • Total disturbance footprint (between Points A and A_1) approximately 72.78 ha.	• Linear distance (between Points A and A_1) approximately 5,190 m. • Total disturbance footprint (between Points A and A_1) approximately 93.07 ha.

Northern	Central V1 (original central concept alignment)	Central V2 (revised central concept alignment, slightly more north than Central V1)	Southern
Gradients			
• Steepest HR gradient within divergent area approximately 68.5% (rocky minor creek channel). • Steepest HR gradient within divergent area that is not a drainage line approximately 20.1%. • Elevation range between 274.9 and 310.6 mAHD (35.7 m).	• Steepest HR gradient within divergent area approximately 35.0% (main creek channel). • Steepest HRgradient within divergent area that is not a drainage line approximately 12.4%. • Elevation range between 271.7 and 310.6 mAHD (38.98 m).	• Steepest HR gradient within divergent area approximately 18.41% (main creek channel). • Steepest HR gradient within divergent area that is not a drainage line approximately 10.4%. • Elevation range between 272.8 and 310.6 mAHD (37.8 m).	• Steepest HR gradient within divergent area approximately 73.71% (main creek channel). • Steepest HR gradient within divergent area that is not a drainage line approximately 16.1%. • Elevation range between 258.8 and 310.6 mAHD (51.8 m).
TEC			
• Total area of TEC impacted approximately 0 ha. • Total area of non-TEC mallee vegetation (VA5) impacted approximately 56.66 ha.	• Total area of TEC impacted approximately 1.29 ha. • Total area of non-TEC Mallee vegetation (VA5) impacted approximately 38.78 ha.	• Total area of TEC impacted approximately 1.80 ha. • Total area of non-TEC Mallee vegetation (VA5) impacted approximately 38.85 ha.	• Total area of TEC impacted approximately 0 ha. • Total area of non-TEC mallee vegetation (VA5) impacted approximately 35.83 ha.

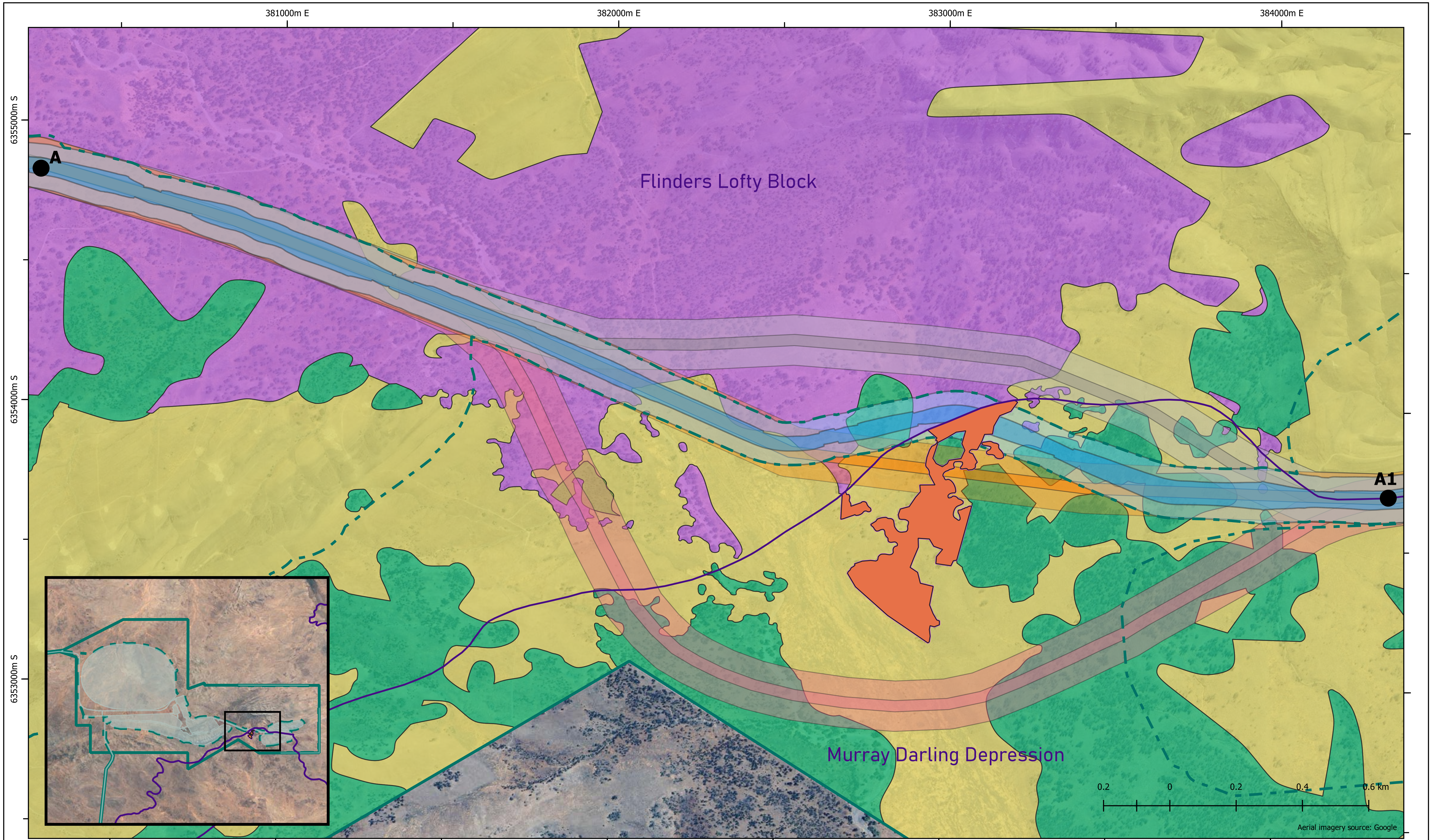

Figure 8-2: Assessed Iron Peak haul road corridor options, with cross-section extents

Project Area
Conceptual footprint
IBRA region

Haul road corridor options
Northern haul road
Northern haul road buffer (70m)
Central V1 haul road
Central V1 haul road buffer (70m)
Central V2 haul road
Central V2 haul road buffer (50m)
Southern haul road
Southern haul road buffer (70m)
VA5(b)/TEC mapped extent

Vegetation associations
VA1: Maireana sedifolia +/- Maireana pyramidata low open grassy shrubland
VA4: Casaurina pauper low woodland
VA5(b): Mixed Eucalyptus leptophylla +\- E. gracillis open mallee / TEC
VA5: Mixed Eucalyptus leptophylla +\- E. gracillis open mallee
VA7: Eremophila sturtii tall open shrubland over M. pyamidata open chenopod shrubland

GDA 1994 MGA Zone 54 | 1:7,000 @ A3
Author: A Kane | Date 08/01/2025
Razorback MLP / Referral

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Key to the assessment of HR options is the nature of the landforms within each respective alignment. An overview of elevation and slope are presented in Figure 8-3 and Figure 8-4 respectively. Elevation and slope are material to the assessment of a preferred alignment as they impact the construction, operational and closure complexity, risks and costs. Operational safety tolerances for road gradients are low; therefore, steep and undulating landforms will result in the need for extensive cuttings and / or embankments to limit road gradients and a range of direct and indirect impacts.

Cross-sections depicting elevation and slope profiles for each HR option are presented in Figure 8-3 and Figure 8-4.

The presence of watercourses is also material to the assessment of HR options. Figure 8-5 displays principal watercourses relevant to the HR options. Watercourses and other drainage features are often associated with the steepest gradients / slopes, representing deeply excised channels (usually very limited in extent). Watercourses may require extensive civil works to maintain safe vehicular access while simultaneously limiting changes to the hydraulic flow patterns, negating increased flood risks and preventing erosion. Watercourse crossings will generally be more expensive per linear unit for construction, operational maintenance and closure.

Figure 8-6 provides an overview of the soil types relevant to the area. Due to the broadscale nature of the soils mapping, the erosive soils are not shown. However, Plate 8-1 shows the current significant erosivity associated with the drainage features that form the un-named creek which is material when considering the Iron Peak HR options. The plate is representative of the active erosional and depositional processes that continue to extend eastwards and westwards.

Plate 8-1: Erosion at un-named creek (Location: UTM E382120, 6354521).

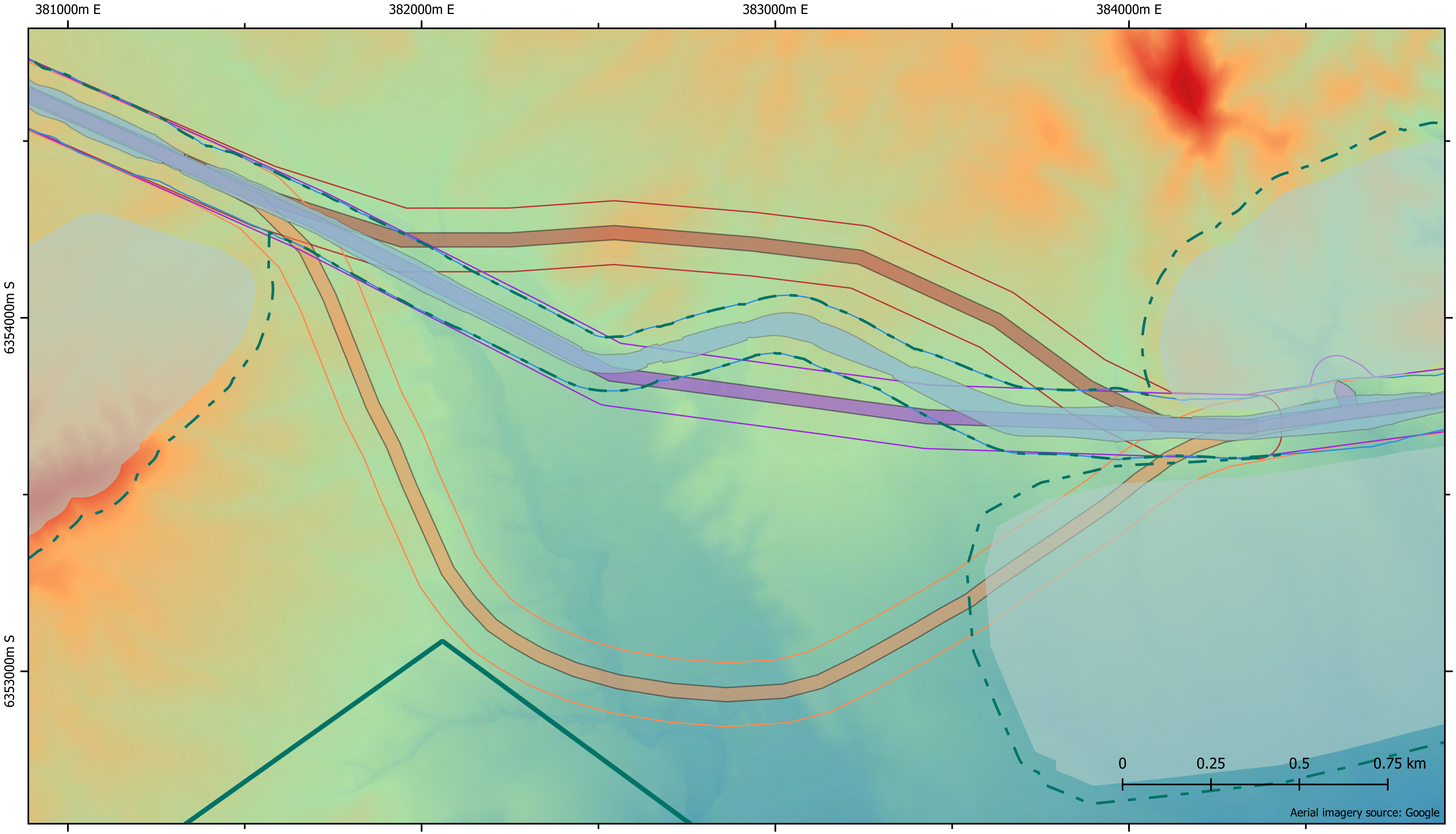

Figure 8-3: Elevation, Iron Peak haul road options

Project Area
Proposed Project footprint
Proposed disturbance area

Iron Peak haul road options
Central V1 haul road
Central V1 haul road buffer (70m)
Central V2 haul road
Central V2 haul road buffer (50m)
Southern haul road
Southern haul road buffer (70m)
Northern haul road
Northern haul road buffer (70m)

Elevation
m AHD
400
243

GDA 1994 MGA Zone 54 | 1:15,000 @ A4
Author: A Kane | Date: 21/01/2025
Razorback MLP / Referral

N

MAGNETITE
MINES

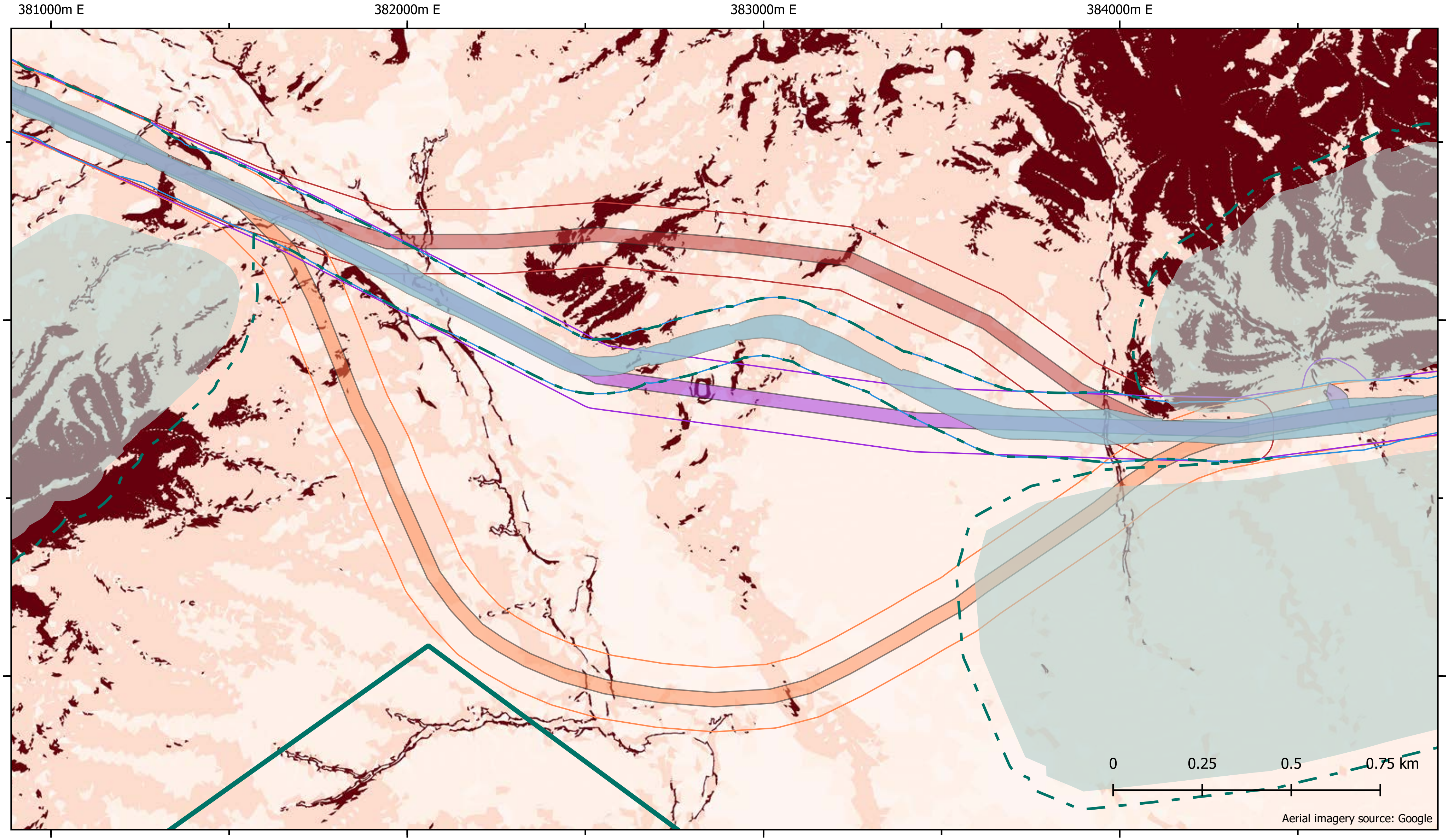

Figure 8-4: Slope, Iron Peak haul road options

Project Area
Proposed Project footprint
Proposed disturbance area

Iron Peak haul road options
Central V1 haul road
Central V1 haul road buffer (70m)
Central V2 haul road
Central V2 haul road buffer (50m)
Southern haul road
Southern haul road buffer (70m)
Northern haul road
Northern haul road buffer (70m)

Slope (degrees)
DEM-derived (0.5m pxl)
<= 1.00
1.00 - 2.50
2.50 - 8.00
> 8.00

GDA 1994 MGA Zone 54 | 1:15,000 @ A4
Author: A Kane | Date: 21/01/2025
Razorback MLP / Referral

N

MAGNETITE MINES

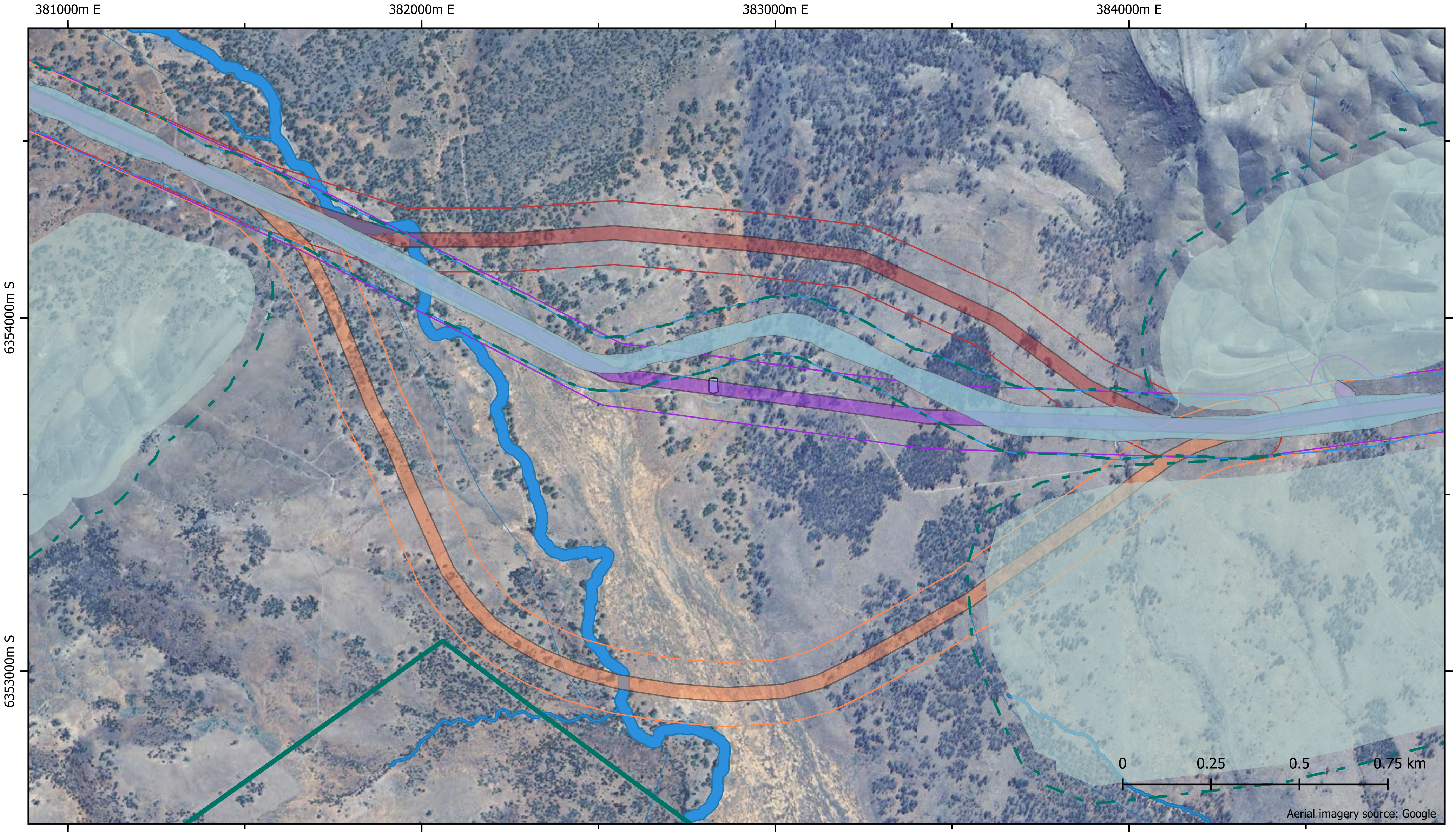

Figure 8-5: Watercourses and dams, Iron Peak haul road options

Project Area
Proposed Project footprint
Proposed disturbance area

Watercourses (from Surface Water IA)
Farm dams

Iron Peak haul road options

Central V1 haul road
Central V1 haul road buffer (70m)
Central V2 haul road
Central V2 haul road buffer (50m)
Southern haul road
Southern haul road buffer (70m)
Northern haul road
Northern haul road buffer (70m)

GDA 1994 MGA Zone 54 | 1:15,000 @ A4
Author: A Kane | Date: 21/01/2025
Razorback MLP / Referral

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MAGNETITE MINES

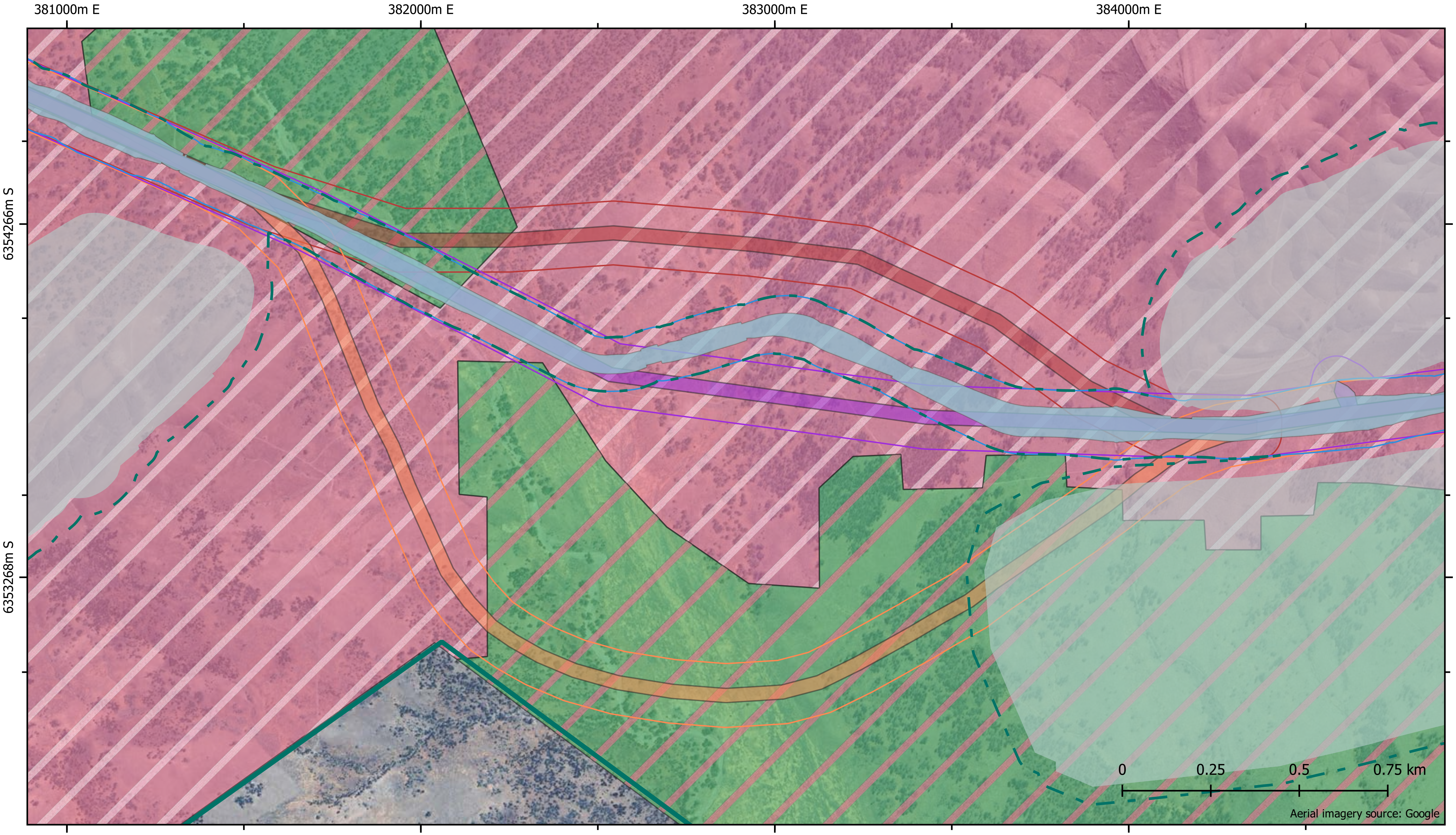

Figure 8-6: Soil subgroups, Iron Peak haul road options

Project Area
Proposed Project footprint
Proposed disturbance area

Iron Peak haul road options
Central V1 haul road
Central V1 haul road buffer (70m)
Central V2 haul road
Central V2 haul road buffer (50m)
Southern haul road
Southern haul road buffer (70m)
Northern haul road
Northern haul road buffer (70m)

Soil subgroups
A2/L1 - calcareous loams on rock & shallow soils on rock
A3/A4 - moderately calcareous loams & calcareous loams

GDA 1994 MGA Zone 54 | 1:15,000 @ A4
Author: A Kane | Date: 21/01/2025
Razorback MLP / Referral

N

MAGNETITE MINES

NORTHERN OPTION

The northern Iron Peak HR option is shown in Figure 8-2. This option was designed to avoid direct impacts on the MBC of the MDDB TEC, and achieves this aim with no direct loss of the TEC. However, the northern Iron Peak HR option would impact 56.66 ha of mallee habitat located approximately 120 m to the north of the patch of MBC of the MDDC TEC. This mallee vegetation is part of the same patch of vegetation as the TEC, however this portion of the patch is north of the MDDB boundary and within the FLB Bioregion, and hence does not technically meet the definition of the TEC (DCCEEW, 2023). Further, elevations and slopes for this option are the most pronounced amongst the four assessed options (refer Figure 8-7).

Whilst the mallee vegetation that would be cleared for the Northern Iron Peak HR option is not the MBC of the MDDB TEC, it is part of the same patch of mallee vegetation and is likely to provide habitat of similar value to the MBC as that present in the TEC. Section 2.5 of the Approved Conservation Advice for the MBC of the MDDB TEC states it is important to consider the whole environment surrounding occurrences of the TEC, and that indicators of high value include surrounding, adjacent and/or buffering areas of native vegetation and those that function as wildlife corridors that connect conservation areas where the MBC occurs, or function as havens for some populations of mallee birds. Hence the connected mallee habitat within the Flinders Block Bioregion is likely to be of consequence to the functioning of the TEC. The impact to 56.66 ha of this mallee habitat is considered a poorer environmental outcome than the clearing of 38.85 ha of mallee habitat (inclusive of 1.80 ha of TEC mallee) resulting from the preferred central V2 option.

The construction and operation of the Northern option Iron Peak HR would create a linear barrier within the patch of mallee vegetation within the FLB Bioregion which would separate the majority of the mallee patch north of the road from the patch of mallee vegetation (including the TEC) to the south of the road. Whilst birds of the MBC are highly mobile, they are less likely to cross the linear barrier with associated noise and vibration than to disperse, forage and utilise the undisturbed mallee habitat to the north of the proposed HR. This may result in the southern patch of mallee habitat (including the TEC) becoming more isolated from the remainder of the patch north of the HR.

Of note, Southern Whiteface records exist throughout the Project Area and there are records of this species from within this patch of mallee habitat which would be bisected by the northern HR option. Clearing of this habitat may result in direct or indirect impacts on Southern Whiteface, including loss of potential breeding habitat. To reduce the risk of such impacts, the area of habitat to be cleared for Iron Peak HR, and fragmentation of this habitat should be minimised.

Due to the increased impacts (including fragmentation) on mallee vegetation likely to be used by the MBC and by other MNES species such as Southern Whiteface, the Northern Iron Peak HR option was discounted.

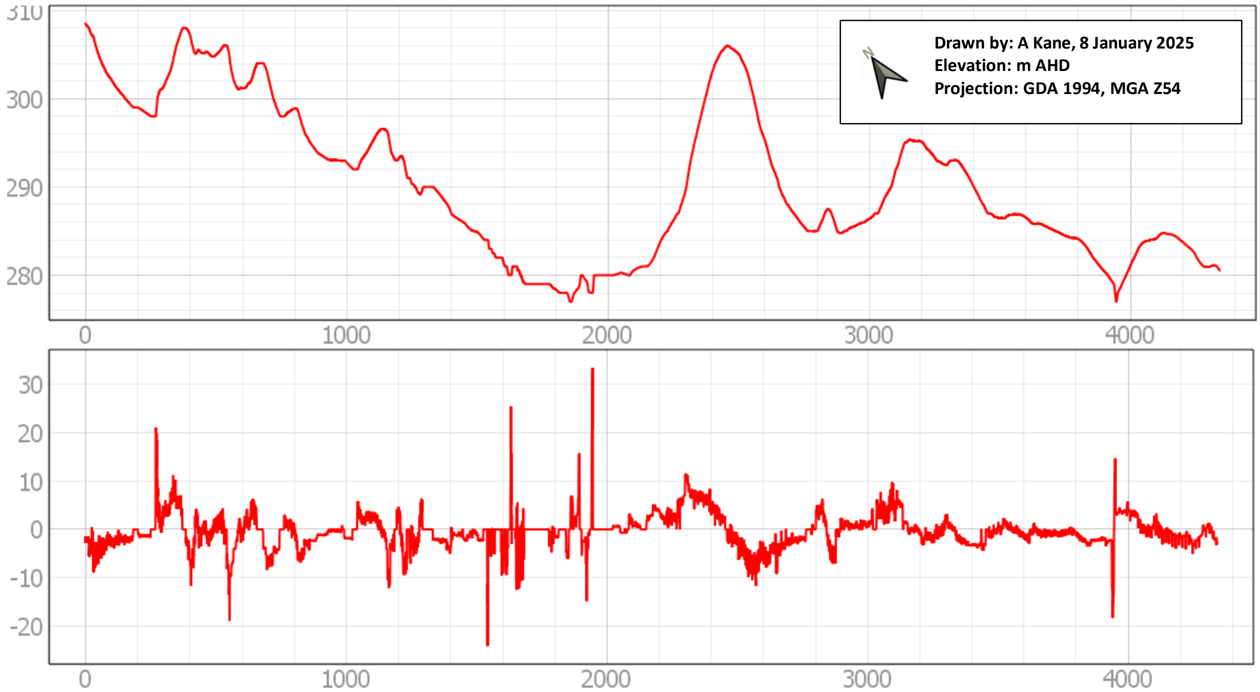

Figure 8-7: Cross-sections, Iron Peak ‘Northern’ haul road option and slope (degrees)

CENTRAL V1 OPTION

The Central V1 Iron Peak HR option is shown in Figure 8-2 and generally follows the alignment of an existing disturbed/cleared area, being a station vehicle track with an assumed width of 3 m. As this currently cleared track will be included in the HR footprint, the additional disturbance area for this option is reduced. This option uses areas of pre-existing disturbance and has relatively flat and stable terrain, requiring least engineering to produce a safe and suitable HR (refer Figure 8-8). However, the Central V1 Iron Peak haul route option bisects the MBC of the MDDB TEC and would result in the disturbance to up to 1.3 ha of the TEC. It should be noted that due to the spacing of the mallee vegetation and the resultant gaps between stands, the impact on individual mallee trees may be minimal. The location of the HR would cause the fragmentation of the TEC into two Sections of 2.0 ha (northern) and 9.2 ha (southern). As neither resultant patch meets the minimum patch size of 10 ha, the total loss of MBC of the MDDB habitat is considered to be 12.5 ha (direct loss of 1.3 ha plus indirect loss of two fragments totalling 11.2 ha).

It should be noted that although technically, the northern fragment of 2.0 ha is calculated to be an indirect loss of MBC of the MDDB habitat, this 'fragment' remains connected to a much larger patch of the same mallee habitat within the Project Area. This patch of mallee habitat is only not defined as MBC of the MDDB due to the position of the MDDB IBRA region boundary. It should be noted that there are no differences between the mallee habitat to the north and south of the IBRA boundary, and hence the northern 'fragment' is not ecologically isolated and hence should not be treated as a fragment or a loss of habitat for the mallee bird community.

There may be indirect impacts on the mallee bird community resulting from the noise, dust, light, air turbulence and potential vehicle strike associated with haulage of ore between Iron Peak and the processing plant (estimated at approximately 400 round trips per day). The majority of these indirect impacts are expected to be retained within the Conceptual Footprint.

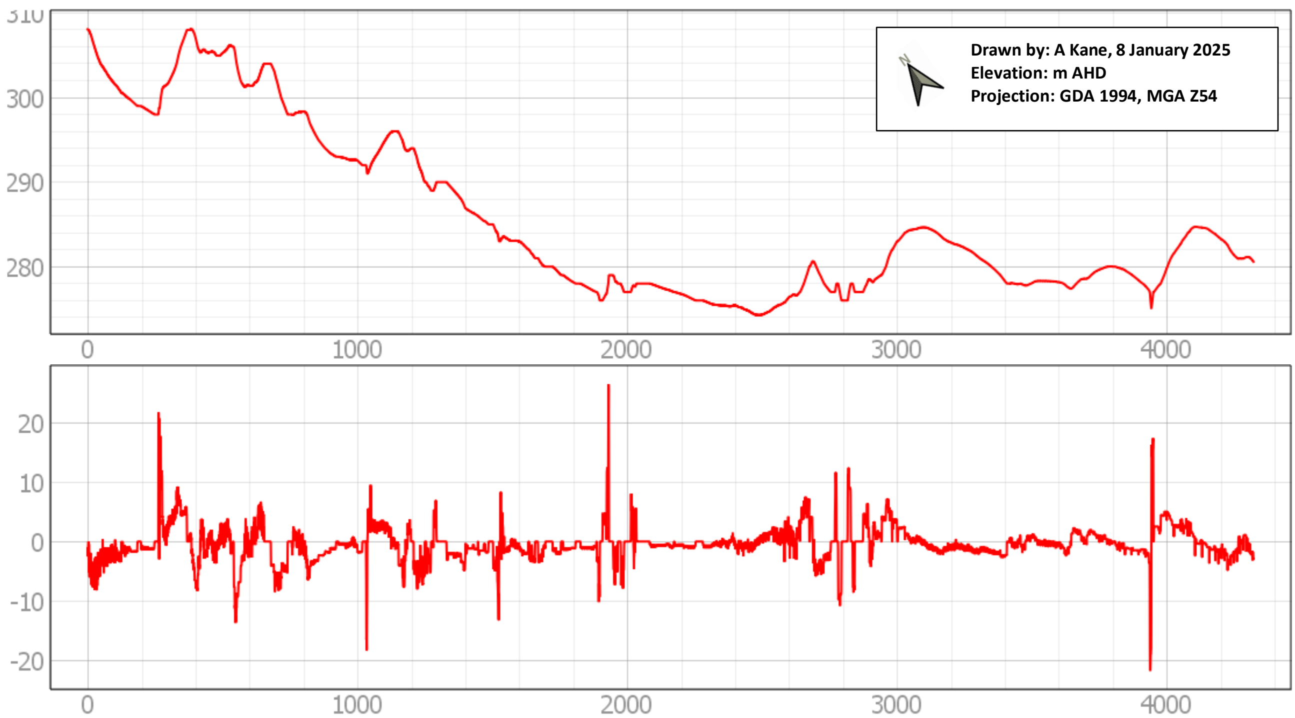

Figure 8-8: Cross-sections, Iron Peak 'Central V1' haul road option (m AHD) and slope (degrees)

CENTRAL V2 OPTION

The Central V2 option HR option is shown in Figure 8-2. This option is a variation on the central V1 option, positioned slightly north, and hence avoids creating a patch of mallee habitat less than the minimum patch size of 10 ha. The Central V2 route alignment creates a northern fragment of 0.05 ha and a southern functioning patch of 10.69 ha. As discussed in relation to central V1 option above, the division of the Section north of the HR from that south of the HR does not prevent it functioning as part of the larger patch of mallee habitat to the north of the MDDB bioregion boundary, therefore this does not constitute an indirect loss of this area as it is not an isolated fragment. The area of MBC of the MDDB to the south of the HR retains a minimum patch size of >10 ha and hence this also is not an indirect loss through fragmentation. As with all options, the indirect impacts of noise, dust, light, air turbulence and vehicle strike are expected to be minimal due to the highly mobile nature of the bird community and extensive suitable habitat in the surrounding area available for self-relocation. In selecting central V2 option, there is no indirect loss of habitat for the mallee bird community.

The operational considerations for the location of Central V2 route is as for the central V1 route, however due to the slightly different alignment, the area of disturbance to the MDB of the MDDB habitat would be 1.80 ha. Hence for Central V2 option, the total loss of TEC habitat would remain as 1.80 ha with no indirect loss.

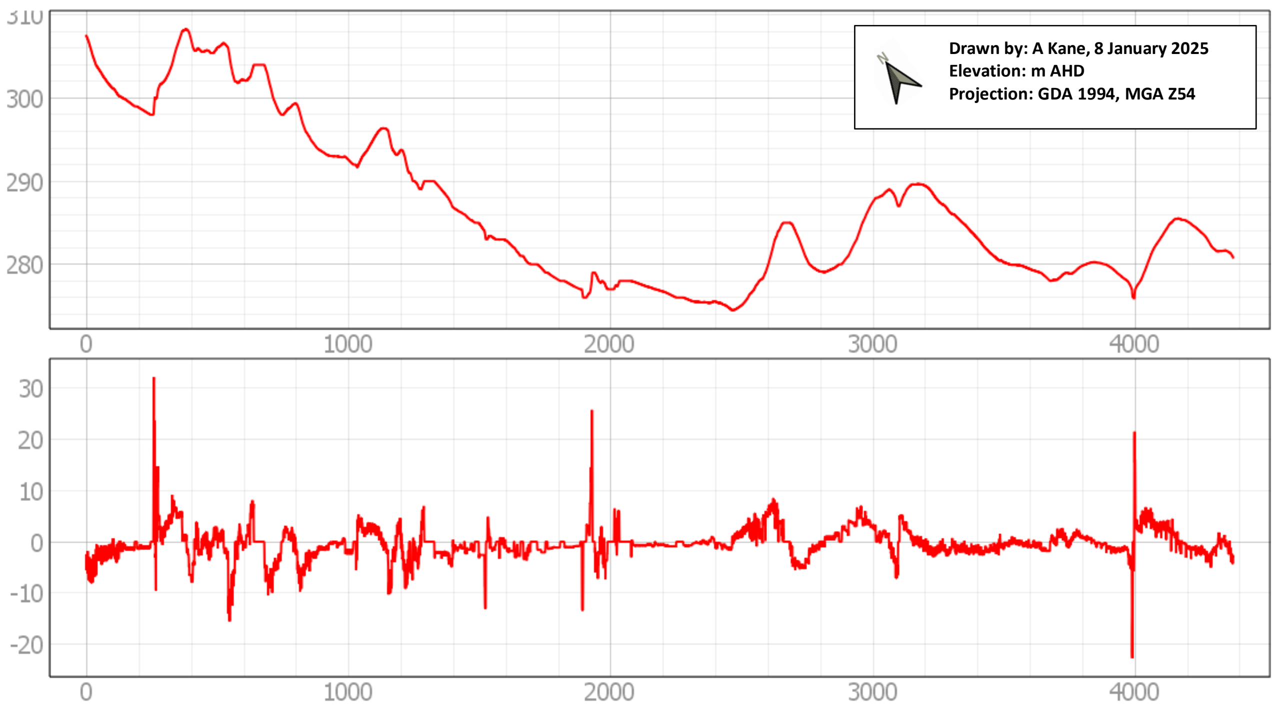

Figure 8-9: Cross-sections, Iron Peak 'Central V2' haul road option (m AHD) and slope (degrees)

SOUTHERN OPTION

The Southern Iron Peak HR option is shown in Figure 8-2. This option was located to avoid direct impacts on the MBC of the MDDB TEC, and achieves this aim with no direct loss of the TEC. However, to avoid impacts on the TEC, provide sufficient distance between the TEC and the Southern HR, and to ensure the curves in the road meet safety design criteria, the southern Iron Peak HR option would be approximately 1 km longer than the other three options, requiring the removal of an additional 18 ha of vegetation compared with the northern, central V1 and central V2 options. The Southern Iron Peak HR option would cross sodic and erosive soils and require crossing of a drainage channel /floodplain of a much greater width than the other two options (as evident in the elevation cross-section in Figure 8-10). This option would result in greater capital and operating costs, the risk of soil erosion (and associated impacts on surface water) is materially greater, and the undulating terrain would require greater safety controls potentially requiring a wider road corridor than the other options. Due to the extensive disturbance to unstable soils and the potential impact on the associated drainage channel, the Southern Iron Peak HR option was discounted.

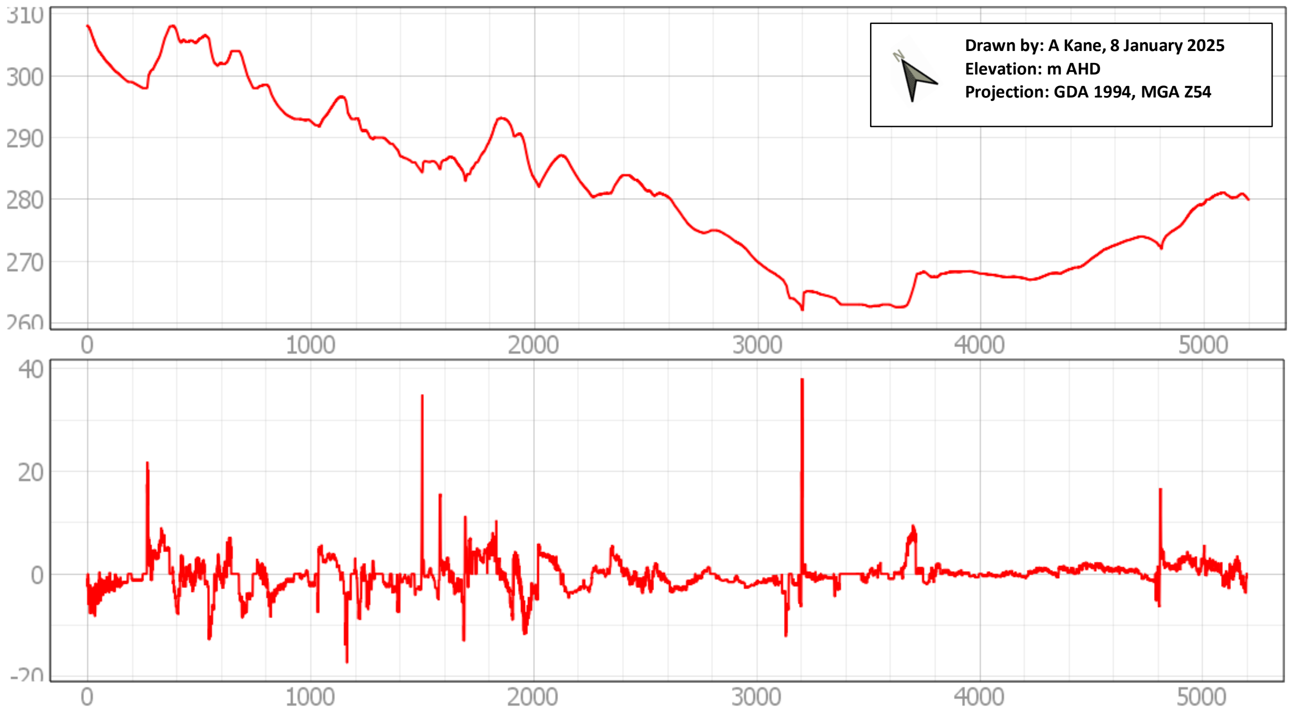

Figure 8-10: Cross-sections, Iron Peak 'Southern' haul road option (m AHD) and slope (degrees)

8.4.3.3. Multi-criteria analysis methodology

An MCA was completed to select the preferred Iron Peak HR option. The MCA is adapted from the QLD TMR 'Smarter Solutions – Multi-Criteria Analysis Tool – User Guide' (TMR, 2019) (TMR MCA Tool), and is used to differentiate and evaluate options systemically using a set of assessment criteria to provide a transparent and structured approach.

A total of thirteen criteria have been identified are categorised as environmental, economic, technical or social. Criteria and scoring range definitions are shown in Table 8-5. For each criteria, a score of between 1 and 5 is assigned based on the scoring definitions also included within Table 8-5 and the information provided in Section 8.4.3. A score of 1 correlates to a very high impact or the least-favourable outcome, while a score of 5 correlates to a very low impact or the most-favourable outcome.

The weighting of each criterion uses an inverse ranking method as per the TMR MCA Tool methodology that shows the relative importance of a given criterion within the scope of the decision context. Each criterion is ranked from 1 to 13 in order of importance (a ranking of 1 is most important, a ranking of 13 is least important), with normalised weightings established as either a fraction (of 1.0) or percentage (of 100%). The score from each criterion is then multiplied by the normalised weighting for a maximum score of 5.0. The option with the highest score would be deemed the preferred option.

The weightings for the 13 assessment criteria are shown in Table 8-6.

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Table 8-5: MCA criteria and score descriptions

Assessment Criteria	Criteria Rationale	Indicator	Measure	Scoring Range				
				1	2	3	4	5
ECONOMIC								
(A) Construction cost	The terrain intersected by the road alignment determines the scale of engineering required in terms of: • construction methodology • earthworks cut/fill • structural design and safety; and • drainage control structures required to manage surface water flows. Alignments intersecting steep and/or complex terrain will likely involve greater design complexity and resulting capital cost	Estimated construction cost, inclusive of critical factors like slope (topographic) and length.	Qualitative	Relative to other options, the option likely has the highest construction cost	Relative to other options, the option likely has a moderate-to-high construction cost	Relative to other options, the option likely has a mid-range construction cost	Relative to other options, the option likely has a moderate-to-low construction cost	Relative to other options, the option likely has the lowest construction cost
(B) Operating cost	Alignments intersecting steep and/or complex terrain will likely involve greater design complexity and hence ongoing capital cost to maintain. Road alignment options with a longer linear travel distance and/or steeper inclines will also incur higher surface mobile equipment (SME) operating costs (i.e., greater travel time and fuel consumption per unit of bulk material moved).	Estimated operating cost, inclusive of critical factors like slope (topographic) and length.	Qualitative	Relative to other options, the option has the highest operating cost	Relative to other options, the option has a moderate-to-high operating cost	Relative to other options, the option has a mid-range operating cost	Relative to other options, the option has a moderate-to-low operating cost	Relative to other options, the option has the lowest operating cost
(C) Closure cost	Alignments intersecting steep and complex terrain, and/or with the larger total disturbance footprint, will likely have a higher future cost for landform reinstatement and rehabilitation.	Estimated closure cost, inclusive of critical factors like slope (topographic) and length	Qualitative	Relative to other options, the option has the highest cost for decommissioning and rehabilitation	Relative to other options, the option has a moderate-to-high decommissioning and rehabilitation cost	Relative to other options, the option has a moderate decommissioning and rehabilitation cost	Relative to other options, the option has a moderate-to-low decommissioning and rehabilitation cost	Relative to other options, the option has the lowest decommissioning and rehabilitation cost
TECHNICAL								
(D) Engineering complexity	Alignments intersecting steep and/or complex terrain will likely involve greater engineering complexity. Engineering complexity will also be influenced by the nature of the local soils and geology. For example, soils/substrates that are unconsolidated and erosive may have greater geotechnical constraints.	Extent and complexity of engineering required	Qualitative	Relative to other options, the option has the greatest engineering complexity due to terrain	Relative to other options, the option has moderate-to-high engineering complexity due to terrain	Relative to other options, the option has moderate engineering complexity due to terrain	Relative to other options, the option has moderate-to-low engineering complexity due to terrain	Relative to other options, the option has the lowest engineering complexity due to terrain
(E) Watercourse crossings – flow regimes and flood hazard	The point and elevation at which a road alignment intersects a watercourse influences design and engineering requirements to maintain flows and to manage peak flow events (flood/inundation hazard). Watercourse crossings in narrow high-flow Sections of a watercourse, or lower in elevation reaches with a higher total upstream catchment area, may experience a greater volume and/or velocity of flow and therefore require more complex hydraulic engineering.	Extent and complexity of engineering required	Qualitative	Relative to other options, the option likely has the greatest engineering complexity to manage water flows and accommodate peak flow events	Relative to other options, the option likely has moderate-to-high engineering complexity to manage water flows and accommodate peak flow events	Relative to other options, the option likely has moderate engineering complexity to manage water flows and accommodate peak flow events	Relative to other options, the option likely has moderate-to-low engineering complexity to manage water flows and accommodate peak flow events	Relative to other options, the option likely has the lowest engineering complexity to manage water flows and accommodate peak flow events

Assessment Criteria	Criteria Rationale	Indicator	Measure	Scoring Range				
				1	2	3	4	5
(F) Driver safety	Road alignments traversing steep and/or complex terrain may pose a greater driver safety risk due to factors such as reduced lines-of-sight, steep road shoulders/drop-offs and gradients which increase the potential for vehicle collision, rollover and loss control/ These risks are increased with the use of large SME operating on unsealed roads in wet weather / road conditions (particularly when fully loaded).	Potential driver safety risk	Qualitative	Relative to other options, this option likely presents the highest driver safety risk	Relative to other options, this option likely presents a moderate-to-high driver safety risk	Relative to other options, this option likely presents a moderate driver safety risk	Relative to other options, this option likely presents a moderate-to-low driver safety risk	Relative to other options, this option likely presents the lowest driver safety risk
ENVIRONMENTAL								
(G) Flora and fauna – Commonwealth	The road alignment determines the potential for and extent of 'significant impact' on matters of national environmental significance (MNES) under the EPBC Act (Cth).	Total area of EPBC-listed ecological communities directly impacted/fragmented and/or the total number of EPBC-listed species impacted that is assessed as 'significant impact' under the MNES Significant Impact Guidelines, relative to other options	Quantitative (TEC area impacted) Qualitative (species impacts)	The option is likely to result in a 'significant impact on MNES' as defined in the EPBC Act, and this impact is the highest relative to other options	The option is likely to result in a 'significant impact on MNES' as defined in the EPBC Act, and this impact is moderate-to-high relative to other options	The option is likely to result in a 'significant impact on MNES' as defined in the EPBC Act, and this impact is moderate relative to other options	The option is likely to result in a 'significant impact on MNES' as defined in the EPBC Act, and this impact is moderate-to-low relative to other options	The option will not result in impacts on MNES, or if 'significant impacts on MNES' will occur, this impact is the lowest relative to other options
(H) Vegetation clearance	The road alignment determines the extent of ground disturbance required for construction and associated direct loss of vegetation and habitat for native fauna species.	Total vegetation clearance (ha)	Quantitative	Relative to other options, the option requires the greatest vegetation clearance	Relative to other options, the option requires moderate-to-high vegetation clearance	Relative to other options, the option requires moderate vegetation clearance	Relative to other options, the option requires moderate-to-low vegetation clearance	Relative to other options, the option requires the greatest vegetation clearance
(I) Use of existing disturbed land	Road alignment options that utilise previously disturbed land (e.g. existing tracks and other cleared ground), either wholly or partly, are preferred.	Extent of use of existing disturbed land, relative to other options	Qualitative	Relative to other options the option does not use, or uses the least amount of, existing disturbed land	Relative to other options, the option uses a moderate-to-low amount of existing disturbed land	Relative to other options, the option uses a moderate amount of existing disturbed land	Relative to other options, the option uses a moderate-to-high amount of existing disturbed land	Relative to other options the option only uses, or uses the most amount of, previously disturbed land
(J) Soil erodibility in road corridor	The road alignment determines the type and nature of soils that will be disturbed. Certain soil types may pose a greater erosion hazard both to the environment through sediment runoff and geotechnical constraints for construction.	Potential for greater erosion hazard based on available soil type mapping	Qualitative	Relative to other options, the option has the greatest erosion hazard	Relative to other options, the option has a moderate-to-high erosion hazard	Relative to other options, the option has a moderate erosion hazard	Relative to other options, the option has a moderate-to-low erosion hazard	Relative to other options, the option has the lowest erosion hazard
(K) Surface water – downstream erosional stability	Some road alignment options, due to their position in the landscape and/or surface water management design, may have greater potential for concentrated, downstream surface water flows and greater potential for downstream erosion and surface water quality/environmental impact.	Potential for concentrated downstream surface water flows and erosion downstream of watercourse crossings	Qualitative	Relative to other options, the option has the greatest potential cause erosion downstream of the watercourse crossing	Relative to other options, the option has moderate-to-high potential cause erosion downstream of the watercourse crossing	Relative to other options, the option has moderate potential cause erosion downstream of the watercourse crossing	Relative to other options, the option has moderate-to-low potential cause erosion downstream of the watercourse crossing	Relative to other options, the option has the lowest potential to alter streambank dynamics and cause erosion downstream of the watercourse crossing, or does not involve any watercourse crossings
(L) Rehabilitation complexity and risk	Alignments intersecting steep and complex terrain, and/or crossing watercourses at points where concentrated or peak water flows pose an erosional stability hazard, are likely to be more complex to rehabilitate and with a greater potential for rehabilitation failure. For example, downstream streambank erosion and altered watercourse dynamics due to changed hydraulic flow regimes caused by waterway crossings/structures are likely to be difficult and/or costly to rehabilitate.	Potential for increased rehabilitation risk and effort, relative to other options	Qualitative	Relative to other options, rehabilitation is likely to be the most complex and/or has the greatest potential for rehabilitation failure	Relative to other options, rehabilitation is likely to have moderate-to-high complexity and/or have moderate-to-high potential for rehabilitation failure	Relative to other options, rehabilitation is likely to be moderately complex and/or moderate potential for rehabilitation failure	Relative to other options, rehabilitation is likely to have moderate-to-low complexity and/or have moderate-to-low potential for rehabilitation failure	Relative to other options, rehabilitation is likely to be the least complex and/or has the lowest potential for rehabilitation failure

Assessment Criteria	Criteria Rationale	Indicator	Measure	Scoring Range				
				1	2	3	4	5
SOCIAL								
(M) Cultural heritage	The position of the alignment in the context of the topography is likely to determine the extent and severity of direct impact on cultural heritage. This may include sites, places, artefacts and burials. For example, alignments that intersect terrain with softer, unconsolidated soils and substrate (i.e., extensive watercourse embankments and riparian zones) may have a greater potential to disturb/impact Aboriginal burial places.	The potential for direct impact on unknown / as-yet undiscovered cultural heritage sites (Note: Cultural heritage surveys have only been completed for some parts of the proposed overall mine development and disturbance footprint, and consent for disturbance to heritage will be conditional on relevant agreements with Traditional Owners, noting that the 'significance' of impacts is highly variable depending on the nature of the heritage (whether tangible, intangible or otherwise) and the individual stakeholder or stakeholder group)	Qualitative	Unacceptable potential for impact on cultural heritage beyond that reasonably anticipated in existing consultation and/or agreements with Traditional Owners	Significant potential for impact on cultural heritage beyond that reasonably anticipated in existing consultation and/or agreements with Traditional Owners	Moderate potential for impact on cultural heritage, and the impact is within that reasonably anticipated in existing consultation or agreements with Traditional Owners	Minimal potential for impact on cultural heritage, and the impact is within that reasonably anticipated in existing consultation or agreements with Traditional Owners	No or negligible potential for impact on cultural heritage, and the impact is within that reasonably anticipated in existing consultation or agreements with Traditional Owners

Table 8-6: MCA assessment criteria weightings

Criteria		Category	Straight Rank [1] (r_j)	Rank Sum Weightings			Highest Potential Weighted Score
				Raw Weight [2] ($n-r_j+1$)	Normalised Weight [3]		
					Fraction	%	
G	Flora and fauna (Commonwealth)	Environmental	1	13	0.14	14%	0.71
D	Engineering complexity	Technical	2	12	0.13	13%	0.66
A	Construction cost	Economic	3	11	0.12	12%	0.60
F	Driver safety	Technical	4	10	0.11	11%	0.55
E	Watercourse crossings – flow regimes and flood hazard	Technical	5	9	0.10	10%	0.49
M	Cultural heritage	Social	6	8	0.09	9%	0.44
H	Vegetation clearance	Environmental	7	7	0.08	8%	0.38
J	Soil erodibility in road corridor	Environmental	8	6	0.07	7%	0.33
K	Surface water – downstream erosional stability	Environmental	9	5	0.05	5%	0.27
B	Operating cost	Economic	10	4	0.04	4%	0.22
L	Rehabilitation complexity and risk	Environmental	11	3	0.03	3%	0.16
I	Use of existing disturbed land	Environmental	12	2	0.02	2%	0.11
C	Closure cost	Economic	13	1	0.01	1%	0.05
				TOTAL	**1**	**100%**	**5.00**

1. LEVEL OF IMPORTANCE IN RANK ORDER
2. N = TOTAL NUMBER OF CRITERIA
3. NORMALISED WEIGHT = RAW WEIGHT OF CRITERION / SUM OF ALL RAW WEIGHTS

8.4.3.4. Option selection

Table 8-7 shows the summary results of the MCA that identifies the Central V2 option as the highest-scoring Iron Peak HR alignment. The detailed MCA can be viewed in Appendix E.

Table 8-7: Iron Peak haul road options MCA

Criteria	Weighted Scores			
	Northern	Central V1	Central V2	Southern
Flora and fauna (Commonwealth)	0.71	0.14	0.57	0.71
Engineering complexity	0.26	0.40	0.40	0.13
Construction cost	0.24	0.48	0.48	0.12

Criteria	Weighted Scores			
	Northern	Central V1	Central V2	Southern
Driver safety	0.33	0.44	0.44	0.33
Watercourse crossings – flow regimes and flood hazard	0.40	0.40	0.40	0.10
Cultural heritage	0.26	0.26	0.26	0.18
Vegetation clearance	0.23	0.31	0.15	0.08
Soil erodibility in road corridor	0.20	0.20	0.20	0.07
Surface water – downstream erosional stability	0.27	0.22	0.22	0.11
Operating cost	0.09	0.13	0.13	0.04
Rehabilitation complexity and risk	0.07	0.10	0.10	0.03
Use of existing disturbed land	0.02	0.07	0.02	0.02
Closure cost	0.02	0.03	0.03	0.01
TOTAL	**3.11 / 5.00**	**3.18 / 5.00**	**3.41 / 5.00**	**1.93 / 5.00**

Of the four HR alignment options assessed, the Central V2 option has a total weighted score of 3.41 (of the maximum potential score of 5.00) and is proposed as the carry-forward option for the Project. The most material factors differentiating the Central V2 option are as follows:

- minimises direct impact on the Commonwealth-listed TEC, maintaining a functional TEC patch size of >10 ha on the southern side of the proposed alignment, avoiding associated fragmentation effects and the indirect loss of mallee bird habitat.
- minimises the clearing of equivalent connected non-TEC mallee vegetation
- traverses generally flat terrain higher in the landscape providing economic benefit (lower construction, operating and closure cost), reduced engineering complexity and lower risk for other environmental and social criteria (e.g. erosion, rehabilitation complexity and Aboriginal cultural heritage)
- maximises driver safety.

While the Northern and Central V1 options share several common benefits to the Central V2 alignment, they are discounted given:

- for the 'Northern' option, the increased complexity, cost and risk associated with operations within elevated and rugged terrain
- for the 'Central V1' option, the greater impact on both the TEC and equivalent connected non-TEC mallee vegetation (direct and fragmentation effects) and thus overall magnitude of impact on the MDDB mallee bird community.

The Southern option, whilst avoiding the TEC, is unfavourable across almost all economic, environmental and social criterion relative to the other options considered. This includes higher life-cycle costs, engineering complexity, driver safety risk, greater potential for Aboriginal heritage impact and surface water, erosion and rehabilitation risk.

In summary, the Central V2 option is selected as the preferred Iron Peak – Razorback HR alignment and will be carried forwards in the impact assessment in the remainder of this Chapter.

8.4.4. Mitigation

General mitigation measures for impacts on listed and non-listed species are discussed in 7.3.3. The following discussion focuses on the mitigation measures as they relate to the MBC of the MDDB TEC. There are no statutory or policy basis for the mitigation measures. The mitigation measures will be endorsed and monitored by DEM as part of the standard compliance reporting process.

8.4.4.1. Pre-mining

During mine planning, detailed design will consider the location of the MBC of the MDDB and work to prevent impacts on this MNES to the greatest extent possible. Due to the nature of the TEC, there are often large gaps between stands of mallee. Whilst these gaps are still considered part of the TEC (as they are not 100 m or more in width), use of these gaps for siting infrastructure will have lesser impacts than the clearing of mallee habitat. Hence the impact of the Project on the TEC can be reduced by careful micro-siting of infrastructure.

8.4.4.2. During mine operation

All areas of MBC of the MDDB TEC will be avoided to the greatest extent possible. This may include strategies such as:

- mapping of all TEC locations provided to contractors (example provided in Figure 8-1)
- physical delineation of TEC to prevent accidental impacts
- clearing for auxiliary purposes (such as laydowns) is prohibited within the TEC
- pre-clearance surveys within mapped TEC to minimise direct impacts on fauna species
- minimise loss of key fauna habitat (including but not limited to tree hollows)
- use fauna management protocols to limit disturbance to fauna remaining onsite
- removal of pastoral grazing (sheep) from the Site for the duration of the Project, hence decreasing herbivorous grazing pressure and trampling of the TEC.

8.4.4.3. Mine closure

The vegetation clearing within the MBC of the MDDB required for construction is both minimal and short-term and will be rehabilitated post construction (approximately one year post disturbance). The vegetation clearing for the operational HR will be longer term, with an operational lifespan of approximately 12 years, after which the road will be decommissioned and rehabilitated.

As set out in Table 7-12, a RMP will be implemented which will include the requirement for progressive rehabilitation where it does not result in the sterilisation of resources. During progressive rehabilitation, revegetation trials will be undertaken to support adaptive management approach and determine the likely effectiveness of the approach.

8.4.4.4. Cost

The majority of the mitigation measures proposed within this document are considered as standard practice and would not be an additional cost. Planning level cost estimates for mitigation measures are presented in Table 8-8.

Table 8-8: Mitigation measures

Mitigation measure	Summary
Mine planning	Design to avoid
Pre-clearance inspections	$40,000 pa
Waste management	Included in OPEX
Traffic control	Included in OPEX
Pest and weed control	Included in OPEX
Rehabilitation trials	$250,000
Light and noise/vibration controls	Included in OPEX

Mitigation measure	Summary
Dust impacts monitoring	$30,000 pa
Fire	Included in OPEX
Total	**$70,000 pa for LOM** **$250,000 R&D**

8.5. Potential direct impacts to TEC

8.5.1. Clearing of TEC

8.5.1.1. Clearing within transmission line alignment

Approximately 25.14 ha of MBC of the MDDB is mapped as occurring within the southern extent of the TL corridor (refer Figure 8-1). Due to the nature of the disturbance from construction and operation of a TL, it is very likely that micro-siting of infrastructure components could be used to avoid all direct impacts on the TEC as the habitat often has large open spaces between stands of mallee. A detailed survey has been undertaken by suitably qualified ecologists to determine the exact on-ground extent of patches of mallee, and this will be used to inform final design. Due to construction methods for the TL, any indirect disturbance to the TEC is likely to be of short duration and extent, and is unlikely to constitute a significant residual impact on the TEC. Hence the impact of the TL on the TEC will not be significant and will not be considered further in this report.

8.5.1.2. Clearing within the ML, Iron Peak haul road alignment

The Conservation Advice for the MBC of the MDDB TEC lists clearing as a 'major' threat with the reduction of mallee vegetation affecting the extent and quality of habitat and hence the available resources for the bird assemblages (DAWE, 2021).

Whilst the area TEC mallee vegetation requiring clearing for the construction, operation and closure of Iron Peak HR has been minimised by micro-siting and reduction of road buffer width, it will still require clearing of 1.80 ha of the TEC.

8.5.2. Loss or injury of fauna individuals as a result of construction and operational activities

The use of vehicles and machinery for construction and operation of the Project has the potential to result in collision with bird species representative of the MBC of the MDDB that may be present in the Project Area, resulting in injury or mortality to individuals.

As discussed above, the HR is likely to be operational for approximately 12 years, with minor additional traffic during the subsequent rehabilitation phase. During mining operations at Iron Peak, the frequency of trucks on the Iron Peak HR (one vehicle movement approximately every 3 minutes) is such that there will be a relatively consistent disturbance associated with the HR. It is likely that as the bird community is highly mobile and there is a large extent of mallee vegetation elsewhere within and surrounding the Project Area, any individuals would move away from the HR area. Vehicle strike and resultant loss of individuals associated with the HR is expected to be a rare occurrence, and not a significant impact on the MBC of the MDDB community.

During operation, mining may be undertaken on a 24-hour basis, seven days per week, however the bird community of the MDC of the MDDB are diurnal species and hence the increase in vehicle movements after dark is not expected to significantly impact on these species.

Impacts related to on-ground construction activities and disturbed areas such as the presence of uncovered voids are unlikely to impact on the bird species of the MBC of the MDDB community due to their highly mobile and mostly aerial nature.

There is potential for birds of the MBC of the MDDB to be attracted to uncovered construction and operation water storage areas during seasons when naturally occurring standing water is in short supply.

8.6. Potential indirect impacts to TEC

A variety of indirect impacts resulting from the Project have the potential to impact on the MBC of the MDDB TEC. Each potential indirect impact is considered below.

8.6.1. Fragmentation

Fragmentation of mallee habitats is listed as a threat to MBC of MDDB TEC (DAWE, 2021), although it is noted as being more severe in the biological subregions to the south of the Project Area. Fragmentation can lead to ongoing loss of species diversity, habitat complexity and ecological function of assemblages of plants and animals (Saunders et al. 1991 and Howling et al. 2019). Smaller areas of habitat are more vulnerable, have reduced resilience to stochastic events and are overall more difficult to manage for long-term biodiversity. Specifically, isolated and smaller areas of mallee habitats are less likely to support the range of resources required to maintain a diverse or abundant bird assemblage (DAWE, 2021).

As discussed in Section 8.4.3, an options analysis was undertaken to ensure the best placement of the Iron Peak HR. The resulting alignment has eliminated the fragmentation of the TEC to the south of the Iron Peak HR.

8.6.2. Groundwater

Modelling of potential changes to groundwater quality and quantity has been completed (refer Section 7.6.2.1). The modelling results indicate that there is a low to moderate probability that the water table will rise to between 3-5 m of land within some parts of the Site containing mallee vegetation (CDM Smith, 2024 (Appendix C2)). Due to proximity to the pit voids, there is likely to be some degree of groundwater drawdown in the locality of the TEC (CDM Smith, 2024). The mallee vegetation is not a groundwater dependent ecosystem and hence minor changes in groundwater levels resulting from the Project would not significantly affect the TEC.

8.6.3. Surface water

There are no significant impacts or changes to surface water quality or quantity anticipated in the vicinity of the TEC locations, hence there will be no resulting significant impact.

8.6.4. Light

The Iron Peak HR will remain unlit, and there is no other new infrastructure proposed in the vicinity of the TEC, hence there will be no significant impacts resulting from an increase in light pollution.

8.6.5. Noise and vibration

Noise emissions arising from the construction and operation of the Proposed Action have the potential to disturb some bird species comprising the MBC of the MDDB community in the Project Area.

Noise within the Project Area is expected to increase from current ambient noise levels during the construction and operation phases of the mine. During these phases, increased noise is likely to occur in short, intense pulses from mobile plant equipment as well as in the form of more prolonged noises with consistent vibration, pitch and volume due to generators, excavators, pumps and vehicles. Noise modelling has shown that worst-case scenarios show construction and operational noise levels significantly above pre-construction ambient levels (Resonate, 2024). Whilst the majority of operational noise emissions are expected to be at frequencies below the spectral range where typical bird vocalisations occur, the increase in noise may potentially causing masking and behavioural impacts (Resonate, 2024).

Modelling of vibration and overpressure impacts from pit blasting has shown that there is potential for resulting behavioural (startle) impacts on MBC due to the proximity of the TEC to the pit locations.

8.6.6. Weeds

Iron Peak HR will be built mostly on the alignment of an existing access track. Hence there is already disturbance in the locality, and therefore a higher existing risk of weed establishment than in the less disturbed areas of the Site.

Eight listed weed species were recorded during baseline Site surveys including three Weeds of National Significance (*Optunia robusta* (Wheel Pear), other *Optunia sp.* (cactus species) and *Lycium ferocissimum* (African Boxthorn)), which were recorded within mallee habitats across the Site (ELA, 2024a). Whilst it is acknowledged that mallee fragments can be impacted by weeds, especially in landscapes where native vegetation has become severely fragmented, the Conservation Advice for MBC of the MDDB TEC rates the likely severity of weed impact on the community as ‘minor’ (DAWE, 2021).

8.6.7. Pests

Five pest mammal species were recorded within the study area (fox, sheep, rabbit, brown hare and goat (refer Section 3.9.7). The Conservation Advice for MBC of the MDDB (DAWE, 2021) rates the potential impact of these species on this TEC as ‘major’, as pest herbivores alter the structure and composition of native vegetation communities by exerting selective grazing pressure on native plants and removing large amounts of biomass. Their presence can degrade the quality of native vegetation as useful habitat for many bird and other fauna species (Mallee CMA, 2012).

As with other grazing animals, unmanaged sheep and goats can affect native flora and fauna by grazing on native vegetation by selectively overgrazing, which causes soil erosion; by competing for food and shelter; by introducing weeds through seeds carried in their dung; and by fouling waterholes (DEWHA, 2008).

Pest predators for the MBC of the MDDB are foxes (recorded within the Site), and cats (if present, not recorded during site survey).

As discussed in Section 8.4.4, pastoral grazing stock (sheep) will be removed from the Site for the duration of the Project, hence reducing the potential impact of large herbivore grazing on the TEC.

8.6.8. Dust

The impact of dust is not listed as a threatening process to the MDC of the MDDB within the Conservation Advice (DAWE, 2021), however dust modelling completed for the Project (Katestone, 2024) shows that, prior to mitigation, dust impacts should be considered within the mallee habitat of the mapped TEC.

Analysis of changes in air quality at the MBC of the MDDB TEC resulting from the Project shows that impacts may occur for short-term averaging periods (24-hour), while longer term averages (annual) are unlikely to be significant. This indicates that some short duration periods of elevated dust and particulates are predicted, however these will be infrequent as evidenced by lower annual averages. The Project will have greatest impact on the MBC of the MDDB TEC during mining of the Iron Peak pit. Conditions are expected to improve once Iron Peak mining is complete (approximately year 12 of LOM) and the mining moves to Razorback which is separated from the TEC.

However, before allowing for natural reductions in dust accumulation on flora by wind/rain/dew/plant movement, the model predicted changes in dust deposition below levels assessed by Doley and Rossato (2010) which resulted in <7% reduction in photosynthesis and <1% reduction in plant productivity. This, together with other studies examining dust impacts from mining on vegetation (NSW Minerals Council, 2000 and Lodge et al., 1981), suggests that there will be no significant difference in the fecundity of vegetation within the MBC of the MDDB TEC as a result of the Project (Katestone, 2024).

8.6.9. Altered fire regimes

Mallee vegetation communities are fire-prone systems where much of the vegetation is adapted to particular fire regimes with many plants showing adaptations for recovery after fire. However, many birds have no adaptation to fire other than to temporarily move to non-burnt areas (Boulton and Lau 2015). The Project Area is within an area prone to bushfire with a sequence of fires collectively accounting for 89% of the Murray Mallee subregion being burnt between 1972 and 2007; however, no single fire has burnt across the entire bioregion (DAWE, 2021).

The Project is unlikely to significantly impact on the frequency or intensity of bushfire as although there may be a potential increase in ignition sources, there will be firefighting equipment and personnel on Site which may reduce the risk of any fire becoming out of control and spreading.

8.6.10. Climate change

Climate change projections for the MDDB forecast higher temperatures, declining rainfall (especially in the cooler seasons) and harsher drought and fire weather (CSIRO and BOM, 2015). Such changes are likely to reduce the reproductive performance and survival of birds, and the growth and survival of many plant species consequently affecting food availability (DAWE, 2021). These climate change issues are likely to compound existing impacts of habitat loss, fragmentation, invasive species and broadscale fires as discussed above.

8.7. Cumulative impacts

The proposed water supply for the Razorback Project, which is outside the scope of this MLP, will be located outside of the MDDB and hence the likelihood of resultant additional impacts on the MBC of the MDDB TEC is very low.

The PMST search results returned 27 projects that had been referred under the EPBC Act within the search area (Project Area plus 50 km buffer) since 2002. Of these, only five were in proximity to the Project Area. The current status of these referrals is shown in Table 8-9.

Table 8-9: Related actions

EPBC reference number	Title of referral	Industry type	Referral outcome	Stage
2002/726	SA-NSW Electricity	Energy generation and supply	Controlled action	Withdrawn
2015/7522	Improving rabbit biocontrol	Natural Resources	Not controlled action	Completed
2019/8468	SA-NSW Energy Interconnector; Robertstown to NSW border (SA)	Energy generation and supply	Controlled action	Post-approval

Of these, only referral 2019/8468 is a controlled action for an active project. The available documentation for this referral shows that it is for a TL between the Bundey Substation near Robertstown in SA, across the SA / NSW border to Wagga Wagga. Hence the western end of this project is co-located with the southern end of the TL for the Razorback Project at Bundey Substation. The decision notice for 2019/8468 shows it is controlled for habitat clearing for *Manorina melanotis* (Black-eared Miner) and *Polytelis anthopeplus monarchoides* (Regent Parrot (eastern subspecies)). Neither of these species have suitable habitat or have been recorded within the Project Area for the Razorback Project.

On the basis of the larger action and nearby projects, cumulative impacts are not anticipated.

8.8. Significant residual impact assessment

8.8.1. Species fefinition of 'areas critical to the survival of the ecological community

Areas critical to the survival of the MBC of the MDDB TEC are those that meet the key diagnostic criteria and with:

- Known populations of threatened mallee birds listed individually under national environmental law, especially the limited range mallee specialists.
- Areas where several members of the MBC are known to occur and can act as reservoirs or source populations to colonise other nearby sites, if populations in the latter suffer impacts.

There have been no individuals of threatened mallee birds listed under national environmental law recorded during surveys within the Study area. Whilst sufficient members of the MBC occur to meet the definition of the TEC, the population within the Project Area is unlikely to be sufficient in population number, extent or diversity to be a source population or reservoir as there are no habitat niches present that are of particularly high value compared to the surrounding landscape. Hence the MBC of the MDDB TEC within the Project Area is unlikely to be considered within a critical area.

8.8.2. Significant residual impact assessment

The following significant residual impact (SRI) assessment (referTable 8-10) considers the significant impact criteria for an endangered ecological community (TEC) as set out in the Guidelines. After assessing the Proposed Action against the Guidelines, it is concluded that an SRI is unlikely.

Table 8-10: MDB of the MDDB TEC significant residual impact assessment

Significant impact criteria for an Endangered ecological community	Assessment of impact to *MBC of the MDDB TEC*
Reduce the extent of an ecological community?	**Yes** The Central V2 option Iron Peak haul road which connects Iron Peak mining area with the processing area will bisect the MBC of the MDDB TEC. This will lead to the loss of 1.8 ha or ≈10% of this patch of TEC.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?	**Yes** The Iron Peak haul road will bisect the MBC of the MDDB TEC within the Site. The location of the Iron Peak haul road ensures that the southern section remains a viable patch of MBC of the MDDB TEC. Whilst a this section of TEC north of the proposed haul road will be separated from the remainder of the TEC, this fragment would remain connected to the large patch of mallee habitat (approx. 820 ha) (not TEC) which is likely to support a similar community of mallee bird species, and hence although it technically would become a fragment (due to the technical definition of the TEC being based on the arbitrary location of the IBRA boundaries), ecologically it would not be fragmented
Adversely affect habitat critical to the survival of an ecological community?	**No** There is no habitat critical to the survival of the TEC within the Project Area (refer Section 8.8.1).
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?	**No** There will be no significant change to any abiotic factors resulting from the Project. Surface water flow within the Project Area is infrequent and short-lived and hence minor changes from the construction of the haul road is unlikely to significantly impact the TEC. Groundwater modelling show a potential drawdown of groundwater in proximity of the TEC over the life of mine, however the TEC is unlikely to be a groundwater dependent ecosystem and hence is unlikely to be significantly impacted by a change in groundwater levels.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?	**No** There will be no substantial change to the remaining TEC outside of the haul road footprint with no management of this TEC proposed.

Significant impact criteria for an Endangered ecological community	Assessment of impact to *MBC of the MDDB TEC*
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • **assisting invasive species, that are harmful to the listed ecological community, to become established, or** • **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**	**No** The haul road will not assist invasive species to be established. The MBC of the MDDB has an open structure within the Project Area, with significant expanses of open ground in between clumps of mallee. Hence the haul road will not change the open nature of the community to enable new species to become established. Pest and weed monitoring and control during construction and operation will ensure no increase in invasive flora or fauna species to the extent that the TEC will be significantly impacted. The haul road will not cause regular mobilisation of fertiliser, herbicides or other chemicals or pollutants to the extent that the TEC will be significantly impacted.
Interfere with the recovery of an ecological community?	**No** There is no recovery plan for the MBC of the MDDB TEC.
Conclusion	**The Proposed Action is <u>unlikely</u> to have a significant residual impact on the MBC of the MDDB TEC**

8.8.3. Regional scale analysis of impacts

Due to the TEC requiring both a suitable habitat, and the presence of a specific assemblage of birds, a map of the distribution of the TEC has not been produced to date. However, the broad vegetation groups in the MDDB within which the TEC may be located can be mapped. The two vegetation NVIS Major Vegetation Groups (MVGs; a high-level Australia-wide classification) of mallee vegetation are:

- MVG 14: *Mallee woodlands and shrublands* that features a more developed tree canopy with a projective foliage cover of 10 to 30%
- MVG 32: *Mallee open woodlands and sparse mallee shrublands* that has a very open to sparse tree canopy with a projective foliage cover of less than 10% (DAWE, 2021).

Figure 8-11 shows the distribution of mallee vegetation both across SA (9,827,210 ha), and within the Project Area (558 ha). Hence only a very small proportion (0.0056%) of the regional extent of mallee habitat is present within the Project Area.

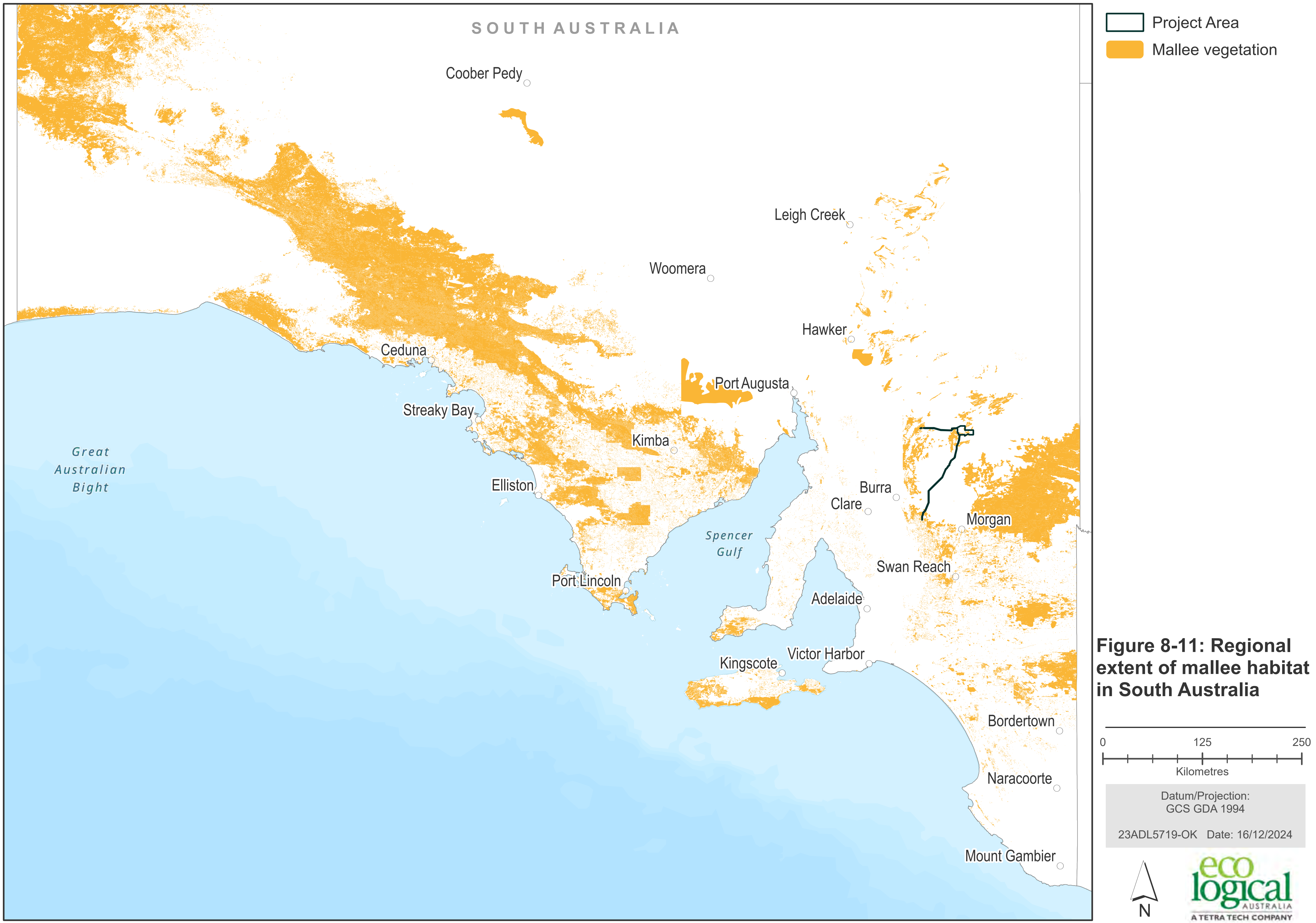

Figure 8-11: Regional extent of mallee habitat in South Australia

As well as an estimated 9,827,210 ha of mallee vegetation within SA, additional areas of potential habitat are present in NSW and Victoria. The mallee vegetation is not continuous, with one discontinuity between the mallee of the MDDB and the mallee further west, and another associated with the Eyrean barrier (DAWE, 2021).

The MBC of the MDDB is limited to suitable mallee habitat within the following bioregions:

- Murray Darling Depression (all seven subregions)
- Riverina subregions RIV03, RIV05 and RIV06
- Darling Riverine Plains subregions DRP08 and DRP09

The Project Area is remote from the Riverina and Darling Riverine Plains subregions and will have no impact on the MBC of the MDDB TEC within those regions.

Within the MDD bioregion 28.1% of vegetation, or 5,601,930 ha consists of Mallee habitat (DAWE, 2021). It is likely that not all of this mapped mallee vegetation supports sufficient mallee dependent or mallee specialist bird species to meet the definition of MBC of the MDDB TEC. However, without further information, and using the precautionary principle, the presence of suitable mallee habitat is used as a substitute for presence of MBC of the MDDB TEC.

The MBC of the MDDB is impacted by several threats, primarily clearing of mallee habitats and their fragmentation into smaller, degraded remnants that are more susceptible to invasive species, fire impacts and other climate change, and hence less suitable to sustain a diverse assemblage of birds and other flora and fauna on which they depend (Arthur Rylah Institute, 2003; Mallee CMA, 2012; Boulton and Lau, 2015).

On a landscape scale, the Conservation Advice provides context as to which patches of MBC of the MDDB TEC may be of higher relative value. These factors are considered in Table 8-11, which shows that the TEC within the Project Area is not considered to be of high value relative to the surrounding area.

Table 8-11: Criteria for high value areas of MBC of the MDDB TEC

Criteria	Relevance to the Project
Mallee habitats that are most intact, larger and retain mid to old growth mallee trees (particularly those with hollows) and support a diversity of bird species.	The quality and age of the MBC of the MDDB within the Project Area is the same as that outside of the Project Area. The Project Area does not have any habitat features that make it of greater value than the surrounding area?
Occurrences outside of conservation tenure that function as wildlife corridors that connect conservation areas where the Mallee Birds occur, or function as havens for some populations of Mallee Birds.	The TEC within the Project Area is outside a conservation tenure. The patch within the Project area is part of a wider mosaic of patches but does not directly connect conservation areas where the TEC may be protected, or which may be havens for Mallee Bird populations.
Occurrences that are in areas where the ecological community has been most heavily impacted, or that are at the natural edge of some species' range. These provide important refuges of mallee bird populations that potentially enable dispersal and recolonisation after catastrophic impacts.	The TEC within the Project Area is not in an ecological community that has been most heavily impacted. The mosaic of surrounding mallee habitat is used for grazing, and hence although it is subject to some impacts such as grazing pressure of domestic and pest species, it is not otherwise disturbed. The TEC within the Project Area is part of a larger patch of homogenous mallee habitat extending to the north (and to the north of the MDDB IBRA region boundary) and is surrounded by extensive mallee habitat with no known barriers to bird movement. It does not form the natural edge of mallee bird species range. Hence it is not likely to be an important refuge for mallee bird species.

Criteria	Relevance to the Project
Areas of woodland that contain nationally or state-listed threatened species, not limited to members of the Mallee Bird Community.	There are no nationally listed threatened species likely to occur within the Project Area. Whilst State-listed species have been recorded within the Project Area, there are no significant patches of woodland that have value above that found in the surrounding habitat mosaic. The MBC of the MDDB TEC within the Project Area is not likely to provide significant habitat features for nationally or state-listed species.
Mallee areas where key threats are relatively low level and where these can be managed efficiently, notably for pest animal impacts such as total grazing pressure and feral cat and fox predation.	The key threats to the MBC of the MDDB TEC are relatively low within the Project Area, consisting of total grazing pressure and feral cat and fox predation. However, the threats to the MBC of the MDDB TEC that exists in the area surrounding the Project Area are at the same relatively low level.

Based on the area of MBC of the MDDB TEC to be cleared (1.8 ha or 0.00002% of the SA available habitat, or 0.00003% of the mapped MDDB mallee habitat), and because it is not impacting on any areas of high value, such as wildlife corridors or at the edge of species ranges, it is unlikely that the Project will have any impact on the short-term or long-term viability of the MBC of the MDDB TEC.

8.8.4. Certainty of impacts

There is high confidence that the extent of direct impact on the TEC is known. The area of direct disturbance has been based on road designs completed by suitably qualified professionals. The on-ground extent of the disturbance area will be physically demarcated (using flagging barriers or similar) for the extent of the construction period, and the location and importance of the TEC will be communicated during inductions to all workers.

The certainty regarding the extent and resulting impacts of indirect factors related to construction and ongoing operation of the Iron Peak HR (such as increased light, noise and vibration) are less well known due to lack of data regarding such impacts on the mallee bird community. Monitoring undertaken as part of the proposed annual fauna survey will provide information on these potential indirect impacts.

The results of the SRI assessment on TEC are relatively insensitive to changes in assumptions regarding the effect of indirect impacts on the TEC as a precautionary approach has been used. This assumes the bird community directly adjacent to the HR may be disturbed during construction and operation, however the high mobility of the bird species and the extensive area of suitable mallee vegetation community directly adjacent to the disturbance means these individuals should be able to relocate without significant effort. Hence small changes in the sensitivity of these species to the disturbance is unlikely to materially affect the outcome of the SRI.

It is unlikely that there are any unknown, unpredictable, irreversible or sub-lethal impacts that have not been considered within this impact assessment.

8.8.5. Acceptability of impacts

As discussed in Section 8.5.1.1, careful design and micro-siting of the towers and stringing techniques will be used to avoid direct disturbance of the TEC within the TL alignment. As per Section 8.5.1, whilst noting that direct impacts to the TEC could technically be avoided by relocation of the Iron Peak HR, a greater overall environmental impact would be caused to the MBC as a by-product of diversion around the TEC. The preferred Central V2 option for the Iron Peak HR results in small to negligible direct impact on the TEC of 1.8 ha (approximately 0.00002% of available MBC of the MDDB habitat in SA). Potential fragmentation and isolation of the southern part of the TEC has been avoided by revising the design of the Iron Peak HR to the current preferred location.

Any indirect impacts are likely to be minimal given the highly mobile nature of the MBC, and the ample well-connected similar mallee vegetation surrounding the Project Area.

In conclusion, the direct loss of 1.8 ha or 0.00002% of the available MBC of the MDDB habitat in SA, with no resultant fragmentation of habitat nor expected significant indirect impacts is not significant and should be considered acceptable.

8.9. Impact assessment

An assessment of impacts on fauna species (including MBC of the MDDB TEC) is presented in Section 7.3, including environmental and conservation objectives, performance criteria, monitoring and reporting and corrective actions, and timing.

Further detail including translocation protocol will be included in the Vegetation Management Plan (including fauna management).

8.10. Offset

As discussed, as a result of the re-design of the Iron Peak HR, SRI on the TEC is not expected. Therefore, provision of an offset is not anticipated.

8.11. Environmental record of the person proposing to take the action

The Person Proposing the Action (MGT) has no proceedings under Commonwealth, State or Territory laws.

MGT is currently operating the ELs under the Generic PEPR – low impact exploration in SA, whilst advanced exploration activities are undertaken under exploration PEPRs. Each PEPR requires consideration of the environment, including consideration of potential environmental impacts, control strategies, required environmental outcomes and outcome measurement criteria. MGT remains compliant with all outcomes and conditions within these statutory documents since major field and exploration programs commenced in 2009.

MGT views robust and sustained ESG performance as an opportunity to pursue meaningful social and environmental objectives while underwriting long-term financial performance. In June 2023, MGT launched its bespoke sustainability platform ‘f**ore**sight’ that, together with its Stage 1 Sustainability Framework, provides a structure for transparently evaluating the Proposed Action’s compliance with a range of principle and performance based voluntary initiatives intended to engender sustainable business practices for the mining sector. These initiatives include voluntary alignment with the UN Sustainable Development Goals and adoption of the IRMA Standard for Responsible Mining (which will be incrementally operationalised in line with the scale up of the organisation).

The Proposed Action will be undertaken in accordance with MGT's expanding corporate governance and operations framework (refer https://magnetitemines.com/about-us/corporate-governance/), of which its Risk Management Policy leads company consideration of structural and project-based risks. An umbrella sustainability policy is currently under development, which will form the specific agenda for the environmental policy and procurement systems that the Proposed Action will be developed under.

8.12. Ecologically sustainable development

Section 3A of the EPBC Act defines the principles of ecologically sustainable development (ESD). Table 8-12 outlines how each of the five principles have been applied to the Proposed Action.

Table 8-12: Consideration of principle in proposed action

Principle	Consideration of principle in proposed action
'Integration Principle' Decision-making processes should effectively integrate both long-term and short-term economic, social and equitable considerations	A holistic decision-making process has been established for the Project with the aim to provide an integrated approach. MCA processes have been adopted to drive informed and transparent decision-making in the scoping and design of the Project. MGT has invited comment from a range of stakeholders and has considered and responded to these considerations. There has been evaluation of the socio-economic, cultural and ecological features of the environment that may be affected by the Proposed Action and there is demonstration that any impact and risks will be acceptable.
'Precautionary Principle' If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	The Precautionary Principle has been referred to several times throughout this impact assessment document. Significant effort has been used to identify risk associated with the Project. A wide range of field studies have been completed by MGT over the past ten years and the results of these studies have been combined with extensive desktop research. Information gathered during these studies was used to inform the Proposed Action and has reduced the uncertainty surrounding the prediction of impacts for assessment. MGT have ensured that the design of the Project is such that where possible it avoids serious or irreversible impacts to the environment, with levels of conservatism factored into conceptual and detailed designs. Impacts have been identified and described under each key environmental factor. Avoidance, minimisation and mitigation measures have been proposed to ensure that impacts resulting from the Proposed Action are environmentally acceptable.
'Intergenerational Principle' That the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations	MGT has committed to a range of mitigation measures to ensure that the environmental impacts and risk resulting from the Project are managed to an acceptable level. The resulting mitigation measures include extensive land rehabilitation and associated revegetation research and, as such, the Project will not forego the health, diversity and productivity of the environment for future generations. The Company targets the participation of stakeholders, such as landowners and Ngadjuri peoples, in the continuing collaborative management of the environment, with recognition of the additional social, cultural and economic (productive capacity) values of the Project Area.

Principle	Consideration of principle in proposed action
'Biodiversity Principle' The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making	MGT has designed the Project including preferentially siting facilities north of Razorback Ridge to avoid interaction with the TEC to the south of the ridge. This decision reduces the area of impact to known rated biota and hence conserves biological diversity and ecological integrity within the Conceptual Footprint.
'Valuation Principle' Improved valuation, pricing and incentive mechanisms should be promoted	MGT accepts that the cost of the Project must include environmental impact mitigation, management, maintenance and closure and rehabilitation activities. The Company has factored in costs for statutory bonds and offset programs to ensure that Project financial metrics are inclusive of primary/early obligations.

8.13. Conclusion

The objectives of the EPBC Act include provision of protection of the environment, especially those aspects of the environment that are MNES, to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and to promote the conservation of biodiversity.

Through the process of referral of the Project under the EPBC Act, and liaison with DCCEEW, the potential direct and indirect (fragmentation) impacts of the Proposed Action have been identified and reduced. The redesign of the proposed Iron Peak HR route (Central V2 option) has avoided fragmentation of the MBC of the MDDB TEC within the Project Area. As a result, the direct impact on the MBC of the MDDB TEC within the Project Area is a loss of 1.8 ha, which represents approximately 0.00002% of the regionally available habitat. A range of mitigation measures, including monitoring and feedback mechanisms, has also been proposed to reduce direct and potential indirect impacts. The conservation objective in the Approved Conservation Advice for the MBC of the MDDB is:

> *To prevent further loss and degradation of the Mallee Bird Community and help recover its biodiversity, viability, function and extent by protecting it from significant impacts as a Matter of National Environmental Significance under national environmental law and by guiding implementation of management and recovery, consistent with the recommended priority conservation and research actions set out in this advice.*
>
> (DAWE, 2021)

The avoidance, minimisation and mitigation measures have reduced the potential impact of the Project on the MBC of the MDDB TEC to a level where there are no expected significant residual impacts, hence the Project meets the Conservation Advice objective.

As the Project is not expected to result in significant residual impacts to any MNES, the minor impacts to the MBC of the MDDB TEC are considered acceptable, and no offsets are required.

8.14. Information sources

Report name (source of information)	How recent is the information	How the reliability of the information was tested	What uncertainties (if any) are in the information
Arthur Rylah Institute. *The Vegetation of North-West Victoria. A report to the Wimmera, North Central and Mallee Catchment Management Authorities.* Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria	2003	Peer reviewed document in scientific journal. High reliability	Low uncertainty
Boulton RL and Lau J. *Threatened Mallee Birds Conservation Action Plan, Report June 2015*. Report to the Threatened Mallee Birds Implementation Team, Birdlife Australia	2015	Peer reviewed document in scientific journal. High reliability	Low uncertainty
Department of Agriculture, Water and the Environment (DAWE), 2021. *Approved conservation advice for the Mallee Bird Community of the Murray Darling Depression Bioregion.*	2021	National Government Report. High reliability	Low uncertainty
Doley, David and Rossato, Laurence. *Mineral particulates and vegetation: Modelled effects of dust on photosynthesis in plant canopies, Air Quality and Climate Change*, vol. 44, issue. 2, pg.22-27	2010	Peer reviewed report in scientific journal. High reliability	Low uncertainty
DEWHA. *Threat abatement plan for competition and land degradation by unmanaged goats,* Canberra	2008	National Government Report. High reliability	Low uncertainty
Eco Logical Australia 2021. *Razorback Spring Baseline Flora and Fauna Survey Report*. Prepared for Magnetite Mines.	2021	Site specific study completed by qualified and experienced scientists following government methodology and guidelines. High reliability	Low uncertainty
Eco Logical Australia, 2024a. *Razorback Iron Ore Project Baseline Flora and Fauna Survey Report*. Prepared for Magnetite Mines.	2024	Site specific study completed by qualified and experienced scientists following government methodology and guidelines. High reliability	Low uncertainty
Eco Logical Australia, 2024b. *Addendum to Razorback Iron Ore Project Flora and Fauna Baseline Assessment*. Prepared for Magnetite Mines.	2024	Site specific study completed by qualified and experienced scientists following government methodology and guidelines. High reliability	Low uncertainty

Report name (source of information)	How recent is the information	How the reliability of the information was tested	What uncertainties (if any) are in the information
Howling GM, Boulton RL and Lau J. *Threatened Mallee Birds Conservation Action Plan, second edition.* Report to the Threatened Mallee Birds CAP Steering Committee. Birdlife Australia, Melbourne	2019	Peer reviewed report in scientific journal. High reliability	Low uncertainty
Lodge J P, Waggoner AP, Klodt D T and Crain C N. *Non-health effects of airborne particulate matter*, Atmospheric Environment, vol. 15, pg. 431-482 .	1981	Peer reviewed report in scientific journal. High reliability	Low uncertainty
Mallee CMA. Mallee Ecology Manual 2012. *Mallee Catchment Management Authority,* Mildura Victoria.	2012	Peer reviewed document in Manual. High reliability	Low uncertainty
National Vegetation Information System (NVIS). *Native Vegetation Floristic Areas - NVIS - Statewide*. Location Metadata System - Location SA – Public.	2023	National Information System	Low uncertainty
NSW Minerals Council 2000. *Technical Paper: Particulate Matter and Mining Interim Report.*	2000	State Government (NSW) Report. High reliability	Low uncertainty
Saunders DA, Hobbs RJ and Margules CR. *Biological consequences of ecosystem fragmentation: A review*. Conservation Biology 5: 18-32	1991	Peer reviewed report in scientific journal. High reliability	Low uncertainty

Chapter 9

Description of potential benefits and contribution to the economy

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

Chapter 9 responds to the requirement for a description of the expected contribution of the Razorback Iron Ore Project to the economy. This includes discussion of goods and services used in the local economy, state and national level, economic benefits derived from local employment, royalty payments and taxes, and any other potential economic contribution resulting from the Razorback Project.

9. Description of potential benefits and contribution to the economy

As required under regulation 30(1)(g) of the *Mining Regulations 2020*, this Section outlines the contributions of the Project to the economy.

9.1. Economic modelling

Economic analysis and predictive modelling for the Project was undertaken by BDO EconSearch (BDO EconSearch, 2023) (refer Appendix C9) utilising an extended input/output (IO) model known as the RISE (Regional Industry Structure and Employment) model, which incorporates models for the local area, Economic Study Area (ESA), SA and Australia (regions). RISE models are representative of the whole economy of the respective region and the economic impacts are not added across the regions but are included in the broader region (i.e., the impacts for SA include the ESA, which in-turn includes the local area).

Commissioned by the Department of the Premier and Cabinet (DPC), the RISE extended IO models describe the structure of the SA economy and its regions and can estimate the economic impacts of shocks to economic activity. The RISE model, which was developed by BDO EconSearch, is updated annually for use by the Government of SA. The models enable estimation of project/program level impacts on state and regional economies for indicators such as gross regional/state product and employment. Application of the models include assessments of programs, infrastructure and other investments.

The modelling period adopted by BDO EconSearch was limited to 30 years, reflecting the diminishing certainty in prevailing economic conditions with time and the resulting reduced reliability of outcomes. It is expected that the Project will maintain its significant annual economic contributions until the end of the 38-year mining operations and, at a reduced rate, into the closure phase. While assumptions used for the Project's construction and operational commencement dates have subsequently been changed, the results of the economic analysis remain representative of likely contributions of the Project to local, regional, State and national economies on a 'Project year' basis.

To develop an appropriate RISE model, the ESA was defined and included a total of 11 LGAs (see Table 9-1), with the Peterborough local government area (Peterborough) identified as the local area due to it being the closest service centre and housing population to the Project, as well as its anticipated role as a transit hub for the Project.

Table 9-1: LGAs in the ESA

LGA	Reason for inclusion
Flinders Ranges	Area where regional employees are likely to live
Goyder	Area where regional employees are likely to live
Loxton Waikerie	Construction and operation of conceptual water supply infrastructure
Mid Murray	Construction and operation of conceptual water supply infrastructure
Mount Remarkable	Area where regional employees are likely to live
Northern Areas	Area where regional employees are likely to live
Orroroo/Carrieton	Area where regional employees are likely to live
Peterborough	Nearest service centre and housing population
Port Augusta	Possible region where goods will be ported. Area where regional employees are likely to live
Port Pirie	Possible region where goods will be ported. Area where regional employees are likely to live

LGA	Reason for inclusion
Whyalla	Likely region where goods will be ported. Area where regional employees are likely to live

The local (Peterborough) area and the ESA are presented in Figure 9-1.

It is noted that the Loxton Waikerie and Mid Murray LGAs were included in the ESA based on the location of conceptual water supply infrastructure from the Murray Basin. While the Project's proposed process water supply option has subsequently changed, the location of water supply infrastructure remains within the broader ESA and, as such, the modelled economic contributions are maintained.

RISE models (based on 2020/21 data) were specifically developed for the local Peterborough area and ESA, and used with the already developed SA and Australia RISE models to make economic estimates for the respective assessment areas. The models are based on IO tables that describe the interdependencies between industries within the regional economy (local area and ESA) and within economies outside the region (SA and Australia). The IO method used in the RISE model was extended to incorporate population and unemployment changes (where possible), which allows for the estimation of impacts on government administration, health, defence and education. Additionally, the inclusion of unemployment data allows estimation of the offsetting effects on consumption-induced flow on effects[65].

Two key assumptions were made in the economic modelling:

- Impacts were measured using models that represent the structure of the various economies for the year in which the most recent data is available (2020/21). However, over time there are likely to be improvements in primary factor productivity within these economies. To allow for improvements, an across-the-board (all sectors) labour productivity improvement rate of 0.5% per annum for subsequent years of the construction and operation phases have been incorporated into the modelling.
- When new jobs are created, it should be determined where the people come from to fill those jobs. In some cases, the jobs will be taken by previously unemployed locals, or by someone who is currently employed locally but whose own job is taken by a previously unemployed local (i.e., backfilled). In both cases the impact of the newly created job and associated income is partially offset by the fact that someone who was previously receiving unemployment benefits is no longer doing so. To calculate this effect it requires estimates of the parameter "rho (ρ)[66]" - the proportion of new jobs that are likely to be filled by previously unemployed locals. The estimated rho (ρ) values vary depending on the economy represented in the RISE model. The Australian rho (ρ) was assumed to be 1, the State rho (ρ) was assumed to be 0.7, the ESA rho (ρ) was assumed to be 0.6 and the local area rho (ρ) was assumed to be 0.5.

[65] Induced consumption is a key component of the multiplier effect, which describes how an initial increase in spending leads to further increases in income and consumption, thereby amplifying the initial impact on the economy (Quickonomics, 2024).

[66] A mathematical term representing a correlation coefficient for population.

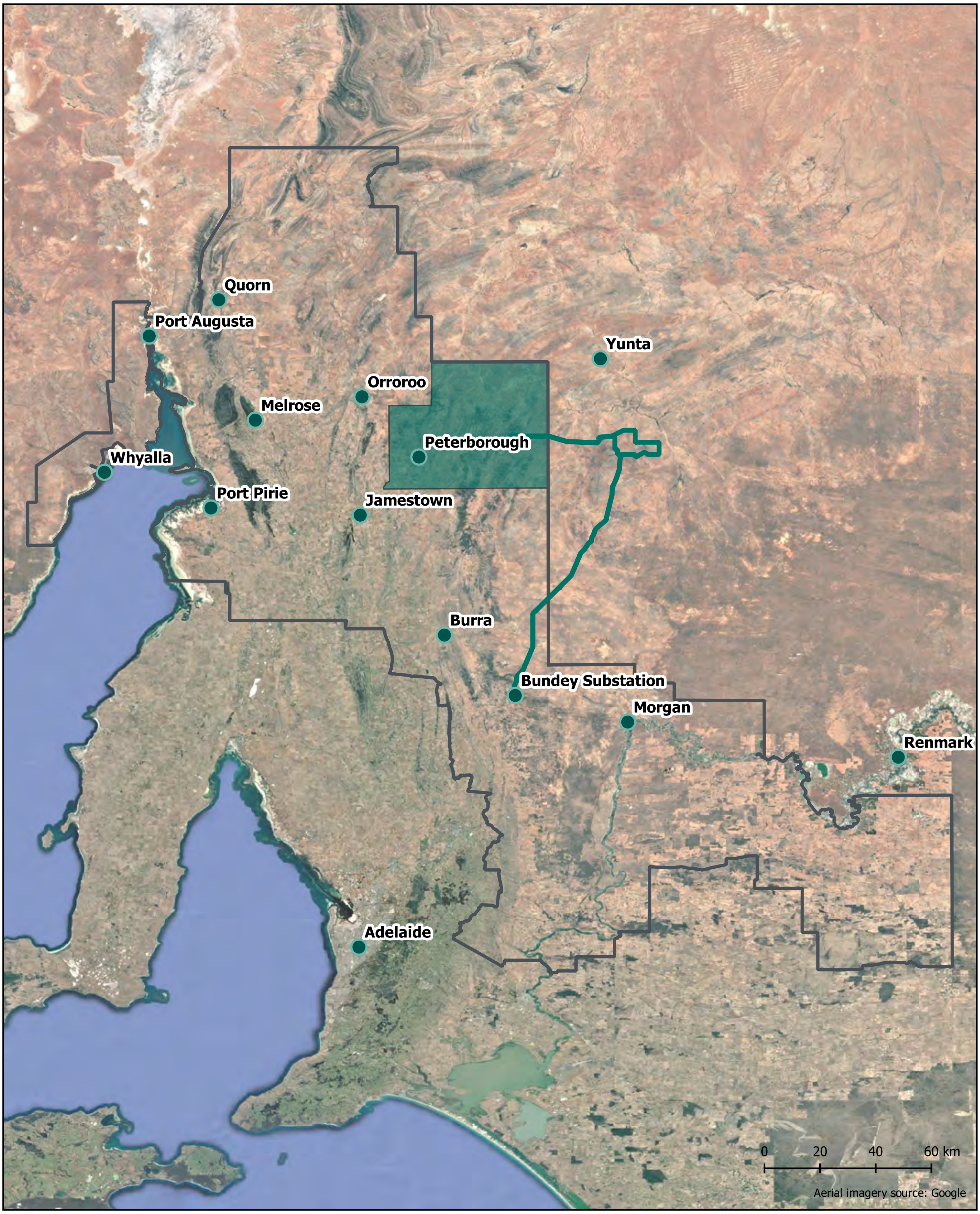

Figure 9-1: Local and Economic Study areas

Localities
Project Area

Economic Impact Study areas
Local Study Area
Economic (regional) Study Area

Datum/Projection:
GDA 1994 MGA Zone 54

Razorback MLP
Date: 14/01/2025

MAGNETITE MINES

Detailed input data for the construction and operation phases of the Project was provided by MGT, which included production, forecast price estimates and location proportions for expenditure. Predicted revenue received inputs included:

- expected production rate of 5 Mtpa of high-grade iron ore concentrate
- two-and-a-half-year construction period
- capped 30-year project life
- expected price of USD$110 per tonne (index price) plus USD$27.30 per tonne high grade premium
- expected exchange rate (AUD/USD) of 0.68
- anticipated or targeted employment outcomes by area.

Estimates of State Government revenues included 5% royalties and 4.95% payroll tax, with annual lease payment information provided by MGT.

Federal government revenues were calculated on a diesel excise rate of 27 cents per litre, with the total volume based on data provided by MGT and income tax rates calculated on current income tax rates and tax brackets.

Some taxes and duties were excluded from the economic analysis, including land tax, Goods and Services Tax (GST) and company tax.

9.2. Direct contributions

9.2.1. Gross product

The Project's capital investment over the two-and-a-half-year construction period is $2.97 billion, with both direct and flow on expenditure to:

- local area (Peterborough) - $23 million in total Gross Regional Product (GRP) and 62 FTE jobs
- regional area (ESA) - $377 million in total GRP and 878 FTE jobs
- SA - $1,174 million Gross State Product (GSP) and 2,697 FTE jobs
- Australia - $2,325 million Gross Domestic Product (GDP) and 4,474 FTE jobs.

The operating phase of the Project is expected to continue for at least 30 years, with an estimated annual gross revenue of $1,010 million. The Project is expected to contribute:

- local area (Peterborough) - $9 million in total GRP annually, 58 FTE jobs and an increase in local population of 23 persons
- regional area (ESA) - $192 million in total GRP annually, 1,058 FTE jobs and an increase in regional population of 797 persons
- SA - $1,001 million GSP annually, 2,849 FTE jobs and an increase in the SA population of 1,580 persons
- Australia - $1,148 million in total GDP, 3,311 FTE jobs no increase to the Australian population.

9.2.2. Goods and services

Cost category groupings presented in Table 9-2, provide a summary of the estimated goods and services spending during the capital expenditure construction phase of the Project.

Table 9-2: Construction cost expenditure

Cost Category	Peterborough	Rest of ESA	Rest of SA	Interstate	Overseas	Total CAPEX ($M)
Mining	0%	100%	0%	0%	0%	2.0
Processing plant	2%	29%	23%	26%	20%	2,424.3
Non-process infrastructure	3%	22%	27%	38%	10%	45.2
Water supply	0%	36%	27%	11%	26%	238
Power supply	0%	27%	35%	27%	11%	193
Product haul and access	0%	24%	31%	27%	24%	65.7
Port	0%	71%	0%	0%	29%	4.4

Cost groupings presented in Table 9-3, provide an annual summary of the estimated goods and services operational expense spending during the operation of the Project.

Table 9-3: Operational cost expenditure

Cost Category	Peterborough	Rest of ESA	Rest of SA	Interstate	Overseas	Total CAPEX ($M)
Wages and Salaries	8%	22%	60%	10%	0%	73.2
Mining specific	3%	42%	40%	14%	0%	4.9
Diesel use and cartage	0%	100%	0%	0%	0%	32.7
Processing plant	0%	63%	37%	0%	0%	55.2
Transporting (mine to vessel)	0%	73%	27%	0%	0%	99.2
Electricity usage	0%	100%	0%	0%	0%	84.8

NB. WATER USAGE WAS NOT INCLUDED AS THE WATER SOURCE FOR THE PROJECT HAD NOT BEEN FINALISED AT TIME OF ASSESSMENT.

9.2.3. Wages

Wages and salaries expenditure for the operations phase is predicted to be approximately $73.2 million annually, with 90% of the forecasted spend in SA (Table 9-3).

Local and regional wage spending is predicted to be approximately 30% of the total wage expenditure and will feed directly into the flow-on effects for the local communities through general living expenses and additional purchasing capacity.

In addition to the direct employment benefits through additional wages in the region, public sector employment is expected to increase as a result of the Project; however, it should be noted that impacts to the public sector within the local area (Peterborough) is relatively small, as the majority of the provision of public services is provided in surrounding LGAs.

Annual flow-on employment increases predicted FTE jobs in the Peterborough and surrounding LGAs for the operations phase is presented in Table 9-4.

Table 9-4: Predicted flow-on annual employment increases (operations phase) – local (Peterborough) and surrounding LGAs

Area	Local area (Peterborough)	Rest of ESA
Public administration and regulatory services	0.3 FTE	8 FTE
Public order and safety	0.4 FTE	4 FTE
Education and training	0.5 FTE	14 FTE
Health and community services	1.4 FTE	37 FTE
Employing sector		
Food and beverage services	9.4 FTE	-
Personal and other services	6 FTE	-
Retail trade	2.4 FTE	-
Wholesale trade	0.8 FTE	-
Health and community services	1.4 FTE	-
Electricity generation	-	174 FTE
Rail transport	-	154 FTE
Water, pipeline and other transport	-	68 FTE
Electricity supply	-	15 FTE
Personal and other services	-	102 FTE

9.2.3.1. Estimates of impact of Local area wages

The potential benefits arising from the Project may be profound at a local level. While the Project sits within the Unincorporated SA area, principal service communities are situated to the east of the Project area, particularly the town of Peterborough located within the Peterborough LGA.

According to the Index of Relative Socio-economic Disadvantage (IRSD) (ABS, 2021a), Peterborough LGA is the 34th most disadvantaged community in Australia (7th percentile) and third most disadvantaged in SA (5th percentile). Peterborough is listed as the lowest in SA and 12th lowest nationally in ABS' Index of Employment and Education (IEO) (2021a). Regional IRSD scores by census area are presented in Figure 3-63.

A conservative estimate of 8% of the operations-stage workforce being sourced from the Peterborough LGA equates to 36 full-time roles. Based on the median Australia mining worker salary of $2,403/week (Jobs and Skills Australia, 2024), this new employment results in an additional $4.5 m of salaries paid locally – a 19% increase on total employee income paid locally in 2020/21 (ABS, 2021b).

9.2.4. Taxation and royalties

State and Federal revenues from the Project are predicted to total approximately $2 billion over the 30-year forecast period. Revenue distribution through State and Federal taxation and royalty streams will continue until end of operations.

9.2.4.1. State Government

$37 million in the first year of operation and $55 million annually thereafter, for a total of $1.6 billion over 30 years (comprising of $1.5 billion in royalties, $26 million in Lease payments and $108 million in payroll tax).

9.2.4.2. Federal Government

$12 million in the first year of operation and $16 million annually thereafter for a total of $462 million over 30 years (comprising of $272 million excise duty and $190 million income tax).

9.3. Job creation

The total average workforce of 1,000 people will be required for the construction of the Project, with approximately 660 based on Site at any one time. It is anticipated that the majority of the construction workforce would be sourced from local and regional communities surrounding the Project, however it is acknowledged that workers would also likely be sourced from other regions in SA and Australia. Construction of the TL is expected to require up to 100 workers during peak construction times, with an average of 80 workers across the entire phase. Due to the specialised nature of the construction, it is expected that approximately 70% of TL workers will be from the broader SA region or interstate.

Economic analysis of the Project estimates an average of 878 FTE jobs annually will be created during the construction phase in LGAs surrounding the Project, including 529 FTE direct jobs (those generated by expenditure on things such as materials, equipment and services for the Project) and 350 FTE indirect jobs, generated through additional household spending as a result of increased employment and wages. In total the construction phase is expected to create approximately 2,697 FTE jobs in SA, including 1,226 FTE directly related to expenditure by the Project and 1,471 FTE jobs relating to the flow-on economic activity.

9.4. Community investment

The Project is expected to provide employment opportunities for younger members of the community, who may have traditionally moved away from the area and may now choose to remain in local towns. It is expected there will also be a degree of migration to local towns, as a response to employment opportunities at or resulting indirectly from the Project, likely including workers with young families.

Table 9-5 provides the predicted average annual population increases (inward migration) and gross product for each of the modelled areas.

Table 9-5: Predicted average annual population increase and gross product contribution

	Peterborough	Rest of ESA	SA	Australia
Average annual population increase (person)	23	797	1,580	0
Average annual GRP/GSP/GDP ($ million)	9.2	192	1,001	1,148

Inward migration to local towns presents opportunities for enhanced social capital and community cohesion through potential increase in community participation, such as community activities and events (i.e. community, recreation and sporting groups and clubs). Additionally, an increase in the pool of likely volunteers to support local activities will help to address the lack of volunteers currently experienced in towns such as Peterborough and Yunta (refer Section 3.11.3).

Under its f**ore**sight sustainability program, MGT has committed to developing a policy to guide their engagement and planning relating to community participation and development opportunities that will include:

- a commitment to promoting the diversification and economic development of local businesses, through sourcing local goods and services where appropriate
- supporting the development of education and upskilling programs to build human capital and increase resilience in the local workforce

- community event support in the form of sponsorships, participation and internal communications at the Project site.

An example of the commitment to-date includes the development of MoU prepared between DC Peterborough and MGT, signed on 5 May 2023. The MoU establishes a strong collaborative commitment to the responsible and sustainable development of the Project and its interactions with local communities.

The MoU enables a broad level of strategic support for the Project with the key objective of bringing together DC Peterborough, MGT and key stakeholders to:

- collaborate on matters of shared local interest, including to maximise significant social, environmental, employment and other economic opportunities
- support engagement between MGT and DCP and with local residents, businesses and other entities
- identify opportunities to develop, fund or manage shared infrastructure
- provide structure to consider support for ancillary developments that may benefit the Razorback Project, its local workforce and its local stakeholders.

Chapter 10

Operator capability

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter includes a description of Magnetite Mines' capability to deliver the Razorback Iron Ore Project to an effective and efficient standard.

Information is provided on the governance, administrative and sustainability systems, and processes established to manage Company activities

An overview of current and planned future technical and operation capabilities is also included.

The proposed financing delivery model is described in the Chapter as part of the statement on the Company's financial capability to operate the Project.

10. Operator capability

This Chapter responds to requirements of Mining Regulations 2020 Sections 30 (1) (d) (l), (f), and 37 (a) and (C).

In preparing this Chapter and the statements of technical, operational and financial capabilities, consideration has been given to the 'Financial and technical capability guideline' prepared by the Department of Natural Resources, Mines and Energy (2020).

10.1. Corporate governance system

MGT has an established corporate governance framework that is aligned with the recommendations set out in the Australian Securities Exchange (ASX) Corporate Governance Council's Corporate Governance Principles and Recommendations (4th edition). Commensurate with these recommendations, the key principles of MGT's governance framework are to:

1. lay solid foundations for management and oversight
2. structure, the board, to add value
3. act ethically and responsibly
4. safeguard integrity in corporate reporting
5. make timely and balanced disclosure
6. respect the rights of security holders
7. recognise and manage risks
8. remunerate fairly and responsibly.

The Corporate Governance framework comprises governance charters (which includes Boards, Audit and Risk Committee, and a Nomination and Remuneration Committee), policies (refer Section 10.1.1) and procedures that follow the MGT Constitution. This establishes clear roles and responsibilities, with the development of policies that need to be followed by anyone working at or for MGT. The framework is subject to continual review and is expected to grow with Company development.

Further, all employees and contractors will follow MGT's Code of Conduct, which requires them to conduct themselves according to MGT's standards of ethics, integrity, and behaviour when dealing with colleagues and other external stakeholders. The code of conduct is based on the Company's core values:

1. Integrity
2. Accountability
3. Trust and respect
4. Technical rigour
5. Creativity.

10.1.1. Corporate policies

MGT maintains a suite of corporate policies to clearly establish the standards and expectations of Directors, management, staff and agents during the conduct of business – ensuring the effective and efficient operation of the Company. Principal corporate policies include:

- Risk management policy
- Anti-bribery and corruption policy
- Equal employment opportunity and anti-discrimination, harassment and bullying policy

- Grievance handling policy
- Whistleblower policy
- Selecting and (re)appointment of Directors policy
- Securities trading policy
- Shareholder communication and investor relations policy.

A HSE policy has also been developed as part of MGT's health and safety policy suite.

10.1.2. Governance structures

Appropriate governance structures have been established and resources allocated to ensure the management of the Company's current operations are compliant with relevant requirements and practices, and future projects are constructed, operated and closed to achieve compliance with environmental outcomes and other statutory controls.

The following Sections outline MGT's leadership structure that will have responsibility to achieve compliance with general statutory requirements and lease, licence and approval conditions across the life of project (through implementation of environmental management, monitoring and reporting programs that will be described in the PEPR and EMPs).

10.1.2.1. The Board

The Board's Chair, Secretary and Committee is appointed following the MGT constitution and relevant policies. The MGT Board includes a diversity of skills with high level of experience and expertise in the resources sector. As of the date of submission, experience held by the Board of Directors includes senior and executive roles with major global resources companies, including ArcelorMIttal Mining, BHP, AngloAmerican, Sherrit International, Lihir Gold and Norilsk Nickel.

The Board is ultimately responsible for deciding the nature and extent of the risks it is prepared to take to meet business objectives. Further, the main role of the Board is to set MGT's strategic direction and oversees MGT management and business activities, specifically those relating to the delivery and sustained operations of the Razorback Project.

Information on Board committees is presented below.

AUDIT AND RISK COMMITTEE

An Audit and Risk Committee has been established to ensure the integrity and effectiveness of MGT's risk management framework, risk management processes and risk reporting. The committee also carries responsibility for the assessment and management of strategic sustainability/ESG matters until such time that a separate sustainability committee is established.

NOMINATION & REMUNERATION COMMITTEE

The role of the Nomination and Remuneration Committee is to assist the Company's Board of Directors with assessment of and provision of advice on remuneration and nomination-related matters.

10.1.2.2. Executive team

The CEO ensures that MGT's strategic objectives are implemented while also reinforcing MGT values, code of conduct, budget and risks. The CEO is responsible for designing and implementing the risk management framework (including environmental, social, cultural and other Project risks) and ensuring that the Project will operate within the objectives set by the Board.

Other senior executives, including the Chief Financial Officer, ensure that those MGT strategic objectives within their delegated areas of responsibility are implemented, controlled and reported in line with statutory requirements and adopted performance standards. Similar to the CEO, other senior executives must also demonstrate the MGT values and code of conduct, while ensuring personnel operate within the risk management, environmental management and disclosure processes established by the Company.

10.1.2.3. Management

Managers assume an important role in fostering a sustainability culture that uphold Company ESG objectives, implements and monitors actions to maintain compliance with environmental and other obligations, actively manages risks, and engages with stakeholders. Managers are accountable for ensuring staff, contractors and agents are understanding of and comply with MGT's policies and code of conduct, statutory requirements, lease and licence conditions and adopted standards and guidelines.

10.2. Environment, Social and Governance (ESG)

MGT has made a clear commitment to embedding sustainability as part of its Project design and delivery programs, with the aim to demonstrate leading ESG stewardship and performance for the Razorback Project.

As part of its ESG Statement (see Figure 10-1), MGT defined its ESG Commitment:

> *"Magnetite Mines is committed to building an organisation and project portfolio with corporate sustainability as a core basis of its culture, business planning and delivery".*

MGT's objective for the Project is to assist in developing a sustainable magnetite industry in SA that is valued by its stakeholders and improves the environmental footprint of the global steelmaking sector, while maintaining operations that are sustainable and inclusive. The Company has identified four ESG pillars – (1) Environmental sustainability, (2) Social and community inclusion, (3) Accountable governance and (4) People and culture – each with a subset of key themes relevant to MGT and sustainability performance (see Table 10-1).

Table 10-1: Magnetite Mines ESG policy objectives

Environmental Sustainability	Social and Community Inclusion	Accountable Governance	People and Culture
Decarbonisation and climate change	Stakeholder and community engagement	Performance and reporting transparency	Wellbeing, health and safety
Resilient environmental systems	First Nations rights and participation	Equitable agreement-making	Board and workforce diversity
Water use and management	Community development and benefit	Ethical procurement and supply chains	Workplace rights and opportunity
Tailings and waste management			Workforce capability and development
Site closure planning			

The intended operational impact of the Company's ESG commitment follows the sustainability principle of minimising the impacts from the Project while enhancing responsible environmental and social outcomes. This will be achieved in conjunction with industry, community and other partners as a truly integrated business strategy.

To elevate the Company's commitment into action, MGT has commenced the staged development of a sustainability program and framework that establishes an authoritative and accountable proposition to all stakeholders. This program is called '**fore**sight'.

MAGNETITE MINES

foresight

Environment, Social and Governance Statement

June 2023

Magnetite Mines is a leading ASX-listed iron ore company focused on the development of magnetite iron ore resources in the highly-prospective Braemar iron region of South Australia.

This leadership position is not just about project development; it is about delivering projects that are sustainable and inclusive. We are accountable to all our stakeholders, from investors to staff, from First Nations to local communities. This is our corporate sustainability agenda.

Minimising the impacts from our projects and enhancing environmental and social outcomes are principal goals of our future operating assets, achieved in conjunction with industry, community and other partners, as part of a truly integrated business strategy.

Our objective for sustainable magnetite operations

Magnetite Mines is committed to developing a sustainable magnetite industry in South Australia that is valued by its stakeholders and improves the environmental footprint of the global steelmaking sector.

We have the foresight to contribute to the effort to address some of the most challenging global issues through our dedicated actions at local and regional levels.

Environmental Sustainability	Social and Community Inclusion	Accountable Governance	People and Culture
Decarbonisation and climate change	Stakeholder and community engagement	Performance and reporting transparency	Wellbeing, health and safety
Resilient environmental systems	First Nations rights and participation	Equitable agreement-making	Board and workforce diversity
Water use and management	Community development and benefit	Ethical procurement and supply chains	Workplace rights and opportunity
Tailings and waste management			Workforce capability and development
Site closure planning			

Our Environment, Social and Governance commitment

Magnetite Mines is committed to building an organisation and project portfolio with corporate sustainability as a core basis of its culture, business planning and delivery.

Tim Dobson
Chief Executive Officer

Figure 10-1: MGT Environment Social and Governance Statement, June 2023

10.2.1. f**ore**sight sustainability program

MGT's f**ore**sight program is the foundation of MGT's sustainability framework and seeks to embed ESG considerations into all aspects of MGT's activities, providing the platform for the Company to become a leader in sustainable magnetite iron ore mining and the green steel sector.

In simple terms, sustainability success and leadership under the f**ore**sight program is demonstrated by:

- integrating sustainability into the company's strategic focus
- engaging early and broadly with stakeholders on complex environmental, social and governance matters
- championing sustainable practices
- ensuring ESG metrics are included in the company's decision-making process
- establishing a long-term view to futureproofing company and project development.

The f**ore**sight ESG framework will be updated progressively through the life of the project to align with company growth and to respond to changes in stakeholder expectations, emerging material issues and assurance requirements. Further information on the f**ore**sight sustainability program, including the development of the corresponding sustainability framework, can be found in Section 5.1.

10.2.1.1. ESG commitments under f**ore**sight

MGT has made a commitment to foundational actions that will ensure the Razorback Project is delivered in a strategic, sustainable and sensitive manner, and one that will significantly progress the Company's current and future sustainability performance. The commitments include:

- alignment with leading global sustainability initiatives
- the adoption of advanced assurance standards to drive company and project performance behaviour
- the designation of a primary (initial) disclosure framework to build the performance transparency profile of the company.

A summary of key commitments made is listed in Table 10-2.

Table 10-2: Key sustainability/ESG commitments, MGT

Commitment type	Commitment summary
Global sustainability alignment	• United Nations (UN) Global Compact (Ten Principles) • UN Sustainable Development Goals • Reconciliation Action Plan (RAP)
Assurance and performance standards	• IRMA standard frameworks (see Section 10.2.2 for further information) • Global Industry Standard on Tailings Management
Reporting and disclosure standards	• Stakeholder Capitalism Metrics, as an initial reporting framework • Global Reporting Initiative (GRI) and Task Force on Climate-related Financial Disclosures (TCFD) as targeted disclosure frameworks (subject to review)

10.2.2. IRMA assurance standard

MGT has adopted the IRMA Standard for Responsible Mining as its primary environmental, social and cultural performance certification methodology. The IRMA Standard "defines best practices for what responsible mining should look like at the industrial-scale" (IRMA, 2024). Independent auditing of MGT's performance will be benchmarked against IRMA's exhaustive list of expectations. A list of categories of expectations is included in Table 10-3.

MGT intends that it will commence assurance planning pursuant to the draft IRMA Ready standard during its pre-construction and construction phases, before transitioning to the principal IRMA Standard when mining operations commence.

Table 10-3: IRMA Standard expectation categories (elements)

Business integrity	Planning for positive legacies	Social responsibility	Environmental responsibility
Legal compliance	Environmental and social impact assessment and management	Fair labour and terms of work	Waste and materials management
Community and stakeholder engagement	Free- prior and informed consent	Occupational health and safety	Water management
Human rights and due diligence	Obtaining community support and delivering benefits	Community health and safety	Air quality
Complaints and grievance mechanisms	Resettlement	Mining and conflict affect or high-risk areas	Noise and vibration
Transparency in revenue payment to governments	Emergency preparedness and response	Security arrangements	Greenhouse gas emissions
	Planning and financing reclamation and closure	Artisanal and small-scale mining	Biodiversity, ecosystem services and protected areas
		Cultural heritage	Cyanide and mercury management

10.3. Statement of compliance

MGT has not contravened or failed to comply with a provision of a corresponding law or designated Act in connection with authorised operations carried out within the preceding period of five years that resulted in:

- the revocation or suspension of an authority to carry out authorised operations; or
- a prosecution for an offence; or
- the imposition of a penalty by a court; or
- the issuing of a notice, direction or order that required the suspension or discontinuance of any authorised operations or the rectification of any harm to the environment or rehabilitation of any land, place or other aspect of the environment.

MGT maintains an overarching management system to drive its compliance and performance of its broad scope of activities. The management system includes a suite of procedures, manuals, checklists and other reporting templates to set a standard of operational governance, supervision, monitoring and record keeping.

10.4. Statement of technical and operational capability

MGT is an emerging, ASX-listed resources company. As the principal proponent of the Project (as the parent company to Razorback Iron), MGT has engaged the necessary technical capabilities and established the relevant operation capabilities to undertake all preliminary development activities for the Project, including resource investigations, processing studies and trials, feasibility studies, approvals, engagement and investment attraction.

With no current operating mines, the Company expects to increase its technical capabilities and expand its operations capabilities to meet the required scale commensurate with Project complexity.

A summary of current technical capabilities is provided in Section 10.4.1.1.

Further information on the operational capabilities of the Company, including those relevant to project development, please refer to Section 10.4.2. Information on the proposed project delivery model is also included in Section 10.4.2.3.

10.4.1. Technical capabilities

MGT maintains the necessary technical and non-technical capabilities for a resource company at the project definition and pre-development stages. Current technical capabilities, as described in Section 10.4.1.1, reflect the Company’s development strategy with necessary skills engaged for the assessment of mineral resources, technical feasibility studies, project approvals/engagement and project development partnering.

It is prudent for MGT to engage technical specialists for bespoke planning, design and other works at this stage of the development cycle. The use of mining, processing and infrastructure specialists, such as AMC, Hatch and GHD, enable the Company to access industry-leading skills and competencies with global-scale experience. This has been particularly relevant for feasibility and other studies relating to mine planning, process flowsheet design and test work, tailings management, and non-process infrastructure design.

As the project proceeds through residual planning, pre-construction, construction, production and closure stages, additional internal and external resourcing will be engaged to ensure that MGT is adequately resourced to meet its corporate and governance, planning and project control, operational, safety and compliance performance, and social responsibilities and commitments.

Additional technical capability will be leveraged during the construction and production (operations) through the proposed contracting model, as described in Section 10.4.2.3.

10.4.1.1. Current technical capabilities

An overview of the current MGT Project technical delivery team capabilities is presented in Table 10-4.

Table 10-4: MGT current technical capabilities for project delivery and operations

Name / Position	Accreditations and memberships	Summary of technical expertise
Mr Tim Dobson Managing Director	BAppSc Ext.Metallurgy GAICD, FAusIMM	Over 35 years international experience in leading/transforming complex operational settings in the resources sector. Project leadership roles at Ambatovy (Madagascar), Moa Bay (Cuba), Lihir (Papua New Guinea), Cawse Nickel (WA) and White Dam (SA).
Mrs Inthu Siva Company Secretary	CPA, CGMA, GIA (Affiliated)	Corporate professional with extensive Australian and international experience in accounting, finance, taxation, corporate governance and compliance across both private and public sectors, with almost 15 years at with Royal Resources/Magnetite Mines.
Mr Trevor Thomas Director – Studies	MEarthSci (Hons) MAIG, MAusIMM	A geologist with over 17 years of experience in iron ore, uranium and gold, including more than five years managing technical and engineering studies and feasibility assessments for the Razorback Project. A leading authority on the characterisation of Braemar Formation and qualified as a Competent Person for JORC Code 2012 reporting of exploration results, Mineral Resources and Ore Reserves.

Name / Position	Accreditations and memberships	Summary of technical expertise
Mr Allan Kane Director – Sustainability	BEnvMgmt (Hons) GradCertProjMgmt MAusIMM, AIAP2	Over 16 years of resource sector experience in environmental, compliance and community/social roles. Led extensive engagement programs in SA and nationally in support of major mining projects, with a strong focus on landowner and Traditional Owner engagement and participation.
Mr Matthew Paul Senior Geologist	BSc (Hons) MAIG	Over 10 years of experience as an exploration geologist, with a focus on iron ore and experience across base metals, gold and rare earth elements. Leader of numerous exploration programs, including design, planning, budgeting and field execution. Responsible for tenement administration, technical reporting, and ensured workplace health and safety compliance.

10.4.2. Operational capabilities

As a pre-development stage company, MGT has already established a number of critical operating capabilities relevant to the delivery, construction, operations and closure of the Project. An emerging environmental management system and established risk management system are in operation, and are described in Sections 10.4.2.1 and 10.4.2.2, respectively.

For further information on MGT’s operational capabilities relating to company governance structures and systems, please refer to Section 10.1.

For further information on MGT’s ESG program and framework, which will drive related operation performance, please refer to Section 10.2.

10.4.2.1. Environmental management

Compliance with environmental outcomes will be achieved through the PEPR and supporting environmental management plans (EMPs) that address statutory conditions imposed by Commonwealth and State Government (and other relevant regulatory requirements) and align with best-practice operations. The EMPs capture all required outcomes and measurement criteria, and assign controls, implementation, monitoring, measurement and reporting responsibilities to operational and/or management positions for the Project.

MGT currently utilises the ‘Donesafe’ platform to record and manage health, safety and environmental actions, incidents and other records (audits, checklists, contractor and staff checklists and inductions). Donesafe, or an alternative proprietary system, will be used to manage HSE records through the life of project. It is MGT’s intention to record and manage all compliance, performance and other ESG data within a single platform to streamline interpretation, reporting and disclosure. MGT will ensure that incident reporting, audits, checklists, contractor and staff checklists and inductions are readily accessible. The reporting system will be regularly audited to identify risks and confirm compliance with EMPs, PEPR and legislative requirements.

10.4.2.2. Risk management

Recognising and managing risks is considered crucial for MGT, with an established risk management policy and procedure applicable to MGT's directors, employees and contractors. The risk management policy comprises of a risk management framework with the principle and guidelines developed with the help of the Australian/New Zealand Standard 'AS/NZS ISO 31000:2009 Risk management – Principles and guidelines'. The risk management principles and guidelines involve:

- risk identification
- risk analysis
- risk evaluation
- risk treatment
- monitoring and review
- documentation.

All personnel will be responsible for minimising risk in accordance with the risk management policy and related MGT procedures, and in accordance with statutory responsibilities and internal delegations. MGT will ensure all personnel are aware of these responsibilities, with routine training provided.

As part of the project risk management system, MGT will also develop and implement an emergency management plan specific to the Project or individual project elements and/or phases. This approach will provide a system for response and control of critical, unplanned events that may arise across the life of the project. The emergency management plan will establish clear roles and responsibilities for emergency response, identify critical actions for different emergency types, describe how MGT will interface with external emergency services providers (including volunteer-serviced providers), and prescribe what and how on-site emergency resources (personnel and equipment) will be provided, maintained and deployed.

10.4.2.3. Project delivery model and forecasted operational capabilities

Additional operating capabilities will be accessed by MGT at different phases of the Project life cycle, including in the residual planning phase, construction execution planning and delivery, and during operations, by engaging and collaborating with industry-leading partners and service providers. The following Sections provide indicative approaches being assessed by MGT.

EARLY CONTRACTOR INVOLVEMENT

MGT anticipates early contractor involvement (ECI) in the residual design, procurement planning and construction planning stages of the Project. ECI will leverage the design capabilities and project execution experience of a major construction partner with relevant experience in iron ore mining and beneficiation to optimise Project design and de-risk Project delivery. The ECI program will focus on constructability (and modularisation), plant integration and optimisation (including forecasted performance benchmarking), final vendor equipment selection, and safety and operability.

ECI-led optimisation and de-risking of the Project execution strategy will be completed prior to MGT reaching a Final Investment Decision (FID). Further, the ECI program will inform the Project contracting strategy to ensure the appropriate management of project resourcing risks.

Given the scale of the Project, MGT expects that to attract the participation of a Tier 1 or 2 contracting partner. MGT has already engaged with a number of potential ECI partners with broad national- and international-level experience in the iron ore sector.

CONSTRUCTION EXECUTION STRATEGY

MGT has assessed a range of contracting strategies, with an Engineering, Construction, Procurement (EPC) or Engineering, Construction, Procurement, Management (EPCM) model preferred. The final selection of contracting model is subject to further assessment of market conditions and availability of a suitable contractor, relative to the scale of the Project, in SA; however, for current planning purposes a preliminary EPC model has been proposed.

An EPC project execution strategy has been developed in accordance with MGT's critical selection criteria and Project-specific context:

- a primarily debt-funded financing approach requiring risk sharing and cost certainty
- MGT's strategy to retain a lean internal team for delivering capital development projects
- a stable and favourable project context (greenfield development, labour environment, etc.)
- a single-point accountability structure via EPC contractor for all construction activities.

The overall responsibility of the execution, including site management, health and safety management, and interfaces with various contractors and consultants, will be delegated to the EPC contractor with its overarching procurement, coordination, construction and reporting role. MGT will operate an 'Owner's Team' that provides overall project governance and principal contract management.

The Owner's Team will retain a high level of involvement over packages deemed critical to the success of the project, and the reputation of MGT and the industry. The team will be suitably resourced with the necessary specialists to ensure key outcomes are achieved and risks managed. Critical packages include:

- environment, community relations, and cultural heritage
- project contract oversight, including scope definition/management and cost control
- process performance and flow sheet optimisation
- operational readiness planning, commissioning, and ramp-up

The Owner's Team will be supplemented by an Owner's Engineering Team, whose resourcing will fluctuate based on demand and project progress. The composition of the Owner Engineer Team will evolve as the project transitions from civil and concrete works to structural, mechanical, piping, electrical, and instrumentation installation.

OPERATIONAL CAPABILITIES AND CONTRACTING

MGT has contemplated the operational resourcing requirements as part of the preliminary Project study program (refer Section 4.11.1.1). As the Project owner and site operator, MGT will assess the contemporary labour force capacity and capability to mitigate any risk from competing projects and other industries, as well as optimising the workforce transition and retention from the construction to operations phase.

An operational and business readiness strategy and plan will be developed as part of the next study phase, with a focus on the transition to operations phase, operational workforce demand and supporting internal business functions (i.e., human resources, supply and procurement, supply chain). Additionally, operational readiness will confirm those functions that may be better operated by specialist service providers, rather than MGT initially, which may include:

- contract mine development and mining services (including ROM management)
- concentrate product haulage (road, rail)
- ancillary services (i.e., for accommodation camp).

10.5. Statement of financial capability

As an ASX listed entity, MGT has numerous avenues to finance its existing and future operations.

MGT has historically relied upon its existing and new shareholders to fund its operations and has been successful in raising over $20M via Rights Offers to shareholders over the past 24 months.

In January 2025, MGT announced a $7M financing facility with a United States-based fund, C/M Capital. These funds will provide MGT with sufficient working capital to enable a transaction with JFE Shoji Australia Pty Ltd (JFE Shoji) to be completed (see Section 10.5.1.1) and for other strategic partners to become investors in the project to fund residual study programs prior to the FID being made.

An overview of the Project financing strategy is provided in Section 10.5.1.

The company's existing material financial commitment are reported in Section 10.5.1.

10.5.1. Project financing strategy

The Company has assessed that the Project is best developed via a Joint Venture (JV) with motivated investors and offtake partners, with MGT as project operator. This format has been used extensively and successfully in large-scale Australian resource projects over recent decades and has the benefit of sharing capital and risk burden between the JV partners. Additional project financing through conventional debt and export financing methods is also contemplated.

A conceptual model Project JV and financing model is provided in Figure 10-2.

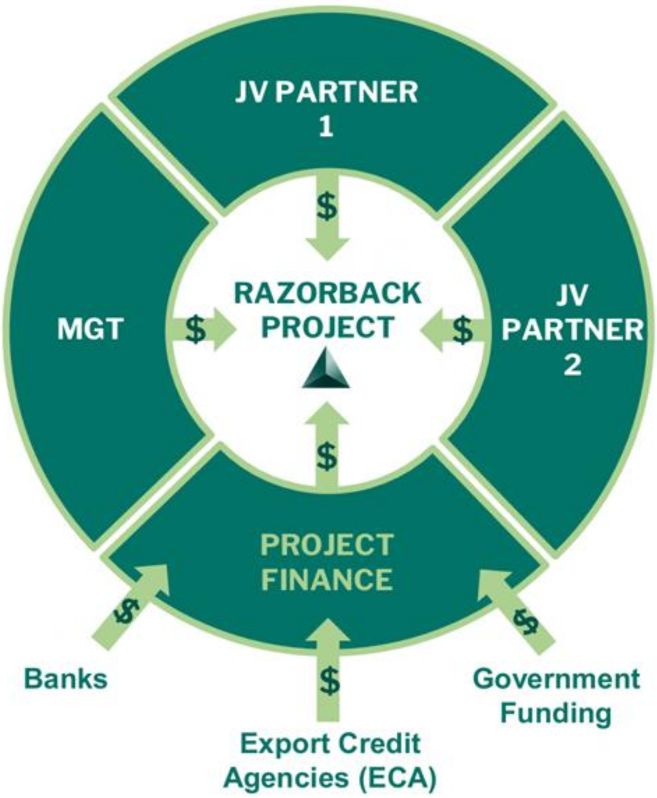

Figure 10-2: Project joint venture and financing model

The Razorback project will require significant debt and equity resources to fund the capital cost of construction (estimated to be approx. A$2B) and the cash required to fund the start-up operations of the mine until it becomes cash flow positive.

The Joint Venture structure enables motivated steelmakers, trading houses and private equity investors (collectively Strategic Partners) to secure future offtake rights and/or equity by contributing equity funds and/or debt facilities to the overall project finance pool of funds.

MGT will be the operator of the mine and throughout the financing of the Project will retain majority ownership of the Project (for example 51%). It is expected that 2-3 other Strategic Partners will be the equity owners of the remaining 49% of the Project.

It is important to note that the Company has advanced discussions with Export Credit Agencies (ECA) both in Australia and Japan. ECAs can provide significant low cost capital to large projects such as this Project, especially when there is a clear case of doing so in their nation's best interest.

MGT has also engaged Federal Government funds to provide financial assistance to the Project. These funds include the National Reconstruction Fund, Future Made in Australia Fund and Clean Energy Finance Corporation. These funds have a priority to assist projects that fit within their mandate of adding value along the nature resources supply chain. Areas that these funds may become involved in the project included funding multi-user infrastructure.

In recognition of the increasing demand from global steelmakers to secure future green iron supply produced from premium-grade magnetite concentrates, MGT has prioritised engagement with strategic partners over the past 12 to 18 months.

As a significant step forward in the Project financing strategy, MGT signed a Heads of Agreement (HoA) with JFE Shoji in July 2024 (MGT, 2024). JFE Shoji is a wholly owned subsidiary of JFE Shoji Corporation – the core trading company of JFE Holdings that is centred on the provision of raw materials for steel production amongst other commodity and value chains.

10.5.1.1. Heads of Agreement with JFE Shoji

The HoA provides the framework under which the parties will negotiate a binding transaction to support the completion of relevant studies for the Project and progress towards a final investment decision. The binding transaction contemplated by the HoA proposes a number of preliminary terms, subject to the negotiation and execution of a definitive agreement:

Funding	JFE Shoji will provide funding to MGT for the completion of relevant studies, commencing immediately upon execution of a definitive agreement.
Offtake rights	JFE Shoji will earn offtake rights for the delivery of DR-grade magnetite concentrate production for up to 10% of planned Project Stage 1 production, i.e. up to 500ktpa, for a 15-year period on commercial terms to be negotiated.
Conversion to participating interest	Subject to agreement on the terms of such a conversion, JFE Shoji has the right to convert the value of its offtake agreement into a participating interest in the Razorback Project or MGT, at the election of JFE Shoji.
Future funding	Subject to study and FID outcomes and subject to negotiations, JFE Shoji may participate in a JV (or other investment vehicle) with MGT to realise the Razorback Project.

10.5.2. Existing financial commitments

MGT's material financial commitments (including those of its subsidiary companies) are limited to SA exploration activities. Minimum expenditure commitments are prescribed for the primary amalgamated expenditure area and for other individual tenements. The approximate aggregated value of tenement expenditure commitments until respective tenement expiries is $2.0 M. The value of this commitment is well within the financial capacity of the Company given its ability to generate investment as an ASX-listed entity.

Tenement information, including expiry dates, is provided in Table 10-5.

Table 10-5: MGT tenements summary

Tenement and Tenement name	Tenement Owner	Expiry date	Ownership
EL 6126*	Ironback Pty Ltd#	16/09/2028	100%
EL 6127*	Ironback Pty Ltd#	09/12/2028	100%
EL 6353*	Razorback Iron Pty Ltd#	21/06/2030	100%
EL 5902*	Razorback Iron Pty Ltd#	30/11/2027	100%
EL6788*	Magnetite Mines Ltd	8/06/2028	100%
EL 6037*	Magnetite Mines Ltd	1/11/2028	100%
EL6746	Magnetite Mines Ltd	5/05/2028	100%
EL6745	Magnetite Mines Ltd	6/05/2028	100%
EL6878	Magnetite Mines Ltd	29/11/2028	100%
EL 6877	Magnetite Mines Ltd	29/11/2028	100%

* DENOTES TENEMENTS WITHIN THE APPROVED AMALGAMATED EXPENDITURE AREA
# DENOTES COMPANIES OWNED BY MAGNETITE MINES LTD

MAGNETITE MINES

Chapter 11

References

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

This Chapter contains an alphabetical list of references included within the Razorback Iron Ore Project Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans.

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Chapter 12

Terms of Reference Checklist

Razorback Iron Ore Project – **Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans**

The contents of this MLP have been developed to meet the requirements of TOR – *Terms of Reference for the Razorback Iron Ore Project Mining Lease Application in accordance with EPBC Act Accredited Assessment under the Mining Act 1971 (Notice under Section 36 of the Mining Act 1971).* Please use this checklist to find source information within the MLP.

12. Terms of Reference checklist

Table 12-1: Terms of Reference checklist

Frame work	Requirement	Section included
	An application for a mining lease (ML) for the recovery of metallic and industrial minerals must be accompanied by:	
	• a proposal that complies with section 36 of the Mining Act 1971, regulations 46 and 47 of the Mining Regulations 2020 and any determinations set out in this Terms of Reference; and	S.2.1. Mining Act
	• information that complies with regulation 30 of the Mining Regulations 2020 and any determinations set out in this Terms of Reference; and	S.2.1. Mining Act
	• a declaration of accuracy that complies with regulation 84 of the Mining Regulations 2020; and	S.2.1. Mining Act
	• the relevant application fee.	N/A
TOR	**Form of Application**	
	Applicant name(s) (company and/or individual and/or related body corporate) and each applicant's percentage share in the application	S.1.1. Project proponent
	Name of project	S.1.1. Project proponent
	Mineral type	S.1.1. Project proponent
	Mineral(s) to be authorised	S.1.1. Project proponent
	Primary mineral(s) sought	S.1.1. Project proponent
	Other mineral(s) sought	S.1.1. Project proponent
	Details of the tenement(s) giving authority to apply for the Mining Lease	S.1.2. Proposed new tenements
	Native title land	S.1.4.1. Native title
	Details of relevant land ownership, notices, consents and agreements	S.1.4. Landowners & S.1.7. Reasonable prospect of access to land
	Declaration of accuracy	Page vi
	Applicant(s) details including:	
	• Name of Company and/or Individual ABN (if applicable)	S.1.1. Project proponent
	• ACN (if applicable) Registered address	S.1.1. Project proponent
	Applicant contact details including:	
	• Postal Address	S.1.1. Project proponent
	• Email	S.1.1. Project proponent
	• Website	S.1.1. Project proponent
	• Phone number (s)	S.1.1. Project proponent
	Contact Person details including:	

Frame work	Requirement	Section included
	• Name	S.1.1. Project proponent
	• Position Title	S.1.1. Project proponent
	• Email	S.1.1. Project proponent
	• Phone number(s)	S.1.1. Project proponent
	• Consent to receive electronic correspondence (or otherwise)	S.1.1. Project proponent
	An application for an ML must in accordance with section 36(1)(a) of the *Mining Act 1971* be in the following form, unless otherwise specified by the Director of Mines or an authorised officer:	
	• an electronic version of the Proposal must be submitted in accordance with regulation 88 of the *Mining Regulations 2020*; hardcopies must be submitted upon request; the information in all must be identical;	N/A
	• each page, plan or other separate sheet of the Proposal must include the mineral claim, retention lease or exploration licence number(s), date of the application submission and sequential page numbering; and	All pages
	• the electronic version of the Proposal must be submitted in one single Acrobat PDF file or if requested by the Director of Mines or an authorised officer, Microsoft Word compatible files must be submitted.	N/A
TOR – 1	**Description of the Existing Environment**	
	In setting out an assessment of the environmental impacts of the proposed authorised operations in accordance with section 36(1)(c)(ii)(A) of the *Mining Act 1971* and regulation 46(2) of the *Mining Regulations 2020*, the Minister determines in accordance with regulation 46(7)(e) of the *Mining Regulations 2020* that a proposal must include a description and assessment of the environment as set out in this Terms of Reference. Each of the elements of the existing environment (as defined in section 6(4) of the Mining Act 1971) listed in clauses 1.1-1.20 must be described only to the extent that they may need to be considered in assessing the potential impacts of the proposed mine operations. If the element is not likely to be impacted by the operation, a statement to that effect must be included. For Matters of National Environmental Significance (MNES) provide information as per section 1.22.	Chapter 3: Description of the Existing Environment
TOR – 1.1	**Topography and landscape**	
	Provide a description and map (as per 5.1.1.1) of the topography and landscape, detailing the: • application area; and • general surroundings	S.3.1. Topography and landscape Figure 3-2: Regional topography cross-Sections to Figure 3-5: Regional topography
TOR – 1.2	**Climate**	
	Provide: • a summary of rainfall and temperature patterns, evaporation rates, and wind directions and speed (including maximum wind gusts); and	S.3.2. Climate S.3.2.1.1. Temperature S.3.2.1.2. Precipitation S.3.2.1.3. Evaporation S.3.2.1.4. Humidity and Wind

Frame work	Requirement	Section included
	• details of the maximum average recurrence interval or annual exceedance probability rainfall event used for the operational and closure design of the project, and the justification for the value(s) selected.	S.3.2.2. Climate design criteria
TOR – 1.3	**Topsoil and subsoil**	
	Provide: • a description of the soil profile (type and depth), and the characteristics and/or productivity of all soils on the application area (show this information on a map as per 5.1.1.2 if there is a variation in soils over the application area); and	S.3.3. Topsoil and subsoils S.3.3.1. Soil properties Figure 3-13: Dominant SA soil subgroups intersecting the Project Area
	• identify any soil characteristics, including (but not limited to) erodibility, acid sulfate, sodic or non-wettable soils, that may require control measures to reduce environmental impacts during operations or rehabilitation.	S.3.3.1.5. Surface soil erosivity S.3.3.1.9. Acid sulphate soils S.3.3.1.6. Sodicity and dispersion S.3.3.1.8. Non-wetting soils
TOR – 1.4	**Geological Environment**	
	Provide a description of the following, as a minimum: • regional geology;	S.3.4.1. Regional geology
	• local geology within the application area and geological map(s) (as per 5.1.1.2), including but not limited to;	S.3.4.2. Local geology
	○ location, dimensions and orientation (dip and strike), and extent of the mineral resource and ore reserve;	S.3.4.3. Location, dimensions and orientation of the mineral resource and ore reserve, Referring to Appendix A1: Location, dimensions and orientation of mineral resource and ore reserve
	○ location and composition of all rock types and rock units that are proposed to be disturbed;	S.3.4.3. Location, dimensions and orientation of the mineral resource and ore reserve
	○ interpretation of the stratigraphy of the rocks hosting the deposit as well as any overlying and adjacent rock units;	S.3.4.2. Local geology Figure 3-17: Schematic x-sec of Braemar iron Formation Figure 3-18: Stratigraphic column of the Braemar Iron Formation
	○ and an indication of the potential for extension to the orebody;	S.3.4.4. Potential for extension to the orebody
	• representative cross-sections and long section (as per 5.2.1.1) of the geology of the application area; and	S.3.4.5. Representative cross-Sections
	• the exploration data on which the geological interpretation was based on	S.3.4.6. Exploration data on which geological interpretation was based on Appendix A5: XRF assay results
TOR – 1.5	**Geochemistry and Geohazards**	
	Provide: • a geochemical assessment of all rock types that are proposed to be disturbed, based on representative sampling and analysis that includes the identification and quantification of, but not limited to, sulfide minerals that have the potential to generate acid or mobilise metals into the environment; and	S.3.5.1. Geochemistry S.3.5.3. Sulfide minerals S.3.5.4. Acid-base accounting

Frame work	Requirement	Section included
	• a mineralogical assessment of all the rock types that are proposed to be disturbed, based on representative sampling and analysis for the presence and quantification of (but not limited to) radioactive minerals, asbestiform minerals or minerals that have the potential to produce respirable silica.	S.3.5.2. Minerology S.3.5.6. Radioactive materials S.3.5.5. Asbestiform materials S.3.5.6. Radioactive materials S.3.5.7. Respirable silica
	Describe the potential for any of the following natural geohazards to be present in the application area and show on a map:	
	• structural instability, including slips, faults, karst features or geological discontinuities; and	S.3.5.8. Structural instabilities
	• major seismic events (based on historical data).	S.3.5.9. Earthquakes Figure 3-30: NSHA18 Hazard map showing Project Area and proposed pit locations
TOR – 1.6	**Groundwater**	
	If all proposed operations are to occur at least 3 m above the seasonally high water table, provide:	N/A
	• a statement that all proposed operations are to occur at least 3 m above the seasonally high water table;	N/A
	• a statement that the proposed operations will not /are unlikely to increase the seasonally high water table to within 3 m of the mining operations anywhere within the lease application area;	N/A
	• an assessment of the position of the seasonally high water table beneath the entire lease application area; and	N/A
	• the drillhole, borehole and hydrogeological data and information the assessment is based on.	N/A
	If any part of the proposed operations is likely to occur within 3 m of the seasonally high water table, or the proposed operations will/are likely to increase the seasonally high water table to within 3 m of the operations, or the proposed operations are likely to intersect aquifer unit(s), provide:	
	• a statement describing if the application area is within an area where the water resources are prescribed under the *Landscape South Australia Act 2019* and details on the current availability of groundwater resources within the prescribed area;	S.3.6.1. Prescribed water resources
	• a description of the local and regional hydrogeology, detailing both the stratigraphy and Hydrostratigraphy;	S.3.6.3. Hydrogeology S.3.6.4. Hydrostratigraphy
	• a detailed baseline description of the groundwater characteristics and flow dynamics for aquifers within the application area which includes:	
	○ static water levels and groundwater heads/groundwater elevations, including seasonal fluctuations for each aquifer;	S.3.6.5.1. Static water levels and groundwater elevations
	○ baseline groundwater hydrochemistry and mineralogy, including any seasonal fluctuations and spatial variability for each aquifer;	S.3.6.3. Hydrogeology S.3.6.6. Groundwater quality
	○ aquifer properties including hydraulic conductivity, transmissivity, specific yield, storage coefficient, total porosity, effective porosity and aquifer thickness;	S.3.6.4. Hydrostratigraphy S.3.6.5.2. Aquifer properties
	○ recharge and discharge mechanisms,	S.3.6.5.3. Recharge and discharge mechanisms

Frame work	Requirement	Section included
	○ hydrogeological characteristics of confining strata, including hydraulic conductivity and thickness;	S.3.6.4. Hydrostratigraphy
	○ connectivity between the proposed mining aquifer and lateral, overlying or underlying aquifers and surface water;	S.3.6.5.3. Recharge and discharge mechanisms
	○ conceptualisation of the hydrogeology inclusive of conceptual diagram: a summary of all above and a description of the hydrogeological setting considered important for impact assessment; and	S.3.6.8. Conceptual hydrogeological model Figure 3-48: Conceptual hydrogeological cross-Section for the groundwater Study Area
	○ a preliminary impact assessment/numerical model of groundwater flow (and contaminant transport model, if applicable), based on the conceptual hydrogeology	Appendix C2: Groundwater Impact Assessment
	• local and regional potentiometric surface/groundwater elevation map(s) (as per 5.1.1.3) for each aquifer within the application area;	Figure 3-34: Registered bores with groundwater level data and indicative groundwater flow paths Figure 3-35: Potentiometric surface map for the fractured rock aquifer(s) within the Study Area with inferred flow directions
	• cross-section(s) (as per 5.2.1.2) of the hydrostratigraphy;	Figure 3-48: Conceptual hydrogeological cross-section for the groundwater Study Area
	• the environmental value of each aquifer determined according to the Environment Protection (Water Quality) Policy 2015, or any subsequent updates;	S.3.6.6.2. Environmental values
	• a description of the existence, location, condition and value of all aquatic, terrestrial and subterranean Groundwater Dependent Ecosystems (GDEs) within the application area and within and immediately surrounding the extent of predicted hydrogeological impact of the proposed mine operations; and	S.3.6.7. Groundwater dependent ecosystems
	• an assessment of any current or historical use of local groundwater by the landowner(s) and other users which includes a baseline survey of bores, including depth to groundwater, groundwater quality, bore construction details, status and purpose and collar/ground elevations	Appendix B4: Surface Water and Groundwater Baseline Assessment
TOR – 1.7	**Surface water**	
	Provide a topographic map (as per 5.1.1.1) and description of the current drainage patterns for the application area and water catchment including:	
	• location of watercourses, drains, dams and wetlands;	S.3.7.2. Catchment description Figure 3-51: Major and minor watercourses and natural surface water features Figure 3-60: Location of identified pastoral dams within the Study Area
	• surface water catchment boundaries;	S.3.7.2. Catchment description Figure 3-50: Regional catchments and major natural surface water features
	• direction of drainage and discharge from the application area;	S.3.7.2. Catchment description Figure 3-50 Major and minor watercourses
	• a statement describing if the application area is within an area where the water resources are prescribed under the *Landscapes South Australia Act 2019*, and provide details on the current availability of water resources within the prescribed area;	S.3.7.1. Prescribed water resources

Frame work	Requirement	Section included
	• a statement if the application area is within a water protection area including areas under the River Murray Act 2003;	S.3.7.1. Prescribed water resources
	• a statement as to whether the application falls within the Murray Darling Basin; and	S.3.7.1. Prescribed water resources
	• groundwater – surface water interactions.	S.3.7.2.4. Groundwater-surface water interactions
	Provide water quality data for identified watercourses, where there is potential for discharge into that watercourse from the proposed operation (whether intentional or not). Should identified watercourses be ephemeral, and it is not possible to collect water samples, provide a characterisation of sediments sampled from the watercourse bed upstream and downstream of the application area.	S.3.7.3. Surface water quality
	If there is potential for changing a flow regime (including change in flow volume) or discharge into these watercourses from the proposed operations, an assessment of the use of this water by the landowner, downstream users and water dependent ecosystems must be included	S.3.7.4. Identified surface water receptors
TOR – 1.8	**Vegetation, Weeds and Plant Pathogens**	
	Provide: • a description and map (as per 5.1.1.1) of existing flora (native and introduced) in the application area and surroundings, the State conservation status and habitat value of native vegetation present in the application area;	S.3.8.5. Vegetation associations S.3.8.6. Flora species S.3.8.6.4. Introduced species Figure 3-61: Native vegetation associations
	• a description of the presence of State listed species and ecological communities;	S.3.8.6.3. State-listed flora species
	• a description of the extent the application area and adjoining land is affected or potentially affected by pathogens and declared weeds; and	S.3.8.6.4. Introduced species S.3.8.6.5. Pathogens
	• if known, a description of the history of land use to identify if the existing vegetation is the result of deliberate cultivation or natural regrowth arising from previous clearance.	S.3.8.4. Land use
	Note: the proponent may choose to integrate section 1.8 (Vegetation, Weeds and Plant Pathogen State matters) and section 1.22 (Commonwealth MNES)	State matters and Commonwealth MNES are discussed separately.
TOR – 1.9	**Fauna**	
	Describe the native and feral fauna that may be present in the application area	S.3.9. Fauna S.3.9.7. Pest species
	noting State conservation status of all species. *Note: the proponent may choose to integrate section 1.9 (Fauna State matters) and section 1.22 (Commonwealth MNES)*	S.3.9.2. Bird S.3.9.3. Mammals S.3.9.4. Reptiles S.3.9.5. Amphibians S.3.9.6. Aquatic ecology Note State matters and Commonwealth MNES are discussed separately.
TOR – 1.10	**Caves**	
	If the application area is within, or near to, known caves or significant limestone formations a survey for the presence of caves must be performed.	S.3.10. Caves and S.3.17.2.1. Exploration by SA Mines Department

Frame work	Requirement	Section included
	Provide a summary of the results of the survey and describe the presence of any caves in karst (limestone) areas within, or near to, the application area and show on a map (as per 5.1.1.5).	S.3.10. Caves and S.3.17.2.1. Exploration by SA Mines Department Figure 3-76: Location of adit at Razorback Ridge
TOR – 1.11	**Local Community**	
	Provide: • a description of the local population, the economy, services and employment; and	S.3.11. Community S.3.11.2. Population profile S.3.11.4. Economy and employment
	• details of nearest town or urban areas, with a summary of the demographics of the local population	S.3.11.2. Population profile S.3.11.5. Proximity to infrastructure and housing
TOR – 1.12	**Landowners and land use**	
	Provide a description of: • land ownership for all titles within and adjacent to the application area;	S.1.4. Landowners
	• land use (historical and current) for the application area and the surrounding areas;	S.1.4. Landowners S.1.7.5 General interests and restrictions in Project Area S.3.8.4. Land use S.3.17. Pre-existing site contamination and previous disturbance
	• the zoning as defined by the Planning and Design Code or relevant council development plans;	S.2.7.4. Planning and Design code
	• policies relevant to the application area, including region or council wide, zone specific and sub areas within a zone;	S.2.7. Local government
	• known plans for potential future land use changes by other parties; and	S.2.7.4. Planning and Design Code
	• any other interests or restrictions on the application area, including:	
	○ public utility easements;	S.1.7.5. General interests and restrictions in Project Area
	○ if the application is within land used for defence purposes, including (but not limited to) the Woomera Prohibited Area or the Cultana Army Training Area;	S.1.7.5. General interests and restrictions in Project Area
	○ any overlapping or adjacent tenements under the Mining Act 1971, or Petroleum and Geothermal Energy Act 2000.	S.1.7.3. Other tenements
TOR – 1.13	**Proximity to Infrastructure and Housing**	
	Provide information and a map (as per 5.1.1.4): • identifying residences within and near the application area;	S.3.11.5. Proximity to infrastructure and housing
	• identifying other human infrastructure such as (but not limited to) schools, hospitals, commercial or industrial sites, roads, sheds, bores, dams, ruins, pumps, cemeteries, scenic lookouts, roads, railway lines, fences, transmission lines, gas and water pipelines, and telephone lines (both underground and above ground); and	S.1.7.5. General interests and restrictions in Project Area
	• identifying public roads to be utilised or affected as part of proposed operations, including an estimate of the existing traffic movements	S.3.12. Traffic
TOR – 1.14	**Exempt Land**	
	Provide a description and map (as per 5.1.1.4) of any applicable exempt land under Section 9 of the Mining Act 1971.	S.1.5. Exempt land identification

Frame work	Requirement	Section included
TOR – 1.15	**Amenity**	
	Provide a description of scenic or aesthetic values for the application area and immediate surrounds, including features of community, tourist or visitor interest.	S.3.13. Visual amenity
TOR – 1.16	**Air Quality**	
	Provide a description of the existing levels of dust and contributors to air quality including odour (both natural and anthropogenic).	S.3.14. Air quality
TOR – 1.17	**Noise**	
	Provide a description and measurement data of the existing levels of noise and contributors to noise (both natural and anthropogenic).	S.3.15. Noise
TOR – 1.18	**Heritage (Aboriginal, European, geological)**	
	Detail and show on a map (as per 5.1.1.1): • any registered state heritage sites in or adjacent to the application areas that are protected under legislation (in so far as may be permitted under the relevant legislation); and	S.3.16.2. European heritage
	• include a statement concerning whether or not an Aboriginal cultural heritage survey has been conducted by the proponent and if so, the results of the survey. *Note: the proponent may choose to integrate section 1.18 (State Heritage matters) and section 1.22 (Commonwealth MNES)*	S.3.16.1.3. Ngadjuri cultural heritage surveys
TOR – 1.19	**Proximity to Conservation Areas**	
	Provide: • information and a map (as per 5.1.1.1) showing proximity to national parks and reserves, private conservation areas, State recognised conservation areas, heritage agreement areas and geological heritage sites; and	S.1.6. Protected areas
	• Include a statement as to whether the application area falls within the Adelaide Dolphin Sanctuary, Adelaide International Bird Sanctuary or a Marine Park. *Note: the proponent may choose to integrate section 1.19 (State matters) and section 1.22 (Commonwealth MNES)*	S.1.6. Protected areas
TOR – 1.20	**Pre-existing site contamination and Previous Disturbance**	
	Provide information and a map (as per 5.1.1.1) showing: • any known existing contamination of the site and of any disturbance by previous operations or other activities, including mineral exploration activities, including mineral exploration activities.	S.3.17. Pre-existing site contamination and previous disturbance
TOR – 1.21	**Tailings generation and management**	
	If tailings generation and management is proposed, the standards set out in Minerals Policy MPOL007 must be used for baseline environmental data collection and material characterisation relating to tailings.	S.4.7.2. Tailings storage facility
TOR – 1.22	**MNES**	

Frame work	Requirement	Section included
	Provide a description of any protected MNES that have the potential to be impacted by the proposed action.	S.8. Matters of National Environmental Significance
	For listed threatened species and communities, provide a minimum of:	
	• Information on the abundance, distribution, ecology and habitat preference for each listed species or community;	S.8.2.2. MNES communities and species Appendix B5: Baseline Flora and Fauna Survey Report
	• quantification of the extent of habitat and the number of individuals present, or historical patterns of use within the proposed project area and surrounds (including mapping identified known and/or potential habitat);	S.8.2.2. MNES communities and species Appendix B5: Baseline Flora and Fauna Survey Report
	• assessment of the quality and importance of known or potential habitat for the relevant listed species or community within the proposed application area and surrounds;	S.8.2.2. MNES communities and species Appendix B5: Baseline Flora and Fauna Survey Report
	• information detailing the locations of known populations of species, and any historical records of individuals within the proposed application area, if available.	S.8.2.2. MNES communities and species Appendix B5: Baseline Flora and Fauna Survey Report
	Provide information about the resources and expertise used to identify and assess environmental values on site and an assessment on the adequacy of any surveys undertaken, in particular the extent to which these surveys were appropriate to key protected matters and the relevant conservation advices, recovery plans, threat abatement plans and survey guidelines where applicable. (note: The relevant matters that must be carried forward into the Mining Proposal will be based on the criteria set out in the Commonwealth Significant Impact Guidelines)	S.8.2.1. Surveys and survey effort Appendix B5: Baseline Flora and Fauna Survey Report
TOR – 2	**Description of the Proposed Mining Operations**	
	In specifying the nature and extent of the authorised operations that are proposed in accordance with section 36(1)(c)(i) of the *Mining Act 1971*, the Minister determines in accordance with regulation 46(6)(e) of the Mining Regulations 2020 that a proposal must include a description of the proposed operations as set out in this Terms of Reference. Each of the elements listed in clauses 2.1 2.10 must be described only to the extent that they apply to the proposed mine operation.	
TOR– 2.1	**General Description and Maps/Plans of Operations**	
	Provide a summary description of all elements of the proposed operation, including mining, processing and waste management (include maps/plans and cross sections as per 5.1.2 and 5.2.2).	S.4.1. Summary of operations
TOR – 2.1.1	**Options**	
	Provide a summary description of relevant options considered for mining, processing and mine waste management strategies, and provide justification for the chosen strategies, including a description of any elimination or substitution strategies that have been adopted to control a hazard in order to protect the environment. If tailings generation and management is proposed, relevant tailings options (including TSF site locations) must be analysed using an appropriate multi-criteria assessment tool. The results of the multi-criteria assessment must be provided.	S.4.2.1. Mining, processing and mine wastes Appendix E2 Tailings Storage Facility MCA

Frame work	Requirement	Section included
TOR – 2.2	**Reserves, Product and Market**	
TOR – 2.2.1	**Ore reserves or Mineral Resources (or both)**	
	Statement nominating the principal mineral or minerals that are to be recovered under the mining lease.	S.1.1. Project proponent (for statement of principal mineral) S.4.3. Reserves, products and market
	Statement that provides detailed information about the mineral resource or ore reserve, or both	S.4.3.1. Ore reserves and mineral resources
	Provide: • a statement of the current Australasian Joint Ore Reserves Committee (JORC) compliant ore reserve or mineral resource estimates (or both) in the application area; and	S.4.3.1.1. Mineral Resource estimate
	• a statement of what reserve and/or resource forms the basis for the application;	S.4.3.1. Ore Reserves and Mineral Resources
	or (if a JORC compliant reserve or resource (or both) has not been reported • an estimate of the resource to be mined and the basis of this estimate.	N/A as there is a JORC compliant reserve reported
	Provide steps that have been taken to ensure proposed operations will not sterilize/prevent future extraction of mineral resources.	S.4.3.1.3. Resource sterilisation
TOR – 2.2.2	**Production Rate and Products**	
	Provide: • a statement of the relevant commodities that are proposed to be extracted, recovered, processed and sold, and the expected market or end use;	S.4.3.2.1. Target commodities S.4.3.2.2. End market
	• a statement of any other commodities present in the application area that are not proposed to be recovered for sale, and the reasons for this decision;	S.4.3.2.3. Other commodities
	• a quantitative estimate of production of mine gate product(s) for the life of mine, and a schedule of the annual production of mine gate product(s); and	S.4.3.2.4. Annual production S.4.5.3. Material movements
	• a statement if any extractive minerals (as defined by Section 6 of the *Mining Act 1971)* will leave the lease	S.4.3.2.5. Extractive minerals
TOR – 2.3	**Exploration Activities**	
	Provide information on exploration activities to be undertaken in the application area as part of the operation, including:	S.4.4. Exploration Activities
	• purpose of exploration activities	S.4.4.1. Resource and geotechnical exploration
	• types of drilling	S.4.4.1. Resource and geotechnical exploration
	• geophysical techniques likely to be used	S.4.4.1. Resource and geotechnical exploration

Frame work	Requirement	Section included
	• earthworks required to conduct exploration activities	S.4.4.1. Resource and geotechnical exploration
	• equipment required to conduct exploration activities; and	S.4.4.1. Resource and geotechnical exploration
	• rehabilitation methods for exploration activities (including that not yet rehabilitated from previous tenure)	S.4.4.2. Exploration rehabilitation
TOR – 2.4	**Mining Activities**	
TOR – 2.4.1	**Type or Types of Mining Operation to be Carried Out**	
	Provide a clear statement on the type or types of mining operation proposed to be carried out, such as: • the mining method(s) to be adopted	S.4.5.1. Proposed Mining Operation S.4.5.1.1. Mining method overview
TOR – 2.4.2	**Open Pit**	
	Describe proposed open pit workings, including (but not limited to):	S.4.5.2. Open Pit Workings
	• Overall pit wall angles, bench height and berm width	Table 4-8: Wall design parameters S.4.5.2.1. Pit design parameters, operating parameters and final dimensions
	• Dimensions and depth of pit	Table 4-8: Wall design parameters S.4.5.2.1. Pit design parameters, operating parameters and final dimensions
	• Access ramps	Table 4-8: Wall design parameters S.4.5.2.1. Pit design parameters, operating parameters and final dimensions
	• Maps, plans and cross-sections of the pit (as per 5.1.2 and 5.2.2)	Figure 4-17: Design – Iron Peak – Stage 1 to Figure 4-34: Design – Razorback Consolidated – Stage 14
TOR – 2.4.3	**Material Movements**	
	Provide: • expected life of mine (including scope for extension);	S.4.5.3. Material Movements
	• annual mine production rates and mine production schedule of ore and waste rock over the life of mine; and	S.4.5.3. Material Movements Table 4-10: Summary LOM material movements Table 4-11: Material movements by year and area Figure 4-11: Material movements by pit design Figure 4-12: Material movements – ore and waste rock
	• life of mine and annual strip ratios.	S.4.5.1.1. Mining method overview S.4.5.3. Material Movements Table 4-11: Material movements by year and area
TOR – 2.4.4	**Stockpiles**	
	Describe for all ore, product, subsoil and topsoil stockpiles the:	

Frame work	Requirement	Section included
	• Location, size, shape and height	S.4.5.4. Stockpiles S.4.5.4.2. Subsoil and topsoil Figure 4-1: Proposed Mining Lease and principal project elements Figure 4-13: Proposed ML indicative vegetation and soil stockpile areas Figure 4-14: Short-term and long-term ore stockpiling, ML Figure 4-15: Radial concentrate stockpile concept visualisation Figure 4-47: Waste stockpile locations
	• Method of placement	S.4.5.4. Stockpiles
	• Method of stabilisation and erosion control	S.4.5.4. Stockpiles
	• Water movement through stockpiles	S.4.5.4 Stockpiles
	The location, maximum height and extent of stockpiles must be shown on map (as per 5.1.2.1)	S.4.5.4. Stockpiles Figure 4-1: Proposed Mining Lease and principal project elements Figure 4-13: Proposed ML indicative vegetation and soil stockpile areas Figure 4-14: Short-term and long-term ore stockpiling, ML Figure 4-15: Radial concentrate stockpile concept visualisation Figure 4-47: Waste stockpile locations
TOR – 2.4.5	**Use of Explosives**	
	If explosives are proposed to be used, describe:	S.4.5.5. Use of Explosives
	• type of explosives used on the site;	S.4.5.5.1. Explosive types, blast frequency and blast sizes
	• proposed timing and frequency of blasting;	S.4.5.5.1. Explosive types, blast frequency and blast sizes Table 4-12: Indicative blasting frequency
	• size of blasts; and	S.4.5.5.1. Explosive types, blast frequency and blast sizes Table 4-13: Indicative Blasting Pattern and Size
	• storage of explosives (amount, type, detailed location and method of storage).	S.4.5.5.2. Magazine location and design S.4.5.5.3. ANFO storage location and design Figure 4-16: Magazine and ANFO storage locations
TOR – 2.4.6	**Type of Mining Equipment**	
	Provide a description of the equipment (fixed and mobile) proposed to be used in the mining operation in terms of:	S.4.5.6. Mining Equipment
	• Type, size and capacity of machines	S.4.5.6. Mining Equipment Table 4-14: Indicative Mining Equipment and Application

Frame work	Requirement	Section included
	• Approximate number of units	S.4.5.6. Mining Equipment Table 4-14: Indicative Mining Equipment and Application
	• Noise outputs	S.4.5.6. Mining Equipment Table 4-14: Indicative Mining Equipment and Application
	• Exhaust outputs, and	S.4.5.6. Mining Equipment Table 4-15: Indicative Diesel Exhaust Gas Composition and Emissions
	• Fire ignition sources	S.4.5.6. Mining Equipment Table 4-14: Indicative Mining Equipment and Application
	• The location of fixed equipment shown on a map (as per 5.1.2.1)	Figure 4-37: Process plant and non-process infrastructure layout
TOR – 2.4.7	**Mine Dewatering**	
	Provide: • estimated inflows of groundwater, stormwater and water from any other mining activities into mine workings;	S.4.5.7. Mine Dewatering
	• details of proposed mine dewatering infrastructure, and mine water management and disposal;	S.4.5.7. Mine Dewatering
	• contingency measures for greater than planned water inflows into mine workings; and	S.4.5.7. Mine Dewatering
	• a mine water balance of water inflows and water outflows during operations and at completion (if not included in the water balance in clause 2.5.4).	S.4.6.2.1. Water balance Table 4-25: Site water balance – key inputs and outputs Figure 4-46: Representative process water balance flow diagram
TOR – 2.4.8	**Sequence of Mining and Rehabilitation Operations**	
	Provide the following information on the sequence of operations in both text and map form (as per 5.1.2.2): • description of the sequence of mining stages;	S.4.5.8.1. Mining sequence Table 4-16: Pit staged development sequence and maximum material volumes – to Year 38 Figure 4-17: Design – Iron Peak – Stage 1 to Figure 4-34: Design – Razorback Consolidated – Stage 14
	• proposed sequencing of progressive and final rehabilitation, including demonstration that progressive rehabilitation has been integrated with the mining plan;	S.4.5.8.2. Staged rehabilitation Figure 4-35: Conceptual site rehabilitation sequence
	• an estimation of the quantities of sulfide minerals that have the potential to generate acid or mobilise metals, or other hazardous minerals to be mined at each mining stage; and	S.3.5.3. Sulfide materials S.3.5.4. Acid-base accounting S.3.5.5. Asbestiform material S.3.5.6. Radioactive minerals S.3.5.7. Respirable silica
	• any mineral resource that may be sterilised from future mining by the proposed mining operations	S.4.3.1.3. Resource sterilisation
TOR – 2.4.9	**Rehabilitation Strategies and Timing**	

Frame work	Requirement	Section included
	Describe all activities, strategies and designs relating to mine closure for rehabilitation of open pit, stockpiles, explosives storage, mining equipment and mine dewatering infrastructure. Include timing of these activities and all opportunities for progressive rehabilitation. Include (but not limited to) the maximum area of land disturbed by proposed mining operations at any time, battering of mining faces and other earthworks, mine void backfilling, abandonment bunds, soil management, revegetation and expected water infill rates.	S.4.5.10. Rehabilitation Strategies and Timing Table 4-19: Mining and associated features – general rehabilitation and closure strategy S.4.10.2. Rehabilitation strategies Appendix L: Razorback Iron Ore Project Mine Closure Plan 2025
TOR – 2.4.10	**Modes and hours of Operation**	
	State if the proposed mining operation will be worked on a continuous (24 hour, 7 days a week), regular periodical or campaign basis.	S.4.5.9. Hours of Operation
	If the proposed mining operation is to be worked on a regular periodical basis, specify:	
	• proposed period(s) (daily, weekly and public holidays) to be worked; and	S.4.5.9. Hours of Operation
	• proposed start and finish hours the site is to be worked per period. If the operation is to be worked on a campaign basis, specify:	S.4.5.9. Hours of Operation S.4.6.6. Hours of Operation
	• minimum hours the site is to be worked per year;	S.4.5.9. Hours of Operation
	• the minimum time of each campaign;	N/A
	• the maximum and minimum time between campaigns;	N/A
	• define the beginning and end of each campaign;	N/A
	• hours of mining operations during campaign;	N/A
	• days of mining operations during campaign;	N/A
	• determining factors for initiating and ceasing a campaign;	N/A
	• maximum and minimum tonnage of each campaign; and	N/A
	• maximum and minimum tonnage of production per year	S.4.5.3. Material Movements Table 4-10: Summary LOM material movements
TOR – 2.5	**Crushing, Grinding, Processing and Product Transport**	
TOR – 2.5.1	**Crushing and Grinding Plant**	
	Provide a description of the crushing/grinding plant including:	S.4.6. Crushing, Grinding, Processing and Product Transport
	• Area, size, type of construction and location of crushing/grinding plant	S.4.6.1. Crushing, grinding and processing plant Table 4-22: Indicative major equipment type, quantity and size S.4.6.1.1. Crushing and grinding plant S.4.6.3. Process plant construction Figure 4-37: Process plant and non-process infrastructure
	• Throughput rate	S.4.6.1. Crushing, grinding plant and processing plant Table 4-20: Estimated material flows into and out of the processing plant
	• A description of ore preparation for processing	S.4.6.1.1. Crushing and grinding plant

Frame work	Requirement	Section included
	• Grind size of ore	S.4.6.1.1. Crushing and grinding plant
	• Noise sources	S.4.6.1.3. Potential Emissions Sources
	• Dust sources and composition	S.4.6.1.3. Potential Emissions Sources
	• Fire ignition sources	S.4.6.1.3. Potential Emissions Sources
	• Plans (as per 5.1.2.3)	S.4.6.1. Crushing, grinding plant and processing plant Figure 4-37: Process plant and non-process infrastructure layout Figure 4-38: Primary crushing concept visualisation Figure 4-39: Primary HPGR concept visualisation
TOR – 2.5.2	**Processing Plant**	
	Provide a description of the processing plant including:	S.4.6.1.2. Processing plant
	• the methods and details of processing and value adding proposed;	S.4.6.1.2. Processing plant
	• number, location, area, size, type of construction (including lining and drainage systems, as appropriate) of processing plant;	S.4.6.1. Crushing, grinding and processing plant Table 4-22: Indicative major equipment type, quantity and size S.4.6.1.2. Processing plant S.4.6.3. Process plant construction
	• any ancillary plant and infrastructure to be used for processing the minerals on site; examples of associated structures are concrete batching plants, wheel wash facilities, silos, fuel tanks, water tanks, chemical storage/use, reverse osmosis plants and bore fields;	S.4.8.5.3. Offices and other non-process infrastructure S.4.8.6.2. Process water supply pipeline S.4.8.8. Fuel and bulk chemical storage facilities Figure 4-37: Process plant and non-process infrastructure layout
	• if chemicals are to be used in the beneficiation or processing of ore, describe the nature and quantities of the chemicals to be used, their reactions with ore and their ultimate fate;	S.4.6.1.2. Processing plant Table 4-23: Process reagents and estimated consumptions and storage volumes.
	• noise sources;	S.4.6.1.3. Potential Emissions Sources
	• dust sources and composition;	S.4.6.1.3. Potential Emissions Sources
	• fire ignition sources;	S.4.6.1.3. Potential Emissions Sources
	• other potential air emissions (including odour) and their composition; and	S.4.6.1.3. Potential Emissions Sources

Frame work	Requirement	Section included
	• plans (as per 5.1.2.3).	Figure 4-38: Primary crushing concept visualisation Figure 4-39: Primary HPGR concept visualisation Figure 4-40: Rougher magnetic feed tank and magnetic separation module concept visualisation Figure 4-41: Secondary grinding concept visualisation Figure 4-42: Rougher flotation conceptual visualisation Figure 4-43: Cleaner magnetic separation concept visualisation Figure 4-44: Concentrate filtration and radial stockpile concept visualisation Figure 4-45: Tailings thickening concept visualisation
TOR – 2.5.3	**Process Water Management**	
	Provide a water balance including:	S.4.6.2.1. Water balance
	• approximate water volumes required;	S.4.6.2.1. Water balance Table 4-25: Site water balance – key inputs and outputs
	• a summary of the inputs and outputs (with consideration of any purge requirements);	S.4.6.2.1. Water balance Table 4-25: Site water balance – key inputs and outputs
	• determination of net surplus or deficit; and	S.4.6.2.1. Water balance Table 4-25: Site water balance – key inputs and outputs
	• process flowsheet showing all streams including stormwater management and mine dewatering where these are connected to the processing circuit.	S.4.6.2.1. Water balance Figure 4-46: Representative process water balance flow diagram
	Provide a description of all water ponds, including:	
	• size, capacity, layout and location of ponds;	S.4.6.2.2. Water holding ponds S.4.7.2.3. TSF Location, design and construction S.4.6.2.2. Water holding ponds Figure 4-1: Proposed Mining Lease and principal project elements Table 4-26: Water holding ponds – key inputs and outputs S.4.7.2.3. Location, design and construction Figure 4-52: Proposed Tailings Storage Facility, ultimate configuration Figure 4-53: Proposed Tailings Storage Facility, ultimate configuration
	• design and construction methods;	S.4.6.2.2. Water holding ponds Table 4-26: Water holding ponds – key inputs and outputs
	• chemical composition of the solution to be stored in each pond;	S.4.6.2.2. Water holding ponds Table 4-26: Water holding ponds – key inputs and outputs

Frame work	Requirement	Section included
	• minimum freeboard to be maintained; and	S.4.6.2.2. Water holding ponds Table 4-26: Water holding ponds – key inputs and outputs
	• plans (as per 5.1.2.1).	Figure 4-1: Proposed Mining lease and principal project elements Figure 4-37: Process plant and non-process infrastructure layout
TOR – 2.5.4	**Type of Mobile Equipment**	
	For mobile equipment to be used in crushing/grinding, processing ore and in transporting the mine product to the point of sale, describe:	S.4.6.4. Mobile equipment
	• type, size and capacity of machines	S.4.6.4. Mobile equipment Table 4-14: Indicative mining equipment and application Table 4-27: Indicative Mobile Equipment – Haul Road and Rail Siding Operations
	• approximate number of units;	S.4.6.4. Mobile equipment Table 4-14: Indicative mining equipment and application Table 4-27: Indicative Mobile Equipment – Haul Road and Rail Siding Operations
	• noise outputs;	S.5.6. Mining equipment Table 4-14: Indicative mining equipment and application Table 4-27: Indicative Mobile Equipment – Haul Road and Rail Siding Operations
	• exhaust outputs; and	S.5.6. Mining equipment Table 4-14: Indicative mining equipment and application Table 4-27: Indicative Mobile Equipment – Haul Road and Rail Siding Operations
	• fire ignition sources.	S.5.6. Mining equipment Table 4-14: Indicative mining equipment and application Table 4-27: Indicative Mobile Equipment – Haul Road and Rail Siding Operations
TOR – 2.5.5	**Conveyors and Pipelines**	
	Provide a description of any conveyors or pipelines to be used for transporting material to or from the mine, processing facilities and the point of sale including:	S.4.6.5. Conveyors and pipelines
	• length, size (volumes to be transported), design and type of construction and location;	N/A
	• the material being transported;	N/A
	• noise sources;	N/A
	• dust sources and composition;	N/A
	• fire ignition sources; and	N/A

Frame work	Requirement	Section included
	• plans (as per 5.1.2.1).	N/A
TOR – 2.5.6	**Hours of Operation**	
	Describe the proposed hours of operation of crushing/grinding, processing and transport activities	S.4.6.6. Hours of operation
TOR – 2.5.7	**Rehabilitation Strategies and Timing**	
	Detail all activities, strategies and designs relating to mine closure for removal, disposal and rehabilitation of processing facilities, and material transport systems, including timing of these activities.	S.4.6.7. Rehabilitation Strategies and Timing Table 4-29: Crushing, griding and processing infrastructure – general rehabilitation and closure strategy
TOR – 2.6	**Wastes**	
TOR – 2.6.1	**Waste Rock and Tailings Storage Facilities**	
	The standards set out in Minerals Policy MPOL007 must be used for the planning, design and assessment of tailings generation and management relating to all aspects of the tailings lifecycle (i.e. construction, operation, rehabilitation, closure and governance).	S.4.7. Wastes
	For waste rock and tailings storage facilities (TSF) provide:	
	• the estimated tonnes and volumes of all waste rock and tailings to be stored;	S.4.7.1.1. Waste rock volumes S.4.7.2.1. Tailings volumes Table 4-10: Summary LOM material movements and Table 4-11: Material movements by year and area
	• the reserve and any resource or potential resource that the estimated tonnes and volumes of waste rock and tailings is based on;	S.4.7.1.1. Waste rock volumes S.4.7.2.1. Tailings volumes Table 4-10: Summary LOM material movements and Table 4-11: Material movements by year and area
	• the type, location, size, shape, height and method of construction of permanent and temporary waste storage facilities;	S.4.7.2.3. TSF location, design and construction S.4.7.1.3. WRD location, design and construction Figure 4-48: Iron Peak WRD conceptual development sequence Figure 4-49: Razorback WRD conceptual development sequence Table 4-34: selected CTD TSF design parameters
	• a geochemical and geotechnical assessment of the waste rock and tailings based on the geochemical and geotechnical properties determined from the analysis of representative sampling of all waste rock types and tailings to be disposed;	S.4.7.1.2. Waste rock characterisation S.4.7.2.2. Tailings characterisation
	• an assessment on the weathering and erosive potential of waste rock to be disposed;	S.4.7.1.2. Waste rock characterisation S.4.7.2.3. TSF location, design and construction
	• conceptual specifications, drawings and plans for the design, construction, operation and completion of all facilities (as per 5.1.2.5);	S.4.7.1.3. WRD location, design and construction S.4.7.2.3. TSF location, design and construction
	• the method and rate of waste rock/tailings disposal;	S.4.7.1.1. Waste rock volumes S.4.7.2.1. Tailings volumes

Frame work	Requirement	Section included
	• where relevant, a description and plan (as per 5.1.2.5) of the placement and encapsulation of waste material deemed to be hazardous, including potentially acid forming material (PAF);	S.4.7.1.3. WRD Location, design and construction Figure 4-50: Concept waste rock dump PAF disposal method (Pearce et al. 2016) Figure 4-51: Concept waste rock dump PAF disposal method (Earth Systems and Okane, 2020)
	• the method of stabilisation and erosion control of waste storage facilities, both during operations and post completion;	S.4.7.1.3. WRD Location, design and construction
	• surface water runoff control on disturbed and rehabilitated areas;	S.4.7.1.3. WRD Location, design and construction S.4.7.2.3. TSF Location, design and construction
	• a geotechnical stability assessment and a factor of safety analysis;	S.4.7.2.3. TSF location, design and construction
	• an assessment of seepage of liquids through the waste rock and tailings storage facilities;	S.4.7.2.3. TSF location, design and construction
	• strategies for the containment of any seepage that has the potential to impact the environment;	S.4.7.2.3. TSF location, design and construction
	• an assessment of the post completion chemical and physical stability of the structure following rehabilitation, including the expected extent of erosion;	S.4.7.1.3. Location, design and construction S.4.7.2.3. Location, design and construction
	• an assessment of the source, pathway and ultimate fate of any potential mobile contaminants; and	Appendix C2: Groundwater impact assessment
	• a description of the governance arrangements for the design, construction, operation and closure including when it is proposed to use third party verification.	S.4.7.2.5. Monitoring and assessment S.4.7.2.6. Governance
	• Include a water balance for the TSF (if not included in the water balance in clause 2.5.4).	N/A. Included in clause 2.5.4
TOR – 2.6.2	**Other Processing Wastes**	
	Provide:	S.4.7.3. Other processing wastes
	• the volumes and composition of all solid and liquid wastes produced	S.4.7.3. Other processing wastes Table 4-39: Anticipated waste streams and management
	• estimated volumes of waste processing water, reverse osmosis reject water, water content of residues and method of disposal or recycling	S.4.6.2.1. Water balance Figure 4-46: Representative process water balance flow diagram
	• wastewater composition	S.4.6.2.1. Water balance
	• disposal and management of any hazardous material or contaminants within waste including radioactive, toxic, corrosive or flammable materials; and	Table 4-39: Anticipated waste streams and management, includes radioactive waste
	• the source, pathway and ultimate fate of potential mobile contaminants	Appendix C2: Groundwater impact assessment
TOR – 2.6.3	**Industrial and Commercial Wastes**	
	List any industrial and commercial wastes generated, including, but not limited to:	
	• putrescible waste, including sewage	S.4.7.5. Sewage treatment facilities
	• oil and other hydrocarbons	Table 4-39: Anticipated waste streams and management
	• tyres	Table 4-39: Anticipated waste streams and management
	For each waste type describe the method of disposal including:	Table 4-39: Anticipated waste streams and management

Frame work	Requirement	Section included
	• offsite disposal	Table 4-39: Anticipated waste streams and management
	• on site waste disposal (including size, location on a plan (as per 5.1.2.1 and 5.1.2.7) and construction details)	N/A
	• recycling (either on or offsite)	Table 4-39: Anticipated waste streams and management
	• the type, area and layout of sewage systems to be installed at the site, and	S.4.7.5. Sewage treatment facilities S.4.8.5.1. Accommodation Camp
	• describe what, if any approvals are required for the disposal of waste	Table 4-39: Anticipated waste streams and management
	For each type of waste, describe any potential contaminants that may be generated from onsite storage, and the ultimate fate of those contaminants.	Table 4-39: Anticipated waste streams and management
TOR – 2.6.4	**Rehabilitation Strategies and Timing**	
	Detail all activities, strategies and designs relating to mine closure, including timing of these activities and all opportunities for progressive rehabilitation of waste rock and tailings and any other waste to be left on site. The standards set out in Minerals Policy MPOL007 must be used for the planning, design and assessment of tailings generation and management relating to cover systems, rehabilitation, and closure	S.4.10.2. Rehabilitation strategies
TOR – 2.7	**Supporting surface infrastructure**	
TOR – 2.7.1	**Access and Roads**	
	Describe:	
	• access route to the proposed operations and show on a map (as per 5.1.2.1 and 5.1.2.6);	S.4.8.2. Site Access and Haul Road Figure 4-59: Haul and access road general layout – Crocker Road to ML
	• indicate if any new roads are to be constructed, or if existing roads or intersections (public and private) are to be upgraded;	S.4.8.2. Site Access and Haul Road and S.1.8.2. Barrier Highway intersection upgrade
	• transport system(s) used to and from the proposed operations and the estimated number of vehicle movements per day; and	S.4.8.2. Site access and haul road Table 4-43: HR estimated daily vehicle movements
	• airport/airstrips to be constructed	S.4.8.1. Air access
TOR – 2.7.2	**Accommodation and Offices**	
	Describe onsite personnel accommodation and offices, including (but not limited to):	S.4.8.5.1. Accommodation camp
	• number, area, size, type of construction and location of accommodation, office, meals or laboratory buildings, caravans or camp, and associated structures to be used on site; and	S.4.8.5. ML accommodation, offices and other non-process infrastructure Table 4-44: Living quarters by type and supporting infrastructure Figure 4-66: Proposed accommodation camp layout Table 4-45: Non-Processing Infrastructure Area – proposed NPI Figure 4-67: Non-Processing Infrastructure Area – proposed general arrangement

Frame work	Requirement	Section included
	• if temporary or permanent.	S.4.8.5. ML accommodation, offices and other non-process infrastructure
TOR – 2.7.3	**Public and Private Services and Utilities Used by the Operation**	
	Describe:	
	• sources of services or utilities that are, or are to be supplied to the proposed site, including but not limited to power, water, telecommunications;	S.4.8.6. Public and Private Services and Utilities
	• if new connections to services and utilities are required, the proposed routes for connection; and	S.4.8.6. Public and Private Services and Utilities
	• the effects to any existing services or utilities that have been or may be affected by the proposed operations	S.4.8.6. Public and Private Services and Utilities
TOR – 2.7.4	**Visual Screening**	
	Describe the type of screening, including existing or proposed vegetation (i.e. species and density of plantings) and show on a map (as per 5.1.2.1).	S.4.8.7. Visual Screening
TOR – 2.7.5	**Fuel and chemical storage**	
	For all fuels and chemicals proposed to be stored on site show the proposed location of storage on a map (as per 5.1.2.1) and provide detail on:	S.4.8.8. Fuel and bulk chemical storage facilities
	• types of bulk chemicals and the volumes of each; and	S.4.8.8. Fuel and bulk chemical storage facilities
	• proposed storage, bunding and containment for all chemical and fuel storage vessels	S.4.8.8. Fuel and bulk chemical storage facilities
TOR – 2.7.6	**Site security**	
	Describe and show on a map (as per 5.1.2.1) infrastructure and measures that will be adopted to prevent unauthorised access by the public, including but not limited to:	S.4.8.9. Site security
	• fencing; and	S.4.8.9. Site security Figure 4-71: Location of existing and new fencing, ML
	• signage.	S.4.8.9. Site security Figure 4-61: Conceptual intersection configuration, HR and Crocker Road Figure 4-62: Conceptual intersection configuration, HR and Sawers Road
TOR – 2.7.7	**Erosion, Sediment and Silt Control**	
	Describe and show on a plan (as per 5.1.2.1):	
	• location and design of silt management structures;	S.4.8.10. Run-off, erosion, sediment and silt control
	• management and disposal of silt;	S.4.8.10. Run-off, erosion, sediment and silt control
	• strategies to control runoff on disturbed and rehabilitated areas;	S.4.8.10. Run-off, erosion, sediment and silt control
	• storage, diversion and release of clean water (discharge water must comply with the current Environment Protection (Water Quality) Policy; and	S.4.8.10. Run-off, erosion, sediment and silt control
	• a whole of site stormwater balance, if not included in the water balance in clause 2.5.4	N/A

Frame work	Requirement	Section included
TOR – 2.7.8	**Rehabilitation Strategies and Timing**	
	Detail all activities, strategies and designs relating to mine closure for rehabilitation of supporting surface infrastructure. Provide details for timing of closure activities, including all opportunities for progressive rehabilitation	S.4.8.11. Rehabilitation strategies and timing S.4.10. Completion
TOR – 2.8	**Vegetation Clearance**	
TOR – 2.8.1	**Description of Vegetation Clearance**	
	If clearing of native vegetation is proposed, a map (as per 5.1.2.2) and description of the vegetation present in the application area must be provided, showing:	S.4.9. Vegetation clearance
	• the extent of any proposed vegetation clearance; and	S.7.3. Flora fauna and native vegetation
	• the likelihood of the presence of threatened flora.	S.7.3. Flora fauna and native vegetation
	State the estimated quantum of State significant environmental benefit (SEB) to be gained in exchange for the proposed clearance and describe how the SEB will be provided.	S.4.9.2. Significant Environmental Benefit (SEB)
	Should the applicant's assessment determine that a residual impact to MNES remains likely after the implementation of mitigation measures, provide information to demonstrate how the EPBC Act environmental offsets policy has been complied with.	Chapter 8: Matters of National Environmental Significance
TOR – 2.9	**Completion**	
TOR – 2.9.1	**Description of Site at Completion**	
	Provide a description, plans and cross sections (as per 5.1.2.7 and 5.2.2.2) of the site as it will be at completion after all rehabilitation and closure activities have been completed, including:	S.4.10.1. Description of site at completion
	• potential land use options;	S.4.10.4. Post-mining land uses
	• landforms;	S.4.10.5. Final landforms Figures 4-76: Iron Peak cross-section, north-south position to Figure 4-86: Post closure surface water systems, ML and RS showing post closure landforms
	• proposed vegetation covers (including native vegetation that will not be disturbed due to proposed operations);	S.4.10.6.2. Proposed vegetation covers
	• natural contours of land not to be disturbed by proposed operations;	Figure 4-73: Indicative post-closure/relinquishment condition, ML
	• any infrastructure that will remain on site and will become the responsibility of the landowner;	S.4.10.6.1. Infrastructure to remain
	• location, description and management of waste disposal areas;	S.4.10.5.2. Waste rock landforms S.4.10.5.3. Tailings storage facility
	• location of reshaped and rehabilitated areas showing proposed surface contours and revegetation; mine voids;	S.4.10.5.1. Final voids
	• location of stored and/or exposed PAF material and/or other hazardous materials;	S.4.10.6.3. Residual hazardous materials matters
	• expected final groundwater level and pit level water and time to reach this level, and water quality of mine voids;	Appendix C2: Groundwater impact assessment
	• location of surface water infrastructure including ponds and diversions; and representative plans and cross-sections (as per 5.1.2.7 and 5.2.2.2) that show:	S.4.10.6.4. Surface water management

Frame work	Requirement	Section included
	○ pre-mining natural surface;	Figure 4-73: Indicative post-closure/relinquishment condition, ML
	○ emplacement areas, waste disposal areas and disturbed areas; final rehabilitated surface;	Figure 4-73: Indicative post-closure/relinquishment condition, ML
	○ where relevant, predicted final groundwater elevations; and interpreted geology including all rock types.	Figure 4-73: Indicative post-closure/relinquishment condition, ML
	Provide a description of the proposed mechanism for transferring responsibility for any potential residual liability (i.e. ongoing maintenance or monitoring) subsequent to surrender of the tenement	S.4.10.6.5. Transfer of residual liabilities subsequent to tenement surrender
TOR – 2.10	**Resource inputs**	
TOR – 2.10.1	**Workforce and local procurement**	
	For the proposed workforce (for all operations including mining, processing, waste management and supporting surface infrastructure) describe:	S.4.11.1. Workforce and local procurement
	• how operations on the site will be managed	S.4.11.1. Workforce and Local Procurement
	• number and workforce breakdown by job type;	Table 4-56: Indicative workforce breakdown by role type
	• number of full-time employee positions that would be directly created by the proposal (not to include existing positions);	S.4.11.1.1. Workforce operation and job creation
	• the proportion of the workforce that would reside in the local community and the estimated impact on local employment;	S.4.11.1.1. Workforce operation and job creation
	• any programs to target and assist Aboriginal or local employment at the quarry;	S.4.11.1.3. Employment pathways and training
	• training to be provided to employees and potential employees;	S.4.11.1.3. Employment pathways and training
	• approximate timelines for creation of the positions; and	S.4.11.1.3. Employment pathways and training
	• potential for local business participation, and procurement of local goods and services.	S.4.11.1.4. Local business participation and procurement
TOR – 2.10.2	**Energy Sources**	
	For the proposed energy sources and usage provide:	S.4.11.2. Energy Sources
	• estimates of total annual energy usage (from all sources, including personnel transport and ore transport to point of sale);	Table 4-58: Estimated grid-based electricity consumption during operations Table 4-59: Estimated diesel fuel consumption
	• expected sources of energy;	S.4.11.2. Energy Sources
	• potential for efficiency gains;	S.4.11.2. Energy Sources
	• amount and percentage of zero emission energy to be utilised;	
	• equivalent annual CO2 generated; and	Table 4-60: Estimated carbon emissions over the LOM
	• any carbon offsets proposed	S.4.11.2. Energy Sources

Frame work	Requirement	Section included
TOR – 2.10.3	**Water Sources**	
	Provide details on the source(s) of water to be used at the mine, expected usage and any discharge, including:	S.4.11.3. Water sources
	• expected annual water usage by source;	Table 4-61: Water supply use, recycling and fate
	• indicate if any water usage by source will be more than 5% of the total annual water withdrawal for that source;	Table 4-61: Water supply use, recycling and fate
	• percentage of water that will be recycled; and	Table 4-61: Water supply use, recycling and fate
	• water discharge by quality and destination	Table 4-61: Water supply use, recycling and fate
TOR – 3	**Consultation**	
	In setting out the result of the consultation undertaken in connection with the proposed operations in accordance with section 36(1)(c)(iv) of the Mining Act 1971 and regulation 47 of the Mining Regulations 2020, the Minister determines in accordance with regulation 46(7)(e) of the Mining Regulations 2020 that a proposal must include a description of:	Chapter 5: Stakeholder engagement
	• the process undertaken for identifying stakeholders with an interest in, or stakeholders likely to be directly affected by the proposed operation;	S.5.2.1. Stakeholders S.5.4.1. Targeted engagement
	• the process undertaken for the delivery of information to, gathering of feedback from, and responding to those identified stakeholders;	S.5.4. Engagement activities
	• if any individual or group of similar affected persons were not able to be consulted, what steps were taken to consult with them; and	S.5.4.6. Publication of engagement activities
	• the extent to which the outcomes proposed in clause 4.2.2 have been developed in consultation with the landowner and any other person who may be directly affected by the proposed mine operations.	S.5.6.2. Engagement outcomes
	The results of the consultation undertaken with those identified stakeholders, including:	S.5.6. Results of engagement
	• the persons consulted;	S.5.6.1. Engagement results by stakeholder group
	• any concerns/issues raised; and	S.5.6.1. Engagement results by stakeholder group Table 5-5: Summary of stakeholder and community engagement responses – social and economic Table 5-6: Summary of stakeholder and community engagement responses – environmental Table 5-7: Summary of stakeholder and community engagement responses – cultural Table 7-1: Context and views of affected parties
	• the response and steps (if any) taken or proposed to address those concerns	S.5.6.2. Engagement outcomes Table 5-5: Summary of stakeholder and community engagement responses – social and economic Table 5-6: Summary of stakeholder and community engagement responses – environmental Table 5-7: Summary of stakeholder and community engagement responses – cultural

Frame work	Requirement	Section included
TOR 4	**Management of Environmental Impacts**	
TOR – 4.1	**Assessment of Environmental Impacts**	
	In setting out an assessment of the environmental impacts of the proposed authorised operations in accordance with section 36(1)(c)(ii)(A) of the Mining Act 1971 and regulation 46(2) of the Mining Regulations 2020, the Minister determines in accordance with regulation 46(7)(e) of the Mining Regulations 2020 that a proposal must include an assessment of the environment as set out in this Terms of Reference	Chapter 6: Impact assessment framework & Chapter 7: Assessment of environmental and social effects and impacts
TOR – 4.1.1	**Elements of the environment**	
	Describe the specific elements of the environment (the environment is defined in Section 6(4) of the Mining Act 1971) that may reasonably be expected to be impacted by the proposed operation during construction, operation, and indefinitely post completion.	Chapter 7: Assessment of environmental and social effects and impacts
	For MNES where it has been determined that there is the potential for significant impacts to those matters, address those specific MNES environmental elements in the requirements below.	Chapter 8: Matters of National Environmental Significance
	For each element of the environment identified:	
	• provide a summary of any issues or considerations raised by stakeholders, and any relevant legislated or recognised standards (for MNES summarise relevant National Environmental Standards) in relation to the element of the environment;	S.7.1. View of affected parties. Table 7-1: Context and views of affected parties
	• describe all potential environmental receptors; and	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• undertake an impact assessment of how the element could be potentially impacted by proposed operations (during construction, operation and post completion) through the provision of the information listed in the following clause 4.1.2.	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.1.2	**Potential Impact Events**	
	Describe potential impact events associated with each phase of the proposed operations (construction, operation and post completion) and relevant to each element of the environment. For the purpose of the impact assessment, a potential impact event is the combination of a source, a pathway and an environmental receptor. The source, pathway and environmental receptor of each potential impact event must be described prior to the implementation of engineering or administrative control measures. For each potential impact event identified in clause 4.1.2, provide:	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.1.2.1	**Source**	
	A description of the source of the potential impact event which alone or in combination has the potential to cause harm to an environmental receptor	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.1.2.2	**Pathway**	
	A description of the potential pathway, means or route (with consideration of any natural barriers) by which an identified environmental receptor can be exposed to, or may reasonably be expected to be impacted by an identified source.	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social

Frame work	Requirement	Section included
TOR – 4.1.2.3	**Environmental Receptor**	
	A description of the environmental receptors that may reasonably be expected to be adversely impacted by the source, taking into account the considerations for the element of the environment described under 4.1.1.	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.1.2.4	**Description of Uncertainty**	
	Describe any significant degree of uncertainty pertaining to the evaluation of sources, pathways and environmental receptors, including (but not limited to) lack of site-specific information, limitations on modelling and quality of data. Describe any assumptions connected with the identified uncertainty. So far as is relevant, identify the sensitivity to change of any assumption that has been made, including whether a change in assumption may result in a new environmental impact.	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR– 4.1.2.5	**Confirmation of Impact Events**	
	For each potential impact event (including for MNES) provide:	
	• an analysis of whether a source, pathway and receptor does exist (and if not, or if it remains uncertain, provide an explanation for the conclusion); and	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• a description of the likely impact from the source on the environmental receptor	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.2	**Control and Management Strategies, Uncertainty Assessment, Statement of Environmental Outcomes and Criteria**	
	For each impact event confirmed in clause 4.1.2.5, the information listed in clauses 4.2.1-4.2.4 must be provided	
TOR – 4.2.1	**Control and Management Strategies**	
	In setting out an outline of the measures that the applicant intends to take to manage, limit or remedy environmental impacts as confirmed in clause 4.1.2.5 in accordance with section 36(1)(c)(ii)(B) of the Mining Act 1971 and regulation 46(3) of the Mining Regulations 2020, the Minister determines in accordance with regulation 46(7)(e) of the Mining Regulations 2020 that a proposal must:	
	• Include a description of the strategies proposed to manage, limit or remedy each impact event (for impact events relating specifically to MNES, apply the avoid, mitigate and offset hierarchy);	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• Demonstrate that the control and management strategies proposed are commensurate with the potential impacts, achieve compliance with other applicable statutory requirements (including National Environmental Standards for MNES) and promote progressive rehabilitation;	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• Include a description of any significant degree of uncertainty pertaining to the likely effectiveness of proposed control and management strategies, including (but not limited to) lack of site specific information, limitations on modelling and quality of data;	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• Include a description of any assumptions connected with the identified uncertainty; and	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social

Frame work	Requirement	Section included
	• So far as is relevant, identify the sensitivity to change of any assumption that has been made and assess the likelihood of an outcome not being achieved if an assumption is later found to be incorrect	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.2.2	**Statement of Proposed Environmental Outcomes**	
	Statements of the environmental outcomes that are expected to occur are required in accordance with section 36(1)(c)(ii)(C) of the Mining Act 1971 and regulation 46(4) of the Mining Regulations 2020 and must be made for each impact event confirmed in clause 4.1.2.5. The Minister determines in accordance with regulation 46(7)(e) of the Mining Regulations 2020 that a proposal must:	
	• Provide a statement of the proposed environmental outcome(s) (including for MNES and completion outcomes assessed on a long term basis) for each impact event confirmed in clause 4.1.2.5.	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• Ensure that the statement of environmental outcome(s) describe the likely consequence of the expected impact on the environment by the proposed mine operations subsequent to the implementation of the control measures described in clause 4.2.1.	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• Provide a statement that demonstrates the environmental outcomes would be able to be achieved taking into consideration the effectiveness of the control strategies (clause 4.2.1) and description of uncertainty (clause 4.2.2).	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.2.3	**Draft Measurement Criteria**	
	In preparing a draft statement of the criteria to be adopted to measure each of the proposed environmental outcomes in accordance with section 36(1)(c)(iii) of the Mining Act 1971 and regulation 46(5) of the Mining Regulations 2020, the Minister determines in accordance with regulation 46(7)(e) of the Mining Regulations 2020 that the draft criteria must:	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• as far as practical comply with the five elements set out in regulation 46(5) of the Mining Regulations 2020;	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• include demonstration of the successful implementation for the State significant environmental benefit, if native vegetation is proposed to be cleared and an on-ground off-set proposed in accordance with the Native Vegetation Act;	S.4.9.2. Significant Environmental Benefit
	• Should the applicant's assessment determine that a residual impact to MNES remains likely after the implementation of mitigation measures, include demonstrate of how the EPBC Act environmental offsets policy has been complied with;	N/A
	• be developed separately for construction, operation and completion, as appropriate; and	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
	• where appropriate, recognised industry standards (including National Environmental Standards for MNES), codes of practice or legislative provisions from other Acts should be used as criteria	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social
TOR – 4.2.4	**Draft Leading Indicator Criteria**	
	Where there is a high level of reliance on control measures strategies to achieve an environmental outcome, provide a draft statement of leading indicator criteria that will be used to give an early warning that a control measure strategy may fail or be failing	S.7.2. Heritage (Aboriginal, European and geological) to S.7.13. Social

Frame work	Requirement	Section included
TOR – 5	**Maps, Plans and Cross Sections**	
	In preparing a proposal in accordance with section 36(1)(c) of the Mining Act 1971 and regulation 46 of the Mining Regulations 2020, the Minister determines in accordance with regulation 46(7)(e) of the Mining Regulations 2020 that all maps and plans must comply with the following requirements relating to the amount of detail or information to be provided:	
	• state and show the relevant datum (Australian Height Datum (AHD) is preferred);	
	• metric units;	
	• title, north arrow, scale bar, text and legend;	
	• date prepared and author;	
	• be of appropriate resolution and scale for represented information; and	
	• be legible in both the hardcopy and electronic versions of the submission.	
	All cross-sections must conform to the following standards:	
	• state and show the relevant datum (Australian Height Datum (AHD) is preferred);	
	• metric units;	
	• title, scale bar, text and legend;	
	• date prepared and author;	
	• be of appropriate resolution and scale for represented information; and	
	• be legible in both the hardcopy and electronic versions of the submission; and	
	• be accompanied by a map showing the orientation of the cross-sections.	
TOR - 5.1	**List of Maps**	
TOR - 5.1.1	**Maps required for Description of the Existing Environment**	
TOR – 5.1.1.1	**Topographic Map showing:**	
	• application area boundaries;	Figure 1-1: Project area and locality
	• existing surface contours	Figure 3-5: Regional topography
	• existing vegetation;	Figure 3-61: Native vegetation associations
	• location of watercourses, including ephemeral and permanent rivers, creeks, swamps, streams, wetlands and any man-made water management structures;	Figure 3-51: Major and minor watercourses and natural surface water features Figure 1-7: Exempt land (man-made water management structures) Figure 3-60: Location of identified pastoral dams within the study area

Frame work	Requirement	Section included
	• surface water catchment boundaries	Figure 3-50: Regional catchments and major natural surface water features
	• direction of drainage and discharge from the application area;	Figure 3-36: Modelled groundwater contours and interpreted flow paths
	• location and extent of all previously disturbed areas associated with previous mining;	Figure 3-76: Location of adit, Razorback Ridge Figure 3-78: Location of drilling activities undertaken within the site by MGT and others
	• location and extent of any known existing contamination; and	NA - No known sites of contamination exist in the Project Area
	• location and extent of any adjacent conservation reserves, heritage sites (in so far as may be permitted by the relevant legislation) or any other significant areas.	Figure 1-8: Proximity to protected areas Figure 3-75: Historical Heritage Places
TOR – 5.1.1.2	**Local Geological Map showing:**	
	• application area boundaries;	Figure 3-32: Major aquifer extents and hydrogeological framework for the groundwater Study Area
	• geology within the application area, including but not limited to location, dimensions and orientation (dip and strike), and extent of the mineral resource and ore reserve;	Figures 3-21: Iron Peak deposit, Iron Peak pit - Geological cross-Section looking east (m) to Figure 3-25: Razorback Deposit, West pit - Geological cross-Section looking east (m)
	• topsoil/subsoil variation if there is a variation in soils over the application area; and	Figure 3-13: Dominant SA soil subgroups intersection Project Area
	• natural geohazards in the application area.	Figure 3-30: NSHA18 hazard map showing Project Area and proposed pit locations
TOR – 5.1.1.3	**Aquifer Potentiometric Surface Map(s) showing:**	
	• application area boundaries;	Figure 3-35: Potentiometric surface map for the fractured rock aquifer(s) within the Study Area with inferred flow directions
	• potentiometric surface contours/groundwater elevation contours and the time (or time period) the contours relate to;	Figure 3-35: Potentiometric surface map for the fractured rock aquifer(s) within the Study Area with inferred flow directions
	• interpreted direction(s) of groundwater flow; and	Figure 3-35: Potentiometric surface map for the fractured rock aquifer(s) within the Study Area with inferred flow directions
	• location of representative bores (where measurements were obtained of which the contours are based on) used to establish this information	Figure 3-34: Registered bores with groundwater level data and indicative groundwater flow paths Figure 3-37: Location of bores used for baseline monitoring
TOR – 5.1.1.4	**Land Access Map showing:**	
	• application area boundaries;	Figure 1-6: Land tenure

Frame work	Requirement	Section included
	• cadastral information for the Tenement (including land title(s) and ownership);	Figure 1-6: Land tenure
	• any exempt land;	Figure 1-7: Exempt land
	• location of residences within and near the application area; and	Figure 1-7: Exempt land Figure 3-64: Residences in proximity to project area
	• human infrastructure.	Figure 1-7: Exempt land Figure 3-64: Residences in proximity to project area
TOR – 5.1.1.5	**Caves Map showing:**	
	• application area boundaries; and	Figure 3-76: Location of adit, Razorback Ridge
	• location of the cave(s).	Figure 3-76: Location of adit, Razorback Ridge
TOR - 5.1.2	**Map(s) and Plan(s) required for Description of Proposed Mine Operations**	
TOR – 5.1.2.1	**Site layout map showing all components of the proposed mining operation including (but not limited to):**	
	• application area boundaries;	Figure 4-2: Project layout including activities within proposed MPLs
	• location of surface water and sediment management infrastructure;	Figure 4-2: Project layout including activities within proposed MPLs
	• location of process water dams;	Figure 4-2: Project layout including activities within proposed MPLs Figure 4-37: Process plant and non-process infrastructure layout
	• location of fuel and chemical storage areas;	Figure 4-37: Process plant and non-process infrastructure layout
	• location of haul/access roads;	Figure 4-2: Project layout including activities within proposed MPLs
	• location of fixed plant;	Figure 4-37: Process plant and non-process infrastructure layout
	• location of mobile plant for stage 1 of mining;	N/A
	• location of visual screening measures;	N/A
	• location of fencing;	Figure 4-71: Location of existing and new fencing ML
	• location and extent of topsoil/subsoil and product stockpiles.	Figure 4-13: Proposed Mining Lease indicative vegetation and soil stockpile area
	• location and extent of all areas proposed to be disturbed from mining including waste rock, silt/slime dams, mine infrastructure, processing plant, process water ponds, waste disposal facilities; and	Figure 4-2: Project layout including activities within proposed MPLs
	• location and extent of open pit(s) and/or underground workings.	Figure 4-2: Project layout including activities within proposed MPLs
	• location of key environmental features that are within or in close proximity to the Tenement and that are relevant to the design of the Site Layout Plan, including but not limited to housing and infrastructure, existing heritage sites, existing ephemeral and permanent rivers, watercourses, creeks or dams and/or existing native vegetation	Figure 1-7: Exempt land Figure 3-64: Residences in proximity to project area Figure 1-8: Proximity to protected areas Figure 3-75: Historical heritage places Figure 3-51: Major and minor watercourses and natural surface water features Figure 3-61: Native vegetation associations

Frame work	Requirement	Section included
TOR – 5.1.2.2	**Sequence of mining and progressive rehabilitation map showing:**	
	• application area boundaries;	All maps
	• staging of each progressive mining stage;	Figure 4-17: Design – Iron Peak – Stage 1 to Figure 4-34: Design – Razorback Consolidated – Stage 14, sequential design drawings Razorback and Iron Pit
	• proposed native vegetation clearance;	Figure 1-2: Project components Figure 3-61: Native vegetation associations
	• location and applicable buffer zones for protection of native vegetation that will not be cleared; and	Figure 1-2: Project components Figure 3-61: Native vegetation associations
	• conceptual staging of each progressive rehabilitation stage.	Figure 4-35: Conceptual site rehabilitation sequence
TOR – 5.1.2.3	**Crushing, grinding and processing plant plan showing:**	
	• application area boundaries	Figure 4-37: Process plant and non-process infrastructure layout
	• layout of crushing, grinding and processing plant(s) and ancillary plant and infrastructure; and	Figure 4-37: Process plant and non-process infrastructure layout
	• if required; including lining and drainage systems.	Figure 4-37: Process plant and non-process infrastructure layout
TOR – 5.1.2.4	**Tailings Storage Facility (TSF) plan showing:**	
	• application area boundaries	All maps
	• conceptual drawings and plans for design, construction, operation and completion of all facilities;	Figure 4-52: Proposed TSF ultimate configuration Figure 4-53: Proposed TSF starter configuration
	• size, shape, height and method of construction; and	Figure 4-52: Proposed TSF ultimate configuration Figure 4-53: Proposed TSF starter configuration
	• location of any waste material deemed to be hazardous including potentially acid forming material.	N/A
TOR – 5.1.2.5	**Access route map showing:**	
	• application area boundaries	Figure 3-66: Key access routes associated with the Project
	• access route for heavy vehicles;	Figure 3-66: Key access routes associated with the Project Figure 3-68: Existing 36.5m road train network
	• exit route for heavy vehicles; and	Figure 3-66: Key access routes associated with the Project Figure 3-68: Existing 36.5m Road Train (HML) network within the study area locality
	• any road upgrades or new roads to be constructed.	N/A
TOR – 5.1.2.6	**Completion map showing:**	
	• application area boundaries	Figure 4-73: Indicative post closure / relinquishment condition, ML

Frame work	Requirement	Section included
	• conceptual final landforms (including rehabilitated and non-disturbed areas);	Figure 4-73: Indicative post closure / relinquishment condition, ML
	• proposed topographical contours of the entire site (including rehabilitated and non-disturbed areas);	Figure 4-73: Indicative post closure / relinquishment condition, ML
	• backfilled and remaining underground workings;	Figure 4-73: Indicative post closure / relinquishment condition, ML
	• location of waste disposal areas (including waste rock dumps, tailings storage facilities and PAF encapsulation); and	Figure 4-73: Indicative post closure / relinquishment condition, ML
	• interpreted geology including all rock types	Figure 4-73: Indicative post closure / relinquishment condition, ML
TOR – 5.2	**Summary of Cross-Sections and Long Sections**	
	Following is a summary of all cross-sections and long sections required in the proposal:	
TOR – 5.2.1	**Cross-sections required for description of the existing environment**	
TOR – 5.2.1.1	**Long section and geological cross-section(s) showing:**	
	• a representation of the geological profile within the application area; and	Figure 3-21: Iron Peak deposit, Iron Peak pit - Geological cross-Section looking east (m) to Figure 3-25: Razorback Deposit, West pit - Geological cross-Section looking east (m), geological cross sections
	• depth of the resource and any overlying overburden.	Figure 3-21: Iron Peak deposit, Iron Peak pit - Geological cross-Section looking east (m) to Figure 3-25: Razorback Deposit, West pit - Geological cross-Section looking east (m), geological cross sections
TOR – 5.2.1.2	**Hydrogeological cross-section(s) showing:**	
	Include a series of hydrogeological cross-sections that represent the following at a regional scale and/or tenement application scale, as specified:	
	• mineral claim boundaries;	Figure 3-48: Conceptual hydrogeological cross - section for groundwater study area
	• major geological units (regional scale);	Figure 3-48: Conceptual hydrogeological cross - section for groundwater study area
	• geological units showing aquifer and confining units (tenement scale)	Figure 3:32: Major aquifer extents and hydrogeological framework for the groundwater study area
	• aquifer systems (regional and tenement scale) including any palaeochannels;	Figure 3:32: Major aquifer extents and hydrogeological framework for the groundwater study area
	• interpreted hydrostratigraphy showing the known and inferred groundwater heads/groundwater elevations, interpreted groundwater flow direction, recharge and discharge mechanisms (if applicable);	Appendix C2: Groundwater Impact Assessment Figure 3-34: Registered bores with groundwater level data and indicative groundwater flow paths Figure 3-35: Potentiometric surface maps for the fractured rock aquifers within the study area with inferred flow directions Figure 3-36: Modelled groundwater contours and interpreted flow paths

Frame work	Requirement	Section included
	• location of GDEs; and other groundwater dependent receptors and users	Figure 3-46: Potential aquatic GDEs as identified by the BoM GDE Atlas Figure 3-47: Distribution of recorded stygofauna taxa
	• interpreted faults (regional and tenement scale);	Appendix A7: Geological mapping
	• mineralised zone (tenement scale);	Figure 3-20: Resource extension potential with MGT 38-metre Depth Slice Magnetic Inversion Model
	• location of representative drill log sites from which geological information was obtained (regional and tenement scale); and.	Figure 3:26: Location of drillholes used for Resource assessment
	• location of representative monitoring bores from which baseline groundwater information was obtained	Figure 3-37: Location of bores used for baseline monitoring
TOR – 5.2.2	**Cross-sections required for description of operations**	
TOR – 5.2.2.1	**Mining Operation cross-section(s) showing:**	
	• pre-mining natural surface;	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)
	• proposed pit depth;	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)
	• proposed pit dimensions (length and width);	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)
	• proposed pit batters and benches;	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)
	• location of underground shafts and stopes; and	N/A
	• stages of operation.	N/A
	• proposed pit depth;	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)
TOR – 5.2.2.2	**Completion cross-section(s) showing:**	
	• pre mining natural surface;	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)
	• proposed conceptual rehabilitated final batters and benches;	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)
	• predicted final groundwater elevations; and	Appendix M: Razorback Iron Ore Project completion cross-section
	• proposed conceptual final rehabilitated surface.	Figures 4-76: Iron Peak pit cross-Section, north-south position to Figure 4-80: Razorback pit cross-Section, east-west position (eastern sector)

Frame work	Requirement	Section included
TOR – 6	**Reasonable Prospect of Access to Land**	
	In preparing a statement under regulation 30(1)(e)(i) of the Mining Regulations 2020 that demonstrates that there is a reasonable prospect that the land in respect of which an ML is sought could be effectively and efficiently mined, the Minister determines in accordance with regulation 30(2) of the Mining Regulations 2020 that this statement must be supported by the following evidence:	S.1.7. Reasonable prospect of access to land
	• A description of any waivers of exemption obtained, and/or information on the status of waivers of exemption yet to be negotiated/finalised under Section 9AA of the Mining Act 1971; and	S.1.7. Reasonable prospect of access to land Table 1-11: Status of land access negotiations by access stage, private landowners
	• A description of any native title mining agreements obtained under the Mining Act 1971 or Aboriginal Land Use Agreements (ILUA) under the Native Act 1993 (Cth).	S.1.7.4. Native title matters
TOR – 7	**Description of contributions to the Economy**	
	For the purposes of regulation 30(1)(g) of the Mining Regulations 2020, the Minister determines that the following information must accompany an application for an ML: Describe:	Chapter 9: Description of potential benefits and contribution to the economy
	• goods and services used in the local community, state and external to state;	S.9.2.2. Goods and services Table 9-2: Construction cost expenditure
	• wages and other employee benefits;	S.9.2.3. Wages
	• economic benefits derived from local employment;	S.9.2.3.1. Estimate of impact of local area wages
	• approximate royalty payments and other direct state government taxes; and	S.9.2.4. Taxation and royalties
	• any other potential economic contributions proposed during the development of the mine, operation of the proposed mine and post completion.	S.9.3. Job creation & S.9.4. Community investment
TOR – 8	**Reserves or Resources (or Both)**	
	Provide: • a JORC compliant reserve or resource estimate (or both); and	Appendix A3: JORC reserve statement (90 years) Appendix A4: JORC reserve statement (56 years)
	• the accompanying JORC Public Report and competent person statement;	S.4.3.1. Ore reserves and mineral resources
	or (if a JORC compliant reserve or resource (or both) has not been reported)	N/A
	• a detailed estimate of the resource to be mined, the basis of this estimate, and evidence that demonstrates that the resource can be economically mined at current market prices	N/A

Additional requirements in site-specific TOR resulting from accredited assessment under EPBC Act.

Frame work	Requirement	Section included
TOR – 9	**Background and description of the EPBC Act action and MNES**	
	The Proposal must include how the action relates to any other actions (or which the proponent should reasonably be aware) that have been, or are being, taken or that have been approved in the region affected by the action. The Proposal must also provide details on the current status of the action as well as the consequences of not proceeding with the action.	S.8.1: Project background S.8.2 MNES values of the Project Area S.8.7: Cumulative impacts S.8.4.3.1: Alternatives take no action
TOR 10	**Impacts**	
	The Proposal must provide an assessment including potential impacts (including direct, indirect, consequential and cumulative impacts) that may occur as a result of all elements and project phases of the proposed action on the protected matter	S.8.5: Potential direct impacts to TEC S.8.6: Potential indirect impacts to TEC S.8.7: Cumulative impacts
	Consideration of impacts must not be confined to the immediate areas surrounding the proposed actions, but must also consider the potential of the proposed action to impact on adjacent areas that are likely to contain protected matters. For each protected matter, this must include, but not be limited to an assessment of:	
	• the direct and indirect loss and / or disturbance of habitat from the proposed action. This must include the quality of habitat and total area in hectares (and number of individuals, if available and applicable), and the area of potential habitat for the species and communities likely to be impacted;	S.8.5: Potential direct impacts to TEC S.8.6: Potential indirect impacts to TEC
	• An impact assessment for the Mallee Bird Community of the Murray Darling Depression Bioregion (MBCMDDB) for the preferred haul road route of the proposed action;	S.8.8: Significant residual impact assessment
	• Details on whether any impacts are likely to be unknown, unpredictable or irreversible or sub-lethal (reversible over time) and what confidence is placed on the predictions or relevant impacts;	S.8.8.4: Certainty of impacts
	• An analysis of the acceptability of the relevant impacts	S.8.8.5: Acceptability of impacts
	• Any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	S.8.1: Background
	• A local and regional scale analysis of the likely impacts. This should include a discussion of connectivity, potential cumulative impacts and information on the long-term viability of the protected matter within the surrounding Interim Biogeographic Regionalisation for Australia (IBRA) regions.	S.8.8.3: regional scale analysis of impacts
	All discussions and conclusions drawn regarding the assessment of direct or indirect impacts from the proposed action should include a full justification based on the best information available. The discussion of impacts must incorporate relevant conservation advices, recovery plans and threat abatement plans, if applicable. If these are not applicable, a brief statement to this effect must be included.	S8.1: Background

Frame work	Requirement	Section included
TOR 11	Avoidance, alternatives, mitigation and safeguards	
	The Proposal must provide information on specific measures proposed to avoid, mitigate and manage the impacts to the relevant protected matters from the proposed action. A description of proposed avoidance, management and mitigation measures relation to MNES should be presented in the form of management plans or suitable alternative. The discussion must incorporate conservation advices, recovery plans and threat abatement plans, where relevant. Specific measures should be presented in a detailed management plan for the protected matter likely to be impacted by the proposed action. To assist you, the Department of Climate Change, Energy, the Environment and Water's (DCCEEW) Environmental Management Plan Guidelines are available at www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines. Documentation should clearly set out the following measures for each environmental issue and protected matter likely to be impacted by the proposed action. Measure including, but not limited to, the following items must be outlined in the documentation to:	
	• Address all phases of the proposed action;	S8.4: Avoidance, minimisation and alternatives
	• Provide a full avoidance and mitigation analysis of all haul road options including all reasoning and justification for selecting the preferred option	S8.4.3.2: Iron Peak haul road options analysis
	• Details of any redesign of the preferred haul road options and subsequent impact assessments that will outline how any impacted patches of the MBCMDDB will / will not meet the criteria to retain their status as a protected threatened ecological community under the EPBC Act	S8.4.3.2: Iron Peak haul road options analysis
	• State the environmental and conservation objectives, performance criteria, monitoring, reporting, corrective action responsibility and timing for each relevant issue	S8.9: Impact assessment
	• Describe contingencies for events, such as the identification of protected matters during pre-commencement searches (e.g. translocation management protocols)	S8.9: Impact assessment
	• Include maps that illustrate the location of any exclusion zones or buffer zones and details on how these areas will be protected;	Figure 1-2: Project components S.8.4.2: minimisation
	• Provide details of ongoing research and monitoring programs to support an adaptive management approach and determine the effectiveness of the proposed mitigation measures	S8.4.4.3: Mine closure
	• Provide an assessment of the expected or predicted effectiveness of the avoidance and mitigation measures for each MNES protected matter. This includes the scale and intensity of impacts of the proposed action and the on-ground benefits to be gained through each of these measures. Where impact on a protected matter is avoided, this should be stated.	Section 8.4: avoidance, minimisation and alternatives.
	• Any statutory or policy basis for the mitigation measures	S8.4.4: mitigation
	• The cost of the mitigation measures	S8.4.4.4: Cost of mitigation
	• The name of the agency responsible for endorsing or approving each mitigation measure or monitoring program	S8.4.4.4: mitigation
	• A consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by state governments, local governments or the proponent.	Table 7-12: flora, fauna and native vegetation mitigation measures

Frame work	Requirement	Section included
	Should the applicant's assessment determine that a residual impact to MNES remains likely after the implementation of mitigation measures, provide information of the likely residual impacts to the protected matter after the proposed avoidance or mitigation measures are taken into account:	
	• Include reasons why avoidance or mitigation of impacts is not reasonably achieved	N/A
	• Identify the significant residual impacts on protected matters; and	N/A
	• Demonstrate how the EPBC Act environmental offsets policy has been considered	N/A
	The Proposal must include any feasible alternatives to the action to the extent reasonably practicable, including	
	• If relevant, the alternative of taking no action	S.8.4.3.1: Take no action
	• A comparative description of the impacts of each alternative on the triggered MNES protected by controlling provisions of Part 3 of the EPBC Act for the action; and	S.8.4.3: Alternatives
	• Sufficient detail to make clear why any alternative is preferred to another	S.8.4.3: Alternatives
	Short, medium and long-term advantages and disadvantages of the options must be discussed.	S.8.4.3: Alternatives
TOR 12	**Offsets (if required)**	
	The Proposal must include an assessment of the likelihood of residual impacts occurring, after mitigation and management measures relating to the project have been applied. This includes direct impacts such as habitat clearing and indirect impacts such as degradation of retained habitat. If residual significant impacts to protected matters are likely, the proposal must provide:	
	• details of an offset package (this may be in the form of an offset management plan) proposed to be implemented to compensate for any residual impact of the project (if relevant)	S.8.10: Offset
	• details of how the offset will compensate for the significant residual impacts upon protected matters, resulting from the action;	S.8.10: Offset
	• a description of how the offset will ensure the protection, conservation and management of protected matters for the duration of the impact;	S.8.10: Offset
	• an analysis about how the offset meets the requirements of the Department of Climate Change, Energy, the Environment and Water's (DCCEEW) Environment Protection and Biodiversity Conservation Act 1999 Offset Policy October 2012; and	S.8.10: Offset
	• The anticipated cost (financial and other) of the delivery of the offset	S.8.10: Offset
	The offset proposal should include, but not be limited to:	
	• the location, description and suitability of the proposed offset site, including baseline conditions, environmental values and connectivity with other relevant habitat;	S8.10: Offset
	• the extent to which the proposed offset actions correlate to, and adequately compensate for, the impacts of protected matters and habitat critical to the survival of protected matters;	S8.10: Offset
	• a description of the conservation gain to be achieved by the offset;	S8.10: Offset
	• information on current land tenure of any proposed offset and the method of legally securing the offset for at least the duration of the impact	S8.10: Offset

Frame work	Requirement	Section included
	• measures to protect, manage and rehabilitate the ecological community and protected matter habitat at the offset site, including timing, frequency and longevity for each measure and performance criteria that must be met;	S8.10: Offset
	• details of monitoring and reporting activities to assess the success of the offset;	S8.10: Offset
	• an assessment of the proposed offset with clear justification for each input entered	S8.10: Offset
	The analysis and information should be undertaken in accordance with DCCEEW's Offset Guide (offset calculator and justification of figures used in the calculation), which is available on DCCEEW's website.	S8.10: Offset
	The information provided should specify in detail the proposed offset and fully explain how the offset will compensate for the impacts of the proposal on MNES for the full duration of the impact. Any management plan proposed to minimize the impact to the level anticipated and deliver the offset should also be provided	S8.10: Offset
TOR 13	**Social and economic matters**	
	The information must address the economic and social impacts (both positive and negative) of the proposed action. Consideration of economic and social matters may include:	
	• details of any public consultation activities undertaken and the outcomes;	S5: Stakeholder Engagement
	• details of any consultation with indigenous stakeholders;	S5: Stakeholder Engagement
	• any monitoring programs to monitor ongoing changes to economic and social characteristics potentially affected by the proposed action;	S9: Description of Potential Benefits and Contribution to the Economy
	• projected economic costs and benefits of the project, including the basis for their estimation through cost/benefit analysis or similar studies;	S9: Description of Potential Benefits and Contribution to the Economy
	• employment opportunities expected to be generated by the project at each phase of the proposed action;	S9: Description of Potential Benefits and Contribution to the Economy
	• benefits to the local and wider community as a result of the proposed action	S9: Description of Potential Benefits and Contribution to the Economy
	Economic and social impacts should be considered at the local, regional and national levels.	S9: Description of Potential Benefits and Contribution to the Economy
TOR 14	**Ecologically sustainable development (ESD)**	
	The information must include a description of the proposed action in relation to the principles of ecologically sustainable development, as defined in the EPBC Act:	
	• the long-term and short-term economic, environmental, social and equitable considerations;	S8.12: Ecologically sustainable development
	• the precautionary principle which states that a lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation where there are threats of serious or irreversible environmental damage;	S.8.12: Ecologically sustainable development
	• the principles of inter-generational equity which states that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;	S.8.12: Ecologically sustainable development
	• the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;	S.8.12: Ecologically sustainable development

Frame work	Requirement	Section included
	• improved valuation, pricing and incentive mechanisms should be promoted	S.8.12: Ecologically sustainable development
TOR 15	**Environmental record of person(s) proposing to take the action**	
	The information provided must include details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:	
	• the person proposing to take the action; and	S.8.11: Environmental record of the person proposing to take the action
	• for an action for which a person has applied for a permit, the person making the application.	S.8.11: Environmental record of the person proposing to take the action
	If the person proposing to take the action is a corporation, details of the corporation's environmental policy and planning framework must also be included.	S.8.11: Environmental record of the person proposing to take the action
TOR 16	**MNES information sources provided in the proposal**	
	For information relating to MNES addressed in the Proposal, state:	
	• the source of the information;	S.8.14: Information sources
	• how recent the information is;	S.8.14: Information sources
	• how the reliability of the information was tested;	S.8.14: Information sources
	• what uncertainties (if any) are in the information; and	S.8.14: Information sources
	• what guidelines, plans and/or policies were considered.	S.8.14: Information sources
TOR 17	**MNES conclusion**	
	For MNES matters, provide an overall conclusion as to the environmental acceptability and sustainability of the proposal on each MNES, including:	
	• a discussion on the consideration with the requirements of the EPBC Act, including the objects of the EPBC Act,	S8.13: Conclusion
	• reasons justifying undertaking the proposal in the manner proposed, including the acceptability of the avoidance and mitigation measures;	S8.13: Conclusion
	• if relevant, a discussion of residual impacts and any offsets and compensatory measures proposed or required for significant residual impacts on MNES, and the relative degree of compensation and acceptability; and	S8.13: Conclusion
	• discussion of how impacts to the listed Threatened Ecological Community Mallee Bird Community of the Murray Darling Depression Bioregion are acceptable, when considering all proposed avoidance, mitigation and offset measures, as consistent with the following statutory documents: ○ Approved Conservation Advice for the Mallee Bird Community of the Murray Darling Depression Bioregion (DAWE, 2021) ○ Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2010)	S8.13: Conclusion